Weathermaster®
48/50P2,P3,P4,P5030-100
Single Package Large Rooftop Units with
*Comfort*Link Version 6.X Controls

Controls, Start-Up, Operation, Service and Troubleshooting

CONTENTS

	Page
SAFETY CONSIDERATIONS	2
GENERAL	3
Conventions Used in this Manual	4
BASIC CONTROL USAGE	4
***Comfort*Link Controls**	4
Scrolling Marquee	4
Accessory Navigator™ Display	4
Operation	5
System Pilot™ Interface	5
CCN Tables and Display	5
• GENERIC STATUS DISPLAY TABLE	
START-UP	7
Unit Preparation	7
Internal Wiring	7
Accessory Installation	7
Crankcase Heaters	7
Evaporator Fan	7
Controls	7
Gas Heat	7
CONTROLS QUICK START	32
Variable Air Volume Units Using Return Air Sensor or Space Temperature Sensor	32
Multi-Stage Constant Volume Units with Mechanical Thermostat	32
Multi-Stage Constant Volume Units with Space Sensor	33
Economizer Options	33
Indoor Air Quality Options	33
Exhaust Options	33
Set Clock on VFD (if installed)	34
Programming Operating Schedules	34
SERVICE TEST	35
General	35
Service Test Mode Logic	35
Independent Outputs	35
Fans	35
Actuators	35
Humidi-MiZer® System	37
Cooling	37
Heating	38
THIRD PARTY CONTROL	38
Thermostat	38
Alarm Output	38
Remote Switch	38
VFD Control	38
Supply Air Reset	38
Demand Limit Control	39
Economizer/Outdoor Air Damper Control	39
CONTROLS OPERATION	40
Modes	40
• SYSTEM MODES	
• HVAC MODES	
Unit Configuration Submenu	43
Cooling Control	45
• SETTING UP THE SYSTEM	
• MACHINE DEPENDENT CONFIGURATIONS	
• SET POINTS	
• SUPPLY AIR RESET CONFIGURATION	
• COOLING CONFIGURATION	
• COOL MODE SELECTION PROCESS	
• COOL MODE DIAGNOSTIC HELP	
• SUMZ COOLING ALGORITHM	
• DEMAND LIMIT CONTROL	
• HEAD PRESSURE CONTROL	
• ECONOMIZER INTEGRATION WITH MECHANICAL COOLING	
Heating Control	58
• SETTING UP THE SYSTEM	
• HEAT MODE SELECTION PROCESS	
• TEMPERATURE DRIVEN HEAT MODE EVALUATION	
• HEAT MODE DIAGNOSTIC HELP	
• TWO-STAGE GAS AND ELECTRIC HEAT CONTROL	
• HYDRONIC HEATING CONTROL	
• STAGED GAS HEAT CONTROL	
• MODULATING GAS HEAT CONTROL	
• SCR ELECTRIC HEAT CONTROL	
• CONTROL BOARD INFORMATION	
• RELOCATE SAT FOR HEATING-LINKAGE APPLICATIONS	
• TEMPERING MODE	
Static Pressure Control	67
• OPERATION FOR VAV	
• OPERATION FOR CV	
• SETTING UP THE SYSTEM	
• STATIC PRESSURE RESET	
• RELATED POINTS	
Fan Status Monitoring	70
• GENERAL	
• SETTING UP THE SYSTEM	
• SUPPLY FAN STATUS MONITORING LOGIC	
Dirty Filter Switch	70
Economizer	70
• ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) CONTROL	
• DIFFERENTIAL DRY BULB CUTOFF CONTROL	
• ECONOMIZER SELF-TEST	
• FAULT DETECTION DIAGNOSTIC CONFIGURATION POINTS	
• SETTING UP THE SYSTEM	
• ECONOMIZER OPERATION	
• ECONOMIZER CHANGEOVER SELECT	
• UNOCCUPIED ECONOMIZER FREE COOLING	
• OUTDOOR AIR CFM CONTROL	
• ECONOMIZER OPERATION CONFIGURATION	
• ECONOMIZER DIAGNOSTIC HELP	

CONTENTS (cont)

Page

Building Pressure Control . . . 78
- BUILDING PRESSURE CONFIGURATION
- BUILDING PRESSURE CONTROL OPERATION
- CONFIGURING THE BUILDING PRESSURE ACTUATORS TO COMMUNICATE VIA ACTUATOR SERIAL NUMBER
- CONTROL ANGLE ALARM CONFIGURATION

Smoke Control Modes . . . 81
- FIRE SMOKE INPUTS
- AIRFLOW CONTROL DURING FIRE/SMOKE MODES
- RELEVANT ITEMS

Indoor Air Quality Control . . . 82
- OPERATION
- SETTING UP THE SYSTEM
- PRE-OCCUPANCY PURGE
- OPTIONAL AIRFLOW STATION

Humidification . . . 85
- SETTING UP THE SYSTEM
- OPERATION
- CONFIGURING THE HUMIDIFIER ACTUATOR

Dehumidification and Reheat . . . 86
- SETTING UP THE SYSTEM
- OPERATION

Humidi-MiZer® Adaptive Dehumidification System . . . 88
- SET UP THE SYSTEM
- OPERATION
- HUMIDI-MIZER MODES

Temperature Compensated Start . . . 89
- SETTING UP THE SYSTEM
- TEMPERATURE COMPENSATED START LOGIC

Carrier Comfort Network® (CCN) . . . 90
Alert Limit Configuration . . . 91
Sensor Trim Configuration . . . 92
Discrete Switch Logic Configuration . . . 93
Display Configuration . . . 94
VFD Configurations . . . 94
Remote Control Switch Input . . . 96
Hot Gas Bypass . . . 96
Space Temperature Offset . . . 96
TIME CLOCK CONFIGURATION . . . 97
TROUBLESHOOTING . . . 98
Complete Unit Stoppage . . . 98
Single Circuit Stoppage . . . 98
Service Analysis . . . 98
Restart Procedure . . . 98
Humidi-MiZer® Troubleshooting . . . 98
Thermistor Troubleshooting . . . 99
Transducer Troubleshooting . . . 101
Forcing Inputs and Outputs . . . 101
Run Status Menu . . . 101
Alarms and Alerts . . . 114
MAJOR SYSTEM COMPONENTS . . . 124
General . . . 124
Factory-Installed Components . . . 124
Accessory Control Components . . . 145
SERVICE . . . 148
Service Access . . . 148
Adjustments . . . 151
Cleaning . . . 153
Lubrication . . . 154
Refrigerant Feed Components . . . 154
Thermostatic Expansion Valve (TXV) . . . 154
Refrigeration Circuits . . . 154
Gas System Adjustment (48P Only) . . . 174
Moisture/Liquid Indicator . . . 174
Filter Drier . . . 175
Liquid Line Service Valves . . . 175

Page

Protective Devices . . . 175
Temperature Relief Devices . . . 175
Control Circuit, 115 V . . . 175
Control Circuit, 24 V . . . 175
Gas Heat (48P Only) . . . 175
Compressor Removal . . . 176
Compressor Replacement . . . 176
APPENDIX A — LOCAL DISPLAY TABLES . . . 177
APPENDIX B — CCN TABLES . . . 191
APPENDIX C — UNIT STAGING TABLES . . . 211
APPENDIX D — VFD INFORMATION . . . 213
APPENDIX E — MODE SELECTION PROCESS . . . 223
APPENDIX F — UPC OPEN CONTROLLER . . . 225
APPENDIX G — OPTIONAL MOTORMASTER V CONTROL . . . 236
INDEX . . . 243
CONTROLS SET POINT AND CONFIGURATION LOG . . . CL-1
UNIT START-UP CHECKLIST . . . CL-8

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment. Untrained personnel can perform the basic maintenance functions of replacing filters. Trained service personnel should perform all other operations.

When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply. Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguishers available for all brazing operations.

⚠ WARNING

Before performing service or maintenance operation on unit, turn off and lock off main power switch to unit. Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. The unit may have an internal non-fused disconnect or a field-installed disconnect.

⚠ 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.

⚠ WARNING

1. Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or loss of life. Refer to the User's Information Manual provided with this unit for more details.
2. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

⚠ WARNING

What to do if you smell gas:

1. DO NOT try to light any appliance.
2. DO NOT touch any electrical switch, or use any phone in your building.
3. IMMEDIATELY call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
4. If you cannot reach your gas supplier call the fire department.

⚠ 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 or 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 equipment.

⚠ WARNING

CARBON-MONOXIDE POISONING HAZARD

Failure to follow instructions could result in severe personal injury or death due to carbon-monoxide poisoning, if combustion products infiltrate into the building.

Check that all openings in the outside wall around the vent (and air intake) pipe(s) are sealed to prevent infiltration of combustion products into the building.

Check that furnace vent (and air intake) terminal(s) are not obstructed in any way during all seasons.

GENERAL

This book contains Start-Up, Controls, Operation, Troubleshooting and Service information for the 48/50P Series rooftop units. See Table 1. These units are equipped with *Comfort*Link controls version 6.X or higher. Use this guide in conjunction with the separate installation instructions packaged with the unit. Refer to the Wiring Diagrams literature for more detailed wiring information.

The 48/50P Series units provide ventilation, cooling, and heating (when equipped) in variable air volume (VAV) and constant volume (CV) applications.

Table 1 — P Series Product Line

UNIT	SIZE	APPLICATION
48P2	All	Gas Heat Vertical Supply/Return CV ComfortLink Controls
48P3	All	Gas Heat Vertical Supply/Return VAV ComfortLink Controls
48P4	All	Gas Heat Horizontal Supply/Return CV ComfortLink Controls
48P5	All	Gas Heat Horizontal Supply/Return VAV ComfortLink Controls
50P2	All	Optional Electric Heat Vertical Supply/Return CV ComfortLink Controls
50P3	All	Optional Electric Heat Vertical Supply/Return VAV ComfortLink Controls
50P4	All	Optional Electric Heat Horizontal Supply/Return CV ComfortLink Controls
50P5	All	Optional Electric Heat Horizontal Supply/Return VAV ComfortLink Controls

LEGEND

CV — Constant Volume
VAV — Variable Air Volume

The 48/50P units contain the factory-installed *Comfort*Link control system which provides full system management. The main base board (MBB) stores hundreds of unit configuration settings and 8 time of day schedules. The MBB also performs self diagnostic tests at unit start-up, monitors the operation of the unit, and provides alarms and alert information. The system also contains other optional boards that are connected to the MBB through the Local Equipment Network (LEN). Information on system operation and status are sent to the MBB processor by various sensors and optional board that are located at the unit and in the conditioned space. Access to the unit controls for configuration, set point selection, schedule creation, and service can be done through a unit-mounted scrolling marquee. Access can also be done through the Carrier Comfort Network® using ComfortVIEW™ software, Network Service Tool, or the accessory Navigator™ device.

The *Comfort*Link system controls all aspects of the rooftop. It controls the supply-fan motor, compressors, and economizers to maintain the proper temperature conditions. The controls also cycle condenser fans to maintain suitable head pressure. All VAV units are equipped with a VFD (variable frequency drive) for supply duct pressure control. The *Comfort*Link controls can directly control the speed of the VFD based on a static pressure sensor input. In addition, the *Comfort*Link controls can adjust (but not control on CV and non-modulating power exhaust units) the building pressure using multiple power exhaust fans controlled from damper position or from a building pressure sensor. The control safeties are continuously monitored to prevent the unit from operating under abnormal conditions. Sensors include pressure transducers and thermistors.

A scheduling function, programmed by the user, controls the unit occupied/unoccupied schedule. Up to 8 different schedules can be programmed.

The controls also allow the service person to operate a service test so that all the controlled components can be checked for proper operation.

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

Parameter names will be written with the Mode name first, then any submodes, then the parameter name, each separated by an arrow symbol (→). Names will also be shown in bold and italics. As an example, the IAQ Economizer Override Position which is located in the Configuration mode, Indoor Air Quality Configuration sub-mode, and the Air Quality Set Points sub-sub-mode, would be written as ***Configuration→IAQ→IAQ.SP→IQ.O.P.***

This path name will show the user how to navigate through the local display structure to reach the desired configuration. The user would scroll through the modes and submodes using the UP ARROW and DOWN ARROW 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 parentheses after the value. As an example, ***Configuration→IAQ→AQ.CF→IQ.A.C*** = 1 (IAQ Analog Input).

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description of the parameter name 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 cross-referenced in the local display tables (Appendix A) for users configuring the unit with CCN software instead of the local display. The CCN tables are located in Appendix B of this manual.

BASIC CONTROL USAGE

***Comfort*Link Controls —** The *Comfort*Link controls are a comprehensive unit-management system. The control system is easy to access, configure, diagnose and troubleshoot.

The controls are flexible, providing constant volume and variable air volume cooling control sequences, and heating control sequences for two-stage electric and gas systems, multiple-stage gas heating, and hydronic heat in both Occupied and Unoccupied schedule modes. This control also manages:

- VAV duct pressure (through optional VFD), with configurable static pressure reset
- Building pressure through four different power exhaust schemes
- Return fan applications using fan tracking
- Condenser fan head pressure control
- Dehumidification (with optional reheat) and humidifier sequences
- Space ventilation control, in Occupied and Unoccupied periods, using CO_2 sensors or external signals, with ventilation defined by damper position or ventilation airflow measurement
- Smoke control functions
- Occupancy schedules
- Occupancy or start/stop sequences based on third party signals
- Alarm status and history and run time data
- Management of a complete unit service test sequence
- Economizer operation and Fault Detection and Diagnostics (FDD) per California Energy Commission (CEC) Title 24-2013.

System diagnostics are enhanced by the use of sensors for air temperatures, air pressures and refrigerant pressures. Unit-mounted actuators provide digital feedback data to the unit control.

The *Comfort*Link controller is fully communicating and cable-ready for connection to the Carrier Comfort Network® (CCN) building management system. The control provides high-speed communications for remote monitoring. Multiple 48/50P Series units can be linked together (and to other *Comfort*Link controller equipped units) using a 3-wire communication bus.

The *Comfort*Link control system is easy to access through the use of a unit-mounted display module. A computer is not needed to perform unit start-up. Access to control menus is simplified by the ability to quickly select from 11 menus. A scrolling readout provides detailed explanations of control information. Only four, large, easy-to-use buttons are required to maneuver through the entire controls menu. The display readout is designed to be visible even in bright sunlight.

For added service flexibility, an accessory hand-held Navigator™ module is also available. This portable device has an extended communication cable that can be plugged into the unit's communication network either at the main control box or at the opposite end of the unit, at a remote modular plug. The Navigator display provides the same menu structure, control access and display data as is available at the unit-mounted scrolling marquee display.

Scrolling Marquee — This device is the keypad interface used to access the control information, read sensor values, and test the unit. The scrolling marquee is located in the main control box and is standard on all units. The scrolling marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display module. The display also contains an Alarm Status LED. See Fig. 1. The display is easy to operate using 4 buttons and a group of 11 LEDs that indicate the following menu structures: Run Status, Service Test, Temperatures, Pressures, Set points, Inputs, Outputs, Configuration, Timeclock, Operating Modes, and Alarms.

Through the scrolling marquee, the user can access all of the inputs and outputs to check on their values and status, configure operating parameters plus evaluate the current decision status for operating modes. Because the 48/50P Series units are equipped with suction pressure and discharge pressure transducers, the scrolling marquee can also display refrigerant circuit pressures typically obtained from service gages. The control also includes an alarm history which can be accessed from the display. In addition, through the scrolling marquee, the user can access a built-in test routine that can be used at start-up commissioning and to diagnose operational problems with the unit.

Accessory Navigator™ Display — The accessory hand-held Navigator display can be used with the 48/50P Series units. See Fig. 2. The Navigator display operates the same way as the scrolling marquee device. The Navigator display is plugged into the RJ-11 jack in the main control box on the COMM board. The Navigator display can also be plugged into the RJ-11 jack located on the unit corner post located at the economizer end of the unit.

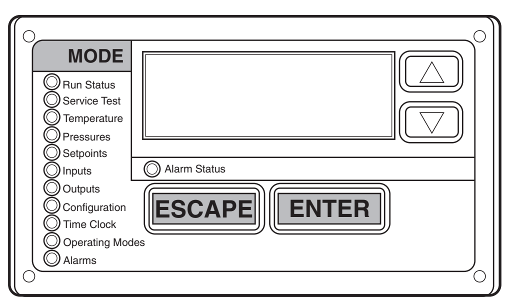


Fig. 1 — Scrolling Marquee

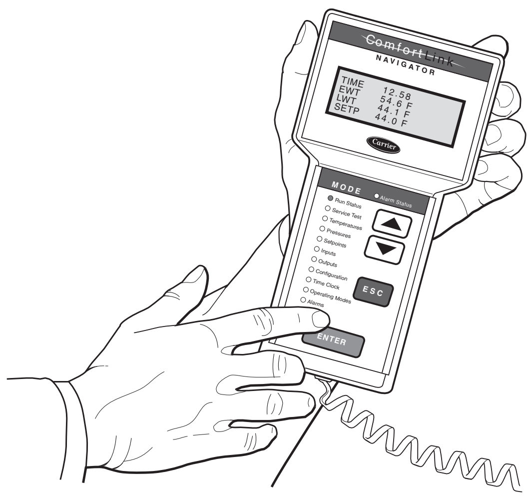


Fig. 2 — Accessory Navigator Display

Operation — All units are shipped from the factory with the scrolling marquee display, which is located in the main control box. See Fig. 1. In addition, the *Comfort*Link controls also supports the use of the handheld Navigator™ display.

Both displays provide the user with an interface to the *Comfort*Link control system. The displays have ▲ and ▼ arrow keys, an ESCAPE key and an ENTER key. These keys are used to navigate through the different levels of the display structure. The Navigator and the scrolling marquee operate in the same manner, except that the Navigator display has multiple lines of display and the scrolling marquee has a single line. All further discussions and examples in this document will be based on the scrolling marquee display. See Table 2 for the menu structure.

The four keys are used to navigate through the display structure, which is organized in a tiered mode structure. See Table 2 for the first two levels of the mode structure. If the buttons have not been used for a period, the display will default to the AUTO VIEW display category as shown under the RUN STATUS category. To show the top-level display, press the ESCAPE key until a blank display is shown. Then use the ▲ and ▼ arrow keys to scroll through the top-level categories. These are listed in Appendix A and will be indicated on the scrolling marquee by the LED next to each mode listed on the face of the display.

When a specific mode or sub-mode is located, push the ENTER key to enter the mode. Depending on the mode, there may be additional tiers. Continue to use the ▲ and ▼ keys and the ENTER keys until the desired display item is found. At any time, the user can move back a mode level by pressing the ESCAPE key. Once an item has been selected the display will flash showing the item, followed by the item value and then followed by the item units (if any).

Items in the Configuration and Service Test modes are password protected. The display will flash PASS and WORD when required. Use the ENTER and arrow keys to enter the four digits of the password. The default password is 1111.

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description across the display indicating the full meaning of each display point. Pressing the ESCAPE and ENTER keys when the display is blank will return the display to its default menu of rotating AUTO VIEW display items. In addition, the password will need to be entered again before changes can be made.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. If the display is in rotating auto-view, press the ENTER key to stop the display at the desired item. 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.

If the user needs to force a variable, follow the same process as when editing a configuration parameter. When using the Navigator display, a forced variable will be displayed with a blinking "f" following its value. For example, if supply fan requested (***FAN.F***) is forced, the display shows "YESf", where the "f" is blinking to signify a force on the point. Remove the force by selecting the point that is forced with the ENTER key and then press the arrow keys simultaneously.

When using the scrolling marquee display, a forced variable is displayed by a blinking "." following its value.

Depending on the unit model, factory-installed options and field-installed accessories, some of the items in the various mode categories may not apply.

System Pilot™ Interface — The System Pilot interface (33PILOT-01) is a component of the 3V™ system and can serve as a user-interface and configuration tool for all Carrier communicating devices. The System Pilot interface can be used to install and commission a 3V zoning system, linkage compatible air source, universal controller, and all other devices operating on the Carrier communicating network.

Additionally, the System Pilot interface can serve as a wall-mounted temperature sensor for space temperature measurement. The occupant can use the System Pilot interface to change set points. A security feature is provided to limit access of features for unauthorized users. See Fig. 3 for System Pilot interface details.

CCN Tables and Display — In addition to the unit-mounted scrolling marquee display, the user can also access the same information through the CCN tables by using the System Pilot, Service Tool or other CCN programs. Details on the CCN tables are summarized in Appendix B. The point names used for the CCN tables and the scrolling marquee tables may be different and more items are displayed in the CCN tables. As a reference, the CCN point names are included in the scrolling marquee tables and the scrolling marquee acronyms are included in the CCN tables in Appendix B.

GENERIC STATUS DISPLAY TABLE — The GENERICS points table allows the service/installer the ability to create a custom table in which up to 20 points from the 5 CCN categories (Status, Config/Service-Config, Set Point, Maintenance, and Occupancy) may be collected and displayed.

In the Service-Config table section, there is a table named "generics." This table contains placeholders for up to 20 CCN point names and allows the user to decide which points are displayed in the GENERIC points table. Each one of these placeholders allows the input of an 8-character ASCII string.

Using a CCN method of interface, go into the Edit mode for the Service-Config table "generics" and enter the CCN name for each point to be displayed in the custom points table in the order they will be displayed. When done entering point names, download the table to the rooftop unit control.

Table 2 — Scrolling Marquee Menu Display Structure

RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SETPOINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
Auto View of Run Status (VIEW)	Service Test Mode (TEST)	Air Temperatures (AIR.T)	Air Pressures (AIR.P)	Occupied Heat Setpoint (OHSP)	General Inputs (GEN.I)	Fans (FANS)	Unit Configuration (UNIT)	Time of Day (TIME)	System Mode (SYS.M)	Currently Active Alarms (CURR)
Econ Run Status (ECON)	Software Command Disable (STOP)	Refrigerant Temperatures (REF.T)	Refrigerant Pressures (REF.P)	Occupied Cool Setpoint (OCSP)	Compressor Feedback (FD.BK)	Cooling (COOL)	Cooling Configuration (COOL)	Month, Date, Day and Year (DATE)	HVAC Mode (HVAC)	Reset All Current Alarms (R.CUR)
Cooling Information (COOL)	Soft Stop Request (S.STP)			Unoccupied Heat Setpoint (UHSP)	Thermostat Inputs (STAT)	Heating (HEAT)	Evap/Discharge Temp. Reset (EDT.R)	Local Time Schedule (SCH.L)	Control Type (CTRL)	Alarm History (HIST)
VFD Information (VFDS)	Supply Fan Request (FAN.F)			Unoccupied Cool Setpoint (UCSP)	Fire-Smoke Modes (FIRE)	Actuators (ACTU)	Heating Configuration (HEAT)	Local Holiday Schedules (HOL.L)	Mode Controlling Unit (MODE)	
Mode Trip Helper (TRIP)	Test Independent Outputs (INDP)			Heat - Cool Setpoint (GAP)	Relative Humidity (REL.H)	General Outputs (GEN.O)	Supply Static Press. Config. (SP)	Daylight Savings Time (DAY.S)		
CCN Linkage (LINK)	Test Fans (FANS)			VAV Occ Cool On (V.C.ON)	Air Quality Sensors (AIR.Q)		Economizer Configuration (ECON)			
Compressor Run Hours (HRS)	Calibrate Test Actuators (ACT.C)			VAV Occ Cool Off (V.C.OF)	CFM Sensors (CFM)		Building Press. Configs (BP)			
Compressor Starts (STRT)	Test Humidimizer (HMZR)			Supply Air Setpoint (SASP)	Reset Inputs (RSET)		Cool/Heat Setpt. Offsets (D.L.V.T)			
Software Version Numbers (VERS)	Test Cooling (COOL)			Supply Air Setpoint Hi (SA.HI)	4-20 Milliamp Inputs (4-20)		Demand Limit Config. (DMD.L)			
	Test Heating (HEAT)			Supply Air Setpoint Lo (SA.LO)			Indoor Air Quality Cfg. (IAQ)			
				Heating Supply Air Setpoint (SA.HT)			Humidity Configuration (HUMD)			
				Tempering Purge SASP (T.PRG)			Dehumidification Config. (DEHU)			
				Tempering in Cool SASP (T.CL)			CCN Configuration (CCN)			
				Tempering in Vent Occ SASP (T.V.OC)			Alert Limit Config. (ALLM)			
				Tempering in Vent Unocc. SASP (T.V.UN)			Sensor Trim Config. (TRIM)			
							Switch Logic (SW.LG)			
							Display Configuration (DISP)			
							Supply Fan VFD Config. (S.VFD)			
							Exhaust Fan VFD Config. (E.VFD)			

IMPORTANT: The computer system software (ComfortVIEW™, Service Tool, etc.) that is used to interact with CCN controls always saves a template of items it considers as static (e.g., limits, units, forcibility, 24-character text strings, and point names) after the software uploads the tables from a control. Thereafter, the software is only concerned with run time data like value and hardware/force status. With this in mind, it is important that anytime a change is made to the Service-Config table “generics” (which in turn changes the points contained in the GENERIC point table), that a complete new upload be performed. **This requires that any previous table database be completely removed first.** Failure to do this will not allow the user to display the new points that have been created and the software will have a different table database than the unit control.

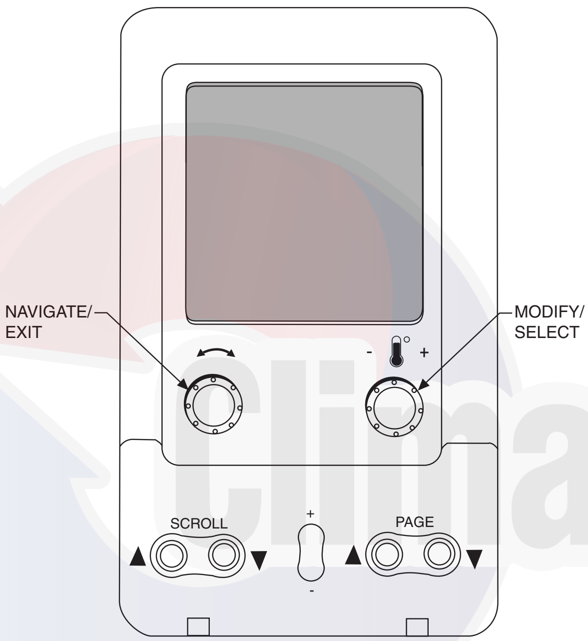


Fig. 3 — System Pilot User Interface

START-UP

IMPORTANT: Do not attempt to start unit, even momentarily, until all items on the Start-Up Checklist (at the back of this book) and the following steps have been completed.

IMPORTANT: The unit is shipped with the unit control disabled. To enable the control, set Local Machine Disable (***Service Test→STOP***) to No.

Unit Preparation — Check that unit has been installed in accordance with the installation instructions and applicable codes. Make sure that the economizer hood has been installed and that the outdoor filters are properly installed.

Internal Wiring — Ensure that all electrical connections in the control box are tightened as required. If the unit has staged gas, modulating gas, or SCR (silicon controlled rectifier) electric heat make sure that the LAT (leaving air temperature) sensors have been routed to the supply ducts as required.

Accessory Installation — Check to make sure that all accessories including space thermostats and sensors have been installed and wired as required by the instructions and unit wiring diagrams.

Crankcase Heaters — Crankcase heaters are energized as long as there is power to the unit, except when the compressors are running.

IMPORTANT: Unit power must be on for 24 hours prior to start-up of compressors. Otherwise damage to compressors may result.

Evaporator Fan — Fan belt and fixed pulleys are factory-installed. See Tables 3-24 for fan performance. Remove tape from fan pulley, and be sure that fans rotate in the proper direction. Static pressure drop is shown in Table 25. See Tables 26-28 for motor limitations.

FIELD-SUPPLIED FAN DRIVES — Supply fan and power exhaust fan drives are fixed-pitch, non-adjustable selections, for maximum reliability and long belt life. If the factory drive sets must be changed to obtain other fan speeds, consult the nearest Browning Manufacturing Co. sales office with the required new wheel speed and the data from Physical Data and Supply Fan Drive Data tables (center distances, motor and fan shaft diameters, motor horsepower) in Installation Instructions for a modified drive set selection. For minor speed changes, the fan sheave size should be changed. (Do not reduce the size of the motor sheave; this will result in reduced belt horsepower ratings and reduced belt life.) See page 151 for belt installation procedure.

Controls — Use the following steps for the controls:

IMPORTANT: The unit is shipped with the unit control disabled. To enable the control, set Local Machine Disable (***Service Test→STOP***) to No.

1. Set any control configurations that are required (field-installed accessories, etc.). The unit is factory configured for all appropriate factory-installed options.
2. Enter unit set points. The unit is shipped with the set point default values. If a different set point is required, use the scrolling marquee, Navigator™ display, or CCN interface to change the configuration values.
3. If the internal time schedules are going to be used, configure the Occupancy schedule.
4. Verify that the control time periods programmed meet current requirements.
5. Use Service Test mode to verify operation of all major components.
6. If the unit is a VAV unit make sure to configure the static pressure set point. To check out the VFD, use the VFD instructions shipped with the unit.

Gas Heat — Verify gas pressure before turning on gas heat as follows:

1. Turn off field-supplied manual gas stop, located external to the unit.
2. Connect pressure gages to supply gas tap, located at field-supplied manual shutoff valves.
3. Connect pressure gages to manifold pressure tap on unit gas valve.
4. Supply gas pressure must not exceed 13.5 in. wg. Check pressure at field-supplied shut-off valve.
5. Turn on manual gas stop and initiate a heating demand. Jumper R to W1 in the control box to initiate heat.
6. Use the Service Test procedure to verify all heat stages of operation.
7. After the unit has run for several minutes, verify that incoming pressure is 5.0 in. wg or greater and that the manifold pressure is 3.5 in. wg. If manifold pressure must be adjusted refer to Gas Valve Adjustment section on page 174.

Table 3 — Fan Performance — 48P2,P3,P4,P5030 and 50P2,P3030 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	222	0.59	284	0.91	339	1.27	388	1.66	430	2.07	469	2.50	504	2.93	536	3.38
7,500	248	0.94	300	1.28	350	1.68	395	2.11	437	2.57	475	3.05	511	3.54	544	4.05
9,000	278	1.46	323	1.80	366	2.22	407	2.69	446	3.19	483	3.71	517	4.25	550	4.81
10,500	311	2.16	349	2.52	387	2.95	424	3.43	459	3.96	493	4.51	526	5.10	558	5.70
12,000	344	3.08	378	3.44	412	3.89	445	4.39	477	4.93	508	5.51	539	6.12	569	6.75
13,500	379	4.25	410	4.62	440	5.07	469	5.58	498	6.13	527	6.73	555	7.36	583	8.02
15,000	415	5.69	442	6.06	470	6.52	496	7.04	523	7.61	549	8.22	575	8.87	601	9.55

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	567	3.84	595	4.30	622	4.78	647	5.26	671	5.75	695	6.25	717	6.76	738	7.27
7,500	575	4.57	604	5.10	632	5.63	658	6.18	683	6.73	707	7.29	730	7.86	752	8.43
9,000	581	5.38	611	5.97	639	6.56	665	7.16	691	7.78	715	8.40	739	9.03	761	9.66
10,500	588	6.31	617	6.95	645	7.59	672	8.25	697	8.92	722	9.59	746	10.28	769	10.97
12,000	598	7.41	625	8.08	652	8.77	679	9.47	704	10.19	728	10.91	752	11.65	775	12.39
13,500	610	8.71	637	9.41	662	10.14	687	10.88	712	11.63	736	12.40	759	13.18	782	13.98
15,000	626	10.25	651	10.98	675	11.74	699	12.51	723	13.30	746	14.10	768	14.92	790	15.75

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	759	7.79	779	8.32	799	8.85	817	9.39
7,500	773	9.01	794	9.60	814	10.20	833	10.80
9,000	783	10.30	805	10.95	825	11.60	845	12.26
10,500	791	11.67	812	12.38	833	13.09	854	13.81
12,000	797	13.15	819	13.91	840	14.68	860	15.45
13,500	804	14.77	825	15.59	846	16.41	867	17.23
15,000	812	16.59	833	17.45	853	18.31	874	19.19

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 4 — Fan Performance — 48P2,P3,P4,P5035 and 50P2,P3035 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	246	0.84	301	1.19	352	1.58	398	2.01	440	2.46	479	2.93	514	3.40	547	3.90
8,000	266	1.14	315	1.50	362	1.92	406	2.37	447	2.85	484	3.35	519	3.87	552	4.39
10,000	310	1.98	350	2.36	389	2.80	427	3.30	464	3.83	499	4.38	532	4.96	564	5.55
12,000	357	3.20	390	3.60	424	4.06	457	4.58	489	5.15	520	5.74	551	6.36	580	7.01
14,000	406	4.87	435	5.28	463	5.76	492	6.30	520	6.89	548	7.52	576	8.18	603	8.86
15,000	430	5.89	458	6.31	485	6.80	511	7.35	538	7.95	564	8.59	590	9.26	616	9.96

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	577	4.40	606	4.91	633	5.43	659	5.95	684	6.49	707	7.03	730	7.58	752	8.14
8,000	583	4.94	612	5.49	640	6.05	666	6.62	691	7.19	715	7.78	738	8.37	760	8.97
10,000	594	6.16	623	6.79	651	7.42	677	8.07	703	8.73	727	9.39	751	10.06	774	10.74
12,000	609	7.67	636	8.36	663	9.05	689	9.77	714	10.49	738	11.22	762	11.97	785	12.72
14,000	629	9.57	655	10.30	680	11.04	704	11.81	728	12.59	751	13.38	774	14.18	796	14.99
15,000	641	10.69	666	11.44	690	12.20	714	12.99	737	13.79	760	14.61	782	15.44	804	16.28

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	773	8.70	793	9.27	813	9.85	832	10.43
8,000	782	9.57	802	10.18	823	10.80	842	11.43
10,000	796	11.42	817	12.11	838	12.81	858	13.52
12,000	807	13.48	828	14.25	849	15.02	869	15.80
14,000	818	15.82	840	16.66	860	17.50	880	18.35
15,000	825	17.13	846	18.00	866	18.87	886	19.76

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 5 — Fan Performance — 48P2,P3,P4,P5040 and 50P2,P3040 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	252	0.98	303	1.33	350	1.72	394	2.14	434	2.58	472	3.06	507	3.55	540	4.07
10,000	290	1.67	333	2.11	373	2.55	412	3.01	448	3.51	483	4.03	517	4.58	549	5.16
12,000	330	2.65	369	3.18	404	3.70	438	4.23	470	4.78	501	5.35	532	5.94	562	6.56
14,000	372	3.96	407	4.61	439	5.22	469	5.83	498	6.44	526	7.07	554	7.72	581	8.38
16,000	415	5.67	447	6.44	476	7.15	504	7.85	530	8.54	556	9.24	581	9.95	605	10.67
18,000	459	7.84	488	8.72	515	9.55	541	10.34	565	11.12	589	11.91	612	12.69	634	13.47
20,000	503	10.51	530	11.51	555	12.46	579	13.36	602	14.24	624	15.11	645	15.98	666	16.84

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	571	4.60	600	5.14	628	5.70	654	6.27	679	6.85	703	7.44	726	8.04	748	8.65
10,000	579	5.75	608	6.36	636	6.98	662	7.62	688	8.28	712	8.94	736	9.62	758	10.30
12,000	590	7.21	618	7.87	645	8.55	671	9.25	696	9.96	720	10.69	744	11.43	766	12.19
14,000	607	9.07	633	9.78	658	10.51	683	11.25	707	12.02	730	12.80	753	13.60	775	14.41
16,000	629	11.41	653	12.16	676	12.94	699	13.73	722	14.54	744	15.37	766	16.22	787	17.08
18,000	656	14.28	678	15.09	700	15.91	721	16.76	742	17.62	762	18.49	783	19.39	803	20.29
20,000	687	17.71	707	18.60	727	19.48	747	20.38	766	21.30	785	22.22	804	23.17	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	770	9.27	791	9.90	811	10.54	830	11.18
10,000	780	11.00	802	11.71	822	12.43	842	13.15
12,000	789	12.96	810	13.73	831	14.52	851	15.32
14,000	797	15.24	818	16.07	839	16.93	859	17.79
16,000	808	17.95	828	18.85	849	19.75	868	20.67
18,000	823	21.21	842	22.15	862	23.11	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 6 — Fan Performance — 48P2,P3,P4,P5050 and 50P2,P3050 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	276	1.34	323	1.73	366	2.15	407	2.60	445	3.08	482	3.58	516	4.11	549	4.66
10,000	296	1.74	339	2.17	379	2.62	418	3.09	454	3.59	489	4.12	522	4.68	554	5.26
12,000	339	2.76	376	3.29	411	3.81	445	4.35	477	4.91	509	5.49	539	6.09	568	6.71
14,000	382	4.15	416	4.79	448	5.40	478	6.01	506	6.63	535	7.26	562	7.92	589	8.60
16,000	427	5.96	458	6.71	487	7.42	514	8.11	540	8.81	565	9.52	590	10.23	615	10.97
18,000	473	8.26	501	9.12	527	9.93	552	10.72	576	11.50	600	12.29	623	13.08	645	13.88
20,000	519	11.10	545	12.06	570	12.99	593	13.88	615	14.76	637	15.63	658	16.50	679	17.38

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	579	5.23	608	5.81	636	6.41	662	7.02	687	7.64	712	8.27	735	8.91	757	9.57
10,000	584	5.85	613	6.47	641	7.10	667	7.74	692	8.40	717	9.07	740	9.75	763	10.44
12,000	597	7.36	625	8.03	651	8.72	677	9.42	702	10.14	726	10.88	750	11.63	772	12.39
14,000	615	9.29	641	10.01	666	10.74	690	11.50	714	12.27	738	13.06	760	13.87	783	14.69
16,000	639	11.71	663	12.48	686	13.27	709	14.07	731	14.89	753	15.73	775	16.58	796	17.45
18,000	667	14.69	689	15.51	711	16.35	732	17.20	753	18.07	773	18.96	793	19.86	813	20.78
20,000	699	18.25	719	19.14	739	20.04	759	20.95	778	21.88	797	22.82	816	23.77	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	779	10.23	800	10.90	821	11.58	840	12.27
10,000	785	11.14	806	11.85	826	12.57	846	13.30
12,000	794	13.16	816	13.94	836	14.73	857	15.54
14,000	804	15.52	825	16.37	846	17.22	866	18.10
16,000	817	18.34	837	19.24	857	20.15	877	21.08
18,000	833	21.71	853	22.66	872	23.62	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 7 — Fan Performance — 48P2,P3,P4,P5055 and 50P2,P3055 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	207	1.04	253	1.50	295	2.03	334	2.66	371	3.41	405	4.26	438	5.20	468	6.20
12,500	235	1.69	276	2.23	312	2.78	346	3.40	379	4.10	410	4.88	440	5.75	469	6.70
15,000	265	2.59	302	3.23	335	3.85	365	4.51	394	5.20	422	5.96	449	6.78	476	7.67
17,500	295	3.78	331	4.52	361	5.24	389	5.97	415	6.71	440	7.48	465	8.30	489	9.17
20,000	327	5.31	360	6.15	388	6.98	414	7.79	439	8.60	462	9.43	485	10.28	507	11.17
22,500	359	7.23	390	8.16	417	9.09	442	10.00	465	10.90	487	11.81	508	12.72	528	13.65
25,000	392	9.59	421	10.60	447	11.62	470	12.64	492	13.64	513	14.63	533	15.62	552	16.62

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	497	7.27	523	8.39	549	9.55	573	10.75	596	11.98	618	13.23	639	14.51	659	15.81
12,500	497	7.73	523	8.83	549	10.00	573	11.22	597	12.49	619	13.81	641	15.16	662	16.55
15,000	501	8.63	526	9.67	550	10.77	574	11.94	597	13.17	619	14.46	641	15.80	662	17.19
17,500	512	10.09	535	11.07	557	12.11	579	13.21	601	14.38	622	15.60	643	16.88	663	18.21
20,000	528	12.09	549	13.06	570	14.07	590	15.12	610	16.24	630	17.40	649	18.62	668	19.89
22,500	548	14.60	567	15.59	587	16.61	605	17.66	624	18.75	642	19.88	660	21.06	678	22.28
25,000	571	17.63	589	18.66	607	19.71	624	20.78	642	21.89	659	23.02	676	24.19	692	25.39

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	679	17.13	697	18.46	715	19.81	733	21.17
12,500	682	17.98	702	19.43	721	20.90	739	22.40
15,000	682	18.63	702	20.10	721	21.62	740	23.17
17,500	683	19.60	702	21.04	721	22.53	740	24.06
20,000	687	21.20	706	22.57	724	24.00	742	25.46
22,500	696	23.55	713	24.86	731	26.22	748	27.62
25,000	709	26.62	725	27.91	741	29.22	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 8 — Fan Performance — 48P2,P3,P4,P5060 and 50P2,P3060 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	234	1.54	276	2.03	312	2.57	348	3.20	382	3.93	415	4.74	446	5.63	476	6.58
15,000	271	2.65	309	3.27	341	3.88	370	4.53	399	5.24	428	6.04	455	6.91	482	7.85
18,000	308	4.22	344	5.00	374	5.73	400	6.46	426	7.22	450	8.02	474	8.88	498	9.81
21,000	348	6.36	380	7.29	408	8.18	434	9.04	457	9.88	479	10.74	501	11.64	522	12.58
24,000	390	9.19	417	10.24	444	11.29	469	12.29	491	13.27	512	14.23	532	15.21	551	16.20
27,000	433	12.80	456	13.93	481	15.14	504	16.30	526	17.44	546	18.53	565	19.62	583	20.71
30,000	476	17.29	497	18.50	519	19.82	541	21.15	562	22.45	581	23.70	599	24.93	617	26.14

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	504	7.56	530	8.57	555	9.61	578	10.66	600	11.73	621	12.81	641	13.91	660	15.01
15,000	509	8.87	535	9.95	559	11.07	583	12.25	606	13.45	628	14.68	650	15.95	670	17.23
18,000	521	10.79	544	11.85	567	12.97	590	14.14	612	15.38	633	16.66	654	17.99	675	19.36
21,000	543	13.56	563	14.60	583	15.69	603	16.84	623	18.05	643	19.31	662	20.63	682	21.99
24,000	570	17.22	588	18.28	607	19.39	625	20.53	642	21.72	660	22.95	678	24.24	695	25.58
27,000	601	21.81	618	22.93	635	24.07	651	25.25	667	26.46	684	27.70	700	28.98	715	30.31
30,000	634	27.34	650	28.56	666	29.78	681	31.02	696	32.28	711	33.56	726	34.88	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	679	16.11	697	17.23	714	18.35	730	19.49
15,000	690	18.52	709	19.84	727	21.15	745	22.49
18,000	695	20.76	714	22.20	733	23.66	—	—
21,000	701	23.41	719	24.87	738	26.38	—	—
24,000	713	26.97	730	28.40	747	29.89	—	—
27,000	731	31.67	747	33.08	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 9 — Fan Performance — 48P2,P3,P4,P5070 and 50P2,P3070 Units without Discharge Plenum*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	258	2.23	297	2.80	330	3.38	362	4.02	392	4.73	422	5.53	451	6.42	480	7.37
17,500	302	3.92	338	4.67	368	5.39	395	6.10	421	6.84	446	7.64	471	8.50	495	9.42
21,000	348	6.36	380	7.29	408	8.18	434	9.04	457	9.88	479	10.74	501	11.64	522	12.57
24,500	397	9.74	424	10.80	450	11.88	475	12.91	497	13.91	517	14.89	537	15.88	556	16.89
28,000	447	14.18	470	15.35	494	16.60	516	17.82	538	19.01	558	20.16	576	21.29	594	22.41
30,000	476	17.29	497	18.50	519	19.82	541	21.15	562	22.45	581	23.70	599	24.93	617	26.14

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	507	8.39	533	9.46	558	10.57	582	11.71	605	12.89	627	14.08	648	15.29	668	16.52
17,500	519	10.42	542	11.48	565	12.60	588	13.78	610	15.02	632	16.30	653	17.62	674	18.99
21,000	543	13.56	563	14.60	583	15.69	603	16.84	623	18.05	643	19.31	662	20.63	682	21.99
24,500	575	17.93	593	18.99	611	20.10	629	21.24	646	22.43	664	23.67	681	24.96	698	26.29
28,000	612	23.55	628	24.69	645	25.86	661	27.05	677	28.27	692	29.53	708	30.82	723	32.15
30,000	634	27.34	650	28.56	666	29.78	681	31.02	696	32.28	711	33.56	726	34.88	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	687	17.76	706	19.01	724	20.27	741	21.54
17,500	694	20.38	713	21.79	732	23.24	—	—
21,000	701	23.41	719	24.87	738	26.38	—	—
24,500	715	27.67	732	29.10	749	30.58	—	—
28,000	739	33.51	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 10 — Fan Performance — 50P2,P3030 Units with Discharge Plenum and 50P4,P5030 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	255	0.95	313	1.35	364	1.82	411	2.35	454	2.92	494	3.52	530	4.14	563	4.78
7,500	291	1.51	340	1.93	386	2.41	428	2.94	468	3.51	505	4.13	541	4.78	574	5.46
9,000	330	2.28	372	2.73	413	3.22	451	3.76	487	4.34	522	4.96	555	5.61	587	6.30
10,500	371	3.28	408	3.76	444	4.28	479	4.84	512	5.43	544	6.06	574	6.71	604	7.40
12,000	413	4.56	447	5.07	479	5.61	510	6.19	540	6.80	570	7.44	598	8.11	626	8.80
13,500	456	6.12	487	6.66	516	7.23	544	7.83	572	8.46	599	9.12	626	9.81	651	10.51
15,000	500	7.99	528	8.58	555	9.18	581	9.80	606	10.45	631	11.13	656	11.83	680	12.56

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	594	5.43	623	6.09	651	6.75	676	7.41	701	8.08	725	8.75	747	9.42	769	10.10
7,500	605	6.16	635	6.88	664	7.62	691	8.36	716	9.11	741	9.88	765	10.64	787	11.41
9,000	617	7.02	646	7.76	674	8.52	702	9.31	728	10.11	753	10.93	777	11.76	800	12.60
10,500	633	8.12	660	8.86	687	9.64	713	10.43	739	11.25	764	12.09	788	12.95	811	13.82
12,000	652	9.52	679	10.27	704	11.04	729	11.84	753	12.66	777	13.50	800	14.37	823	15.26
13,500	676	11.25	701	12.00	725	12.78	748	13.58	771	14.40	794	15.24	816	16.11	838	16.99
15,000	703	13.30	726	14.07	749	14.86	771	15.66	793	16.49	814	17.34	835	18.20	856	19.09

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	789	10.77	809	11.45	829	12.13	848	12.81
7,500	809	12.18	830	12.96	851	13.73	870	14.51
9,000	823	13.44	844	14.29	866	15.15	886	16.01
10,500	833	14.71	856	15.61	877	16.52	898	17.44
12,000	845	16.16	867	17.08	888	18.01	—	—
13,500	859	17.90	880	18.82	—	—	—	—
15,000	876	20.00	896	20.92	—	—	—	—

LEGEND

(shaded) 50P3,P5 units only.

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 11 — Fan Performance — 50P2,P3035 Units with Discharge Plenum and 50P4,P5035 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) 0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**
7,000	285	1.35	337	1.78	384	2.26	428	2.80	469	3.38	507	4.00	542	4.66	576	5.34
8,000	311	1.81	358	2.25	402	2.75	442	3.29	481	3.87	517	4.50	551	5.16	584	5.86
10,000	367	3.04	406	3.52	443	4.05	479	4.61	512	5.21	545	5.84	576	6.51	606	7.21
12,000	426	4.74	459	5.26	491	5.82	522	6.42	552	7.05	581	7.70	609	8.38	637	9.09
14,000	486	6.98	515	7.55	543	8.15	570	8.78	597	9.44	623	10.12	649	10.83	674	11.55
15,000	517	8.33	544	8.92	570	9.54	596	10.18	621	10.85	646	11.55	671	12.27	694	13.01

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) 1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**
7,000	607	6.03	637	6.74	665	7.46	691	8.18	717	8.91	741	9.65	764	10.39	786	11.13
8,000	615	6.58	645	7.32	673	8.07	700	8.84	726	9.62	751	10.41	775	11.20	797	12.00
10,000	636	7.94	664	8.70	691	9.48	717	10.29	743	11.11	768	11.96	792	12.82	815	13.69
12,000	663	9.83	689	10.59	715	11.38	739	12.19	764	13.03	787	13.88	810	14.76	833	15.66
14,000	698	12.31	722	13.08	745	13.88	768	14.69	791	15.53	813	16.39	834	17.27	856	18.17
15,000	718	13.78	741	14.56	763	15.36	785	16.19	807	17.03	828	17.90	849	18.78	869	19.69

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) 3.4		3.6		3.8		4.0	
	Rpm	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**	**Rpm**	**Bhp**
7,000	807	11.88	828	12.62	848	13.37	867	14.12
8,000	819	12.80	841	13.61	861	14.42	881	15.23
10,000	837	14.57	859	15.47	881	16.37	—-	—
12,000	855	16.57	876	17.51	897	18.45	—	—
14,000	876	19.10	897	20.04	—	—	—	—
15,000	890	20.61	—	—	—	—	—	—

LEGEND

(shaded) 50P3,P5 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 12 — Fan Performance — 50P2,P3040 Units with Discharge Plenum and 50P4,P5040 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	293	1.62	344	2.10	390	2.62	432	3.18	470	3.76	507	4.36	541	4.97	573	5.60
10,000	343	2.66	385	3.19	425	3.76	463	4.36	498	4.99	532	5.64	563	6.31	594	7.00
12,000	395	4.09	431	4.68	466	5.29	500	5.93	532	6.60	562	7.30	592	8.01	620	8.75
14,000	449	5.97	481	6.62	512	7.28	541	7.96	570	8.67	598	9.40	626	10.16	652	10.93
16,000	504	8.32	533	9.06	560	9.77	587	10.50	613	11.25	638	12.02	663	12.81	688	13.62
18,000	559	11.20	586	12.04	611	12.82	635	13.59	659	14.38	682	15.19	705	16.01	727	16.86
20,000	615	14.66	640	15.59	663	16.44	685	17.28	707	18.11	728	18.96	749	19.83	770	20.71

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	603	6.23	632	6.87	659	7.50	685	8.14	710	8.78	734	9.43	757	10.07	779	10.71
10,000	623	7.70	651	8.41	678	9.13	703	9.86	728	10.60	752	11.33	776	12.08	798	12.82
12,000	648	9.50	674	10.26	699	11.04	724	11.83	748	12.63	772	13.44	794	14.25	817	15.07
14,000	677	11.73	702	12.54	726	13.35	750	14.19	772	15.04	795	15.89	817	16.76	838	17.64
16,000	712	14.45	735	15.30	757	16.16	779	17.03	801	17.92	822	18.82	843	19.73	863	20.65
18,000	749	17.73	771	18.61	792	19.50	813	20.42	833	21.34	853	22.27	873	23.23	—	—
20,000	790	21.61	811	22.52	830	23.45	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	800	11.35	821	12.00	841	12.64	860	13.28
10,000	820	13.57	841	14.31	862	15.06	882	15.81
12,000	838	15.90	859	16.73	880	17.57	900	18.40
14,000	859	18.53	879	19.42	899	20.32	—	—
16,000	883	21.58	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 50P3,P5 units only.

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 13 — Fan Performance — 50P2,P3050 Units with Discharge Plenum and 50P4,P5050 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	324	2.15	369	2.67	412	3.23	452	3.83	488	4.44	523	5.08	556	5.73	587	6.40
10,000	349	2.74	392	3.28	431	3.87	469	4.48	504	5.12	537	5.78	569	6.46	599	7.16
12,000	403	4.23	439	4.82	474	5.45	507	6.11	539	6.80	570	7.51	599	8.23	627	8.98
14,000	459	6.17	490	6.83	521	7.50	550	8.20	579	8.93	607	9.69	634	10.46	660	11.25
16,000	515	8.63	544	9.34	571	10.07	597	10.82	623	11.59	649	12.38	674	13.20	698	14.03
18,000	573	11.65	599	12.44	623	13.21	647	14.00	671	14.82	694	15.65	716	16.50	739	17.37
20,000	630	15.28	654	16.14	677	16.97	699	17.81	720	18.66	741	19.53	762	20.43	783	21.34

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	617	7.08	645	7.77	672	8.47	698	9.18	723	9.90	747	10.62	770	11.34	793	12.07
10,000	628	7.87	656	8.59	682	9.33	708	10.07	733	10.82	757	11.58	780	12.35	802	13.12
12,000	654	9.74	680	10.51	706	11.30	730	12.10	754	12.90	778	13.73	800	14.56	822	15.39
14,000	686	12.06	710	12.88	734	13.71	757	14.55	780	15.41	802	16.27	824	17.15	845	18.04
16,000	721	14.88	744	15.74	767	16.62	789	17.51	810	18.41	831	19.32	852	20.24	872	21.17
18,000	761	18.27	782	19.17	803	20.09	824	21.02	844	21.96	864	22.92	884	23.88	—	—
20,000	803	22.27	823	23.21	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	814	12.79	835	13.52	855	14.25	875	14.99
10,000	824	13.89	845	14.67	866	15.45	886	16.23
12,000	844	16.24	865	17.09	885	17.95	—	—
14,000	866	18.94	886	19.85	—	—	—	—
16,000	892	22.12	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) — 50P3,P5 units only.
Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 14 — Fan Performance — 50P2,P3055 Units with Discharge Plenum and 50P4,P5055 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	217	1.21	258	1.71	296	2.29	334	2.97	371	3.76	407	4.63	440	5.56	471	6.51
12,500	248	2.01	286	2.63	319	3.26	349	3.95	380	4.71	410	5.58	440	6.52	469	7.54
15,000	281	3.13	317	3.90	347	4.64	374	5.38	400	6.18	425	7.03	450	7.95	476	8.95
17,500	315	4.64	348	5.55	378	6.43	403	7.29	426	8.16	449	9.05	471	10.00	493	10.99
20,000	351	6.64	381	7.64	409	8.68	433	9.68	456	10.66	477	11.64	497	12.65	516	13.68
22,500	389	9.20	414	10.25	440	11.43	464	12.59	486	13.71	506	14.81	525	15.91	543	17.03
25,000	427	12.39	449	13.48	473	14.75	496	16.06	517	17.34	537	18.59	555	19.82	573	21.04

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	500	7.48	527	8.46	552	9.45	576	10.44	598	11.42	619	12.41	639	13.41	659	14.41
12,500	498	8.63	525	9.76	552	10.93	577	12.12	601	13.32	624	14.54	646	15.76	667	16.99
15,000	501	10.03	526	11.17	550	12.38	575	13.65	598	14.97	621	16.32	644	17.71	666	19.11
17,500	514	12.05	536	13.17	557	14.35	579	15.60	600	16.91	621	18.28	643	19.70	663	21.18
20,000	535	14.76	554	15.88	573	17.06	592	18.29	611	19.58	630	20.91	649	22.31	668	23.77
22,500	561	18.17	579	19.34	596	20.54	613	21.78	629	23.06	646	24.40	663	25.78	680	27.20
25,000	590	22.27	606	23.51	622	24.78	637	26.07	653	27.39	668	28.75	683	30.13	699	31.56

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	677	15.40	695	16.40	712	17.40	728	18.41
12,500	687	18.22	706	19.45	725	20.69	742	21.92
15,000	687	20.54	707	21.98	727	23.43	746	24.89
17,500	684	22.69	704	24.24	724	25.83	743	27.43
20,000	686	25.27	705	26.84	723	28.44	742	30.09
22,500	697	28.68	713	30.21	730	31.79	747	33.42
25,000	714	33.04	729	34.55	—	—	—	—

LEGEND

(shaded) 50P3,P5 units only.

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 15 — Fan Performance — 50P2,P3060 Units with Discharge Plenum and 50P4,P5060 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	241	1.82	280	2.41	314	3.04	346	3.72	376	4.47	405	5.26	433	6.11	460	7.01
15,000	281	3.14	316	3.87	346	4.61	374	5.38	400	6.19	426	7.05	450	7.95	474	8.90
18,000	323	5.03	355	5.92	382	6.80	408	7.68	431	8.58	454	9.53	476	10.50	498	11.52
21,000	366	7.61	395	8.66	421	9.69	444	10.71	466	11.73	487	12.78	507	13.85	527	14.94
24,000	410	10.97	437	12.20	460	13.39	482	14.55	503	15.71	523	16.88	541	18.07	560	19.27
27,000	455	15.23	479	16.65	501	18.00	522	19.33	542	20.64	560	21.95	578	23.26	595	24.58
30,000	500	20.52	522	22.11	543	23.64	563	25.14	581	26.61	599	28.06	616	29.52	632	30.97

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	486	7.94	511	8.91	535	9.91	559	10.94	581	11.99	603	13.07	624	14.16	645	15.28
15,000	498	9.90	520	10.93	543	12.01	564	13.11	586	14.26	606	15.43	627	16.63	646	17.86
18,000	518	12.57	539	13.66	559	14.78	579	15.95	598	17.15	617	18.39	636	19.65	654	20.95
21,000	546	16.07	564	17.23	583	18.42	600	19.64	618	20.90	635	22.19	653	23.51	669	24.86
24,000	577	20.49	594	21.74	611	23.00	628	24.31	644	25.63	660	26.99	676	28.38	691	29.77
27,000	611	25.91	628	27.26	643	28.63	659	30.03	674	31.44	689	32.87	703	34.33	718	35.82
30,000	648	32.43	663	33.90	678	35.38	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	664	16.40	683	17.55	702	18.70	720	19.87
15,000	666	19.12	685	20.39	703	21.69	721	23.01
18,000	672	22.28	690	23.64	708	25.02	725	26.44
21,000	686	26.25	703	27.67	719	29.11	735	30.59
24,000	707	31.23	722	32.71	737	34.20	—	—
27,000	—	—	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 50P3,P5 units only.

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 16 — Fan Performance — 50P2,P3070 Units with Discharge Plenum and 50P4,P5070 Units

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	268	2.64	304	3.32	335	4.02	364	4.76	391	5.55	418	6.39	444	7.27	468	8.20
17,500	316	4.67	348	5.54	376	6.39	402	7.25	426	8.14	449	9.06	472	10.03	493	11.03
21,000	366	7.61	395	8.66	421	9.69	444	10.71	466	11.73	487	12.78	507	13.85	527	14.94
24,500	417	11.61	444	12.87	467	14.09	489	15.28	509	16.47	529	17.66	547	18.86	565	20.08
28,000	470	16.88	493	18.35	515	19.77	536	21.15	555	22.51	573	23.87	590	25.22	607	26.59
30,000	500	20.52	522	22.11	543	23.64	563	25.14	581	26.61	599	28.06	616	29.52	632	30.97

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	493	9.17	516	10.19	539	11.24	562	12.33	583	13.45	605	14.60	625	15.77	645	16.96
17,500	515	12.07	535	13.14	556	14.26	576	15.42	595	16.61	615	17.84	634	19.09	652	20.39
21,000	546	16.07	564	17.23	583	18.42	600	19.64	618	20.90	635	22.19	653	23.51	669	24.86
24,500	583	21.32	600	22.59	616	23.87	633	25.18	649	26.53	664	27.89	680	29.29	695	30.71
28,000	623	27.96	639	29.35	655	30.75	670	32.18	685	33.63	699	35.09	—	—	—	—
30,000	648	32.43	663	33.90	678	35.38	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	665	18.18	684	19.42	703	20.68	721	21.95
17,500	671	21.70	689	23.05	706	24.42	724	25.82
21,000	686	26.24	703	27.67	719	29.11	735	30.59
24,500	711	32.17	726	33.65	741	35.16	—	—
28,000	—	—	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 50P3,P5 units only.

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Table 17 — Fan Performance — 48/50P2,P3,P4,P5075 Units with Forward-Curved Fan*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) 0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	211	2.35	243	3.06	272	3.80	299	4.59	325	5.43	349	6.30	372	7.21	395	8.15
16,000	232	3.27	261	4.06	288	4.88	313	5.74	337	6.65	360	7.59	381	8.57	402	9.58
18,000	253	4.42	281	5.31	305	6.21	329	7.14	351	8.11	372	912	393	10.17	413	11.25
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) 1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	416	9.12	437	10.10	457	11.10	476	12.13	495	13.17	513	14.22	531	15.29	548	16.38
16,000	423	10.62	442	11.68	462	12.77	480	13.88	498	15.00	516	16.15	533	17.31	550	18.48
18,000	432	12.36	450	13.50	469	14.66	486	15.84	504	17.05	521	18.27	537	19.53	553	20.78
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) 3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	564	17.47	581	18.58	596	19.71	612	20.84
16,000	566	19.68	582	20.88	597	22.10	613	23.33
18,000	569	22.06	585	23.36	600	24.66	615	25.99
20,000	574	24.68	589	26.06	604	27.45	618	28.85
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan and high-capacity power exhaust units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

Table 18 — Fan Performance — 48/50P2,P3,P4,P5075 Units with Airfoil Fan*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.30		0.60		0.90		1.20		1.50		1.80		2.10		2.40	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	620	3.02	671	3.91	720	4.83	767	5.80	813	6.81	858	7.87	902	8.97	944	10.10
16,000	655	3.52	703	4.45	749	5.41	794	6.42	838	7.47	881	8.56	922	9.69	963	10.86
18,000	725	4.68	769	5.71	810	6.76	851	7.84	891	8.96	930	10.12	968	11.32	1006	12.55
20,000	795	6.08	836	7.22	874	8.36	911	9.52	947	10.71	983	11.94	1019	13.20	1054	14.51
22,000	867	7.75	904	9.00	940	10.24	974	11.49	1008	12.76	1041	14.06	1073	15.39	1105	16.76
24,000	939	9.71	974	11.07	1007	12.41	1039	13.75	1070	15.11	1101	16.49	1131	17.90	1161	19.33
26,000	1012	11.99	1044	13.46	1075	14.90	1105	16.34	1134	17.79	1163	19.25	1191	20.74	1219	22.25
28,000	1084	14.61	1115	16.18	1144	17.73	1172	19.28	1200	20.82	1227	22.37	1253	23.94	1280	25.52
30,000	1157	17.60	1186	19.28	1214	20.93	1240	22.57	1267	24.22	1292	25.86	1317	27.51	1342	29.18

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	2.70		3.00		3.30		3.60		3.90		4.20		4.50		4.80	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	984	11.25	1023	12.42	1061	13.60	1097	14.80	1131	16.00	1165	17.22	1198	18.44	1229	19.67
16,000	1003	12.06	1041	13.27	1078	14.51	1113	15.76	1148	17.02	1181	18.29	1214	19.56	1245	20.85
18,000	1043	13.82	1079	15.12	1114	16.44	1149	17.79	1182	19.15	1215	20.52	1247	21.91	1278	23.31
20,000	1088	15.84	1122	17.21	1155	18.60	1188	20.02	1220	21.47	1251	22.93	1282	24.42	1312	25.91
22,000	1137	18.15	1169	19.58	1200	21.05	1231	22.54	1261	24.05	1291	25.59	1321	27.15	1350	28.74
24,000	1191	20.79	1220	22.28	1249	23.81	1278	25.36	1307	26.94	1335	28.55	1363	30.18	1390	31.83
26,000	1247	23.78	1274	25.33	1302	26.92	1329	28.53	1356	30.18	1382	31.85	1409	33.54	1435	35.26
28,000	1306	27.12	1332	28.75	1357	30.41	1383	32.08	1408	33.79	1433	35.52	1458	37.28	1483	39.05
30,000	1367	30.86	1391	32.57	1415	34.29	1439	36.03	1463	37.81	1487	39.60	1510	41.42	1534	43.25

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	5.10		5.40		5.70		6.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	1260	20.91	1290	22.15	1319	23.41	1347	24.66
16,000	1276	22.15	1305	23.45	1334	24.76	1362	26.08
18,000	1308	24.71	1337	26.13	1366	27.56	1394	28.99
20,000	1342	27.42	1370	28.95	1399	30.48	1426	32.02
22,000	1378	30.33	1406	31.95	1434	33.57	1461	35.21
24,000	1418	33.51	1445	35.20	1471	36.91	1497	38.64
26,000	1461	37.00	1487	38.76	1512	40.54	1537	42.35
28,000	1507	40.86	1532	42.69	1556	44.54	1580	46.40
30,000	1557	45.12	1580	47.01	1603	48.92	1626	50.85

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan high-capacity power exhaust units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

Table 19 — Fan Performance — 48/50P2,P3,P4,P5090 Units with Forward-Curved Fan*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	232	3.27	261	4.06	288	4.88	313	5.74	337	6.65	360	7.59	381	8.57	402	9.58
18,000	253	4.42	281	5.31	305	6.21	329	7.14	351	8.11	372	9.12	393	10.17	413	11.25
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24
32,000	414	21.36	431	22.99	448	24.59	464	26.17	479	27.75	494	29.32	508	30.90	523	32.49
34,000	437	25.39	454	27.13	470	28.84	485	30.53	500	32.20	514	33.87	528	35.55	542	37.23

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	423	10.62	442	11.68	462	12.77	480	13.88	498	15.00	516	16.15	533	17.31	550	18.48
18,000	432	12.36	450	13.50	469	14.66	486	15.84	504	17.05	521	18.27	537	19.53	553	20.78
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11
32,000	536	34.11	550	35.73	563	37.38	576	39.04	589	40.73	601	42.45	614	44.18	626	45.94
34,000	555	38.92	568	40.63	581	42.36	593	44.10	605	45.87	618	47.64	630	49.45	641	51.27

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	566	19.68	582	20.88	597	22.10	613	23.33
18,000	569	22.06	585	23.36	600	24.66	615	25.99
20,000	574	24.68	589	26.06	604	27.45	618	28.85
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06
32,000	638	47.72	650	49.51	662	51.33	674	53.17
34,000	653	53.12	665	54.98	676	56.87	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan and high-capacity power exhaust units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

Table 20 — Fan Performance — 48/50P2,P3,P4,P5090 Units with Airfoil Fan*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.30		0.60		0.90		1.20		1.50		1.80		2.10		2.40	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	690	4.07	735	5.05	779	6.06	822	7.10	863	8.18	904	9.31	945	10.47	984	11.68
18,000	725	4.68	769	5.71	810	6.76	851	7.84	891	8.96	930	10.12	968	11.32	1006	12.55
20,000	795	6.08	836	7.22	874	8.36	911	9.52	947	10.71	983	11.94	1019	13.20	1054	14.51
22,000	867	7.75	904	9.00	940	10.24	974	11.49	1008	12.76	1041	14.06	1073	15.39	1105	16.76
24,000	939	9.71	974	11.07	1007	12.41	1039	13.75	1070	15.11	1101	16.49	1131	17.90	1161	19.33
26,000	1012	11.99	1044	13.46	1075	14.90	1105	16.34	1134	17.79	1163	19.25	1191	20.74	1219	22.25
28,000	1084	14.61	1115	16.18	1144	17.73	1172	19.28	1200	20.82	1227	22.37	1253	23.94	1280	25.52
30,000	1157	17.60	1186	19.28	1214	20.93	1240	22.57	1267	24.22	1292	25.86	1317	27.51	1342	29.18
32,000	1231	20.97	1258	22.76	1284	24.52	1309	26.26	1334	28.00	1358	29.74	1382	31.48	1406	33.23
34,000	1304	24.75	1330	26.65	1355	28.52	1379	30.36	1403	32.20	1426	34.04	1448	35.87	1471	37.71

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	2.70		3.00		3.30		3.60		3.90		4.20		4.50		4.80	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	1022	12.91	1059	14.17	1096	15.45	1131	16.75	1165	18.06	1198	19.38	1230	20.72	1261	22.06
18,000	1043	13.82	1079	15.12	1114	16.44	1149	17.79	1182	19.15	1215	20.52	1247	21.91	1278	23.31
20,000	1088	15.84	1122	17.21	1155	18.60	1188	20.02	1220	21.47	1251	22.93	1282	24.42	1312	25.91
22,000	1137	18.15	1169	19.58	1200	21.05	1231	22.54	1261	24.05	1291	25.59	1321	27.15	1350	28.74
24,000	1191	20.79	1220	22.28	1249	23.81	1278	25.36	1307	26.94	1335	28.55	1363	30.18	1390	31.83
26,000	1247	23.78	1274	25.33	1302	26.92	1329	28.53	1356	30.18	1382	31.85	1409	33.54	1435	35.26
28,000	1306	27.12	1332	28.75	1357	30.41	1383	32.08	1408	33.79	1433	35.52	1458	37.28	1483	39.05
30,000	1367	30.86	1391	32.57	1415	34.29	1439	36.03	1463	37.81	1487	39.60	1510	41.42	1534	43.25
32,000	1429	35.00	1452	36.78	1475	38.58	1498	40.40	1520	42.24	1543	44.10	1565	45.98	1587	47.88
34,000	1493	39.57	1515	41.43	1537	43.31	1558	45.20	1580	47.11	1601	49.05	1622	50.99	1643	52.96

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	5.10		5.40		5.70		6.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	1291	23.42	1321	24.77	1350	26.14	1378	27.52
18,000	1308	24.71	1337	26.13	1366	27.56	1394	28.99
20,000	1342	27.42	1370	28.95	1399	30.48	1426	32.02
22,000	1378	30.33	1406	31.95	1434	33.57	1461	35.21
24,000	1418	33.51	1445	35.20	1471	36.91	1497	38.64
26,000	1461	37.00	1487	38.76	1512	40.54	1537	42.35
28,000	1507	40.86	1532	42.69	1556	44.54	1580	46.40
30,000	1557	45.12	1580	47.01	1603	48.92	1626	50.85
32,000	1609	49.81	1631	51.76	1653	53.72	1675	55.72
34,000	1664	54.95	1685	56.96	1706	58.99	1727	61.04

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan and high-capacity power exhaust units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

Table 21 — Fan Performance — 48/50P2,P3,P4,P5100 Units with Forward-Curved Fan*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24
32,000	414	21.36	431	22.99	448	24.59	464	26.17	479	27.75	494	29.32	508	30.90	523	32.49
34,000	437	25.39	454	27.13	470	28.84	485	30.53	500	32.20	514	33.87	528	35.55	542	37.23
36,000	461	29.92	477	31.77	492	33.58	506	35.38	521	37.16	534	38.93	548	40.69	561	42.47
38,000	485	34.96	500	36.91	514	38.85	528	40.74	542	42.63	555	44.50	568	46.36	581	48.23
40,000	509	40.54	523	42.61	537	44.65	550	46.66	563	48.64	576	50.62	589	52.59	601	54.56

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11
32,000	536	34.11	550	35.73	563	37.38	576	39.04	589	40.73	601	42.45	614	44.18	626	45.94
34,000	555	38.92	568	40.63	581	42.36	593	44.10	605	45.87	618	47.64	630	49.45	641	51.27
36,000	574	44.25	586	46.03	599	47.85	611	49.67	623	51.51	634	53.37	646	55.25	657	57.14
38,000	593	50.10	605	51.98	617	53.87	629	55.77	640	57.71	652	59.63	663	61.59	674	63.54
40,000	613	56.52	625	58.49	636	60.48	648	62.46	659	64.47	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	574	24.68	589	26.06	604	27.45	618	28.86
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06
32,000	638	47.72	650	49.51	662	51.33	674	53.17
34,000	653	53.12	665	54.98	676	56.87	—	—
36,000	669	59.06	680	60.98	—	—	—	—
38,000	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan and high-capacity power exhaust units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

Table 22 — Fan Performance — 48/50P2,P3,P4,P5100 Units with Airfoil Fan*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.30		0.60		0.90		1.20		1.50		1.80		2.10		2.40	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	795	6.08	836	7.22	874	8.36	911	9.52	947	10.71	983	11.94	1019	13.20	1054	14.51
22,000	867	7.75	904	9.00	940	10.24	974	11.49	1008	12.76	1041	14.06	1073	15.39	1105	16.76
24,000	939	9.71	974	11.07	1007	12.41	1039	13.75	1070	15.11	1101	16.49	1131	17.90	1161	19.33
26,000	1012	11.99	1044	13.46	1075	14.90	1105	16.34	1134	17.79	1163	19.25	1191	20.74	1219	22.25
28,000	1084	14.61	1115	16.18	1144	17.73	1172	19.28	1200	20.82	1227	22.37	1253	23.94	1280	25.52
30,000	1157	17.60	1186	19.28	1214	20.93	1240	22.57	1267	24.22	1292	25.86	1317	27.51	1342	29.18
32,000	1231	20.97	1258	22.76	1284	24.52	1309	26.26	1334	28.00	1358	29.74	1382	31.48	1406	33.23
34,000	1304	24.75	1330	26.65	1355	28.52	1379	30.36	1403	32.20	1426	34.04	1448	35.87	1471	37.71
36,000	1378	28.97	1402	30.97	1426	32.94	1449	34.89	1472	36.84	1494	38.76	1515	40.70	1537	42.64
38,000	1452	33.65	1475	35.75	1498	37.82	1520	39.89	1541	41.92	1562	43.95	1583	45.98	1604	48.01
40,000	1526	38.81	1548	41.02	1570	43.20	1591	45.35	1611	47.49	1632	49.63	1652	51.76	1671	53.88

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	2.70		3.00		3.30		3.60		3.90		4.20		4.50		4.80	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	1088	15.84	1122	17.21	1155	18.60	1188	20.02	1220	21.47	1251	22.93	1282	24.42	1312	25.91
22,000	1137	18.15	1169	19.58	1200	21.05	1231	22.54	1261	24.05	1291	25.59	1321	27.15	1350	28.74
24,000	1191	20.79	1220	22.28	1249	23.81	1278	25.36	1307	26.94	1335	28.55	1363	30.18	1390	31.83
26,000	1247	23.78	1274	25.33	1302	26.92	1329	28.53	1356	30.18	1382	31.85	1409	33.54	1435	35.26
28,000	1306	27.12	1332	28.75	1357	30.41	1383	32.08	1408	33.79	1433	35.52	1458	37.28	1483	39.05
30,000	1367	30.86	1391	32.57	1415	34.29	1439	36.03	1463	37.81	1487	39.60	1510	41.42	1534	43.25
32,000	1429	35.00	1452	36.78	1475	38.58	1498	40.40	1520	42.24	1543	44.10	1565	45.98	1587	47.88
34,000	1493	39.57	1515	41.43	1537	43.31	1558	45.20	1580	47.11	1601	49.05	1622	50.99	1643	52.96
36,000	1558	44.57	1579	46.53	1600	48.48	1620	50.46	1641	52.44	1661	54.44	1681	56.46	1701	58.50
38,000	1624	50.05	1644	52.08	1664	54.13	1684	56.19	1703	58.25	1722	60.33	1742	62.43	1761	64.54
40,000	1691	56.01	1710	58.13	1729	60.26	1748	62.41	1767	64.55	1785	66.71	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	5.10		5.40		5.70		6.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	1342	27.42	1370	28.95	1399	30.48	1426	32.02
22,000	1378	30.33	1406	31.95	1434	33.57	1461	35.21
24,000	1418	33.51	1445	35.20	1471	36.91	1497	38.64
26,000	1461	37.00	1487	38.76	1512	40.54	1537	42.35
28,000	1507	40.86	1532	42.69	1556	44.54	1580	46.40
30,000	1557	45.12	1580	47.01	1603	48.92	1626	50.85
32,000	1609	49.81	1631	51.76	1653	53.72	1675	55.72
34,000	1664	54.95	1685	56.96	1706	58.99	1727	61.04
36,000	1721	60.57	1741	62.64	1761	64.73	1781	66.85
38,000	1780	66.66	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) 48/50P3,P5 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan and high-capacity power exhaust units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

Table 23 — Fan Performance — Standard Capacity Power Exhaust

48/50P2,P3,P4,P5030-050 Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60		1.80		2.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	380	0.95	468	1.47	543	2.01	612	2.60	676	3.24	738	3.92	796	4.64	852	5.39	905	6.17	956	6.98
8,000	440	1.69	523	2.40	591	3.08	651	3.77	706	4.49	759	5.23	810	6.01	859	6.82	907	7.66	953	8.53
10,000	504	2.73	582	3.68	647	4.55	703	5.38	754	6.22	802	7.06	847	7.92	891	8.80	933	9.70	975	10.52
12,000	575	4.17	643	5.33	705	6.42	760	7.45	809	8.44	854	9.41	896	10.38	937	11.27	976	12.29	—	—
14,000	650	6.09	708	7.42	766	8.73	819	9.97	867	11.05	910	12.22	951	13.38	990	14.53	—	—	—	—
16,000	729	8.57	778	10.02	829	11.43	879	12.93	926	14.37	969	15.76	—	—	—	—	—	—	—	—
18,000	809	11.57	851	13.19	896	14.90	942	16.61	987	18.29	—	—	—	—	—	—	—	—	—	—
20,000	891	15.47	927	17.22	967	19.08	—	—	—	—	—	—	—	—	—	—	—	—	—	—

48/50P2,P3,P4,P5055-100 Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	416	1.65	469	2.03	522	2.47	574	2.97	624	3.51	673	4.08	720	4.66	765	5.26	808	5.86	850	6.47
12,000	480	2.67	524	3.09	568	3.56	612	4.09	656	4.67	699	5.29	741	5.94	782	6.61	822	7.30	861	8.00
14,000	546	4.09	584	4.55	621	5.05	659	5.61	697	6.21	735	6.87	772	7.56	809	8.28	845	9.03	881	9.80
16,000	613	5.95	647	6.46	680	7.00	713	7.59	746	8.22	779	8.90	812	9.62	845	10.37	878	11.16	910	11.98
18,000	682	8.32	712	8.88	741	9.47	771	10.10	800	10.76	830	11.47	859	12.21	889	13.00	918	13.81	—	—
20,000	752	11.27	779	11.89	805	12.53	832	13.19	858	13.90	885	14.63	911	15.41	—	—	—	—	—	—
22,000	821	14.86	846	15.53	871	16.23	895	16.94	919	17.69	—	—	—	—	—	—	—	—	—	—
24,000	892	19.16	915	19.89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Bhp — Brake Horsepower

Table 24 — Fan Performance — Optional High-Capacity Power Exhaust (48/50P2,P3,P4,P5075-100)

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	436	3.79	480	4.28	520	4.86	557	5.48	592	6.11
16,000	486	5.37	526	5.86	563	6.47	597	7.12	629	7.80
18,000	536	7.37	574	7.84	608	8.45	639	9.14	670	9.86
20,000	588	9.81	622	10.26	654	10.87	684	11.57	712	12.32
22,000	639	12.75	671	13.16	701	13.76	730	14.46	757	15.23
24,000	692	16.21	722	16.59	750	17.16	777	17.86	802	18.65
26,000	745	20.24	772	20.58	799	21.13	824	21.82	849	22.60
28,000	798	24.87	824	25.18	849	25.70	873	26.37	896	27.14
30,000	851	30.15	875	30.43	899	30.91	922	31.55	944	32.31
32,000	905	36.10	928	36.35	950	36.80	972	37.41	993	38.14
34,000	959	42.76	980	42.98	1001	43.40	1022	43.98	1042	44.69
36,000	1013	50.17	1033	50.37	1053	50.75	1072	51.30	1092	51.98
38,000	1067	58.36	1086	58.53	1105	58.89	1124	59.40	1142	60.05
40,000	1121	67.37	1139	67.52	1157	67.84	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	626	6.76	659	7.42	691	8.09	722	8.77	752	9.45
16,000	660	8.50	690	9.22	720	9.94	749	10.68	777	11.42
18,000	698	10.60	726	11.36	754	12.14	780	12.93	806	13.73
20,000	739	13.10	765	13.91	791	14.73	816	15.57	840	16.41
22,000	782	16.05	807	16.89	831	17.75	854	18.63	877	19.52
24,000	827	19.48	850	20.35	873	21.25	895	22.16	917	23.10
26,000	872	23.44	894	24.33	916	25.26	937	26.21	958	27.17
28,000	918	27.99	940	28.89	961	29.83	981	30.81	1001	31.81
30,000	965	33.15	986	34.06	1006	35.01	1026	36.00	1045	37.02
32,000	1013	38.98	1033	39.88	1053	40.84	1071	41.84	1090	42.88
34,000	1062	45.50	1081	46.39	1100	47.35	1118	48.36	1136	49.41
36,000	1111	52.77	1129	53.65	1147	54.59	1165	55.60	—	—
38,000	1160	60.81	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	782	10.14	811	10.83	839	11.53	866	12.23	892	12.93
16,000	805	12.18	832	12.93	858	13.69	884	14.46	910	15.23
18,000	832	14.53	858	15.35	882	16.17	907	16.99	931	17.82
20,000	864	17.27	888	18.14	911	19.01	934	19.89	957	20.78
22,000	900	20.43	922	21.34	944	22.26	966	23.20	987	24.14
24,000	938	24.04	959	25.00	980	25.98	1000	26.95	1020	27.94
26,000	979	28.17	998	29.16	1018	30.17	1037	31.20	1057	32.23
28,000	1020	32.83	1040	33.86	1058	34.91	1077	35.98	1095	37.05
30,000	1064	38.07	1082	39.14	1100	40.23	1118	41.33	1135	42.44
32,000	1108	43.95	1126	45.05	1143	46.16	1160	47.29	—	—
34,000	1153	50.49	1170	51.61	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	918	13.64	943	14.34	967	15.05	990	15.75	1013	16.46
16,000	934	16.00	959	16.77	983	17.55	1006	18.33	1029	19.11
18,000	955	18.66	978	19.50	1001	20.34	1024	21.19	1046	22.04
20,000	979	21.67	1001	22.57	1023	23.47	1045	24.38	1066	25.29
22,000	1008	25.08	1029	26.03	1050	26.99	1070	27.96	1090	28.92
24,000	1040	28.93	1060	29.94	1080	30.94	1099	31.96	1118	32.98
26,000	1075	33.27	1094	34.32	1113	35.37	1131	36.44	1149	37.51
28,000	1113	38.14	1131	39.23	1148	40.33	1166	41.44	—	—
30,000	1152	43.56	1169	44.69	—	—	—	—	—	—
32,000	—	—	—	—	—	—	—	—	—	—
34,000	—	—	—	—	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Table 25 — Component Pressure Drops (in. wg)

SIZE 030-050 UNITS

COMPONENT	AIRFLOW (cfm)							
	6,000	8,000	10,000	12,000	14,000	16,000	18,000	20,000
ECONOMIZER	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.35
FILTERS								
30% Pleated (2-in.)	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.03
Bags With Prefilters	0.22	0.31	0.41	0.52	0.64	0.76	0.89	1.03
4-in. Filters (field convert)	0.02	0.05	0.06	0.08	0.09	0.11	0.13	0.15
POWER EXHAUST	0.02	0.03	0.05	0.08	0.11	0.15	0.20	0.25
LOW GAS HEAT (48P2,P3 Units)	0.09	0.18	0.31	0.48	0.68	0.92	1.19	1.50
HIGH GAS HEAT (48P2,P3 Units)	—	0.21	0.38	0.60	0.86	1.17	1.53	1.93
LOW GAS HEAT (48P4,P5 Units)	0.24	0.42	0.71	1.09	1.58	2.17	2.86	3.66
HIGH GAS HEAT (48P4,P5 Units)	0.08	0.22	0.46	0.79	1.20	1.71	2.31	3.01
ELECTRIC HEAT*								
36 kW	—	0.03	0.07	0.12	0.18	0.26	0.35	0.46
72 kW	—	0.06	0.11	0.18	0.26	0.36	0.47	0.60
108 kW	—	0.12	0.18	0.26	0.36	0.47	0.59	0.73
HYDRONIC COIL	0.07	0.11	0.16	0.22	0.29	0.37	0.46	0.55
HIGH CAP COIL (030)	0.03	0.05	0.07	0.09	0.11	0.14	—	—
HIGH CAP COIL (040)	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40
HIGH CAP COIL (050)	0.03	0.05	0.08	0.11	0.14	0.19	0.23	0.29
Humidi-MiZer® SYSTEM	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23

SIZE 055-070 UNITS

COMPONENT	AIRFLOW (cfm)										
	10,000	12,000	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000
ECONOMIZER	0.05	0.07	0.08	0.10	0.12	0.14	0.16	0.19	0.21	0.24	0.26
FILTERS											
30% Pleated (2-in.)	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06
Bags With Prefilters	0.45	0.56	0.68	0.81	0.94	1.08	1.22	1.38	—	—	—
4-in. Filters (field convert)	0.06	0.08	0.09	0.11	0.13	0.15	0.17‘	0.19	0.22	0.24	0.27
POWER EXHAUST	0.03	0.04	0.05	0.07	0.08	0.10	0.12	0.14	0.17	0.19	0.22
LOW GAS HEAT (48P2,P3 Units)	0.14	0.18	0.22	0.27	0.31	0.36	0.41	0.47	0.52	0.59	0.65
HIGH GAS HEAT (48P2,P3 Units)	0.21	0.26	0.32	0.37	0.43	0.50	0.56	0.63	0.70	0.78	0.86
LOW GAS HEAT (48P4,P5 Units)	0.11	0.14	0.18	0.23	0.27	0.32	0.37	0.42	0.48	0.54	0.60
HIGH GAS HEAT (48P4,P5 Units)	0.19	0.30	0.40	0.51	0.62	0.73	0.85	0.97	1.09	1.21	1.34
ELECTRIC HEAT*											
36 kW	—	—	0.07	0.09	0.12	0.15	0.18	0.21	0.24	0.28	0.32
72 kW	—	—	0.10	0.13	0.16	0.20	0.24	0.29	0.34	0.39	0.45
108 kW	—	—	0.13	0.17	0.22	0.26	0.32	0.38	0.44	0.51	0.59
HYDRONIC COIL	0.15	0.20	0.26	0.32	0.39	0.47	0.55	0.64	0.73	0.83	0.94
HIGH CAP COIL (055)	0.05	0.07	0.09	0.12	0.14	0.17	0.21	0.24	0.28	0.32	0.37
HIGH CAP COIL (060,070)	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.21	0.25	0.28
Humidi-MiZer® SYSTEM	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35	0.38	0.43

SIZE 075-100 UNITS

COMPONENT	AIRFLOW (cfm)										
	15,000	18,000	21,000	24,000	27,000	30,000	33,000	36,000	39,000	42,000	44,000
ECONOMIZER	0.10	0.12	0.15	0.19	0.22	0.26	0.30	0.34	0.39	0.43	0.47
FILTERS											
30% Pleated (2-in.)	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
65% Pleated (2-in.)	0.14	0.15	0.17	0.18	0.19	0.21	0.23	0.25	0.27	0.29	0.31
4-in. Filters (field convert)	0.10	0.13	0.16	0.19	0.23	0.27	0.31	0.35	0.39	0.44	0.47
POWER EXHAUST	0.06	0.08	0.11	0.14	0.18	0.22	0.27	0.32	0.37	0.43	0.47
LOW GAS HEAT (48P2,P3 Units)	0.24	0.31	0.39	0.47	0.55	0.65	0.75	0.86	0.97	1.09	1.18
HIGH GAS HEAT (48P2,P3 Units)	0.34	0.43	0.53	0.63	0.74	0.86	0.98	1.11	1.24	1.38	1.48
LOW GAS HEAT (48P4,P5 Units)	0.21	0.29	0.37	0.45	0.53	0.61	0.70	0.78	0.87	0.96	1.02
HIGH GAS HEAT (48P4,P5 Units)	0.51	0.70	0.91	1.13	1.37	1.62	1.89	2.17	2.47	2.79	3.01
ELECTRIC HEAT*											
108 kW	0.05	0.07	0.10	0.13	0.16	0.20	0.24	0.29	0.34	0.40	0.44
216 kW	0.08	0.12	0.16	0.20	0.26	0.32	0.39	0.46	0.54	0.63	0.69
HYDRONIC COIL	0.29	0.40	0.52	0.65	0.79	0.94	1.11	1.29	1.47	1.67	1.81
HIGH CAP COIL (075)	0.08	0.11	0.14	0.18	0.22	0.26	0.31	0.36	0.41	0.47	0.51
HIGH CAP COIL (090,100)	0.01	0.02	0.03	0.05	0.08	0.10	0.13	0.16	0.20	0.24	0.27
Humidi-MiZer® SYSTEM (075)	0.16	0.20	0.25	0.31	0.37	0.43	0.50	0.58	0.66	0.74	0.80
Humidi-MiZer SYSTEM (090,100)	0.13	0.16	0.20	0.25	0.29	0.35	0.40	0.46	0.52	0.58	0.63

*Available on vertical return and discharge units only.

(Shaded cells) For interpolation purposes only. Outside of operating limits.

NOTE: Power exhaust pressure drop does not need to be added to supply fan static pressure on return fan units and on high-capacity power exhaust units.

Table 26 — Supply Fan Motor Limitations (Sizes 030-070)

HIGH-EFFICIENCY MOTORS

Nominal		Maximum		Maximum Amps				Rated Efficiency
Bhp	BkW	Bhp	BkW	230 v	380 v	460 v	575 v	
7.5	5.60	8.7	6.49	22.0	—	—	—	84.1
		9.5	7.09	—	15.0	12.0	10.0	88.5
10	7.46	10.2	7.61	28.0	—	—	—	89.5
		11.8	8.80	—	20.7	14.6	12.0	89.5
15	11.19	15.3	11.41	43.8	—	—	—	91.0
		18.0	13.43	—	27.0	21.9	19.0	91.0
20	14.92	22.4	16.71	62.0	—	—	—	91.0
		23.4	17.46	—	37.4	28.7	23.0	91.0
25	18.65	28.9	21.56	72.0	—	—	—	91.7
		29.4	21.93	—	43.8	37.4	31.0	91.7
30	22.38	35.6	26.56	95.0	—	—	—	92.4
		34.7	25.89	—	—	48.0	36.3	92.4
40	29.80	42.0	31.30	—	—	55.0	—	93.0

PREMIUM-EFFICIENCY MOTORS

Nominal		Maximum		Maximum Amps		Rated Efficiency
Bhp	BkW	Bhp	BkW	230 v	460 v	
7.5	5.60	8.7	6.49	22.0	—	91.7
		9.5	7.09	—	12.0	91.7
10	7.46	10.2	7.61	28.0	—	91.7
		11.8	8.80	—	15.0	91.7
15	11.19	15.3	11.41	43.8	—	93.0
		18.0	13.43		21.9	93.0
20	14.92	22.4	16.71	58.2	—	93.6
		23.4	17.46	—	28.7	93.6
25	18.65	28.9	21.56	73.0	—	93.6
		29.4	21.93	—	36.3	93.6
30	22.38	35.6	26.56	82.6	—	93.6
		34.7	25.89	—	41.7	93.6
40	29.84	42.0	31.33	—	55.0	94.5

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts

NOTES:
1. Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

Table 27 — Supply Fan Motor Limitations (Sizes 075-100)

HIGH-EFFICIENCY MOTORS

Nominal HP	BkW	Max Bhp	Max BkW	Max Amps		Rated Efficiency
				460 V	575 V	
30	22.4	34.7	25.9	48.0	36.3	92.4
40	29.8	42.0	31.3	55.0	48.8	93.0
50	37.3	57.5	42.9	71.0	52.8	93.0
60	44.8	69.0	51.5	82.6	60.5	93.6
75	59.5	86.25	64.3	99.5	N/A	94.1

PREMIUM-EFFICIENCY MOTORS

Nominal HP	BkW	Max Bhp	Max BkW	Max Amps		Rated Efficiency
				460 V	575 V	
30	22.4	34.7	25.9	41.7	N/A	93.6
40	29.8	42.0	31.3	55.0	N/A	94.5
50	37.3	57.5	42.9	71.0	N/A	94.5
60	44.8	69.0	51.5	75.0	N/A	95.4
75	59.5	86.25	64.3	95.5	N/A	95.4

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts
N/A — Not Available

NOTES:
1. Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

Table 28 — Optional High-Capacity Power Exhaust Systems Motor Limitations (Sizes 075-100)

HIGH-EFFICIENCY MOTORS						
Nominal HP	BkW	Max Bhp	Max BkW	Max Amps (ea)		Rated Efficiency
				460 V	575 V	
20	14.9	23.6	17.6	14.6	12.0	89.5
30	22.4	36.0	26.9	21.9	19.0	91.0
40	29.8	46.8	34.9	28.7	23.0	91.0
50	37.3	58.8	43.9	37.4	31.0	91.7
60	44.8	69.0	51.5	48.0	36.3	92.4
PREMIUM-EFFICIENCY MOTORS						
Nominal HP	BkW	Max Bhp	Max BkW	Max Amps (ea)		Rated Efficiency
				460 V	575 V	
20	14.9	23.6	17.6	15.0	N/A	91.7
30	22.4	36.0	26.9	21.9	N/A	93.0
40	29.8	46.8	34.9	28.7	N/A	93.6
50	37.3	58.8	43.9	36.3	N/A	93.6
60	44.8	69.0	51.5	41.7	N/A	93.6

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts

NOTES:
1. Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

CONTROLS QUICK START

The following section will provide a quick user guide to setting up and configuring the P Series units with *Comfort*Link controls. See Basic Control Usage section on page 4 for information on operating the control.

Variable Air Volume Units Using Return Air Sensor or Space Temperature Sensor — To configure the unit, perform the following:

1. The type of control is configured under ***Configuration →UNIT→C.TYP.*** Set ***C.TYP*** to 1 (VAV-RAT) for return air sensor. Set ***C.TYP*** to 2 (VAV-SPT) for space temperature sensor.

   NOTE: For VAV with a space sensor (VAV-SPT), under ***Configuration→UNIT→SENS→SPT.S***, enable the space sensor by setting ***SPT.S*** to ENBL.

NOTE: Configuration of the machine control type (***C.TYP***) has no effect on whether a unit has a VFD or just a supply fan installed for static pressure control. No matter what the control type is, it is possible to run the unit in either CV or VAV mode provided there are enough stages to accommodate lower air volumes for VAV operation. Refer to the section on static pressure control for information on how to set up the unit for the type of supply fan control desired.

2. The space temperature set points and the supply air set points are configured under the Setpoints menu. The heating and cooling set points must be configured. See the Heating Control and Cooling Control sections for further description on these configurations. Configure the following set points:

   OHSP Occupied Heat Set point
   OCSP Occupied Cool Set point
   UHSP Unoccupied Heat Set point
   UCSP Unoccupied Cool Set point
   GAP Heat-Cool Set point Gap
   V.C.ON VAV Occupied Cool On Delta
   V.C.OF VAV Occupied Cool Off Delta

   Also configure the following points in the ***Configuration →D.LV.T*** menu:

   L.H.ON Demand Level Low Heat On
   L.H.OF Demand Level Low Heat Off

3. To program time schedules, make sure ***SCH.N***=1 under ***Configuration→CCN→SC.OV→SCH.N*** to configure the control to use local schedules.
4. Under the ***Timeclock→SCH.L*** submenu, enter the desired schedule. See Time Clock section for further descriptions of these configurations.
5. Under ***Configuration→SP→SP.SP***, the Supply Duct Static Pressure set point should be configured.
6. If supply air temperature reset is desired, under the ***Configuration→EDT.R*** submenu, the following set points should be configured:

   RS.CF EDT Reset Configuration
   RTIO Reset Ratio
   LIMT Reset Limit
   RES.S EDT 4-20 mA Reset Input

   This applies to both TSTAT MULTI and SENSOR MULTI modes.

NOTE: Configure either ***RTIO*** and ***LIMT*** or ***RES.S***. All three are not used.

7. See the Economizer Options section on page 33 for additional economizer option configurations.
8. See the Exhaust Options section on page 33 for addition exhaust option configurations.

Multi-Stage Constant Volume Units with Mechanical Thermostat — To configure the unit, perform the following:

1. Under ***Configuration→UNIT→C.TYP***, set ***C.TYP*** to 3 (TSTAT MULTI).
2. Under the **Setpoints** menu, set the following configurations:

   SA.HI Supply Air Set Point Hi
   SA.LO Supply Air Set Point Lo

3. See the Economizer Options section on page 33 for additional economizer option configurations.
4. See the Exhaust Options section on page 33 for additional exhaust option configurations.

Multi-Stage Constant Volume Units with Space Sensor — To configure the unit, perform the following:

1. Under ***Configuration→UNIT→C.TYP***, set ***C.TYP*** to 4 (SPT MULTI).
2. Under the ***Setpoints*** menu, the following configurations should be set:

SA.HI	Supply Air Set Point Hi
SA.LO	Supply Air Set Point Lo

3. Under the ***Setpoints*** submenu, the heating and cooling set points must be configured:

OHSP	Occupied Heat Setpoint
OCSP	Occupied Cool Setpoint
UHSP	Unoccupied Heat Setpoint
UCSP	Unoccupied Cool Setpoint
GAP	Heat-Cool Setpoint Gap
D.LV.T	Cool/Heat Set Point Offsets (located in the ***Configuration*** menu)

4. Under ***Configuration→UNIT→SENS→SPT.S***, enable the space sensor by setting ***SPT.S*** to ENBL.
5. Under ***Configuration→UNIT→FN.MD***, set ***FN.MD*** to 1 for continuous fan or 0 for automatic fan.
6. To program time schedules, set **SCH.N**=1 under ***Configuration→CCN→SC.OV→SCH.N*** to configure the control to use local schedules.
7. Under the ***Timeclock→SCH.L*** submenu, enter the desired schedule. See Time Clock section for further descriptions of these configurations.
8. See the Economizer Options section below for additional economizer option configurations.
9. See the Exhaust Options section below for additional exhaust option configurations.

Economizer Options — Under the ***Configuration→ECON*** submenu, the following set points should be configured:

EC.EN	Economizer Enabled?
EC2.E	Econ Act.2 Installed?
EC.MN	Economizer Min.Position
EC.MX	Economizer Maximum Position
E.TRM	Economizer Trim for SumZ?
E.SEL	Econ Changeover Select
OA.E.C	OA Enthalpy Change Over Select
OA.EN	Outdoor Enthalpy Compare Value
OAT.L	High OAT Lockout Temp
O.DEW	OA Dew Point Temp Limit
ORH.S	Outside Air RH Sensor

Configuration→ECON→EC.MN should always be set for the minimum damper position.

If the unit is equipped with an outdoor air flow station, the following points in ***Configuration→ECON→CFM.C*** need to be set.

OCF.S	Outdoor Air CFM Sensor
O.C.MX	Economizer Minimum Flow
O.C.DB	Economizer Minimum Flow Deadband

If equipped with an outdoor flow station, make sure ***Configuration→ECON→CFM.C→OCF.S*** is enabled. If an outdoor air cfm station is used, then the economizer will control to cfm, not a position, as long as the sensor is valid. Therefore, ***Configuration→ECON→CFM.C→O.C.MX*** supersedes ***Configuration→ECON→EC.MN***.

Indoor Air Quality Options

DEMAND CONTROLLED VENTILATION — Under ***Configuration→IAQ→DCV.C***, the following configuration parameters should be set to establish the minimum and maximum points for outdoor air damper position during demand controlled ventilation (DCV):

EC.MN	Economizer Min.Position
IAQ.M	IAQ Demand Vent Min.Pos.
O.C.MX	Economizer Min.Flow
O.C.MN	IAQ Demand Vent Min.Flow

Configuration→IAQ→DCV.C→IAQ.M is used to set the absolute minimum vent position (or maximum reset) under DCV.

Configuration→IAQ→DCV.C→EC.MN is used to set the minimum damper position (or with no DCV reset). This is also referenced in the economizer section.

Configuration→IAQ→DCV.C→O.C.MX is used only with the outdoor airflow station and will supersede ***Configuration→IAQ→DCV.C→EC.MN*** as long as the outdoor air cfm sensor is valid.

Configuration→IAQ→DCV.C→O.C.MN is used only with the outdoor airflow station and will supersede ***Configuration→IAQ→DCV.C→IAQ.M*** as long as the outdoor air cfm sensor is valid.

Exhaust Options — The following exhaust options should be configured.

UNIT	EXHAUST TYPE			
	Modulating Power Exhaust	VFD PE	High-Capacity Power Exhaust	Return Exhaust
48/50P2,P3	X	X	X*	X*
48/50P4,P5	X	X	X*	NA

LEGEND

X — Available as Factory Option
NA — Not Available on this Unit
PE — Power Exhaust

*Sizes 075-100 only.

<u>***Configuration→BP→BF.CF*=1** (Two-Stage Exhaust Option)</u> — For two-stage exhaust, under the ***Configuration→BP*** submenu, configure the following:

BP.P1	Power Exhaust On Setp.1
BP.P2	Power Exhaust On Setp.2

<u>***Configuration→BP→BF.CF*=2** (Modulating Power Exhaust with Two Actuators Option)</u> — For modulating exhaust, the ***Configuration→BP*** submenu, configure the following:

BP.SP	Building Pressure Set point
BP.SO	BP Set point Offset

Under ***Configuration→BP→B.V.A*** the following configurations may be adjusted:

BP.FS	VFD/Act. Fire Speed
BP.MN	VFD/Act. Min. Speed
BP.1M	BP 1 Actuator Max
BP.2M	BP 2 Actuator Max

Configuration→BP→BP.CF=3 (VFD Power Exhaust Option) — Under ***Configuration→BP*** the following configurations may be adjusted:

BP.SP Building Pressure Set point
BP.SO BP Set point Offset

Under ***Configuration→BP→B.V.A*** the following configurations may be adjusted:

BP.FS VFD/Act. Fire Speed
BP.MN VFD/Act. Min. Speed
BP.MX VFD Maximum Speed

Configuration→BP→BP.CF=4 (High-Capacity VFD Power Exhaust) — Under ***Configuration→BP*** the following configuration may be adjusted:

BP.SP Building Pressure Set point
BP.SO BP Set point Offset

Under ***Configuration→BP→B.V.A*** the following configurations may be adjusted:

BP.FS VFD/Act. Fire Speed
BP.MN VFD/Act. Min. Speed
BP.MX VFD Maximum Speed
BP.CL BP Hi Cap VFD Clamp Val.

Configuration→BP→BP.CF=5 (Return/Exhaust — Fan Tracking Control) — Under ***Configuration →BP*** the following configuration may be adjusted:

BP.SP Building Pressure Setpt. (see note below)

Under ***Configuration→BP→B.V.A*** the following configurations may be adjusted:

BP.FS VFD/Act. Fire Speed
BP.MN VFD/Act. Min. Speed
BP.MX VFD Maximum Speed

Under ***Configuration→BP→FAN.T*** the following configurations may be adjusted:

FT.CF Fan Track Learn Enable (see note below)
FT.TM Fan Track Learn Rate (see note below, not used when Fan Track Learning is disabled)
FT.ST Fan Track Initial DCFM
FT.MX Fan Track Max Clamp (see note below, not used when Fan Track Learning is disabled)
FT.AD Fan Track Max Correction (see note below, not used when Fan Track Learning is disabled)
FT.OF Fan Track Internl EEPROM (see note below, not used when Fan Track Learning is disabled)
FT.RM Fan Track Internal RAM (see note below, not used when Fan Track Learning is disabled)
FT.RS Fan Track Reset Internal (see note below, not used when Fan Track Learning is disabled)
SCF.C Supply Air CFM Config (see note below, not used when Fan Track Learning is disabled)

NOTE: These configurations are used only if Fan Track Learning is enabled. When Fan Track Learning is enabled, the control will add an offset to the Fan Track Initial DCFM (***Configuration→BP→FAN.T→FT.ST***) if the building pressure deviates from the Building Pressure Set Point (***BP.SP***). Periodically, at the rate set by the Fan Track Learn Rate (***FT.TM***) the delta cfm is adjusted upward or downward with a maximum adjustment at a given instance to be no greater than Fan Track Max correction (***FT.AD***). The delta cfm cannot ever be adjusted greater than or less than the Fan Track Max Clamp (***FT.MX***).

Set Clock on VFD (If Installed) — The clock set mode is used for setting the date and time for the internal clock of the VFD. In order to use the timer functions of the VFD control, the internal clock must be set. The date is used to determine weekdays and is visible in the fault logs. Refer to the VFD section in Appendix D on page 213 for information on operating the VFD and using the keypad.

To set the clock, perform the following procedure from the VFD keypad:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use UP or DOWN keys to highlight TIME AND DATE SET on display screen and press ENTER (SOFT KEY 2). The clock set parameter list will be displayed.
3. Use UP or DOWN keys to highlight CLOCK VISIBILITY and press SEL (SOFT KEY 2). This parameter is used to display or hide the clock on the screen. Use UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
4. Use UP or DOWN keys to highlight SET TIME and press SEL (SOFT KEY 2). Use UP or DOWN keys to change the hours and minutes. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
5. Use UP or DOWN keys to highlight TIME FORMAT and press SEL (SOFT KEY 2). Use UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
6. Use UP or DOWN keys to highlight SET DATE and press SEL (SOFT KEY 2). Use UP or DOWN keys to change the day, month, and year. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
7. Use UP or DOWN keys to highlight DATE FORMAT and press SEL (SOFT KEY 2). Use UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
8. Press EXIT (SOFT KEY 1) twice to return to the main menu.

Programming Operating Schedules — The *Comfort*Link controls will accommodate up to eight different schedules (Periods 1 through 8), and each schedule is assigned to the desired days of the week. Each schedule includes an occupied on and off time. As an example, to set an occupied schedule for 8 AM to 5 PM for Monday through Friday, the user would set days Monday through Friday to ON for Period 1. Then the user would configure the Period 1 Occupied From point to 08:00 and the Period 1 Occupied To point to 17:00. To create a different weekend schedule, the user would use Period 2 and set days Saturday and Sunday to ON with the desired Occupied On and Off times.

NOTE: By default, the time schedule periods are programmed for 24 hours of occupied operation.

To create a schedule, perform the following procedure:

1. Scroll to the Configuration mode, and select CCN CONFIGURATION (CCN). Scroll down to the Schedule Number (***Configuration→CCN→SC.OV=SCH.N***). If password protection has been enabled, the user will be prompted to enter the password before any new data is accepted. ***SCH.N*** has a range of 0 to 99. The default value is 1. A value of 0 is always occupied, and the unit will control to its occupied set points. A value of 1 means the unit will follow a local schedule, and a value of 65 to 99 means it will follow a CCN schedule. Schedules 2-64 are not used as the control only supports one internal/local schedule. If one of the 2-64 schedules is configured, then the control will force the number back to 1. Make sure the value is set to 1 to use a local schedule.

2. Enter the Time Clock mode. Scroll down to the LOCAL TIME SCHEDULE (***SCH.L***) sub-mode, and press ENTER. Period 1 (***PER.1***) will be displayed.
3. Scroll down to the MON point. This point indicates if schedule 1 applies to Monday. Use the ENTER command to go into Edit mode, and use the UP or DOWN key to change the display to YES or NO. Scroll down through the rest of the days and apply schedule 1 where desired. The schedule can also be applied to a holiday.
4. Configure the beginning of the occupied time period for Period 1 (OCC). Press ENTER to go into Edit mode, and the first two digits of the 00.00 will start flashing. Use the UP or DOWN key to display the correct value for hours, in 24-hour (military) time. Press ENTER and hour value is saved and the minutes digits will start flashing. Use the same procedure to display and save the desired minutes value.
5. Configure the unoccupied time for period 1 (***UNC***). Press ENTER to go into Edit mode, and the first two digits of the 00.00 will start flashing. Use the UP or DOWN key to display the correct value for hours, in 24-hour (military) time. Press ENTER and hour value is saved and the minutes digits will start flashing. Use the same procedure to display and save the desired minutes value.
6. The first schedule is now complete. If a second schedule is needed, such as for weekends or holidays, scroll down and repeat the entire procedure for period 2 (***PER.2***). If additional schedules are needed, repeat the process for as many as are needed. Eight schedules are provided.

SERVICE TEST

General — The units are equipped with a Service Test feature, which is intended to allow a service person to force the unit into different modes of operation. To use this feature, enter the Service Test category on the local display and place the unit into the test mode by changing ***Service Test→TEST*** from OFF to ON. The display will prompt for the password before allowing any change. The deffault password is 1111. Once the unit enters the Service Test mode, the unit will shut down all current modes.

TEST* —** The ***TEST command turns the unit off (hard stop) and allows the unit to be put in a manual control mode.

STOP* —** The ***STOP command completely disables the unit (all outputs turn off immediately). Once in this mode, nothing can override the unit to turn it on. The controller will ignore all inputs and commands.

S.STP — Setting Soft Stop to YES turns the unit off in an orderly way, honoring any timeguards currently in effect.

***FAN.F* —** By turning the FAN FORCE on, the supply fan is turned on and will operate as it normally would, controlling duct static pressure on VAV applications or just energizing the fan on CV applications. To remove the force, press ENTER and then press the UP and DOWN arrows simultaneously.

The remaining categories: ***INDP, FANS, AC.T.C, HMZR, COOL,*** and ***HEAT*** are sub-menus with separate items and functions. See Table 29.

Service Test Mode Logic — Operation in the Service Test mode is sub-menu specific except for the ***INDP*** sub-menu. Leaving the sub-menu while a test is being performed and attempting to start a different test in the new sub-menu will cause the previous test to terminate. When this happens, the new request will be delayed for 5 seconds. For example, if compressors were turned on under the ***COOL*** sub-menu, any attempt to turn on heating stages within the ***HEAT*** sub-menu would immediately turn off the compressors and 5 seconds later the controller would honor the requested heat stages.

However, it is important to note that the user can leave a Service Test mode to view any of the local display menus (***Run Status***, ***Temperatures***, ***Pressures***, ***Setpoints***, ***Inputs***, ***Outputs***, ***Configuration***, ***Time Clock***, ***Operating Modes***, and ***Alarms***) and the control will remain in the Service Test mode.

Independent Outputs — The ***INDP*** sub-menu items can be turned on and off regardless of the other category states. For example, the humidifier relay or remote alarm/auxiliary relay can be forced on in the ***INDP*** sub-menu and will remain on if compressor stages were requested in the ***COOL*** sub-menu.

Fans — Upon entering the ***FANS*** sub-menu, the user will be able to enact either a manual or automatic style of test operation. The first item in the sub-menu, Fan Test Mode Automatic (***Service Test→FANS→F.MOD)***, allows the fan and the configured static pressure or building pressure control to begin as in the application run mode. During this automatic mode, it is possible to manually control condenser fans 1 to 4.

If Fan Test Mode Automatic (***Service Test→FANS→F.MOD)***, is set to NO, then the user will have individual control over duct static pressure (VFD speed), building pressure and condenser fan control. Additionally, the controller will protect the system from developing too much static pressure. If the static pressure during manual control rises above 3 in. wg or if the Static Pressure Set Point (***Setpoints→SPSP***) is greater than 2.5 in. wg and static pressure is 0.5 in. wg higher than ***SPSP***, then all options in the FANS menu will be cleared back to their default OFF states.

The power exhaust dampers can be energized individually or together and their damper positions can be forced to any position.

Actuators — In the ***AC.T.C*** sub-menu, it will be possible to control and calibrate actuators. Calibration is a mode in which the actuator moves from 0% to the point at which the actuator stalls, and it will then use this angular travel range as its “control angle”. It will also be possible to view the “control angle” adopted by the actuator after a calibration.

Within this sub-menu, the user may calibrate and control economizer actuators 1 and 2, the building pressure actuators 1 and 2, the hydronic heating coil actuator, and the humidifier steam valve control actuator.

NOTE: Once a calibration has been started, the user cannot exit test mode or select any other test mode operation until complete.

Table 29 — Service Test

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
TEST	Service Test Mode	ON/OFF		MAN_CTRL	
STOP	Local Machine Disable	YES/NO		UNITSTOP	config
S.STP	Soft Stop Request	YES/NO		SOFTSTOP	forcible
FAN.F	Supply Fan Request	YES/NO		SFANFORC	forcible
INDP	TEST INDEPENDENT OUTPUTS				
HUM.R	Humidifier Relay	ON/OFF		HUMR_TST	
ALRM	Remote Alarm/Aux Relay	ON/OFF		ALRM_TST	

Table 29 — Service Test (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
FANS	TEST FANS				
F.MOD	Fan Test Automatic?	YES/NO		FANAUTO	
E.POS	Econo Damper Command Pos		%	ECONFANS	
S.FAN	Supply Fan Relay	ON/OFF		SFAN_TST	
S.VFD	Supply Fan Commanded %	0-100	%	SFVFDTST	
P.E.1	Power Exhaust Relay 1	ON/OFF		PE1_TST	
E.VFD	Exhaust Fan Commanded %	0-100	%	EFVFDTST	
P.E.2	Power Exhaust Relay 2	ON/OFF		PE2_TST	
BP1.C	BP 1 Command Position	0-100	%	BLDPTST1	
BP2.C	BP 2 Command Position	0-100	%	BLDPTST2	
CDF.1	Condenser Fan Output 1	ON/OFF		CND1_TST	
CDF.2	Condenser Fan Output 2	ON/OFF		CND2_TST	
CDF.3	Condenser Fan Output 3	ON/OFF		CND3_TST	
CDF.4	Condenser Fan Output 4	ON/OFF		CND4_TST	
AC.T.C	CALIBRATE TEST-ACTUATORS				
ECN.C	Economizer Act.Cmd.Pos.	0-100	%	ECON1TST	
EC.CL	Economizer Calibrate Cmd	YES/NO		ECONOCAL	
ECN.A	Econ Act. Control Angle	read only		ECONCANG	
EC2.C	Economzr 2 Act.Cmd.Pos.	0-100	%	ECON2TST	
E2.CL	Economzr 2 Calibrate Cmd	YES/NO		ECON2CAL	
EC2.A	Econ2 Act.Control Angle	read only		ECN2CANG	
BP1.C	BP 1 Command Position	0-100	%	BLDG1TST	
B1.CL	BP 1 Actuator Cal Cmd	YES/NO		BLDG1CAL	
BP1.A	BP Act.1 Control Angle	read only		BP1_CANG	
BP1.M	BP 1 Actuator Max Pos.	0-100	%	BP1SETMX	
BP2.C	BP 2 Command Position	0-100	%	BLDG2TST	
B2.CL	BP 2 Actuator Cal Cmd	YES/NO		BLDG2CAL	
BP2.A	BP Act.2 Control Angle	read only		BP2_CANG	
BP2.M	BP 2 Actuator Max Pos.	0-100	%	BP2SETMX	
HTC.C	Ht.Coil Command Position	0-100	%	HTCLACTC	
HT.CL	Heating Coil Act. Cal.Cmd	YES/NO		HCOILCAL	
HTC.A	Heat Coil Act.Ctl.Angle	read only		HTCLCANG	
HMD.C	Humidifier Command Pos.	0-100	%	HUMD_TST	
HM.CL	Humidifier Act. Cal.Cmd	YES/NO		HUMIDCAL	
HMD.A	Humidifier Act.Ctrl.Ang.	read only		HUMDCANG	
HMZR	TEST HUMIDIMIZER				
RHV	Humidimizer 3-Way Valve	ON/OFF		RHVH_TST	
C.EXV	Condenser EXV Position	0-100	%	CEXVHTST	
B.EXV	Bypass EXV Position	0-100	%	BEXVHTST	
C.CAL	Condenser EXV Calibrate	ON/OFF		CEXV_CAL	
B.CAL	Bypass EXV Calibrate	ON/OFF		BEXV_CAL	
COOL	TEST COOLING				
E.POS	Econo Damper Command Pos	0-100	%	ECONCOOL	
SP.SP	Static Pressure Setpoint	0-5	" H2O	SPSP_TST	
CL.ST	Requested Cool Stage	0-n		CLST_TST	
MLV	Minimum Load Valve Relay	ON/OFF		MLV_TST	
A1	Compressor A1 Relay	ON/OFF		CMPA1TST	
A1.CP	Compressor A1 Capacity	20-100		A1CAPTST	
A1.B1	Two Circuit Start A1,B1	ON/OFF		CMPABTST	
A2	Compressor A2 Relay	ON/OFF		CMPA2TST	
A3	Compressor A3 Relay	ON/OFF		CMPA3TST	
B1	Compressor B1 Relay	ON/OFF		CMPB1TST	
B2	Compressor B2 Relay	ON/OFF		CMPB2TST	
B3	Compressor B3 Relay	ON/OFF		CMPB3TST	
RHV	Humidimizer 3-Way Valve	ON/OFF		RHVH_TST	
C.EXV	Condenser EXV Position	0-100	%	CEXVHTST	
B.EXV	Bypass EXV Position	0-100	%	BEXVHTST	
HEAT	TEST HEATING				
HT.ST	Requested Heat Stage	0-n		HTST_TST	
HT.1	Heat Relay 1	ON/OFF		HS1_TST	
H1.CP	Modulating Heat Capacity	0-100	%	MGAS_TST	
HT.2	Heat Relay 2	ON/OFF		HS2_TST	
HT.3	Relay 3 W1 Gas Valve 2	ON/OFF		HS3_TST	
HT.4	Relay 4 W2 Gas Valve 2	ON/OFF		HS4_TST	
HT.5	Relay 5 W1 Gas Valve 3	ON/OFF		HS5_TST	
HT.6	Relay 6 W2 Gas Valve 3	ON/OFF		HS6_TST	
H.I.R	Heat Interlock Relay	ON/OFF		HIR_TST	
HTC.C	Ht.Coil Command Position	0-100	%	HTCLHEAT	

Humidi-MiZer® System — In the Humidi-MiZer ***(HMZR)*** sub-menu, it will be possible to control and calibrate the Humidi-MiZer modulating valves (gas bypass and condenser) while the unit's compressors are OFF. Calibration is a mode in which the unit software will first over-drive each valve in the closing direction. This is to ensure that the valve is completely shut and to establish the "zero" open position. The controller then keeps track of the valve's position for normal operation. During this calibration phase, a light ratcheting sound may be heard and will serve as proof of valve operation and closure. Note that the calibration feature in Service Test is only provided as an additional troubleshooting tool. The valves will automatically go through the calibration process anytime the unit is powered down, unit power is cycled, or anytime there is a loss of communication between the EXV board and the valve. There should be no need to manually calibrate the valves under normal circumstances.

This sub-menu also allows manual manipulation of RHV (reheat 3-way valve), the bypass valve, and condenser valve. With the compressors and outdoor fans off, the user should hear a light ratcheting sound during movement of the two modulating valves. The sound can serve as proof of valve operation.

Service Test→HMZR→RHV (Humidi-MiZer 3-Way Valve) — On Humidi-MiZer equipped units, this item allows the user to switch the reheat valve from ON to OFF or OFF to ON when compressors are in the OFF position. When RHV is switched to the ON position, the three-way valve will be energized. When RHV is switched to the OFF position, the three-way valve will be de-energized. To exercise this valve with a Circuit B compressor commanded ON, go to (***Service Test→ COOL→RHV***). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→COOL→RHV***).

Service Test→HMZR→C.EXV (HMV-1: Condenser EXV Position) — On Humidi-MiZer equipped units, this item allows the user to exercise the valve that controls flow to the Circuit B condenser. The valve default position is 100% (completely open). The user will be able to adjust the valve from 0 to 100% through this function. As confirmation that the valve is operational, the user should hear a light ratcheting sound as the valve opens and closes. Note that this function is only operational when Circuit B compressors are OFF. To exercise this valve with a Circuit B compressor commanded ON, go to (***Service Test→COOL→C.EXV***). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→ COOL→C.EXV***).

Service Test→HMZR→B.EXV (HMV-2: Bypass EXV Position) — On Humidi-MiZer equipped units, this item allows the user to exercise the valve that controls discharge gas bypass around the Circuit B condenser. The valve default position is 0% (completely closed). The user will be able to adjust the valve from 0 to 100% through this function. As confirmation that the valve is operational, the user should hear a light ratcheting sound as the valve opens and closes. Note that this function is only operational when Circuit B compressors are OFF. To exercise this valve when a Circuit B compressor is ON, go to (***Service Test→COOL→B.EXV***). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→COOL→B.EXV***).

Service Test→HMZR→C.CAL (Condenser EXV Calibrate) — On Humidi-MiZer configured units, this item allows the user to calibrate the valve that controls flow to the Circuit B condenser. Switching ***C.CAL*** to ON will instruct the unit software to over-drive the valve in the closing direction. This is to ensure that the valve is completely shut and to establish the "zero" open position. The controller then keeps track of the valve's position for normal operation. During this calibration phase, a light ratcheting sound may be heard and will serve as proof of valve operation and closure. Note that the calibration feature in Service Test is only provided as an additional troubleshooting tool. The valves will automatically go through the calibration process anytime the unit is powered down, unit power is cycled, or anytime there is a loss of communication between the EXV board and the valve. There should be no need to manually calibrate the valves under normal circumstances.

Service Test→HMZR→B.CAL (Bypass EXV Calibrate) — On Humidi-MiZer configured units, this item allows the user to calibrate the valve that controls discharge gas bypass around the Circuit B condenser. Switching ***B.CAL*** to ON will instruct the unit software to over-drive the valve in the closing direction. This is to assure that the valve is completely shut and to establish the "zero" open position. The controller then keeps track of the valve's position for normal operation. During this calibration phase, a light ratcheting sound may be heard and will serve as proof of valve operation and closure. Note that the calibration feature in Service Test is only provided as an additional troubleshooting tool. The valves will automatically go through the calibration process anytime the unit is powered down, unit power is cycled, or anytime there is a loss of communication between the EXV board and the valve. There should be no need to manually calibrate the valves under normal circumstances.

Cooling — The cooling sub-menu offers many different service tests.

- ***Service Test→Cool→E.POS*** (Econo Damper Command Pos). It is possible to manually move the actuator during the cooling test mode at all times, regardless if economizer cooling is suitable or not.
- ***Service Test→COOL→SP.SP*** (Static Pressure Setpoint). Upon entering the cooling sub-menu, the static pressure control item will default to the unit's static pressure set point. Thereafter, as mechanical cooling commences and the fan starts, the static pressure can be manually adjusted during the cool mode without affecting the configured set point for normal runtime operation. By adjusting the static pressure set point, the user can increase or decrease the supply airflow. Do not use a static pressure that will exceed the system limits.
- ***Service Test→COOL→CL.ST*** (Requested Cool Stage). If this item is set to a non-zero value, the current assigned compression stage for this unit will be selected and enacted. Thereafter, the individual compressor will be "read-only" and reflect the current staging state. In addition, this item will automatically clamp the cooling stages to its pre-configured maximum.
- Manual relay control of individual compressors. If the cooling stage pattern request is set to zero, the user will have the ability to manually control compressors. If the user energizes mechanical cooling, the supply fan and the outdoor fans will be started automatically. During mechanical cooling, the unit will protect itself. Compressor diagnostics are active, monitoring for high discharge pressure, low suction pressure, etc. The user can also turn the minimum load valve on and off and set the digital scroll capacity (on units equipped with this device).
- ***Service Test→COOL→RHV*** (Humidi-MiZer 3-Way Valve). On Humidi-MiZer equipped units, this item allows the user to switch the reheat valve from ON to OFF and vice versa. When RHV is switched to the ON position, a three-way valve will be energized allowing refrigerant flow to enter the reheat coil as if in a dehumidification mode or reheat mode. When RHV is switched to the OFF position, the three-way valve will be deenergized and the unit will revert back to normal cooling. Note that this function only allows manipulation of RHV if a compressor on Circuit B has already been turned ON. To manually exercise this valve without an active Circuit B compressor, see the section titled ***Service Test→HMZR→RHV***. To view the actual valve

position at any time, the user can use the Outputs menu (***Outputs→COOL→RHV)***.

- ***Service Test→COOL→C.EXV*** (HMV-1: Condenser EXV Position). On Humidi-MiZer equipped units, this item allows the user to exercise the valve that controls refrigerant flow to the Circuit B condenser. To exercise the valve, RHV must first be switched to ON ***(Service Test→COOL→RHV)*** and a Circuit B compressor must be commanded ON. The valve default position is 100% (completely open). The user will be able to adjust the valve from 0 to 100% through this function. The only constraint on the valve position is that the percentage sum of the bypass valve ***(Service Test→COOL→B.EXV)*** and condenser valve must equal 100%. For example, if the condenser modulating valve is only 80% open, then the gas bypass modulating valve must remain at least 20% open. The effect of closing the condenser valve will be to increase the supply air temperature (additional reheat capacity). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→COOL→C.EXV).***
- ***Service Test→COOL→B.EXV*** (HMV-2: Bypass EXV Position). On Humidi-MiZer equipped units, this item allows the user to exercise the valve that controls discharge gas bypass around the Circuit B condenser. To exercise the valve, RHV must first be switched to ON ***(Service Test→COOL→RHV)*** and a Circuit B compressor must be commanded ON. The valve default position is 0% (completely closed). The user will be able to adjust the valve from 0 to 100% through this function. The only constraint on the valve position is that the percentage sum of the bypass valve and condenser valve (***Service Test→COOL→C.EXV)*** must equal 100%. For example, if the condenser modulating valve is only 80% open, then the gas bypass modulating valve must remain at least 20% open. The effect of opening the bypass valve will be to increase the supply air temperature (additional reheat capacity). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→COOL→B.EXV).***

Heating — The Heat Test Mode sub-menu will offer automatic fan start-up if not a gas fired heat unit. On gas heat units, the IGC feedback from the gas control units will bring the fan on as required.

Within this sub-menu, control of the following is possible:

- ***Service Test→HEAT→HT.ST*** (Requested Heat Stage). When this item is non-zero, the currently configured heat type will energize the corresponding heat relay pattern that reflects the requested stage. In addition the upper limit will be clamped to reflect the maximum configured number of stages. When non-zero, the heat relays will be "read-only" and reflect the currently selected pattern.
- ***Service Test→HEAT→HT.1-6, Service Test→HEAT→H.I.R*** (Manual Heat Relay Control). If the "Heat Stage Request" item is set to zero, it will be possible to individually control the heat relays, including the heat interlock relay.
- ***Service Test→HEAT→H1.CP*** (Modulating Heat Capacity). If configured for modulating gas or SCR electric heat, the user will be able to manually control the capacity of the modulating heat section (0 to 100%). The requested heat stage must be greater than or equal to 1 or heat relay 1 must be on before the control will accept a modulating heat capacity request. If neither case is true, the control will overwrite the modulating heat request back to 0%.
- ***Service Test→HEAT→HTC.C*** (Ht Coil Command Position). If configured for hydronic heat type, the user will be able to manually control the positioning of the actuator which controls hot water (0 to 100%).

THIRD PARTY CONTROL

Thermostat — The method of control would be through the thermostat inputs:

Y1 = first stage cooling
Y1 and Y2 = first and second stage cooling
W1 = first stage heating
W1 and W2 = first and second stage heating
G = supply fan

Alarm Output — The alarm output is 24-v at TB201-12 and TB201-11. The contact will provide relay closure whenever the unit is under an alert or alarm condition (5 va maximum).

Remote Switch — The remote switch may be configured for three different functions. Under ***Configuration→UNIT,*** set ***RM.CF*** to one of the following:

0 = no remote switch
1 = occupied/unoccupied switch
2 = start/stop switch
3 = occupancy override switch

Under ***Configuration→SW.LG→RMI.L***, the remote occupancy switch can be set to either a normally open or normally closed switch input. Normal is defined as either unoccupied, start or "not currently overridden," respective to the ***RM.CF*** configuration.

With ***RM.CF*** set to 1, no time schedules are followed and the unit follows the remote switch only in determining the state of occupancy.

With ***RM.CF*** set to 2, the remote switch can be used to shut down and disable the unit, while still honoring timeguards on compressors. Time schedules, internal or external, may be run simultaneously with this configuration.

With ***RM.CF*** set to 3, the remote input may override an unoccupied state and force the control to go occupied mode. As with the start/stop configuration, an internal or external time schedule may continue to control occupancy when the switch is not in effect.

VFD Control — On VFD equipped supply fans, supply duct static pressure control may be left under unit control or be externally controlled. To control a VFD externally with a 4 to 20 mA signal, set ***SP.RS*** to 4, under the ***Configuration→SP*** menu. This will set the reset to VFD control. When ***SP.RS*** = 4, the static pressure reset function acts to provide direct VFD speed control where 4 mA = 0% speed and 20 mA = 100% (***SP.MN*** and ***SP.MX*** will override). Note that ***SP.CF*** must be set to 1 (VFD Control) prior to configuring ***SP.RS*** = 4. Failure to do so could result in damage to ductwork due to overpressurization.

In effect, this represents a speed control signal "pass through" under normal operating circumstances. The *Comfort*Link controller overrides the third party signal for critical operation situations, most notably smoke and fire control.

Wire the input to the controls expansion module (CEM) using TB202-6 and TB202-7. An optional CEM board is required.

See Appendix D and the VFD literature supplied with the unit for VFD configurations and field wiring connections to the VFD.

Supply Air Reset — With the installation of the control expansion module (CEM), the *Comfort*Link controls are capable of accepting a 4 to 20 mA signal, to reset the supply-air temperature up to a maximum of 20°F.

Under ***Configuration→EDT.R*** set ***RS.CF*** to 3 (external 4 to 20 mA supply air reset control). The 4 to 20 mA input to the control system (TB202-9 and TB202-8), will be linearized and range from 0º to 20°F. For example, 4 mA = 0ºF reset, 12 mA = 10°F reset and 20 mA = 20ºF reset.

Demand Limit Control — The term demand limit control refers to the restriction of the machine's mechanical cooling capacity to control the amount of power that a machine may use.

Demand limiting is possible via two means:

Two discrete inputs tied to demand limit set point percentages.

OR

A 4 to 20 mA input that can reduce or limit capacity linearly to a set point percentage.

In either case, it will be necessary to install a controls expansion module (CEM). The control interfaces to a switch input at TB202-10 and TB202-11.

DEMAND LIMIT DISCRETE INPUTS — First, set ***DM.L.S*** in ***Configuration→DMD.L*** to 1 (2 switches).

When ***Inputs→GEN.I→DL.S1*** (Demand Switch no. 1) is OFF, the control will not set any limit to the capacity, and when ON, the control sets a capacity limit to the ***Configuration→DMD.L→D.L.S1*** set point.

Likewise, when ***Inputs→GEN.I→DL.S2*** (Demand Switch no. 2) is OFF, the control will not set any limit to the capacity, and when ON, the control sets a capacity limit to the ***Configuration→DMD.L→D.L.S2*** set point.

If both switches are ON, ***Inputs→GEN.I→DL.S2*** is used as the limiter of capacity.

Under ***Configuration→SW.LG***, set the logic state appropriately for the action desired. Set the ***DL1.L*** **and** ***DL2.L*** configurations. They can be set normally open or normally closed. For example, if ***DL1.L*** is set to OPEN, the user will need to close the switch to cause the control to limit capacity to the demand limit 1 set point. Likewise, if ***DL1.L*** is set to CLSE (closed), the user will need to open the switch to cause the control to limit capacity to the demand limit 1 set point.

DEMAND LIMIT 4 TO 20 mA INPUT — Under ***Configuration→DMD.L***, set configuration ***DM.L.S*** to 2 (2 = 4 to 20 mA control). Under the same menu, set ***D.L.20*** to a value from 0 to 100 to set the demand limit range. For example, with ***D.L.20*** set to 50, a 4 mA signal will result in no limit to the capacity and 20 mA signal will result in a 50% reduction in capacity.

Economizer/Outdoor Air Damper Control — There are multiple methods for externally controlling the economizer damper.

IAQ DISCRETE INPUT CONFIGURATION — The IAQ (indoor air quality) discrete input configuration requires a CEM module (optional) to be installed and an interface to a switch input at TB202-12 and TB202-13. The state of the input on the display can be found at ***Inputs→AIR.Q→IAQ.I.***

Before configuring the switch functionality, first determine how the switch will be read. A closed switch can indicate either a low IAQ condition or a high IAQ condition. This is set at ***Configuration→SW.LG→IAQ.L***. The user can set what a low reading would mean based on the type of switch being used. Setting ***IAQ.L*** to OPEN means that when the switch is open the input will read LOW. When the switch is closed, the input will read HIGH. Setting ***IAQ.L*** to CLSE (closed) means that when the switch is closed the input will read LOW, and therefore, when the switch is open the switch will read HIGH.

There are two possible configurations for the IAQ discrete input. Select item ***Configuration→IAQ→AQ.CF→IQ.I.C*** and configure for either 1 (IAQ Discrete) or 2 (IAQ Discrete Override).

<u>***IQ.I.C*** **= 1** (IAQ Discrete)</u> — If the user sets ***IQ.I.C*** to 1 (IAQ Discrete), and the switch logic (***Configuration→SW.LG→IAQ.L***) is set to OPEN, then an open switch reads low and a closed switch reads high.

If the switch is open, the economizer will be commanded to the IAQ Demand Vent Minimum Position. If the outdoor flow station is installed and outdoor air cfm can be read, the economizer will move to the IAQ Demand Vent Minimum Flow CFM control setting.

These settings may be adjusted and are located here:

Configuration→IAQ→DCV.C→IAQ.M
Configuration→IAQ→DCV.C→O.C.MN

If the switch is closed, the IAQ reading will be high and the economizer will be commanded to the Economizer Minimum Position. If the outdoor airflow station is installed and outdoor air cfm can be read, the economizer will move to the Economizer Minimum Flow CFM control setting.

These settings may be adjusted and are located here:

Configuration→IAQ→DCV.C→EC.MN
Configuration→IAQ→DCV.C→O.C.MX

<u>***IQ.I.C*** **= 2** (IAQ Discrete Override)</u> — If the user sets ***IQ.I.C*** to 2 (IAQ Discrete Override), and ***Configuration→SW.LG→IAQ.L*** is set to OPEN, then an open switch reads low and a closed switch reads high.

If the switch reads low, no action will be taken. If the switch reads high, the economizer will immediately be commanded to the IAQ Economizer Override Position. This can be set from 0 to 100% and can be found at ***Configuration→IAQ→AQ.SP→IQ.O.P***.

FAN CONTROL FOR THE IAQ DISCRETE INPUT — Under ***Configuration→IAQ→AQ.CF***, the ***IQ.I.F*** (IAQ Discrete Input Fan Configuration) must also be set. There are three configurations for ***IQ.I.F.*** Select the configuration which will be used for fan operation. This configuration allows the user to decide whether the IAQ discrete switch will start the fan (if the supply fan is not already running), and in which state of occupancy the fan will start.

IQ.I.F = 0	Minimum Position Override Switch input will not start fan
IQ.I.F = 1	Minimum Position Override Switch input will start fan in occupied mode only
IQ.I.F = 2	Minimum Position Override Switch input will start fan in both occupied and unoccupied modes

IAQ ANALOG INPUT CONFIGURATION — This input is an analog input located on the main base board (MBB). There are 4 different functions for this input. The location of this configuration is at ***Configuration→IAQ→AQ.CF→IQ.A.C.***

The functions possible for ***IQ.A.C*** are:

- 0 = no IAQ analog input
- 1 = IAQ analog input
- 2 = IAQ analog input used to override to a set position
- 3 = 4 to 20 mA 0 to 100% economizer minimum position control
- 4 = 0 to 10,000 ohms 0 to 100% economizer minimum position control

Options 2, 3, and 4 are dedicated for third party control.

<u>***IQ.A.C*** **= 2** (IAQ Analog Input Used to Override)</u> — Under ***Configuration→IAQ→AQ.SP***, set ***IQ.O.P*** (IAQ Economizer Override Position). The ***IQ.O.P*** configuration is adjustable from 0 to 100%. These configurations are also used in conjunction with ***Configuration→IAQ→AQ.CF→IQ.A.F*** (IAQ 4 to 20 mA Fan Configuration). There are three configurations for ***IQ.A.F*** and they follow the same logic as for the discrete input. This configuration allows the user to decide (if the supply fan is not already running), if the IAQ Analog Minimum Position Override input will start the fan, and in which state of occupancy the fan will start.

IQ.A.F = 0 IAQ analog sensor input cannot start the supply fan

IQ.A.F = 1 IAQ analog sensor input can start the supply fan in occupied mode only

IQ.A.F = 2 IAQ analog sensor input can start the supply fan in both occupied and unoccupied modes

If ***IQ.A.F*** is configured to request the supply fan, then configurations ***D.F.ON*** and ***D.F.OF*** need to be set. These configuration settings are located under ***Configuration→IAQ→AQ.SP*** and configure the fan override operation based on the differential air quality (DAQ). If DAQ rises above ***D.F.ON,*** the control will request the fan on until DAQ falls below ***D.F.OF***.

NOTE: If ***D.F.ON*** is configured below ***DAQ.H***, the unit is in occupied mode, and the fan was off, then DAQ rose above ***D.F.ON*** and the fan came on, the economizer will go to the economizer minimum position (***EC.MN***).

The 4 to 20 mA signal from the sensor wired to TB201-8 and TB201-7 is scaled to an equivalent indoor CO_2 (IAQ) by the parameters ***IQ.R.L*** and ***IQ.R.H*** located under the ***Configuration→IAQ→AQ.S.R*** menu. The parameters are defined such that 4 mA = ***IQ.R.L*** and 20 mA = ***IQ.R.H.*** When the differential air quality DAQ (IAQ – ***OAQ.U***) exceeds the ***DAQ.H*** set point (***Configuration→IAQ→AQ.SP*** menu) and the supply fan is on, the economizer minimum vent position (***Configuration→IAQ→DCV.C→EC.MN***) is overridden and the damper is moved to the ***IQ.P.O*** configuration. When the DAQ falls below the ***DAQ.L*** set point (***Configuration→IAQ→AQ.SP*** menu), the economizer damper is moved back to the minimum vent position (***EC.MN***).

NOTE: Configuration ***OAQ.U*** is used in the calculation of the trip point for override and can be found under ***Configuration→ IAQ→AQ.SP***.

<u>***IQ.A.C*** **= 3** (4 to 20 mA Damper Control)</u> — This configuration will provide full 4 to 20 mA remotely controlled analog input for economizer minimum damper position. The 4 to 20 mA signal is connected to terminals TB201-8 and TB201-7. The input is processed as 4 mA = 0% and 20 mA = 100%, thereby giving complete range control of the effective minimum position.

The economizer sequences can be disabled by unplugging the enthalpy switch input and not enabling any other economizer changeover sequence at ***Configuration→ECON→E.SEL***. Complete control of the economizer damper position is then possible by using a 4 to 20 mA economizer minimum position control or a 0 to 10,000 ohms 0 to 100% economizer minimum position control via configuration decisions at ***Configuration→IAQ→IQ.A.C***.

To disable the standard enthalpy control input function, unplug the enthalpy switch and provide a jumper from TB201-6 to TB201-5 (see wiring diagrams in Major System Components section on page 124).

<u>***IQ.A.C*** **= 4** (10 Kilo-ohm Potentiometer Damper Control)</u> — This configuration will provide input for a 10,000 ohm linear potentiometer that acts as a remotely controlled analog input for economizer minimum damper position. The input is processed as 0 ohms = 0% and 10,000 ohms = 100%, thereby giving complete range control of the effective minimum position.

NOTE: For complete economizer control, the user can make the economizer inactive by unplugging the enthalpy switch connection.

CONTROLS OPERATION

Modes — The *Comfort*Link controls operate under a hierarchy of command structure as defined by three essential elements: the System mode, the HVAC mode and the Control mode. The System mode is the top level mode that defines three essential states for the control system: OFF, RUN and TEST.

The HVAC mode is the functional level underneath the System mode which further defines the operation of the control.

The Control mode is essentially the control type of the unit (***Configuration→UNIT→C.TYP***). This defines from where the control looks to establish a cooling or heating mode. Furthermore, there are a number of modes which operate concurrently when the unit is running. The operating modes of the control are located at the local displays under ***Operating Modes***. See Table 30.

<u>Currently Occupied (***OCC***)</u> — This variable displays the current occupancy state of the unit.

<u>Timed Override in Effect (***T.OVR***)</u> — This variable displays if the state of occupancy is currently occupied due to an override.

<u>DCV Resetting Minimum Position (***DCV***)</u> — This variable displays if the economizer position has been lowered from its maximum vent position due to demand control ventilation.

<u>Supply Air Reset (***SA.R***)</u> — This variable displays if the supply air set point that the rooftop is attempting to maintain is currently being reset upwards. This applies to cooling only.

Table 30 — Operating Modes Display Table

ITEM	EXPANSION	RANGE	CCN POINT
SYS.M	ascii string		n/a
HVAC	ascii string		n/a
CTRL	ascii string		n/a
MODE	MODES CONTROLLING UNIT		
OCC	Currently Occupied	ON/OFF	MODEOCCP
T.OVR	Timed Override in Effect	ON/OFF	MODETOVR
DCV	DCV Resetting Min Pos	ON/OFF	MODEADCV
SA.R	Supply Air Reset	ON/OFF	MODESARS
DMD.L	Demand Limit in Effect	ON/OFF	MODEDMLT
T.C.ST	Temp.Compensated Start	ON/OFF	MODETCST
IAQ.P	IAQ Pre-Occ Purge Active	ON/OFF	MODEIQPG
LINK	Linkage Active — CCN	ON/OFF	MODELINK
LOCK	Mech.Cooling Locked Out	ON/OFF	MODELOCK
H.NUM	HVAC Mode Numerical Form	number	MODEHVAC

<u>Demand Limit in Effect (***DMD.L***)</u> — This variable displays if the mechanical cooling capacity is currently being limited or reduced by a third party.

<u>Temperature Compensated Start (***T.C.ST***)</u> — This variable displays if Heating or Cooling has been initiated before occupancy to pre-condition the space.

<u>IAQ Pre-Occupancy Purge Active (***IAQ.P***)</u> — This variable displays if the economizer is open and the fan is on to preventilate the building before occupancy.

<u>Linkage Active CCN (***LINK***)</u> — This variable displays if a linkage master in a zoning system has established "linkage" with this air source (rooftop).

<u>Mechanical Cooling Locked Out (***LOCK***)</u> — This variable displays if mechanical cooling is currently being locked out due to low outside air temperature.

<u>HVAC Mode Numerical Form (***H.NUM***)</u> — This is a numerical representation of the HVAC modes which may be read via a point read.

SYSTEM MODES (***Operating Modes→SYS.M***)

<u>System Mode Off</u> — When the system mode is OFF, all outputs are to be shut down and no machine control is possible. The following list displays the text assigned to the System Mode when in the OFF mode and the conditions that may cause this mode are checked in the following hierarchal order:

1. Wake up timer on a power reset.
   ("Initializing System ...")
2. System in the process of shutting down compressors and waiting for timeguards to expire.
   ("Shutting Down ...")

3. Factory shut down (internal factory control level — SHUTDOWN).
   ("Factory Shut Down")
4. Unit Stop (software application level variable that acts as a hard shut down — ***Service Test→STOP***).
   ("Local Machine Stop")
5. Fire Shut Down (fire shutdown condition based on the Fire Shutdown Input (***Inputs→FIRE→FSD***).
   ("Fire-Shutdown Mode")
6. Emergency Stop, which is forced over the CCN through the Emergency Stop Variable (EMSTOP).
   ("CCN Emergency Stop")
7. Start-up Delay.
   ("Startup Delay = 0-900 secs")
8. Service test ending transition timer.
   ("Service Test Ending")
9. Unexplained internal software failure.
   ("Internal Failure")

System Mode Test — When the system mode is Test, the control is limited to the Test mode and is controllable via the local displays (scrolling marquee and Navigator™ display). The System Test modes are Factory Test Enabled and Service Test Enabled. See the Service Test section on page 35 for details on test control in this mode.

1. Factory Test mode ("Factory test enabled")
2. Service Test mode ("Service test enabled")

System Mode Run — When the system mode is Run, the software application in the control is free to run the HVAC control routines by which cooling, heating, IAQ, etc., is possible. There are two possible text displays for this mode, one is normal run mode and the other occurs if one of the following fire-smoke modes is present: smoke purge, pressurization or evacuation.

1. Normal run time state ("Unit Operation Enabled")
2. Fire-Smoke control mode ("Fire-Smoke Control")

HVAC MODES ***(Operating Mode→HVAC)*** — The HVAC mode is dependent on the system mode to allow it to further determine the operational state of the rooftop unit. The actual determination of an HVAC mode is based on a hierarchal decision making process whereby certain overrides may interfere with normal temperature/humidity control. The decision making process that determines the HVAC mode is shown in Fig. 4 and Appendix E.

Each HVAC mode is described below. The HVAC mode number is shown in the parentheses after the mode.

HVAC Mode — STARTING UP (0) — The unit is transitioning from the OFF mode to a different mode.

HVAC Mode — DISABLED (1) — The unit is shut down due to a command software disable through the scrolling marquee, a CCN emergency stop command, a service test end, or a control-type change delay.

HVAC Mode — SHUTTING DOWN (2) — The unit is transitioning from a mode to the OFF mode.

HVAC Mode — SOFTSTOP REQUEST (3) — The unit is off due to a soft stop request from the control.

HVAC Mode — REM SW.DISABLE (4) — The unit is off due to the remote switch.

HVAC Mode — FAN STATUS FAIL (5) — The unit is off due to a supply fan status failure.

HVAC Mode — STATIC PRESSURE FAIL (6) — The unit is off due to failure of the static pressure sensor.

HVAC Mode — COMP.STUCK ON (7) — The unit is shutdown because there is an indication that a compressor is running even though it has been commanded off.

HVAC Mode — OFF (8) — The unit is off and no operating modes are active.

HVAC Mode — TEST (9) — The unit is in the self test mode which is entered through the Service Test menu.

HVAC Mode — TEMPERING VENT (10) — The economizer is at minimum vent position but the supply-air temperature has dropped below the tempering vent set point. Staged gas heat, modulating gas heat, SCR electric heat, or hydronic heat is used to temper the ventilation air.

HVAC Mode — TEMPERING LOCOOL (11) — The economizer is at minimum vent position but the combination of the outside-air temperature and the economizer position has dropped the supply-air temperature below the tempering cool set point. Staged gas heat, modulating gas heat, SCR electric heat, or hydronic heat is used to temper the ventilation air.

HVAC Mode — TEMPERING HICOOL (12) — The economizer is at minimum vent position but the combination of the outside-air temperature and the economizer position has dropped the supply-air temperature below the tempering cool set point. Staged gas heat, modulating gas heat, SCR electric heat, or hydronic heat is used to temper the ventilation air.

HVAC Mode — VENT (13) — This is a normal operation mode where no heating or cooling is required and outside air is being delivered to the space to control IAQ levels.

HVAC Mode — LOW COOL (14) — This is a normal cooling mode where a low cooling demand is present.

HVAC Mode — HIGH COOL (15) — This is a normal cooling mode where a high cooling demand is present.

HVAC Mode — LOW HEAT (16) — The unit will be in low heating demand mode using either gas, electric, or hydronic heat.

HVAC Mode — HIGH HEAT (17) — The unit will be in high heating demand mode using gas, electric, or hydronic heat.

HVAC Mode — UNOCC. FREE COOL (18) — In this mode the unit will operate in cooling but will be using the economizer for free cooling. Entering this mode will depend on the status of the outside air. The unit can be configured for outside air dry bulb changeover, differential dry bulb changeover, outside air enthalpy changeover, differential enthalpy changeover, or a custom arrangement of enthalpy/dew point and dry bulb. See the Economizer section for further details.

HVAC Mode — FIRE SHUT DOWN (19) — The unit has been stopped due to a fire shutdown input (FSD) from two or more of the fire control modes, purge, evacuation, or pressurization.

HVAC Mode — PRESSURIZATION (20) — The unit is in the special fire pressurization mode where the supply fan is on, the economizer damper is open and the power exhaust fans are off. This mode is invoked by the Fire Pressurization (PRES) input which can be found in the INPUTFIRE submenu.

HVAC Mode — EVACUATION (21) — The unit is in the special Fire Evacuation mode where the supply fan is off, the economizer damper is closed and the power exhaust fans are on. This mode is invoked by the Fire Evacuation (EVAC) input which can be found in the INPUTFIRE submenu.

HVAC Mode — SMOKE PURGE (22) — The unit is in the special Fire Purge mode where the supply fan is on, the economizer damper is open and the power exhaust fans are on. This mode is invoked by the Fire Evacuation (PURG) input which can be found in the INPUTFIRE submenu.

HVAC Mode — DEHUMIDIFICATION (23) — The unit is operating in the Dehumidification mode. On units configured for Humidi-MiZer® operation, this is the Humidi-MiZer dehumidification mode (subcooling).

HVAC Mode — RE-HEAT (24) — The unit is operating in Reheat mode. On units configured for Humidi-MiZer operation, this is the Humidi-MiZer reheat mode.

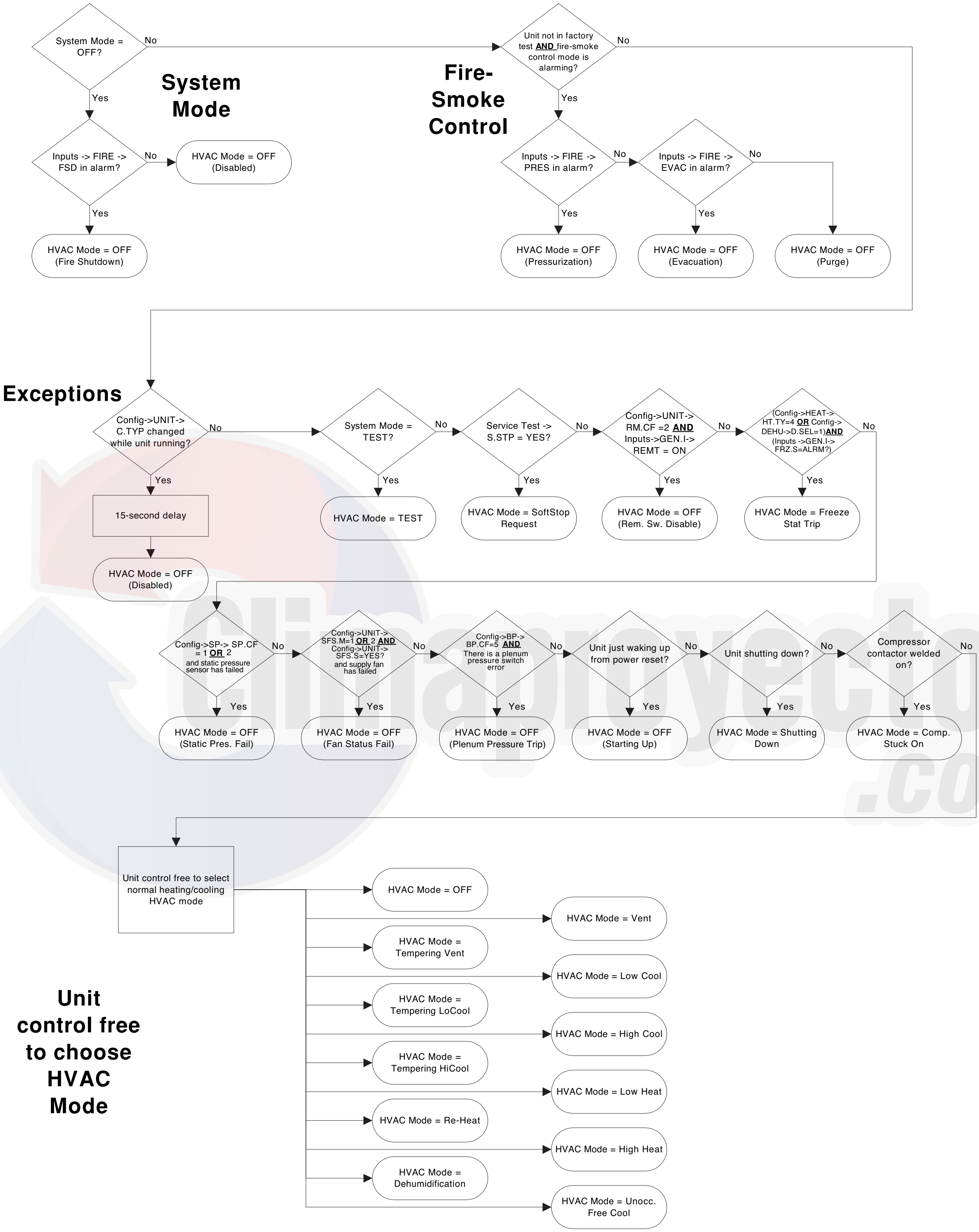


Fig. 4 — Mode Selection

HVAC Mode — FREEZESTAT TRIP (25) — If the freezestat trips, the unit enters the Freezestat Trip HVAC mode. The supply fan will run, the hydronic heat valve will be wide open, and the economizer damper will be closed.

HVAC Mode — PLEN.PRESS.FAIL (26) — The unit is off due to a failure of the plenum pressure switch.

HVAC Mode — RCB COMM FAILURE (27) — The unit is off due to a Rooftop Control Board (RCB) communication failure.

HVAC Mode — SUPPLY VFD FAULT (28) — The unit is off due to a supply fan VFD fault or supply fan VFD communications loss.

Unit Configuration Submenu — The ***UNIT*** submenu under the Configuration mode of the local display contains general unit configuration items. This section will define all of these configurations here for easy reference. The sub-menu which contains these configurations is located at the local display under ***Configuration→UNIT***. See Table 31.

Machine Control Type (***C.TYP***) — This configuration defines the technique and control source responsible for selecting a cooling, heating, or vent mode and in determining the method by which compressors are staged. The control types are:

- ***C.TYP*** = 1 (VAV-RAT) and ***C.TYP*** = 2 (VAV-SPT)

  Both of these configurations refer to standard VAV operation. If the control is occupied, the supply fan is run continuously and return-air temperature will be used in the determination of the selection of a cooling or heating mode. VAV-SPT differs from VAV-RAT only in that during the unoccupied period, space temperature will be used instead of return-air temperature to start the fan for 10 minutes to establish an accurate return-air temperature before the return-air temperature is allowed to call out any mode.
- ***C.TYP*** = 3 (TSTAT – MULTI)

  This configuration will force the control to monitor the thermostat inputs to make a determination of mode. Unlike traditional 2-stage thermostat control, the unit is allowed to use multiple stages of cooling control and perform VAV-type operation. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point.
- ***C.TYP*** = 4 (SPT – MULTI)

  This configuration will force the control to monitor a space temperature sensor to make a determination of mode. Unlike traditional 2-stage space temperature control, the unit is allowed to use multiple stages of cooling control and perform VAV-type operation. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point.

Unit Size (***SIZE***) — There are several unit sizes (tons) for the P Series control. Make sure this configuration matches the size called out by the model number of the unit. This is important as the cooling stage tables are directly determined based on the *SIZE* configuration.

Fan Mode (***FN.MD***) — The Fan Mode configuration can be used for machine control types (***Configuration→UNIT→C.TYP***) 3, and 4. The Fan Mode variable establishes the operating sequence for the supply fan during occupied periods. When set to 1 (Continuous), the fan will operate continuously during occupied periods. When set to 0 (Automatic), the fan will run only during a heating or cooling mode.

Remote Switch Config (***RM.CF***) — The remote switch input is connected to TB201 terminals 3 and 4. This switch can be used for several remote control functions. Please refer to the Remote Control Switch Input section for details on its use and operation.

CEM Module Installed (***CEM***) — This configuration instructs the control to communicate with the controls expansion module (CEM) over the local equipment network (LEN) when set to Yes. When the unit is configured for certain sensors and configurations, this option will be set to Yes automatically.

The sensors and configurations that automatically turn on this board are:

Configuration→UNIT→SENS→SRH.S = Enable (Space Relative Humidity Sensor Enable)

Configuration→UNIT→SENS→RRH.S = Enable (Return Air Relative Humidity Sensor Enable)

Configuration→EDT.R→RES.S = Enable (4 to 20 mA Supply Air Reset Sensor Enable)

Configuration→ECON→ORH.S = Enable (Outside Air Relative Humidity Sensor Enable)

Configuration→ECON→CFM.C→OCF.S = Enable (Outdoor Air CFM Sensor Enable)

Configuration→DEHU→D.SEN = 3 (DISCR.INPUT) (Dehumidification Sensor – Discrete Input Select)

Configuration→DMD.L→DM.L.S = 1 (2 SWITCHES) (Demand Limiting using 2 discrete switches)

Configuration→DMD.L→DM.L.S = 2 (4-20 MA CTRL) (Demand Limiting using a 4 to 20 mA sensor)

Configuration→IAQ→AQ.CF→IQ.I.C = 1 (IAQ DISCRETE) (IAQ discrete switch control)

Configuration→IAQ→AQ.CF→IQ.I.C = 2 (IAQ DISC.OVR) (IAQ discrete switch "override" control)

Configuration→IAQ→AQ.CF→OQ.A.C = 1 (OAQ SENS-DAQ) (Outdoor Air Quality Sensor)

Configuration→IAQ→AQ.CF→OQ.A.C = 2 (4-20 NO DAQ) (4 to 20 mA sensor, no DAQ)

Configuration→SP→SP.RS = 1 (4-20 mA control) (static pressure reset using 4-20 mA input)

Temperature Compensated Start Cooling Factor (***TCS.C***) — This factor is used in the equation of the Temperature Compensated Start Time Bias for cooling. Refer to the Temperature Compensated Start section for more information. A setting of 0 minutes indicates Temperature Compensated Start in Cooling is not permitted.

Temperature Compensated Start Cooling Factor (***TCS.H***) — This factor is used in the equation of the Temperature Compensated Start Time Bias for heating. Refer to the Temperature Compensated Start section for more information. A setting of 0 minutes indicates Temperature Compensated Start in Heating is not permitted.

Fan Fail Shuts Downs Unit (***SFS.S***) — When fan status monitoring is configured on, this configuration will determine whether the unit should shut down on a supply fan status fail or simply alert the condition and continue to run. If set to YES, then the control will shut down the unit and send out an alarm if supply fan status monitoring fails. If set to NO, the control will not shut down the unit if supply fan status monitoring fails but the control will send out an alert.

Fan Status Monitoring (***SFS.M***) — This configuration selects the type of fan status monitoring to be performed.

0 - NONE — No switch or monitoring

1 - SWITCH — Use of the fan status switch

2 - SP RISE — Monitoring of the supply duct pressure.

Table 31 — Unit Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION				
C.TYP	Machine Control Type	1 - 6		CTRLTYPE	4
SIZE	Unit Size (30-100)	30 - 100		UNITSIZE	30
FN.MD	Fan Mode (0=Auto, 1=Cont)	0 - 1		FAN_MODE	1
RM.CF	Remote Switch Config	0 - 3		RMTINCFG	0
CEM	CEM Module Installed	Yes/No		CEM_BRD	No
TCS.C	Temp.Cmp.Strt.Cool Factr	0 - 60	min	TCSTCOOL	0
TCS.H	Temp.Cmp.Strt.Heat Factr	0 - 60	min	TCSTHEAT	0
SFS.S	Fan Fail Shuts Down Unit	Yes/No		SFS_SHUT	No
SFS.M	Fan Stat Monitoring Type	0 - 2		SFS_MON	0
VAV.S	VAV Unocc.Fan Retry Time	0 - 720	min	SAMPMINS	50
50.HZ	50 Hertz Unit ?	Yes/No		UNIT_HZ	No
MAT.S	MAT Calc Config	0 - 2		MAT_SEL	1
MAT.R	Reset MAT Table Entries?	Yes/No		MATRESET	No
MAT.D	MAT Outside Air Default	0 - 100	%	MATOADOS	20
ALTI	Altitude……..in feet:	0 - 60000		ALTITUDE	0
DLAY	Startup Delay Time	0 -900	sec	DELAY	0
AUX.R	Auxiliary Relay Config	0 - 3		AUXRELAY	0
SENS	INPUT SENSOR CONFIG				
SPT.S	Space Temp Sensor	Enable/Disable		SPTSENS	Disable
SP.O.S	Space Temp Offset Sensor	Enable/Disable		SPTOSENS	Disable
SP.O.R	Space Temp Offset Range	1 - 10		SPTO_RNG	5
SRH.S	Space Air RH Sensor	Enable/Disable		SPRHSENS	Disable
RRH.S	Return Air RH Sensor	Enable/Disable		RARHSENS	Disable
FLT.S	Filter Stat.Sw.Enabled ?	Enable/Disable		FLTS_ENA	Disable

VAV Unoccupied Fan Retry Time (***VAV.S***) — Machine control types 1 and 2 (VAV-RAT,VAV-SPT) monitor the return-air temperature during unoccupied periods to determine if there is a valid demand for heating or cooling before initiating an unoccupied heating or cooling mode. If the routine runs but concludes a valid demand condition does not exist, then the process is not permitted for the period of time defined by this configuration. Reducing this value allows a more frequent re-sampling process. Setting this value to zero will prevent any sampling sequence.

50 Hertz Unit? (***50.HZ***) — This configuration is not used. Do not change the setting of this configuration.

MAT Calc Config (***MAT.S***) — This configuration gives the user three options in the processing of the mixed-air temperature (MAT) calculation:

- ***MAT.S*** = 0

  There will be no MAT calculation.
- ***MAT.S*** = 1

  The control will attempt to learn MAT over time. Any time the system is in a vent mode and the economizer stays at a particular position for long enough, MAT = EDT (evaporator discharge temperature). Using this, the control has an internal table whereby it can more closely determine the true MAT value.
- ***MAT.S*** = 2

  The control will stop learning and use whatever the control has already learned. Using this setting infers that the control has spent some time set to ***MAT.S*** = 1.

First set ***MAT.S*** = 1, then go into the Service Test mode. Turn on the fan and open the economizer to a static position for 5 minutes. Move to several positions (20%,40%,60%,80%). It is important that the difference between return and outside temperature be greater than 5 degrees. (The greater the delta, the better.) When done, set ***MAT.S*** = 2.

Reset MAT Table Entries? (***MAT.R***) — This configuration allows the user to reset the internally stored MAT learned configuration data back to the default values. The defaults are set to a linear relationship between the economizer damper position and OAT and RAT in the calculation of MAT.

MAT Outside Air Position Default (***MAT.D***) — This configuration is used to calculate MAT when the economizer option is disabled. The configuration is adjustable from 0 to 100% outside air. This defines the fixed ventilation position that will be used to correctly calculate MAT.

Altitude……..In Feet: (***ALTI***) — As the control does not include a barometric pressure sensor to define the calculation of enthalpy and cfm, the control does include an altitude parameter which will serve to set up a default barometric pressure for use with calculations. The effect of barometric pressure in these calculations is not great, but could have an effect depending on the installed elevation of the unit. If the rooftop is installed at a particularly high altitude and enthalpy or cfm are being calculated, set this configuration to the current elevation of the installed rooftop.

Start Up Delay Time (***DLAY***) — This option inhibits the unit from operating after a power reset. The configuration may be adjusted from 0 to 900 seconds of delay.

Auxiliary Relay Output Configuration (***AUX.R***) — This configuration allows the user to configure the function of the auxiliary relay output. The output is 1.4 vac, 5 va maximum. The configuration can be set from 0 to 3. If ***AUX.R*** is set to 0, the auxiliary relay contact will be energized during an alarm. The output can be used to turn on an indicator light or sound an alarm in a mechanical room. If ***AUX.R*** is set to 1, the auxiliary relay will energize when the controls determine dehumidification/reheat is needed. The relay would be wired to a third party dehumidification/reheat device and would energize the device when needed. If ***AUX.R*** is set to 2, the auxiliary relay will energize when the unit is in the occupied state. The relay could then be used to control lighting or other functions that need to be on during the occupied state. If ***AUX.R*** is set to 3, the auxiliary relay will energize when the supply fan is energized (and, if equipped with a VFD, the VFD output is not 0%). The default is 0.

Space Temp Sensor (***SPT.S***) — If a space temperature sensor is installed (T55/T56), enable this configuration.

Space Temp Offset Sensor (***SP.O.S***) — If a T56 sensor is installed with the space temperature offset slider, enable this configuration.

Space Temp Offset Range (***SP.O.R***) — If a space temperature offset sensor is installed, it is possible to configure the range of the slider by adjusting this range configuration.

Space Air RH Sensor (***SRH.S***) — If a space relative humidity sensor is installed, enable this configuration.

Return RH Sensor (***RRH.S***) — If a return air relative humidity sensor is installed, enable this configuration.

Filter Status Switch Enabled? (***FLT.S***) — If a filter status switch is installed, enable this configuration to begin the monitoring of the filter status input (***Inputs→GEN.I→ FLT.S***). See the Dirty Filter Switch section for more details on installation and operation.

Cooling Control — The P Series *Comfort*Link controls offer two basic control approaches to mechanical cooling: multi-stage cooling (CV) and multiple stages of cooling (VAV). In addition, the *Comfort*Link controls offer the ability to run multiple stages of cooling for either a space temperature sensor or thermostat by controlling the unit to either a low or high cool supply air set point. The control type (***Configuration→UNIT→C.TYP***) determines the selection of the type of cooling control as well as the technique for selecting a cooling mode. Unit staging tables are shown in Appendix C.

NOTE: Whether a unit has a VFD or a supply fan installed for static pressure control has no effect on configuration of the machine control type (***C.TYP***). No matter what the control type, it is possible to run the unit in either CV or VAV mode provided there are enough stages to accommodate lower air volumes for VAV operation. Refer to the section on static pressure control on page 67 for information on how to set up the unit for the type of supply fan control desired.

SETTING UP THE SYSTEM

Machine Control Type (***Configuration→UNIT→C.TYP***) — The most fundamental cooling control configuration is located under ***Configuration→UNIT***.

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION			
C.TYP	Machine Control Type	1 - 4	CTRLTYPE	*

*This default is model number dependent.

This configuration defines the technique and control source responsible for selecting a cooling mode and in determining the method by which compressors are staged. The control types are:

- ***C.TYP*** = 1 (VAV-RAT) and ***C.TYP*** = 2 (VAV-SPT)

  Both of these configurations refer to standard VAV operation. If the control is occupied, the supply fan is run continuously and return-air temperature will be used for both in the determination of the selection of a cooling mode. VAV-SPT differs from VAV-RAT only in that during the unoccupied period, space temperature will be used instead of return-air temperature to start the fan for ten minutes before the return-air temperature is allowed to call out any mode.

- ***C.TYP*** = 3 (TSTAT – MULTI)

  This configuration will force the control to monitor the thermostat inputs to make a determination of mode. Unlike traditional 2-stage thermostat control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point.

- ***C.TYP* = 4** (SPT – MULTI)

  This configuration will force the control to monitor a space temperature sensor to make a determination of mode. Unlike traditional 2-stage space temperature control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point.

MACHINE DEPENDENT CONFIGURATIONS — Some configurations are linked to the physical unit and must not be changed. The configurations are provided in case a field replacement of a board occurs and the settings are not preserved by the download process of the new software. The following configurations apply to all machine control types (***C.TYP***). These configurations are located at the local display under ***Configuration→UNIT***. See Table 32.

Table 32 — Machine Dependent Configurations

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION			
SIZE	Unit Size (30-100)	30 - 100	UNITSIZE	*

*Dependent on unit.

Unit Size (***SIZE***) — There are 10 unit sizes (tons) for the P Series control. Make sure this configuration matches the size called out by the model number of the unit. This is important as the cooling stage tables are directly determined based on the ***SIZE*** configuration.

50 Hertz Unit? (***50.HZ***) — This configuration is not used.

SET POINTS — The set points for both cooling and heating are located at the local display under ***Setpoints***. See Table 33.

SUPPLY AIR RESET CONFIGURATION — Supply air reset can be used to modify the current cooling supply air set point. Supply air reset is applicable to control types, ***C.TYP*** = 1,2,3, and 4. The configurations for reset can be found at the local display under ***Configuration→EDT.R.*** See Table 34.

EDT Reset Configuration (***RS.CF***) — This configuration applies to several machine control types (***Configuration→UNIT→C.TYP*** = 1,2,3, and 4).

- 0 = NO RESET

  No supply air reset is in effect

- 1 = SPT RESET

  Space temperature will be used as the reset control variable along with both ***RTIO*** and ***LIMT*** in the calculation of the final amount of reset to be applied (***Inputs→RSET→SA.S.R***).

- 2 = RAT RESET

  Return-air temperature will be used as the reset control variable along with both ***RTIO*** and ***LIMT*** in the calculation of the final amount of reset to be applied (***Inputs→RSET→SA.S.R***).

- 3 = 3RD PARTY RESET

  The reset value is determined by a 4 to 20 mA third party input. An input of 4 mA would correspond to 0º F reset. An input of 20 mA would correspond to 20º F reset. Configuring the control for this option will cause ***RES.S*** to become enabled automatically with the CEM board. To avoid alarms make sure the CEM board and third party input are connected first before enabling this option.

Reset Ratio (***RTIO***) — This configuration is used when ***RS.CF*** is set to 1 or 2. For every degree that the controlling temperature (space/return) falls below the occupied cooling set point (***OCSP***), the calculated value of the supply air reset will rise by the number of degrees as specified by this parameter.

Reset Limit (***LIMT***) — This configuration is used when ***RS.CF*** is set to 1 or 2. This configuration places a clamp on the amount of supply air reset that can be applied.

EDT 4-20 mA Reset Input (***RES.S***) — This configuration is automatically enabled when ***Configuration→EDT.R→RS.CF*** is set to 3 (third party reset).

COOLING CONFIGURATION — Relevant configurations for mechanical cooling are located at the local display under ***Configuration→COOL***. See Table 35.

Table 33 — Setpoints

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
OHSP	Occupied Heat Setpoint	40-99	dF	OHSP	68
OCSP	Occupied Cool Setpoint	40-99	dF	OCSP	75
UHSP	Unoccupied Heat Setpoint	40-99	dF	UHSP	55
UCSP	Unoccupied Cool Setpoint	40-110	dF	UCSP	90
GAP	Heat-Cool Setpoint Gap	2-10	deltaF	HCSP_GAP	5
V.C.ON	VAV Occ. Cool On Delta	0-25	deltaF	VAVOCON	3.5
V.C.OF	VAV Occ. Cool Off Delta	1-25	deltaF	VAVOCOFF	2
SASP	Supply Air Setpoint	45-75	dF	SASP	55
SA.HI	Supply Air Setpoint Hi	45-75	dF	SASP_HI	55
SA.LO	Supply Air Setpoint Lo	45-75	dF	SASP_LO	60
SA.HT	Heating Supply Air Setpt	90-145	dF	SASPHEAT	85
T.PRG	Tempering Purge SASP	–20-80	dF	TEMPPURG	50
T.CL	Tempering in Cool SASP	5-75	dF	TEMPCOOL	5
T.V.OC	Tempering Vent Occ SASP	–20-80	dF	TEMPVOCC	65
T.V.UN	Tempering Vent Unocc. SASP	–20-80	dF	TEMPVUNC	50

Table 34 — Supply Air Reset Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
EDT.R	EVAP.DISCHRGE TEMP RESET				
RS.CF	EDT Reset Configuration	0 - 3		EDRSTCFG	2
RTIO	Reset Ratio	0 - 10		RTIO	3
LIMT	Reset Limit	0 - 20	deltaF	LIMT	10
RES.S	EDT 4-20 ma Reset Input	Enable/Disable		EDTRSENS	Disable

Table 35 — Cooling Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
COOL	COOLING CONFIGURATION				
A1.EN	Enable Compressor A1	Enable/Disable		CMPA1ENA	Enable
A2.EN	Enable Compressor A2	Enable/Disable		CMPA2ENA	Enable
A3.EN	Enable Compressor A3	Enable/Disable		CMPA3ENA	Enable
B1.EN	Enable Compressor B1	Enable/Disable		CMPB1ENA	Enable
B2.EN	Enable Compressor B2	Enable/Disable		CMPB2ENA	Enable
B3.EN	Enable Compressor B3	Enable/Disable		CMPB3ENA	Enable
CS.A1	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	Enable
CS.A2	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	Enable
CS.A3	CSB A3 Feedback Alarm	Enable/Disable		CSB_A3EN	Enable
CS.B1	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	Enable
CS.B2	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	Enable
CS.B3	CSB B3 Feedback Alarm	Enable/Disable		CSB_B3EN	Enable
Z.GN	Capacity Threshold Adjst	0.1 - 10.0		Z_GAIN	1
MC.LO	Compressor Lockout Temp	–25 - 55	dF	OATLCOMP	40
LLAG	Lead/Lag Operation ?	Yes/No		LLENABLE	No
M.M.	Motor Master Control ?	Yes/No		MOTRMAST	No
SCT.H	Maximum Condenser Temp	100 - 150	dF	SCT_MAX	115
SCT.L	Minimum Condenser Temp	40 - 90	dF	SCT_MIN	72
DG.A1	A1 is Digital Scroll	Yes/No		DIGCMPA1	No
MC.A1	A1 Min Digital Capacity	10 - 100	%	MINCAPA1	50
DS.AP	Dig Scroll Adjust Delta	0 -100	%	DSADJPCT	100
DS.AD	Dig Scroll Adjust Delay	15 - 60	sec	DSADJDLY	20
DS.RP	Dig Scroll Reduce Delta	0 -100	%	DSREDPCT	6
DS.RD	Dig Scroll Reduce Delay	15 - 60	sec	DSREDDLY	30
DS.RO	Dig Scroll Reduction OAT	70-120	dF	DSREDOAT	95
DS.MO	Dig Scroll Max Only OAT	70-120	dF	DSMAXOAT	105
MLV	Min Load Valve Enable	Enable/Disable		MLV_ENAB	Disable
H.SST	Hi SST Alert Delay Time	5 - 30	min	HSSTTIME	10
RR.VF	Rev Rotation Verified?	Yes/No		REVR_VER	No
CS.HP	Use CSBs for HPS Detect?	Yes/No		CSBHPDET	Yes

Enable Compressor A1 (***A1.EN***) — This configuration is used to disable the A1 compressor in case of failure for size 30 to 100 units.

Enable Compressor A2 (***A2.EN***) — This configuration is used to disable the A2 compressor in case of failure for size 50 to 100 units. It is always disabled for size 30 to 40 units.

Enable Compressor A3 (***A3.EN***) — This configuration is used to disable the A3 compressor in case of failure for size 90 and 100 units. It is always disabled for size 30 to 75 units.

Enable Compressor B1 (***B1.EN***) — This configuration is used to disable the B1 compressor in case of failure for size 30 to 100 units.

Enable Compressor B2 (***B2.EN***) — This configuration is used to disable the B2 compressor in case of failure for size 40 to 100 units. It is always disabled for size 30 and 35 units.

Enable Compressor B3 (***B3.EN***) — This configuration is used to disable the B3 compressor in case of failure for size 90 and 100 units. It is always disabled for size 30 to 75 units.

CSB A1 Feedback Alarm (***CS.A1***) — This configuration is used to enable or disable the compressor A1 feedback alarm. This configuration must be enabled whenever ***A1.EN*** is enabled.

CSB A2 Feedback Alarm (***CS.A2***) — This configuration is used to enable or disable the compressor A2 feedback alarm.

This configuration must be enabled whenever ***A2.EN*** is enabled.

CSB A3 Feedback Alarm (***CS.A3***) — This configuration is used to enable or disable the compressor A3 feedback alarm. This configuration must be enabled whenever ***A3.EN*** is enabled.

CSB B1 Feedback Alarm (***CS.B1***) — This configuration is used to enable or disable the compressor B1 feedback alarm. This configuration must be enabled whenever ***B1.EN*** is enabled.

CSB B2 Feedback Alarm (***CS.B2***) — This configuration is used to enable or disable the compressor B2 feedback alarm. This configuration must be enabled whenever ***B2.EN*** is enabled.

CSB B3 Feedback Alarm (***CS.B3***) — This configuration is used to enable or disable the compressor B3 feedback alarm. This configuration must be enabled whenever ***B3.EN*** is enabled.

Capacity Threshold Adjust (***Z.GN***) — This configuration provides an adjustment to the SUMZ Cooling Algorithm for capacity control. The configuration affects the cycling rate of the cooling stages by raising or lowering the threshold that demand must build to in order to add or subtract a stage of cooling.

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 Capacity Threshold Adjust (***Z.GN***) can be used to adjust the overall logic gain. Normally this is set to 1.0, but it can be adjusted from 0.1 to 10. As the value of ***Z.GN*** is increased, the cycling of cooling stages will be slowed.

Compressor Lockout Temperature (***MC.LO***) — This configuration defines the outdoor air temperature below which mechanical cooling is locked out.

Lead/Lag Operation? (***LLAG***) — This configuration selects the type of lead/lag compressor operation for the unit. There are 3 choices: automatic, circuit A, and circuit B.

0 = AUTOMATIC

If this configuration is set to “AUTOMATIC”, every time cooling capacity drops to 0%, on the next call for cooling, the control will start up the first compressor on the circuit that did not start on the previous cooling cycle.

1 = CIRCUIT A

If this configuration is set to “CIRCUIT A”, every time cooling capacity drops to 0%, a circuit A compressor is always the first to start on the next call for cooling.

2 = CIRCUIT B

If this configuration is set to “CIRCUIT B”, every time cooling capacity drops to 0%, a circuit B compressor is always the first to start on the next call for cooling.

NOTE: If the unit is configured for a Digital Scroll (***Configuration→COOL→DG.A1*** = YES) or Minimum Load Valve (***Configuration→COOL→MLV*** = ENABLE), then circuit A is always the lead circuit regardless of the setting of this configuration.

This configuration must be set to 1 (CIRCUIT A) for size 30 to 60 units if an accessory low ambient operation Motormaster® V control is installed on the unit.

If the unit is configured for the Humidi-MiZer® adaptive dehumidification system, then circuit B automatically becomes the lead circuit when the unit enters into one of the Humidi-MiZer modes (dehumidification or reheat). The unit will immediately start a circuit B compressor when a Humidi-MiZer mode is initiated.

MotorMaster Control? (***M.M.***) — The condenser fan staging control for the unit is managed directly by the *Comfort*Link controls. There is no physical Motormaster device in the standard unit. This configuration must be set to YES if an accessory low ambient operation Motormaster V Control is installed on the unit. Setting this configuration to YES alters the condenser fan staging sequence to accommodate the Motormaster V control. See Head Pressure Control section, page 53, for more information.

Maximum Condenser Temp (***SCT.H***) — This configuration defines the saturated condensing temperature at which the head pressure control routine will increase an outdoor fan stage. The saturated condensing temperature of either running circuit rising above this temperature will increase a fan stage. If the outdoor-air temperature is greater than 72°F, then no outdoor fan staging will occur, and the outdoor fan stage will default to the maximum stage.

Minimum Condenser Temp (***SCT.L***) — This configuration defines the saturated condensing temperature at which the head pressure control routine will decrease an outdoor fan stage. The saturated condensing temperature of both running circuits decreasing below this temperature will decrease a fan stage. If the outdoor-air temperature is greater than 72°F no outdoor fan staging will occur, and the outdoor fan stage will default to the maximum stage.

A1 is Digital Scroll (***DG.A1***) — This configuration instructs the unit controls as to whether the A1 compressor is a digital scroll or regular scroll compressor. If set to YES, the compressor will be controlled by the compressor staging routine and SUMZ Cooling Algorithm.

A1 Min Digital Capacity (***MC.A1***) — This configuration defines the minimum capacity the digital scroll compressor is allowed to modulate to. The digital scroll compressor modulation range will be limited from ***MC.A1*** to 100%.

Dig Scroll Adjust Delta (***DS.AP***) — This configuration defines the maximum capacity the digital scroll will be allowed to change per request by the SUMZ Cooling Algorithm.

Dig Scroll Adjust Delay (***DS.AD***) — This configuration defines the time delay in seconds between digital scroll capacity adjustments.

Dig Scroll Reduce Delta (***DS.RP***) — This configuration defines the maximum capacity the digital scroll will be allowed to decrease per request by the SUMZ Cooling Algorithm when OAT is greater than ***Configuration→COOL→DS.RO***. This ramped reduction is only imposed on a decrease in digital scroll capacity. An increase in capacity will continue to follow the value defined by ***Configuration→COOL→DS.AP***.

Dig Scroll Reduce Delay (***DS.RD***) — This configuration defines the time delay, in seconds, between digital scroll capacity reduction adjustments when OAT is greater than ***Configuration→COOL→DS.RO***. This ramped reduction is only imposed on a decrease in digital scroll capacity. An increase in capacity will continue to follow the value defined by ***Configuration→COOL→DS.AD***.

Dig Scroll Reduction OAT (***DS.RO***) — Under certain operating conditions, a sharp decrease in digital scroll capacity can result in unstable unit operation. This configuration defines the outdoor air temperature above which a reduced capacity (***Configuration→COOL→DS.RP***) and time delay (***Configuration→COOL→DS.RD***) will be imposed on a digital scroll capacity reduction. This ramped reduction is only imposed on a decrease in digital scroll capacity. An increase in capacity will continue to follow the values defined by ***Configuration→COOL→DS.AP*** and ***Configuration→COOL→DS.AD***.

Dig Scroll Max Only OAT (***DS.MO***) — This configuration defines the outdoor air temperature above which the digital scroll will not be allowed to modulate. The digital scroll will be locked at 100% above this outdoor-air temperature.

Min Load Valve Enable (***MLV***) — This configuration instructs the control as to whether a minimum load valve has been installed and will be controlled by the compressor staging routine.

High SST Alert Delay Time (***H.SST***) — This option allows the low saturated suction temperature alert timing delay to be adjusted.

Reverse Rotation Verified? (***RR.VF***) — This configuration is used to enable or disable the compressor reverse rotation detection algorithm. This algorithm performs a check for correct compressor rotation upon power up of the unit. The method for detecting correct rotation is based on the assumption that there will be a drop in suction pressure upon a compressor start if it is rotating in the correct direction.

A test is made once, on power up, for suction pressure change on the first compressor of the first circuit to start.

Reverse rotation is determined by measuring suction pressure at 3 points in time:

- 5 seconds prior to compressor start.
- At the instant the compressor starts.
- 5 seconds after the compressor starts.

The rate of suction pressure change from 5 seconds prior to compressor start to compressor start (rate prior) is compared to the rate of suction pressure change from compressor start to 5 seconds after compressor start (rate after).

If (rate after) is less than (rate prior minus 1.25), alarm A140 is generated. This alarm will disable mechanical cooling and will require a manual reset.

It is important to note that in Service Test mode reverse rotation is checked on every compressor start.

Once it has been verified that power to the unit and compressors has been applied correctly and the compressors start up normally, this configuration can be set to YES to disable the reverse rotation check.

Use CSBs for HPS detect? (***CS.HP***) — On units with multiple compressors running on a circuit, the current sensor boards (CSBs) are used to help detect a high pressure switch trip. Setting this configuration to NO disables this additional high pressure switch trip detection.

COOL MODE SELECTION PROCESS — The P Series *Comfort*Link controls offer three distinct methods by which they may select a cooling mode.

1. Thermostat (***C.TYP***=3): The thermostat does not depend upon the state of occupancy or temperature and the modes are called out directly by the discrete inputs (***Inputs→STAT→Y1*** and ***Y2***).
2. VAV cooling types (***C.TYP***=1 and 2) are called out in the occupied period (***Operating Modes→MODE→OCC***=ON).
3. VAV cooling types (***C.TYP***=1 and 2) are called out in the unoccupied period (***Operating Modes→MODE→OCC***=OFF). They are also used for space sensor control types (***C.TYP***=4) in both the occupied and unoccupied periods.

This section is devoted to the process of cooling mode determination for the three types outlined above.

VAV Cool Mode Selection during the Occupied Period (***C.TYP*** = 1,2 and ***Operating Modes→MODE→OCC*** =ON) — There is no difference in the selection of a cooling mode for either VAV-RAT or VAV-SPT in the occupied period. The actual selection of a cool mode, for both control types, is based upon the controlling return-air temperature (***Temperatures→AIR.T→CTRL→R.TMP***). Typically this is the same as the return air temperature thermistor (***Temperatures→AIR.T→ RAT***) except when under CCN Linkage.

Cool Mode Determination — If the machine control type (***Configuration→ UNIT→C.TYP***) = 1 (VAV-RAT) or 2 (VAV-SPT) and the control is occupied (***Operating Modes→MODE→OCC***=**ON**), then the unit will not follow the occupied cooling set point (***OCSP***). Instead, the control will follow two offsets in the determination of an occupied VAV cooling mode (***Setpoints→V.C.ON*** and ***Setpoints→V.C.OF***), applying them to the low-heat off trip point and comparing the resulting temperature to the controlling return temperature (***R.TMP***).

The ***Setpoints→V.C.ON*** (VAV cool mode on offset) and ***Setpoints→V.C.OF*** (VAV cool mode off offset) offsets are used in conjunction with the low heat mode off trip point to determine when to bring cooling on and off and in enforcing a true "vent" mode between heating and cooling. See Fig. 5. The occupied cooling set point is not used in the determination of the cool mode. The occupied cooling set point is used for supply air reset only.

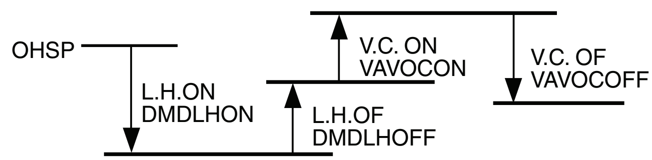


Fig. 5 — VAV Occupied Period Trip Logic

The advantage of this offset technique is that the control can safely enforce a vent mode without worrying about crossing set points. Even more importantly, under CCN linkage, the occupied heating set point may drift up and down and as such this technique of using offsets ensures a guaranteed separation in degrees F between the calling out of a heating or cooling mode at all times.

VAV Occupied Cool Mode Evaluation Configuration — There are VAV occupied cooling offsets under ***Setpoints***.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
V.C.ON	VAV Occ. Cool On Delta	0-25	deltaF	VAVOCON	3.5
V.C.OF	VAV Occ. Cool Off Delta	1-25	deltaF	VAVOCOFF	2

NOTE: There is a sub-menu at the local display (***Run Status →TRIP***) that allows the user to see the exact trip points for both the heating and cooling modes without having to calculate them. Refer to the Cool Mode Diagnostic Help section on page 50 for more information.

To enter into a VAV Occupied Cool mode, the controlling temperature must rise above *[**OHSP** minus **L.H.ON** plus **L.H.OF** plus **V.C.ON**]*.

To exit out of a VAV Occupied Cool Mode, the controlling temperature must fall below *[**OHSP** minus **L.H.ON** plus **L.H.OF** plus **V.C.ON** minus **V.C.OF**]*.

NOTE: With vent mode, it is possible to exit out of a cooling mode during the occupied period if the return-air temperature drops low enough. When supply-air temperature reset is not configured, this capability will work to prevent over-cooling the space during the occupied period.

Supply Air Set Point Control and the Staging of Compressors — Once the control has determined that a cooling mode is in effect, the cooling control point (***Run Status→VIEW →CL.C.P***) is calculated and is based upon the supply air set point (***Setpoints→SASP***) plus any supply air reset being applied (***Inputs→RSET→SA.S.R***).

Refer to the SumZ Cooling Algorithm section on page 50 for a discussion of how the P Series *Comfort*Link controls manage the staging of compressors to maintain supply-air temperature.

<u>VAV Cool Mode Selection during the Unoccupied Period (***C.TYP = 1,2; Operating Modes→MODE→OCC=OFF)*** and Space Sensor Cool Mode Selection ***(C.TYP=4***)</u> — The machine control types that utilize this technique of mode selection are:

- ***C.TYP*** = 1 (VAV-RAT) in the unoccupied period
- ***C.TYP*** = 2 (VAV-SPT) in the unoccupied period
- ***C.TYP*** = 4 (SPT-MULTI) in both the occupied and unoccupied period

These particular control types operate differently than the VAV types in the occupied mode in that there is both a LOW COOL and a HIGH COOL mode. For both of these modes, the control offers two independent set points, ***Setpoints→SA.LO*** (for LOW COOL mode) and ***Setpoints→SA.HI*** (for HIGH COOL mode).

The occupied and unoccupied cooling set points can be found under ***Setpoints***.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
OCSP	Occupied Cool Setpoint	55-80	dF	OCSP	75
UCSP	Unoccupied Cool Setpoint	75-95	dF	UCSP	90

The heat/cool set point offsets are found under ***Configuration→D.LV.T***. See Table 36.

Operating modes are under ***Operating Modes→MODE***.

ITEM	EXPANSION	RANGE	CCN POINT
MODE	MODES CONTROLLING UNIT		
OCC	Currently Occupied	ON/OFF	MODEOCCP
T.C.ST	Temp.Compensated Start	ON/OFF	MODETCST

<u>Cool Mode Evaluation Logic</u> — The first thing the control determines is whether the unit is in the occupied mode (***OCC***) or is in the temperature compensated start mode (***T.C.ST***). If the unit is occupied or in temperature compensated start mode, the occupied cooling set point (***OCSP***) is used. For all other modes, the unoccupied cooling set point (***UCSP***) is used. For further discussion and simplification this will be referred to as the "cooling set point." See Fig. 6.

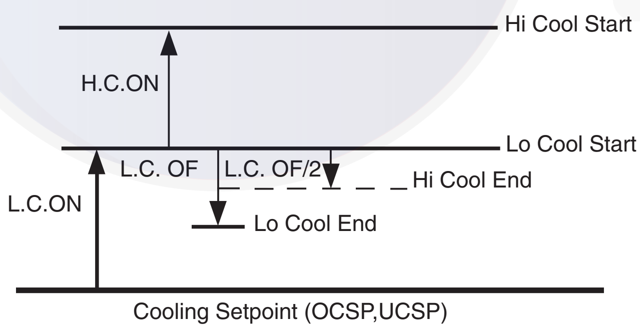


Fig. 6 — Cool Mode Evaluation

Demand Level Low Cool On Offset (***L.C.ON***) — This is the cooling set point offset added to the cooling set point at which point a Low Cool mode starts.

Demand Level High Cool On Offset (***H.C.ON***) — This is the cooling set point offset added to the "cooling set point plus ***L.C.ON***" at which point a High Cool mode begins.

Demand Level Low Cool Off Offset (***L.C.OF***) — This is the cooling set point offset subtracted from "cooling set point plus ***L.C.ON***" at which point a Low Cool mode ends.

NOTE: The "high cool end" trip point uses the "low cool off" (***L.C.OF***) offset divided by 2.

To enter into a LOW COOL mode, the controlling temperature must rise above [the cooling set point plus ***L.C.ON***.]

To enter into a HIGH COOL mode, the controlling temperature must rise above [the cooling set point plus ***L.C.ON*** plus ***H.C.ON***.]

To exit out of a LOW COOL mode, the controlling temperature must fall below [the cooling set point plus ***L.C.ON*** minus ***L.C.OF***.]

To exit out of a HIGH COOL mode, the controlling temperature must fall below [the cooling set point plus ***L.C.ON*** minus ***L.C.OF***/2.]

Comfort Trending — In addition to the set points and offsets which determine the trip points for bringing on and bringing off cool modes, there are 2 configurations which work to hold off the transitioning from a low cool to a high cool mode if the space is cooling down quickly enough. This technique is referred to as comfort trending and the configurations of interest are ***C.T.LV*** and ***C.T.TM***.

Cool Trend Demand Level (***C.T.LV***) — This is the change in demand that must occur within the time period specified by ***C.T.TM*** in order to hold off a HIGH COOL mode regardless of demand. This is not applicable to VAV control types (***C.TYP***=1 and 2) in the occupied period. As long as a LOW COOL mode is making progress in cooling the space, the control will hold off on the HIGH COOL mode. This is especially true for the space sensor machine control type (***C.TYP***) = 4, because the unit may transition into the occupied mode and see an immediate large cooling demand when the set points change.

Cool Trend Time (***C.T.TM***) — This is the time period upon which the cool trend demand level (***C.T.LV***) operates and may hold off staging or a HIGH COOL mode. This is not applicable to VAV control types (***C.TYP***=1 and 2) in the occupied period. See the Cool Trend Demand Level section for more details.

Timeguards — In addition to the set points and offsets which determine the trip points for bringing on and bringing off cool modes there is a timeguard which enforces a time delay between the transitioning from a low cool to a high cool mode. This time delay is 8 minutes. There is a timeguard which enforces a time delay between the transitioning from a heat mode to a cool mode. This time delay is 5 minutes.

Supply Air Set Point Control — Once the control has determined that a cooling mode is in effect, the cooling control point (***Run Status→VIEW→CL.C.P***) is calculated and is based upon either ***Setpoints→SA.HI*** or ***Setpoints→SA.LO***, depending on whether a high or a low cooling mode is in effect, respectively. In addition, if supply air reset is configured, it will also be added to the cooling control point.

Table 36 — Cool/Heat Set Point Offsets Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
D.LV.T	COOL/HEAT SETPT. OFFSETS				
L.H.ON	Dmd Level Lo Heat On	-1 - 2	^F	DMDLHON	1.5
H.H.ON	Dmd Level(+) Hi Heat On	0.5 - 20.0	^F	DMDHHON	0.5
L.H.OF	Dmd Level(-) Lo Heat Off	0.5 - 2.0	^F	DMDLHOFF	1
L.C.ON	Dmd Level Lo Cool On	-1 - 2	^F	DMDLCON	1.5
H.C.ON	Dmd Level(+) Hi Cool On	0.5 - 20.0	^F	DMDHCON	0.5
L.C.OF	Dmd Level(-) Lo Cool Off	0.5 - 2	^F	DMDLCOFF	1
C.T.LV	Cool Trend Demand Level	0.1 - 5	^F	CTRENDLV	0.1
H.T.LV	Heat Trend Demand Level	0.1 - 5	^F	HTRENDLV	0.1
C.T.TM	Cool Trend Time	30 - 600	sec	CTRENDTM	120
H.T.TM	Heat Trend Time	30 - 600	sec	HTRENDTM	120

Refer to the SumZ Cooling Algorithm section for a discussion of how the P Series *Comfort*Link controls manage supply-air temperature and the staging of compressors for these control types.

***C.TYP* = 3** (Thermostat Cool Mode Selection) — When a thermostat type is selected, the decision making process involved in determining the mode is straightforward. Upon energizing the Y1 input only, the unit HVAC mode will be LOW COOL. Upon the energizing of both Y1 and Y2 inputs, the unit HVAC mode will be HIGH COOL. If just input G is energized the unit HVAC mode will be VENT and the supply fan will run.

Selecting the ***C.TYP*** = 3 (TSTAT – MULTI) control type will cause the control to do the following:

- The control will read both the ***Configuration→UNIT→SIZE*** and ***Configuration→UNIT→50.HZ*** configuration parameters to determine the number of cooling stages and the pattern for each stage.
- An HVAC mode equal to LOW COOL will cause the unit to select the ***Setpoints→SA.LO*** set point to control to. An HVAC mode equal to HIGH COOL will cause the unit to select the ***Setpoints→SA.HI*** set point to control to. Supply air reset (if configured) will be added to either the low or high cool set point.
- The control will utilize the SumZ cooling algorithm and control cooling to a supply air set point. See the section for the SumZ Cooling Algorithm section for information on controlling to a supply air set point and compressor staging.

COOL MODE DIAGNOSTIC HELP — To quickly determine the current trip points for the cooling modes, the Run Status sub-menu at the local display allows the user to view the calculated start and stop points for both the cooling and heating trip points. The following sub-menu can be found at the local display under ***Run Status→TRIP***. See Table 37.

Table 37 — Run Status Mode Trip Helper

ITEM	EXPANSION	UNITS	CCN POINT
TRIP	MODE TRIP HELPER		
UN.C.S	Unoccup. Cool Mode Start	dF	UCCLSTRT
UN.C.E	Unoccup. Cool Mode End	dF	UCCL_END
OC.C.S	Occupied Cool Mode Start	dF	OCCLSTRT
OC.C.E	Occupied Cool Mode End	dF	OCCL_END
TEMP	Ctl.Temp R.TMP,S.TMP or Zone	dF	CTRLTEMP
OC.H.E	Occupied Heat Mode End	dF	OCHT_END
OC.H.S	Occupied Heat Mode Start	dF	OCHTSTRT
UN.H.E	Unoccup. Heat Mode End	dF	UCHT_END
UN.H.S	Unoccup. Heat Mode Start	dF	UCHTSTRT
HVAC	the current HVAC MODE		String

The controlling temperature is "*TEMP*" and is in the middle of the table for easy reference. The HVAC mode can also be viewed at the bottom of the table.

For non-linkage applications and VAV control types (***C.TYP*** = 1 or 2), "TEMP" is the controlling return air temperature (***R.TMP***). For space sensor control, "TEMP" is the controlling space temperature average occupied zone temperature (***S.TMP***). For linkage applications, "TEMP" is zone temperature: average occupied zone temperature (***AOZT)*** during occupied periods and average zone temperature (***AZT)*** during unoccupied periods.

SUMZ COOLING ALGORITHM — The SumZ cooling algorithm is an adaptive PID (proportional, integral, derivative) which is used by the control whenever more than 2 stages of cooling are present (***C.TYP*** = 1,2,3, and 4). This section will describe its operation and define the pertinent parameters. It is generally not necessary to modify parameters in this section. The information is presented primarily for reference and may be helpful for troubleshooting complex operational problems.

The only configuration parameter for the SumZ algorithm is located at the local display under ***Configuration→COOL→Z.GN***. See Table 35.

Capacity Threshold Adjust (***Z.GN***) — This configuration affects the cycling rate of the cooling stages by raising or lowering the threshold that capacity must build to in order to add or subtract a stage of cooling.

The cooling algorithm's run-time variables are located at the local display under ***Run Status→COOL***. See Table 38.

Current Running Capacity (***C.CAP***) — This variable represents the amount of capacity currently running in percent.

Current Cool Stage (***CUR.S***) — This variable represents the cool stage currently running.

Requested Cool Stage (***REQ.S***) — This variable represents the requested cool stage. Cooling relay timeguards in place may prevent the requested cool stage from matching the current cool stage.

Maximum Cool Stages (***MAX.S***) — This variable is the maximum number of cooling stages the control is configured for and capable of controlling.

Active Demand Limit (***DEM.L***) — If demand limit is active, this variable will represent the amount of capacity that the control is currently limited to.

Capacity Load Factor (***SMZ***) — This factor builds up or down over time and is used as the means of adding or subtracting a cooling stage during run time. It is a normalized representation of the relationship between "Sum" and "Z". The control will add a stage when ***SMZ*** reaches 100 and decrease a stage when ***SMZ*** equals -100.

Next Stage EDT Decrease (***ADD.R***) — This variable represents (if adding a stage of cooling) how much the temperature should drop in degrees depending on the ***R.PCT*** calculation and exactly how much additional capacity is to be added.

ADD.R = R.PCT * (C.CAP — capacity after adding a cooling stage)

For example: If ***R.PCT*** = 0.2 and the control would be adding 20% cooling capacity by taking the next step up, 0.2 times 20 = 4°F (***ADD.R***)

Next Stage EDT Increase (***SUB.R***) — This variable represents (if subtracting a stage of cooling) how much the temperature should rise in degrees depending on the ***R.PCT*** calculation and exactly how much capacity is to be subtracted.

SUB.R = R.PCT* (***C.CAP*** — capacity after subtracting a cooling stage)

For Example: If ***R.PCT*** = 0.2 and the control would be subtracting 30% capacity by taking the next step down, 0.2 times –30 = –6°F (***SUB.R***)

Rise Per Percent Capacity (***R.PCT***) — This is a real time calculation that represents the number of degrees of drop/rise across the evaporator coil versus percent of current running capacity.

R.PCT = (*MAT* – *EDT*)/ ***C.CAP***

Cap Deadband Subtracting (***Y.MIN***) — This is a control variable used for Low Temp Override (***L.TMP***) and Slow Change Override (***SLOW***).

Y.MIN = ***-SUB.R****0.4375

Cap Deadband Adding (***Y.PLU***) — This is a control variable used for High Temp Override (***H.TMP***) and Slow Change Override (***SLOW***).

Y.PLU = ***-ADD.R****0.4375

Cap Threshold Subtracting (***Z.MIN***) — This parameter is used in the calculation of ***SMZ*** and is calculated as follows:

Z.MIN = Configuration→COOL→Z.GN * (–10 + (4* (***–SUB.R***))) * 0.6

Cap Threshold Adding (***Z.PLU***) — This parameter is used in the calculation of ***SMZ*** and is calculated as follows:

Z.PLU = Configuration→COOL→Z.GN * (10 + (4* (***–ADD.R***))) * 0.6

High Temp Cap Override (***H.TMP***) — If stages of mechanical cooling are on and the error is greater than twice ***Y.PLU***, and the rate of change of error is greater than 0.5°F per minute, then a stage of mechanical cooling will be added every 30 seconds. This override is intended to react to situations where the load rapidly increases.

Low Temp Cap Override (***L.TMP***) — If the error is less than twice ***Y.MIN***, and the rate of change of error is less than –0.5°F per minute, then a mechanical stage will be removed every 30 seconds. This override is intended to quickly react to situations where the load is rapidly reduced.

Pull Down Cap Override (***PULL***) — If the error from set point is above 4°F, and the rate of change is less than –1°F per minute, then pulldown is in effect, and "SUM" is set to 0. This keeps mechanical cooling stages from being added when the error is very large, but there is no load in the space. Pulldown for units is expected to rarely occur, but is included for the rare situation when it is needed. Most likely pulldown will occur when mechanical cooling first becomes available shortly after the control goes into an occupied mode (after a warm unoccupied mode).

Slow Change Cap Override (***SLOW***) — With a rooftop unit, the design rise at 100% total unit capacity is generally around 30°F. For a unit with 4 stages, each stage represents about 7.5°F of change to EDT. If stages could reliably be cycled at very fast rates, the set point could be maintained very precisely. Since it is not desirable to cycle compressors more than 6 cycles per hour, slow change override takes care of keeping the PID under control when "relatively" close to set point.

Humidi-MiZer® Capacity ***(CAPC)*** — This variable represents the total reheat capacity currently in use during a Humidi-MiZer mode. A value of 100% indicates that all of the discharge gas is being bypassed around the condenser and into the Humidi-MiZer dehumidification/reheat coil (maximum reheat). A value of 0% indicates that all of the flow is going through the condenser before entering the Humidi-MiZer dehumidification/reheat coil (dehum/subcooling mode).

Condenser EXV Position ***(C.EXV)*** — This variable represents the position of the condenser EXV (percent open).

Bypass EXV Position ***(B.EXV)*** — This variable represents the position of the bypass EXV (percent open).

Humidi-MiZer 3-Way Valve ***(RHV)*** — This variable represents the position of the 3-way valve used to switch the unit into and out of a Humidi-MiZer mode. A value of 0 indicates that the unit is in a standard cooling mode. A value of 1 indicates that the unit has energized the 3-way valve and entered into a Humidi-MiZer mode.

Cooling Control Point ***(C.CPT)*** — Displays the current cooling control point (a target value for air temperature leaving the evaporator coil location). During a Humidi-MiZer mode, this variable will take on the value of the dehumidify cool set point (***Configuration→DEHU→D.C.SP)***. Compressors will stage up or down to meet this temperature.

Evaporator Discharge Temperature ***(EDT)*** — Displays the temperature measured between the evaporator coils and the Humidi-MiZer dehumidification/reheat coil. Units configured with Humidi-MiZer system have a thermistor grid installed between these two coils to provide the measurement. This temperature can also be read at ***Temperatures→AIR.T→CCT.***

Heating Control Point ***(H.CPT)*** — Displays the current heating control point for Humidi-MiZer coil. During a Reheat mode, this temperature will be either an offset subtracted from return air temperature (***D.V.RA***) or the Vent Reheat Set Point (***D.V.HT***). During a Dehumidification Mode, this temperature will take on the value of the original cooling control point so that the supply air is reheated just enough to meet the sensible demand in the space. The Humidi-MiZer modulating valves will adjust to meet this temperature set point.

Leaving Air Temperature ***(LAT)*** — Displays the leaving air temperature after the Humidi-MiZer reheat/dehumidification coil.

Table 38 — Run Status Cool Display

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
COOL	COOLING INFORMATION				
C.CAP	Current Running Capacity		%	CAPTOTAL	
CUR.S	Current Cool Stage			COOL_STG	
REQ.S	Requested Cool Stage			CL_STAGE	
MAX.S	Maximum Cool Stages			CLMAXSTG	
DEM.L	Active Demand Limit		%	DEM_LIM	forcible
SUMZ	COOL CAP. STAGE CONTROL				
SMZ	Capacity Load Factor	-100 – +100		SMZ	
ADD.R	Next Stage EDT Decrease		^F	ADDRISE	
SUB.R	Next Stage EDT Increase		^F	SUBRISE	
R.PCT	Rise Per Percent Capacity			RISE_PCT	
Y.MIN	Cap Deadband Subtracting			Y_MINUS	
Y.PLU	Cap Deadband Adding			Y_PLUS	
Z.MIN	Cap Threshold Subtracting			Z_MINUS	
Z.PLU	Cap Threshold Adding			Z_PLUS	
H.TMP	High Temp Cap Override			HI_TEMP	
L.TMP	Low Temp Cap Override			LOW_TEMP	
PULL	Pull Down Cap Override			PULLDOWN	
SLOW	Slow Change Cap Override			SLO_CHNG	
HMZR	HUMIDIMIZER				
CAPC	Humidimizer Capacity			HMZRCAPC	
C.EXV	Condenser EXV Position			COND_EXV	
B.EXV	Bypass EXV Position			BYP_EXV	
RHV	Humidimizer 3-Way Valve			HUM3WVAL	
C.CPT	Cooling Control Point			COOLCPNT	
EDT	Evaporator Discharge Tmp			EDT	
H.CPT	Heating Control Point			HEATCPNT	
LAT	Leaving Air Temperature			LAT	

SumZ Operation — The SumZ algorithm is an adaptive PID style of control. The PID (proportional, integral, derivative) is programmed within the control and the relative speed of staging can only be influenced by the user through the adjustment of the ***Z.GN*** configuration, described in the reference section. The capacity control algorithm uses a modified PID algorithm, with a self adjusting gain which compensates for varying conditions, including changing flow rates across the evaporator coil.

Previous implementations of SumZ made static assumptions about the actual size of the next capacity jump up or down. This control uses a "rise per percent capacity" technique in the calculation of SumZ, instead of the previous "rise per stage" method. For each jump, up or down in capacity, the control will know beforehand the exact capacity change brought on. Better overall staging control can be realized with this technique.

SUM Calculation — The PID calculation of the "SUM" is evaluated once every 80 seconds.

SUM = Error + "SUM last time through" + (3 * Error Rate)

Where:

SUM = the PID calculation

Error = EDT – Cooling Control Point

Error Rate = Error – "Error last time through"

NOTE: "Error" is clamped between –10 and +50 and "Error rate" is clamped between –5 and +5.

This "SUM" will be compared against the "Z" calculations in determining whether cooling stages should be added or subtracted.

Z Calculation — For the "Z" calculation, the control attempts to determine the entering and the leaving-air temperature of the evaporator coil and based upon the difference between the two during mechanical cooling, determines whether to add or subtract a stage of cooling. This is the adaptive element.

The entering-air temperature is referred to as ***MAT*** (mixed-air temperature) and the leaving-air temperature of the evaporator coil is referred to as ***EDT*** (evaporator discharge temperature). They are found at the local display under the ***Temperatures→AIR.T→CTRL*** sub-menu.

The main elements to be calculated and used in the calculation of SumZ are:

1) the rise per percent capacity (***R.PCT***)
2) the amount of expected rise for the next cooling stage addition
3) the amount of expected rise for the next cooling stage subtraction

The calculation of "Z" requires two variables, ***Z.PLU*** used when adding a stage and ***Z.MIN*** used when subtracting a stage.

They are calculated with the following formulas:

Z.PLU = ***Z.GN*** * (10 + (4*(–***ADD.R***))) * 0.6

Z.MIN = ***Z.GN*** * (–10 + (4*(–***SUB.R***))) * 0.6

Where:

Z.GN = configuration used to modify the threshold levels used for staging (***Configuration→COOL→Z.GN***)

ADD.R = ***R.PCT*** * ***(C.CAP*** – capacity after adding a cooling stage)

SUB.R = ***R.PCT*** * (***C.CAP*** – capacity after subtracting a cooling stage)

Both of these terms, ***Z.PLU*** and ***Z.MIN***, represent a threshold both positive and negative upon which the "SUM" calculation must build up to in order to cause the compressor to stage up or down.

Comparing SUM and Z — The "SUM" calculation is compared against ***Z.PLU*** and ***Z.MIN***.

- If "SUM" rises above ***Z.PLU***, a cooling stage is added.
- If "SUM" falls below ***Z.MIN***, a cooling stage is subtracted.

There is a variable called ***SMZ*** which is described in the reference section and which can simplify the task of watching the demand build up or down over time. It is calculated as follows:

If SUM is positive: ***SMZ*** = 100*(SUM/***Z.PLU***)

If SUM is negative: ***SMZ*** = 100*(SUM/***Z.MIN***)

Mixed Air Temperature Calculation (MAT) — The mixed-air temperature is calculated and is a function of the economizer position. Additionally there are some calculations in the control which can zero in over time on the relationship of return and outside air as a function of economizer position. There are two configurations which relate to the calculation of "MAT." These configurations can be located at the local display under ***Configuration→UNIT***.

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION			
MAT.S	MAT Calc Config	0 - 2	MAT_SEL	1
MAT.R	Reset MAT Table Entries?	Yes/No	MATRESET	No

MAT Calc Config (***MAT.S***) — This configuration gives the user three options in the processing of the mixed-air temperature (MAT) calculation:

- ***MAT.S*** = 0

  There will be no MAT calculation.
- ***MAT.S*** = 1

  The control will attempt to learn MAT over time. Any time the system is in a vent mode and the economizer stays at a particular position for long enough, MAT = EDT. Using this, the control has an internal table whereby it can more closely determine the true MAT value.
- ***MAT.S*** = 2

  The control will stop learning and use whatever the control has already learned. Using this setting infers that the control has spent some time set to ***MAT.S*** = 1.

First set ***MAT.S*** = 1. Then go into the Service Test mode, turn on the fan and open the economizer to a static position for 5 minutes. Move to several positions (20%,40%,60%,80%). It is important that the difference between return and outside temperature be greater than 5 degrees. (The greater the delta, the better). When done, set ***MAT.S*** = 2 and the system has been commissioned.

Reset MAT Table Entries? (***MAT.R***) — This configuration allows the user to reset the internally stored MAT learned configuration data back to the default values. The defaults are set to a linear relationship between the economizer damper position and OAT and RAT in the calculation of MAT.

SumZ Overrides — There are a number of overrides to the SumZ algorithm which may add or subtract stages of cooling.

- High Temp Cap Override (***H.TMP***)
- Low Temp Cap Override (***L.TMP***)
- Pull Down Cap Override (***PULL***)
- Slow Change Cap Override (***SLOW***)

Economizer Trim Override — The unit may drop stages of cooling when the economizer is performing free cooling and the configuration ***Configuration→ECON→E.TRM*** is set to Yes. The economizer controls to the same supply air set point as mechanical cooling does for SumZ when ***E.TRM*** = Yes. This allows for much tighter temperature control as well as cutting down on the cycling of compressors.

For a long cooling session where the outside-air temperature may drop over time, there may be a point at which the economizer has closed down far enough where the unit could remove a cooling stage and open up the economizer further to make up the difference.

Mechanical Cooling Lockout (***Configuration→COOL→MC.LO***) — This configuration allows a configurable outside-air temperature set point below which mechanical cooling will be completely locked out.

DEMAND LIMIT CONTROL — Demand Limit Control may override the cooling algorithm and clamp or shed cooling capacity during run time. The term Demand Limit Control refers to the restriction of the machine capacity to control the amount of power that a machine will use. Demand limit control is intended to interface with an external Loadshed Device either through CCN communications, external switches, or 4 to 20 mA input.

The control has the capability of loadshedding and limiting in 3 ways:

- Two discrete inputs tied to configurable demand limit set point percentages.
- An external 4 to 20 mA input that can reset capacity back linearly to a set point percentage.
- CCN loadshed functionality.

NOTE: It is also possible to force the demand limit variable (***Run Status→COOL→DEM.L***).

To use Demand Limiting, select the type of demand limiting to use. This is done with the Demand Limit Select configuration (***Configuration→DMD.L→DM.L.S***).

To view the current demand limiting currently in effect, look at ***Run Status→COOL→DEM.L***.

The configurations associated with demand limiting can be viewed at the local display at ***Configuration→DMD.L***. See Table 39.

Demand Limit Select (***DM.L.S***) — This configuration determines the type of demand limiting.

- 0 = NONE — Demand Limiting not configured.
- 1 = 2 SWITCHES — This will enable switch input demand limiting using the switch inputs connected to the CEM board. Connections should be made to TB202 terminals 1,2,3, and 4.
- 2 = 4 to 20 mA — This will enable the use of a remote 4 to 20 mA demand limit signal. The CEM module must be used. The 4 to 20 mA signal must come from an externally sourced controller and should be connected to TB202 terminals 10 and 11.
- 3 = CCN LOADSHED — This will allow for loadshed and red lining through CCN communications.

Two-Switch Demand Limiting (***DM.L.S*** *= 1*) — This type of demand limiting utilizes two discrete inputs:

- Demand Limit Switch 1 Setpoint (***D.L.S1***) — Dmd Limit Switch Setpoint 1 (0 to 100% total capacity)
- Demand Limit 2 Setpoint (***D.L.S2***) — Dmd Limit Switch Setpoint 2 (0 to 100% total capacity)

The state of the discrete switch inputs can be found at the local display:

Inputs→GEN.I→DL.S1

Inputs→GEN.I→DL.S2

The following table illustrates the demand limiting (***Run Status→COOL→DEM.L***) that will be in effect based on the logic of the applied switches:

Switch Status	*Run Status→COOL→DEM.L = 1*
Inputs→GEN.I→DL.S1 = OFF *Inputs→GEN.I→DL.S2* = OFF	100%
Inputs→GEN.I→DL.S1= ON *Inputs→GEN.I→DL.S2* = OFF	*Configuration→DMD.L→D.L.S1*
Inputs→GEN.I→DL.S1= ON *Inputs→GEN.I→DL.S2* = ON	*Configuration→DMD.L→D.L.S2*
Inputs→GEN.I→DL.S1= OFF *Inputs→GEN.I→DL.S2* = ON	*Configuration→DMD.L→D.L.S2*

4-20 mA Demand Limiting (***DM.L.S*** *= 2*) — If the unit has been configured for 4 to 20 mA demand limiting, then the ***Inputs→4-20→DML.M*** value is used to determine the amount of demand limiting in effect (***Run Status→COOL→DEM.L***). The Demand Limit at 20 mA (***D.L.20***) configuration must be set. This is the configured demand limit corresponding to a 20 mA input (0 to 100%).

The value of percentage reset is determined by a linear interpolation from 0% to ***"D.L.20"***% based on the ***Inputs→4-20→DML.M*** input value.

The following examples illustrate the demand limiting (***Run Status→COOL→DEM.L***) that will be in effect based on amount of current seen at the 4 to 20 mA input, ***DML.M***.

D.L.20 = 80% ***DML.M*** = 4mA ***DEM.L*** = 100%	***D.L.20*** = 80% ***DML.M*** = 12 mA ***DEM.L*** = 90%	***D.L.20*** = 80% ***DML.M*** = 20mA ***DEM.L*** = 80%

CCN Loadshed Demand Limiting (***DM.L.S*** = 3) — If the unit has been configured for CCN Loadshed Demand Limiting, then the demand limiting variable (***Run Status→COOL→DEM.L***) is controlled via CCN commands.

The relevant configurations for this type of demand limiting are:

Loadshed Group Number (***SH.NM***) — CCN Loadshed Group number

Loadshed Demand Delta (***SH.DL***) — CCN Loadshed Demand Delta

Maximum Loadshed Time (***SH.TM***) — CCN Maximum Loadshed time

The Loadshed Group Number (***SH.NM***) corresponds to the loadshed supervisory device that resides elsewhere on the CCN network and broadcasts loadshed and redline commands to its associated equipment parts. The ***SH.NM*** variable will default to zero which is an invalid group number. This allows the loadshed function to be disabled until configured.

Upon reception of a redline command, the machine will be prevented from starting if it is not running. If it is running, then ***DEM.L*** is set equal to the current running cooling capacity (***Run Status→COOL→C.CAP***).

Upon reception of a loadshed command, the ***DEM.L*** variable is set to the current running cooling capacity (***Run Status →COOL→C.CAP***) minus the configured Loadshed Demand Delta (***SH.DL***).

A redline command or loadshed command will stay in effect until a Cancel redline or Cancel loadshed command is received, or until the configurable Maximum Loadshed time (***SH.TM***) has elapsed.

HEAD PRESSURE CONTROL — Condenser head pressure for the 48/50P Series is managed directly by the *Comfort*Link controls. The controls are able to cycle up to 6 stages of outdoor fans to maintain acceptable head pressure. Fan stages will be turned on or off in reaction to discharge pressure sensors with the pressure converted to the corresponding saturated condensing temperature.

An option to allow fan speed control (Motormaster®) on the first stage is configured by setting ***Configuration→COOL→M.M*** = Yes.

There are three configurations provided for head pressure control that can be found at the local display:

Configuration→COOL→M.M (MotorMaster enable)

Configuration→COOL→SCT.H (Maximum Condensing Temp)

Configuration→COOL→SCT.L (Minimum Condensing Temp)

There are up to four outputs provided to control head pressure:

Outputs→FANS→CDF.1 — Condenser Fan Output 1

Outputs→FANS→CDF.2 — Condenser Fan Output 2

Outputs→FANS→CDF.3 — Condenser Fan Output 3

Outputs→FANS→CDF.4 — Condenser Fan Output 4

The specific staging sequence for a unit depends on the 3 factors: the unit size (tonnage), which refrigeration circuits are currently operating, and whether or not MotorMaster is enabled. See Fig. 7 for fan staging sequencing.

The condenser fan output controls outdoor fan contactors and outdoor fans for each unit tonnage as shown in Fig. 7. Each stage of fans is also shown. The *Comfort*Link controller adds or subtracts stages of fans based on ***SCT.H*** and ***SCT.L***. When the SCT rises above ***SCT.H***, a fan stage will be added. The *Comfort*Link controller will continue to add a fan stage every 10 seconds thereafter if the SCT remains above ***SCT.H***. If SCT rises above 130°F, the controller will turn on the maximum fan stages for the unit. When the SCT drops below the ***SCT.L***, a fan stage will be subtracted. The *Comfort*Link controller will continue to drop a fan stage every 2 minutes thereafter if the SCT remains below ***SCT.L***.

When a condenser fan output is common to both refrigeration circuits (in other words, when the fan(s) will affect both circuit A and circuit B), the following logic is used: in order to add a fan stage, the SCT of either circuit must be above ***SCT.H*** for 30 seconds and in order to subtract a stage, the SCT of both circuits must be below ***SCT.L*** for 30 seconds.

Whenever the outdoor ambient temperature (OAT) is above 70°F, the maximum stage will always be on when the compressors are on.

On the initial start-up of a circuit, the condenser fans will start 5 seconds prior to the compressor starting in order to ensure proper head pressure of the compressor immediately at start-up. After the compressor starts, the normal head pressure routine will begin 30 seconds after the condenser fan pre-start. What stage fans starts depends on the outdoor ambient temperature. The three situations are:

OAT ≤ 50°F

50°F < OAT < 70°F

OAT ≥ 70°F

See Fig. 7 for what stage of fans starts for each scenario.

ECONOMIZER INTEGRATION WITH MECHANICAL COOLING — When the economizer is able to provide free cooling (***Run Status→ECON→ACTV*** = YES), mechanical cooling may be delayed or even held off indefinitely.

NOTE: Once mechanical cooling has started, this delay logic is no longer relevant.

Multi-Stage Cooling Economizer Mechanical Cooling Delay — This type of mechanical cooling delay is relevant to the following machine control types:

C.TYP = 1 VAV-RAT

C.TYP = 2 VAV-SPT

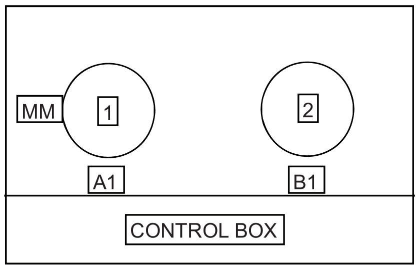
C.TYP = 3 TSTAT-MULTI

C.TYP = 4 SPT-MULTI

If the economizer is able to provide free cooling at the start of a cooling session, the mechanical cooling algorithm (SumZ), checks the economizer's current position (***Run Status →ECON→ECN.P***) and compares it to the economizer's maximum position (***Configuration→ECON→EC.MX***) – 5%. Once the economizer has opened beyond this point a 150 second timer starts. If the economizer stays beyond this point for 2.5 minutes continuously, the mechanical cooling algorithm is allowed to start computing demand and stage compressors and unloaders.

Table 39 — Demand Limit Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
DMD.L	DEMAND LIMIT CONFIG.				
DM.L.S	Demand Limit Select	0 - 3		DMD_CTRL	0
D.L.20	Demand Limit at 20 ma	0 - 100	%	DMT20MA	100
SH.NM	Loadshed Group Number	0 - 99		SHED_NUM	0
SH.DL	Loadshed Demand Delta	0 - 60	%	SHED_DEL	0
SH.TM	Maximum Loadshed Time	0 - 120	min	SHED_TIM	60
D.L.S1	Demand Limit Sw.1 Setpt.	0 - 100	%	DLSWSP1	80
D.L.S2	Demand Limit Sw.2 Setpt.	0 - 100	%	DLSWSP2	50



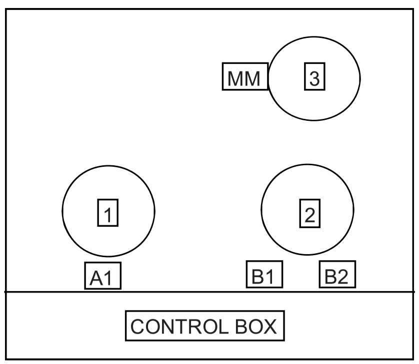
Size 030, 035

Circuit	Controlling Output		Contactor Conrolled	OFM(s) Controlled	Logic
	Software	Board			
Common	CONDFAN1	MBB Rly 6	OFC1	OFM1	Comp A1 or B1 **ON**
Common	CONDFAN2	MBB Rly 5	OFC2	OFM2	Circuit A or B SCT or OAT

M.M. = YES OR NO

		# of Fans ON	**Fans ON**
Stage 1	OFC1	1	OFM1
Stage 2	OFC1,2	2	OFM1,2

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 2
High Ambient Prestart (OAT ≥ 70F) = Stage 2
Allow Fan Staging if OAT < 70F



Size 040

Circuit	Controlling Output		Contactor Conrolled	OFM(s) Controlled	Logic
	Software	Board			
Common	CONDFAN1	MBB Rly 6	OFC1	OFM3	Comp A1, B1 or B2 **ON**
Common	CONDFAN2	MBB Rly 5	OFC2	OFM1,2	Circuit A or B SCT or OAT

M.M. = NO

		# of Fans ON	**Fans ON**
Stage 1*	OFC1	1	OFM3
Stage 2	OFC2	2	OFM1,2
Stage 3	OFC1,2	3	OFM1,2,3

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 2
High Ambient Prestart (OAT ≥ 70F) = Stage 3
Allow Fan Staging if OAT < 70F

M.M. = YES

		# of Fans ON	**Fans ON**
Stage 1*	OFC1	1	OFM3
Stage 2	OFC1,2	3	OFM1,2,3

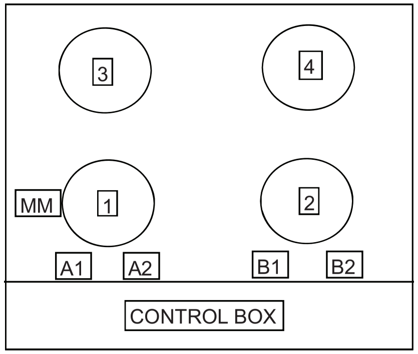
Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 2
High Ambient Prestart (OAT ≥ 70F) = Stage 2
Allow Fan Staging if OAT < 70F

* Stage 1 valid only when OAT <= 55 F

LEGEND

MM — Motormaster
OAT — Outdoor Air Temperature
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
SCT — Saturated Condensing Temperature

Fig. 7 — Condenser Fan Staging Sequence



Size 050, 055, 060

Circuit	Controlling Output: Software	Controlling Output: Board	Contactor Conrolled	OFM(s) Controlled	Logic
Common	CONDFAN1	MBB Rly 6	OFC1	OFM1	Comp A1, A2, B1 or B2 **ON**
Common	CONDFAN2	MBB Rly 5	OFC2	OFM2,3	Circuit A or B SCT or OAT
Common	CONDFAN3	RCB Rly 1	OFC3	OFM4	Circuit A or B SCT or OAT

M.M. = NO

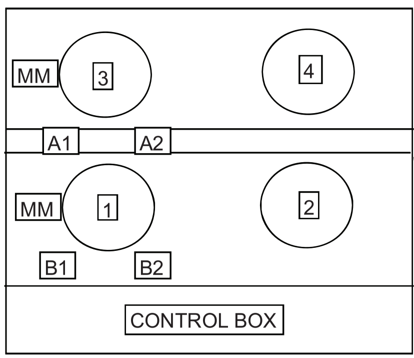
		# of Fans ON	Fans ON
Stage 1	OFC1	1	OFM1
Stage 2	OFC2	2	OFM2,3
Stage 3	OFC1,2	3	OFM1,2,3
Stage 4	OFC1,2,3	4	OFM1,2,3,4

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 3
High Ambient Prestart (OAT ≥ 70F) = Stage 4
Allow Fan Staging if OAT < 70F

M.M. = YES

		# of Fans ON	Fans ON
Stage 1	OFC1	1	OFM1
Stage 2	OFC1,3	2	OFM1,4
Stage 3	OFC1,2	3	OFM1,2,3
Stage 4	OFC1,2,3	4	OFM1,2,3,4

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 3
High Ambient Prestart (OAT ≥ 70F) = Stage 4
Allow Fan Staging if OAT < 70F



Size 070, 075

Circuit	Controlling Output: Software	Controlling Output: Board	Contactor Conrolled	OFM(s) Controlled	Logic
A	CONDFAN3	RCB Rly 1	OFC3	OFM3	Comp A1 or A2 **ON**
B	CONDFAN1	MBB Rly 6	OFC1	OFM1	Comp B1 or B2 **ON**
A	CONDFAN4	RCB Rly 2	OFC4	OFM4	Circuit A SCT or OAT
B	CONDFAN2	MBB Rly 5	OFC2	OFM2	Circuit B SCT or OAT

	Circuit A	# of Fans ON	Fans ON
Stage 1	OFC3	1	OFM3
Stage 2	OFC3,4	2	OFM3,4

	Circuit B	# of Fans ON	Fans ON
Stage 1	OFC1	1	OFM1
Stage 2	OFC1,2	2	OFM1,2

M.M. = YES OR NO

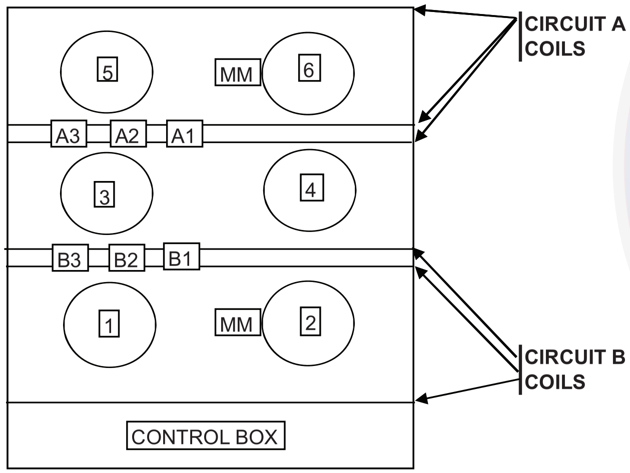
Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 2
High Ambient Prestart (OAT ≥ 70F) = Stage 2
Allow Fan Staging if OAT < 70F

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 2
High Ambient Prestart (OAT ≥ 70F) = Stage 2
Allow Fan Staging if OAT < 70F

LEGEND

MM — Motormaster
OAT — Outdoor Air Temperature
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
SCT — Saturated Condensing Temperature

Fig. 7 — Condenser Fan Staging Sequence (cont)



Size 090, 100

Circuit	Controlling Output Software	Controlling Output Board	Contactor Conrolled	OFM(s) Controlled	Logic
Common	CONDFAN4	RCB Rly 2	OFC4	OFM4	Comp A1, A2, or A3 **ON**, or Comp B1, B2, or B3 **ON**
A	CONDFAN3	RCB Rly 1	OFC3	OFM6	Circuit A SCT or OAT
B	CONDFAN2	MBB Rly 5	OFC2	OFM2	Circuit B SCT or OAT
Common	CONDFAN1	MBB Rly 6	OFC1	OFM1,3,5	Circuit A or B SCT or OAT

CIRCUIT A ON ONLY

Circuit A, M.M. = NO		# of Fans ON	Fans ON
Stage 1*	OFC4	0.5	OFM4
Stage 2	OFC3	1	OFM6
Stage 3	OFC4,3	1.5	OFM4,6
Stage 4	OFC4,1	2	OFM4,1,3,5
Stage 5	OFC3,1	2.5	OFM6,1,3,5
Stage 6	OFC3,4,1	3	OFM4,6,1,3,5

* Stage 1 valid only when OAT <= 55 F

CIRCUIT B ON ONLY

Circuit B, M.M. = NO		# of Fans ON	Fans ON
Stage 1*	OFC4	0.5	OFM4
Stage 2	OFC2	1	OFM2
Stage 3	OFC4,2	1.5	OFM4,2
Stage 4	OFC4,1	2	OFM4,1,3,5
Stage 5	OFC2,1	2.5	OFM2,1,3,5
Stage 6	OFC4,2,1	3	OFM4,2,1,3,5

M.M. = NO

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 3
High Ambient Prestart (OAT ≥ 70F) = Stage 6
Allow Fan Staging if OAT < 70F

CIRCUIT A AND B ON

Common, M.M. = NO		# of Fans ON	Fans ON
Stage 1	OFC4	1	OFM4
Stage 2	OFC2,3	2	OFM2,6
Stage 3	OFC1	3	OFM1,3,5
Stage 4	OFC1,4	4	OFM4,1,3,5
Stage 5	OFC1,2,3	5	OFM2,6,1,3,5
Stage 6	OFC1,2,3,4	6	OFM1,2,3,4,5,6

For 100 Ton Only
If Circuit B is ON and
If M.M. = NO
Minimum Fan Stage = 2
(Fan Stage 1 causes unstable Operation)

CIRCUIT A ON ONLY

Circuit A, M.M. = YES		# of Fans ON	Fans ON
Stage 1	OFC3	1	OFM6
Stage 2	OFC4,3	1.5	OFM4,6
Stage 3	OFC3,1	2.5	OFM6,1,3,5
Stage 4	OFC4,3,1	3	OFM4,6,1,3,5

CIRCUIT B ON ONLY

Circuit B, M.M. = YES		# of Fans ON	Fans ON
Stage 1	OFC2	1	OFM2
Stage 2	OFC4,2	1.5	OFM4,2
Stage 3	OFC2,1	2.5	OFM2,1,3,5
Stage 4	OFC4,2,1	3	OFM4,2,1,3,5

M.M. = YES

Low Ambient Prestart 1 (OAT ≤ 50F) = Stage 1
Low Ambient Prestart 2 (50F < OAT < 70F) = Stage 2
High Ambient Prestart (OAT ≥ 70F) = Stage 4
Allow Fan Staging if OAT < 70F

CIRCUIT A AND B ON

Common, M.M. = YES		# of Fans ON	Fans ON
Stage 1	OFC2,3	2	OFM2,6
Stage 2	OFC2,3,4	3	OFM2,4,6
Stage 3	OFC2,3,1	5	OFM2,6,1,3,5
Stage 4	OFC1,2,3,4	6	OFM1,2,3,4,5,6

LEGEND

MM — Motormaster
OAT — Outdoor Air Temperature
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
SCT — Saturated Condensing Temperature

Fig. 7 — Condenser Fan Staging Sequence (cont)

Heating Control — The P Series *Comfort*Link controls offer control for five different types of heating systems to satisfy general space heating requirements: 2-stage gas heat, 2-stage electric heat, multiple-stage gas heat, modulating gas heat, and hydronic heat. Heating control also provides tempering and reheat functions. These functions are discussed in separate sections. Reheat is discussed under Dehumidification function on page 86.

Variable air volume (VAV) type applications (***C.TYP*** = 1 or 2) require that the space terminal positions be commanded to open to minimum heating positions when gas or electric heat systems are active, to provide for the unit heating system's Minimum Heating Airflow rate.

Also, for VAV applications, the heat interlock relay (HIR) function provides the switching of a control signal intended for use by the VAV terminals. This signal must be used to command the terminals to open to their Heating Open positions. The HIR is energized whenever the Heating mode is active, an IAQ pre-occupied force is active, or if fire smoke modes, pressurization, or smoke purge modes are active.

Hydronic heating applications that use the unit's control require the installation of a communicating actuator on the hydronic heating coil's control valve. This actuator (with or without matching control valve) may be separately shipped for field installation.

All heating systems are available as factory-installed options. The hydronic heating coil may also be field-supplied and field-installed; the actuator is still required if unit control will be used to manage this heating sequence.

SETTING UP THE SYSTEM — The essential heating configurations are located at the local display under ***Configuration→HEAT***. See Table 40.

Heating Control Type (***HT.CF***) — The heating control types available are selected/configured with this variable.

0 = No Heat
1 = Electric Heat
2 = 2 Stage Gas Heat
3 = Staged Gas Heat or Modulating Gas Heat
4 = Hydronic Heat
5 = SCR Electric Heat

Heating Supply Air Set Point (***HT.SP***) — In a low heat mode for either staged gas, modulating gas, SCR electric, or hydronic heat, this is the supply air set point for heating.

Occupied Heating Enable (***OC.EN***) — This configuration only applies when the unit's control type (***Configuration →UNIT→C.TYP***) is configured for 1 (VAV-RAT) or 2 (VAV-SPT). If the user wants to have the capability of performing heating throughout the entire occupied period, then this configuration needs to be set to "YES." Most installations do not require this capability, and if heating is installed, it is used to heat the building up in the morning. In this case set ***OC.EN*** to "NO."

NOTE: This unit does not support simultaneous heating and cooling. If significant simultaneous heating and cooling demand is expected, it may be necessary to provide additional heating or cooling equipment and a control system to provide occupants with proper comfort.

NOTE: If the user does not relocate this sensor for the 2-stage electric or gas heating types and is under CCN Linkage, then the control will send a heating mode (if present) unconditionally to the linkage coordinator in the CCN zoning system regardless of the leaving-air temperature.

Table 40 — Heating Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HEAT	HEATING CONFIGURATION				
HT.CF	Heating Control Type	0 - 5		HEATTYPE	0*
HT.SP	Heating Supply Air Setpt	80 - 120	dF	SASPHEAT	85
OC.EN	Occupied Heating Enabled	Yes/No		HTOCCENA	No
LAT.M	MBB Sensor Heat Relocate	Yes/No		HTLATMON	No
SG.CF	STAGED HEAT CONFIGS				
HT.ST	Staged Heat Type	0 - 8		HTSTGTYP	0*
CAP.M	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45*
M.R.DB	St.Ht DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5
S.G.DB	St.Heat Temp. Dead Band	0 - 5	^F	HT_SG_DB	2
RISE	Heat Rise dF/sec Clamp	0.05 - 0.2		HTSGRISE	0.06
LAT.L	LAT Limit Config	0 - 20	^F	HTLATLIM	10
LIM.M	Limit Switch Monitoring?	Yes/No		HTLIMMON	Yes
SW.H.T	Limit Switch High Temp	80 - 210	dF	HT_LIMHI	170*
SW.L.T	Limit Switch Low Temp	80 - 210	dF	HT_LIMLO	160*
HT.P	Heat Control Prop. Gain	0 - 1.5		HT_PGAIN	1
HT.D	Heat Control Derv. Gain	0 - 1.5		HT_DGAIN	1
HT.TM	Heat PID Rate Config	30 - 300	sec	HTSGPIDR	90*
HH.CF	HYDRONIC HEAT CONFIGS				
HW.P	Hydronic Ctl.Prop. Gain	0 - 1.5		HW_PGAIN	1
HW.I	Hydronic Ctl.Integ. Gain	0 - 1.5		HW_IGAIN	1
HW.D	Hydronic Ctl.Derv. Gain	0 - 1.5		HW_DGAIN	1
HW.TM	Hydronic PID Rate Config	15 - 300	sec	HOTWPIDR	90
ACT.C	HYDR.HEAT ACTUATOR CFGS.				
SN.1	Hydronic Ht.Serial Num.1	0 - 9999		HTCL_SN1	0
SN.2	Hydronic Ht.Serial Num.2	0 - 6		HTCL_SN2	0
SN.3	Hydronic Ht.Serial Num.3	0 - 9999		HTCL_SN3	0
SN.4	Hydronic Ht.Serial Num.4	0 - 254		HTCL_SN4	0
C.A.LM	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85

*Some defaults are model number dependent.

HEAT MODE SELECTION PROCESS — There are two possible heat modes that the control will call out for heating control: HVAC Mode = LOW HEAT and HVAC Mode = HIGH HEAT. These modes will be called out based on control type (***C.TYP***).

VAV-RAT (***C.TYP* = 1**) and VAV-SPT (***C.TYP* = 2**) — There is no difference in the selection of a heating mode for either VAV-RAT or VAV-SPT, except that for VAV-SPT, space temperature is used in the unoccupied period to turn on the supply fan for 10 minutes before checking return-air temperature. The actual selection of a heat mode, LOW or HIGH for both control types, will be based upon the controlling return-air temperature.

With sufficient heating demand, there are still conditions that will prevent the unit from selecting a heat mode. First, the unit must be configured for a heat type (***Configuration→HEAT→HT.CF*** not equal to "NONE"). Second, the unit has a configuration which can enable or disable heating in the occupied period except for a standard morning warmup cycle (***Configuration→HEAT→OC.EN***). See descriptions above in the Setting Up the System section for more information.

Tstat-Multi-Stage (***C.TYP* = 3**) — With thermostat control the W1 and W2 inputs determine whether the HVAC Mode is LOW or HIGH HEAT.

W1 = ON, W2 = OFF: HVAC MODE = LOW HEAT*
W2 = ON, W2 = ON: HVAC MODE = HIGH HEAT

*If the heating type is either 2-stage electric or 2-stage gas, the unit may promote a low heat mode to a high heat mode.

NOTE: If W2 = ON and W1 is OFF, a "HIGH HEAT" HVAC Mode will be called out but an alert (T422) will be generated. See Alarms and Alerts section on page 114.

SPT Multi-Stage (***C.TYP* = 4**) — The unit is free to select a heating mode based on space temperature (SPT).

If the unit is allowed to select a heat mode, then the next step is an evaluation of demand versus set point. At this point, the logic is the same as for control types VAV-RAT and VAV-SPT, (***C.TYP*** = 1,2) except for the actual temperature compared against set point. See Temperature Driven Heat Mode Evaluation section below.

TEMPERATURE DRIVEN HEAT MODE EVALUATION — This section discusses the technique for selecting a heating mode based on temperature. Regardless of whether the unit is configured for return air or space temperature the logic is exactly the same. For the rest of this discussion, the temperature in question will be referred to as the controlling temperature.

First, the occupied and unoccupied heating set points under ***Setpoints*** must be configured.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
OHSP	Occupied Heat Setpoint	55-80	dF	OHSP	68
UHSP	Unoccupied Heat Setpoint	40-80	dF	UHSP	55

Then, the heat/cool set point offsets under ***Configuration→D.LV.T*** should be set. See Table 41.

Related operating modes are under ***Operating Modes→MODE***.

ITEM	EXPANSION	RANGE	CCN POINT
MODE	MODES CONTROLLING UNIT		
OCC	Currently Occupied	ON/OFF	MODEOCCP
T.C.ST	Temp.Compensated Start	ON/OFF	MODETCST

The first thing the control determines is whether the unit is in the occupied mode (***OCC***) or in the temperature compensated start mode (***T.C.ST***). If the unit is occupied or in temperature compensated start mode, the occupied heating set point (***OHSP***) is used. In all other cases, the unoccupied heating setpoint (***UHSP***) is used.

The control will call out a low or high heat mode by comparing the controlling temperature to the heating set point and the heating set point offset. The set point offsets are used as additional help in customizing and tweaking comfort into the building space. See Fig. 8 for an example of offsets.

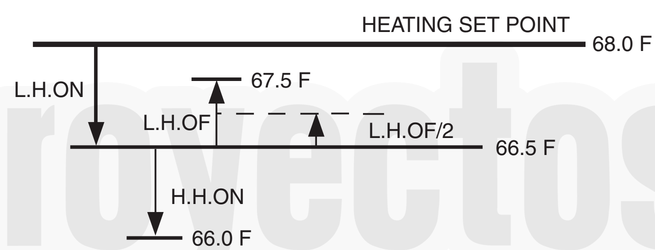


Fig. 8 — Heating Offsets

Demand Level Low Heat on Offset (***L.H.ON***) — This is the heating set point offset below the heating set point at which point Low Heat starts.

Demand Level High Heat on Offset (***H.H.ON***) — This is the heating set point offset below [the heating set point minus ***L.H.ON***] at which point high heat starts.

Table 41 — Heat/Cool Set Point Offsets

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
D.LV.T	COOL/HEAT SETPT. OFFSETS				
L.H.ON	Dmd Level Lo Heat On	-1 - 2	^F	DMDLHON	1.5
H.H.ON	Dmd Level(+) Hi Heat On	0.5 - 2.0	^F	DMDHHON	0.5
L.H.OF	Dmd Level(-) Lo Heat Off	0.5 - 2	^F	DMDLHOFF	1
L.C.ON	Dmd Level Lo Cool On	-1 - 2	^F	DMDLCON	1.5
H.C.ON	Dmd Level(+) Hi Cool On	0.5 - 2	^F	DMDHCON	0.5
L.C.OF	Dmd Level(-) Lo Cool Off	0.5 - 2	^F	DMDLCOFF	1
C.T.LV	Cool Trend Demand Level	0.1 - 5	^F	CTRENDLV	0.1
H.T.LV	Heat Trend Demand Level	0.1 - 5	^F	HTRENDLV	0.1
C.T.TM	Cool Trend Time	30 - 600	sec	CTRENDTM	120
H.T.TM	Heat Trend Time	30 - 600	sec	HTRENDTM	120

Demand Level Low Heat Off Offset (***L.H.OF***) — This is the heating set point offset above [the heating set point minus ***L.H.ON***] at which point the Low Heat mode ends.

To enter into a LOW HEAT mode, if the controlling temperature falls below [the heating set point minus ***L.H.ON***], then HVAC mode = LOW HEAT.

To enter into a HIGH HEAT mode, if the controlling temperature falls below [the heating set point minus ***L.H.ON*** minus ***H.H.ON***], then HVAC mode = HIGH HEAT.

To get out of a LOW HEAT mode, the controlling temperature must rise above [the heating set point minus ***L.H.ON*** plus ***L.H.OF***].

To get out of a HIGH HEAT mode, the controlling temperature must rise above [the heating set point minus ***L.H.ON*** plus ***L.H.OF***/2].

The Run Status table in the local display allows the user to see the exact trip points for both the heating and cooling modes without doing the calculations.

Heat Trend Demand Level (***H.T.LV***) — This is the change in demand that must be seen within the time period specified by ***H.T.TM*** in order to hold off a HIGH HEAT mode regardless of demand. This is not applicable to VAV control types (***C.TYP***=1 and 2) in the occupied period. This technique has been referred to as "Comfort Trending." As long as a LOW HEAT mode is making progress in warming the space, the control will hold off on a HIGH HEAT mode. This is relevant for the space sensor machine control types (***C.TYP*** = 4) because the unit may transition into the occupied mode and see an immediate and large heating demand when the set points change.

Heat Trend Time (***H.T.TM***) — This is the time period upon which the heat trend demand level (***H.T.LV***) operates and may work to hold off staging or a HIGH HEAT mode. This is not applicable to VAV control types (***C.TYP***=1 and 2) in the occupied period. See "Heat Trend Demand Level" section for more details.

HEAT MODE DIAGNOSTIC HELP — To quickly determine the current trip points for the low and high heat modes, there is a menu in the local display which lets the user quickly view the state of the system. This menu also contains the cool trip points as well. See Table 42 at the local display under ***Run Status→TRIP***.

The controlling temperature is "*TEMP*" and is in the middle of the table for easy reference. Also, the "HVAC" mode can be viewed at the bottom of the table.

Table 42 — Mode Trip Helper Table

ITEM	EXPANSION	UNITS	CCN POINT
TRIP	MODE TRIP HELPER		
UN.C.S	Unoccup. Cool Mode Start	dF	UCCLSTRT
UN.C.E	Unoccup. Cool Mode End	dF	UCCL_END
OC.C.S	Occupied Cool Mode Start	dF	OCCLSTRT
OC.C.E	Occupied Cool Mode End	dF	OCCL_END
TEMP	Ctl.Temp RAT,SPT or Zone	dF	CTRLTEMP
OC.H.E	Occupied Heat Mode End	dF	OCHT_END
OC.H.S	Occupied Heat Mode Start	dF	OCHTSTRT
UN.H.E	Unoccup. Heat Mode End	dF	UCHT_END
UN.H.S	Unoccup. Heat Mode Start	dF	UCHTSTRT
HVAC	the current HVAC MODE		String

TWO-STAGE GAS AND ELECTRIC HEAT CONTROL (***HT.CF* = 1,2**) — If the HVAC mode is LOW HEAT:

- If electric heat is configured, then the control will request the supply fan ON
- If gas heat is configured, then the IGC and IFO (IGC fan output) controls the supply fan request
- The control will turn on Heat Relay 1 (***HS1***)
- If evaporator discharge temperature is less than 50°F, then the control will turn on Heat Relay 2 (***HS2***)*

*The logic for this "low heat" override is that one stage of heating will not be able to raise the temperature of the supply airstream sufficient to heat the space.

If the HVAC mode is HIGH HEAT:

- If electric heat is configured, then the control will request the supply fan ON
- If gas heat is configured, then the IGC and IFO output controls the supply fan request
- The control will turn on Heat Relay 1 (***HS1***)
- The control will turn on Heat Relay 2 (***HS2***)

HYDRONIC HEATING CONTROL (***HT.CF* = 4**) — Hydronic heating in P Series units refers to a hot water coil controlled by an actuator. This actuator is a communicating actuator and may be field supplied. When ***Configuration →HEAT→HT.CF***=4, there is a thermistor array called ***Temperatures→AIR.T→CCT***, that is connected to the RXB, that serves as the evaporator discharge temperature (EDT). The leaving-air temperature (LAT) is assigned the thermistor that is normally assigned to EDT and is located at the supply fan housing (***Temperatures→AIR.T→SAT***).

The configurations for hydronic heating are located at the local displays under ***Configuration→HEAT→HH.CF***. See Table 43.

Hydronic Heating Control Proportional Gain (***HW.P***) — This configuration is the proportional term for the PID which runs in the HVAC mode LOW HEAT.

Hydronic Heating Control Integral Gain (***HW.I***) — This configuration is the integral term for the PID which runs in the HVAC mode LOW HEAT.

Hydronic Heating Control Derivative Gain (***HW.D***) — This configuration is the derivative term for the PID which runs in the HVAC mode LOW HEAT.

Hydronic Heating Control Run Time Rate (***HW.TM***) — This configuration is the PID run time rate which runs in the HVAC mode LOW HEAT.

Hydronic Heating Logic

If the HVAC mode is LOW HEAT:

- The control will command the supply fan on
- The control will modulate the hot water coil actuator to the heating control point (***Run Status→VIEW→ HT.C.P***). The heating control point for hydronic heat is the heating supply air set point (***Setpoints→SA.HT***).

If the HVAC mode is HIGH HEAT:

- The control will command the supply fan on
- The control will command the hot water coil actuator to 100%.

Hydronic Heating PID Process — If the HVAC mode is LOW HEAT, then the hydronic heating actuator will modulate to the heating control point (***Run Status→VIEW→HT.C.P***). Control is performed with a generic PID loop where:

Error = Heating Control Point (***HT.C.P***) – Leaving Air Temperature (LAT)

The PID terms are calculated as follows:

P = K * ***HW.P*** * error
I = K * ***HW.I*** * error + "I" last time through
D = K * ***HW.D*** * (error – error last time through)

Where K = ***HW.TM***/60 to normalize the effect of changing the run time rate.

NOTE: The PID values should be not be modified without approval from Carrier.

Freeze Status Switch Logic (***Inputs→GEN.I→FRZ.S***) — If the freezestat input (FRZ) alarms, indicating that the coil is freezing, normal heat control is overridden and the following actions will be taken:

1. Command the hot water coil actuator to 100%.
2. Command the economizer damper to 0%.
3. Command the supply fan on.

Configuring Hydronic Heat to Communicate Via Actuator Serial Number — Every actuator used in the P Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator. These serial numbers are programmed at the factory and should not need changing. Should field replacement of an actuator become necessary, it will be required to configure the serial numbers of the new actuator. Four individual numbers make up this serial number and these can be programmed to match the serial number of the actuator in its Hydronic Heating Actuator Configs group, ***ACT.C*** (***SN.1, SN.2, SN.3, SN.4***). See Fig. 9.

NOTE: The serial numbers for all actuators can be found inside the control doors of the unit as well as on the actuator itself. If an actuator is replaced in the field, it is a good idea to remove the additional peel off serial number sticker on the actuator and cover up the old one inside the control doors.

STAGED GAS HEAT CONTROL (***HT.CF*** = 3 and ***HT.ST*** = 0, 1, or 2) — As an option, the units with gas heat can be equipped with staged gas heat controls that will provide from 2 to 9 stages of heat capacity. This is intended for tempering mode and tempering economizer air when in a cooling mode and the dampers are at minimum vent position. Tempering can also be used during a pre-occupancy purge to prevent low temperature air from being delivered to the space. Tempering for staged gas, modulating gas, and hydronic heat will be discussed in its own section. This section will focus on heat mode control, which ultimately is relevant to tempering, minus the consideration of the supply air heating control point.

MODULATING GAS HEAT CONTROL (***HT.CF*** = 3 and ***HT.ST*** = 3, 4, or 5) — As an option, the units with gas heat can be equipped with modulating gas heat controls that will provide infinite stages of heat capacity. This is intended for tempering mode and tempering economizer air when in a cooling mode and the dampers are at minimum vent position. Tempering can also be used during a pre-occupancy purge to prevent low temperature air from being delivered to the space. Tempering for staged gas, modulating gas, and hydronic heat will be discussed in its own section. This section will focus on heat mode control, which ultimately is relevant to tempering, minus the consideration of the supply air heating control point.

The staged and modulating gas and SCR electric heat configurations are located at the local display under ***Configuration→HEAT→SG.CF***. See Table 44.

SCR ELECTRIC HEAT CONTROL (***HT.CF*** = 5 and ***HT.ST*** = 6, 7, or 8) — As an option, the units with electric heat can be equipped with modulating SCR electric heater controls that will provide infinite stages of heat capacity. This is intended for tempering mode and tempering economizer air when in a cooling mode and the dampers are at minimum vent position. Tempering can also be used during a pre-occupancy purge to prevent low temperature air from being delivered to the space. Tempering for staged gas, modulating gas, hydronic and SCR electric heat will be discussed in its own section. This section will focus on heat mode control, which ultimately is relevant to tempering, minus the consideration of the supply air heating control point.

Staged Heat Type (***HT.ST***) — This configuration instructs the control as to how many stages and in what order they are staged. Setting ***HT.ST = 0, 1, or 2*** configures the unit for Staged Gas Heat. See Table 45. Setting ***HT.ST = 3, 4, or 5*** configures the unit for Modulating Gas Heat. See Table 46. Setting ***HT.ST = 6, 7, or 8*** configures the unit for SCR Electric Heat.

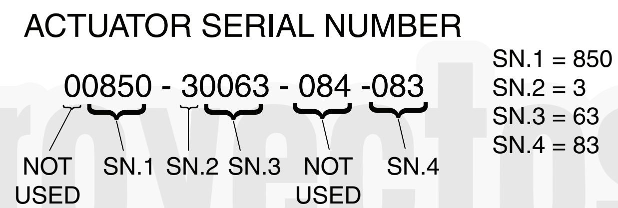


Fig. 9 — Actuator Serial Number Configuration

Table 43 — Hydronic Heat Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HH.CF	HYDRONIC HEAT CONFIGS				
HW.P	Hydronic Ctl.Prop. Gain	0 - 1.5		HW_PGAIN	1
HW.I	Hydronic Ctl.Integ. Gain	0 - 1.5		HW_IGAIN	1
HW.D	Hydronic Ctl.Derv. Gain	0 - 1.5		HW_DGAIN	1
HW.TM	Hydronic PID Rate Config	15 - 300	sec	HOTWPIDR	90
ACT.C	HYDR.HEAT ACTUATOR CFGS.				
SN.1	Hydronic Ht.Serial Num.1	0 - 9999		HTCL_SN1	0
SN.2	Hydronic Ht.Serial Num.2	0 - 6		HTCL_SN2	0
SN.3	Hydronic Ht.Serial Num.3	0 - 9999		HTCL_SN3	0
SN.4	Hydronic Ht.Serial Num.4	0 - 254		HTCL_SN4	0
C.A.LM	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85

Table 44 — Staged Heat Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SG.CF	STAGED HEAT CONFIGS				
HT.ST	Staged Heat Type	0 - 8		HTSTGTYP	0*
CAP.M	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45*
M.R.DB	St.Ht DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5
S.G.DB	St.Heat Temp. Dead Band	0 - 5	^F	HT_SG_DB	2
RISE	Heat Rise dF/sec Clamp	0.05 - 0.2		HTSGRISE	0.06
LAT.L	LAT Limit Config	0 - 20	^F	HTLATLIM	10
LIM.M	Limit Switch Monitoring?	Yes/No		HTLIMMON	Yes
SW.H.T	Limit Switch High Temp	80 - 210	dF	HT_LIMHI	170*
SW.L.T	Limit Switch Low Temp	80 - 210	dF	HT_LIMLO	160*
HT.P	Heat Control Prop. Gain	0 - 1.5		HT_PGAIN	1
HT.D	Heat Control Derv. Gain	0 - 1.5		HT_DGAIN	1
HT.TM	Heat PID Rate Config	30 - 300	sec	HTSGPIDR	90*

*Some configurations are model number dependent.

Table 45 — Staged Gas Heat

NUMBER OF STAGES	HT.ST CONFIGURATION	UNIT SIZE 48P	HEAT SIZE
2	0	030-050	Low
5	1	030-050	High
		055-100	Low
9	2	055-100	High

Table 46 — Modulating Gas Heat

NUMBER OF STAGES	HT.ST CONFIGURATION	UNIT SIZE 48P	HEAT SIZE
1	3	030-050	Low
3	4	030-050	High
		055-100	Low
6	5	055-100	High

Max Cap Change per Cycle (***CAP.M***) — This configuration limits the maximum change in capacity per PID run time cycle.

St.Ht DB Min.dF/PID Rate (***M.R.DB***) — This configuration is a deadband minimum temperature per second rate. See capacity calculation logic on this page for more details.

St.Heat Temp.Dead Band (***S.G.DB***) — This configuration is a deadband delta temperature. See capacity calculation logic on this page for more details.

Heat Rise in dF/Sec Clamp (***RISE***) — This configuration clamps heat staging up when the leaving-air temperature is rising too fast.

LAT Limit Config (***LAT.L***) — This configuration senses when leaving air temperature is outside a delta temperature band around set point and allows staging to react quicker.

Limit Switch Monitoring? (***LIM.M***) — This configuration allows the operation of the limit switch monitoring routine. This is always enabled for 48P Series as a limit switch temperature sensor is always present for staged and modulating gas operation. It is not used on SCR electric heat units.

Limit Switch High Temp (***SW.H.T***) — This configuration is the temperature limit above which stages of heat will be shed.

Limit Switch Low Temp (***SW.L.T***) — This configuration is the temperature limit above which no additional stages of heat will be allowed.

Heat Control Prop. Gain (***HT.P***) — This configuration is the proportional term for the PID which runs in the HVAC mode LOW HEAT.

Heat Control Derv. Gain (***HT.D***) — This configuration is the derivative term for the PID which runs in the HVAC mode LOW HEAT.

Heat PID Rate Config (***HT.TM***) — This configuration is the PID run time rate.

Staged Heating Logic — If the HVAC mode is HIGH HEAT:

- On 48P units, the supply fan for staged heating is controlled by the integrated gas control (IGC) boards and unless the supply fan is on for a different reason, will be controlled by the IFO. On 50P units, the fan is ON whenever the heat is ON.
- Command all stages of heat ON

If the HVAC mode is LOW HEAT:

- On 48P units, the supply fan for staged and modulating gas heating is controlled by the integrated gas control (IGC) boards and, unless the supply fan is on for a different reason, will be controlled by the IGC IFO input. On 50P units, the fan is ON whenever the heat is ON.
- The unit will control stages of heat to the heating control point (***Run Status→VIEW→HT.C.P***). The heating control point in a LOW HEAT HVAC mode for staged heat is the heating supply air set point (***Setpoints→SA.HT***).

Staged Heating PID Logic — The heat control loop is a PID design with exceptions, overrides and clamps. Capacity rises and falls based on set point and supply-air temperature. When the *Comfort*Link control is in Low Heat or Tempering Mode (HVAC mode), the algorithm calculates the desired heat capacity. The basic factors that govern the controlling technique are:

- how frequently the algorithm is run.
- the amount of proportional and derivative gain applied.
- the maximum allowed capacity change each time this algorithm is run.
- deadband hold-off range when rate is low.

This routine is run once every "***HT.TM***" seconds. Every time the routine is run, the calculated sum is added to the control output value. In this manner, integral effect is achieved. Every time this algorithm is run, the following calculation is performed:

Error = ***HT.C.P – LAT***
Error_last = error calculated previous time
P = ***HT.P****(Error)
D = ***HT.D****(Error **–** Error_last)

The P and D terms are overridden to zero if:

Error < ***S.G.DB*** AND Error > ***– S.G.DB*** AND D < ***M.R.DB*** AND D > ***– M.R.DB.***

"P + D" are then clamped based on ***CAP.M.*** This sum can be no larger or no smaller than +***CAP.M*** or –***CAP.M***.

Finally, the desired capacity is calculated:

Staged Heat Capacity Calculation = "P + D" + old Staged Heat Capacity Calculation.

NOTE: The PID values should not be modified without approval from Carrier.

> IMPORTANT: When gas or electric heat is used in a VAV application with third party terminals, the HIR relay output must be connected to the VAV terminals in the system in order to enforce a minimum heating cfm. The installer is responsible to ensure the total minimum heating cfm is not below limits set for the equipment. Failure to do so will result in limit switch tripping and may void warranty.

Staged Gas Heat Staging — Different unit sizes will control heat stages differently based on the amount of heating capacity included. These staging patterns are selected based on the unit model number. The selection of a set of staging patterns is controlled via the heat stage type configuration parameter ***Configuration→HEAT→SG.CF→HT.ST***. Setting ***HT.ST*** to 0, 1, or 2 configures the unit for Staged Gas Heat. The selection of ***HT.ST = 0, 1, or 2*** is based on the unit size and heat size. See Table 45.

As the heating capacity rises and falls based on demand, the staged gas control logic will stage the heat relay patterns up and down respectively. The Heat Stage Type configuration selects one of the staging patterns that the staged gas control will use. In addition to the staging patterns, the capacity for each stage is also determined by the staged gas heating PID algorithm. Therefore, choosing the heat relay outputs is a function of the capacity desired, the available heat staging patterns configured with heat stage type (***HT.ST***), and the capacity presented by each staging pattern.

As the staged gas control desired capacity rises, it is continually checked against the capacity of the next staging pattern. When the desired capacity is greater than or equal to the capacity of the next staging pattern, the next heat stage is selected (***Run Status→VIEW→HT.ST = Run Status→VIEW→HT.ST*** +1).

Similarly, as the staged gas control desired capacity drops, it is continually checked against the next lower stage. When the desired capacity is less than or equal to the next lower staging pattern, the next lower staging pattern is selected (***Run Status→VIEW→HT.ST = Run Status→VIEW→HT.ST*** -1).

The first two staged gas heat outputs are located on the MBB. Outputs 3, 4, 5, and 6 are located on the SCB. These outputs are used to yield from 2 to 9 stages as shown in Table 45. The heat stage selected (***Run Status →VIEW→HT.ST***) is clamped between 0 and the maximum number of stages possible (***Run Status→VIEW→H.MAX***). See Tables 47-49.

Modulating Gas Heat Staging — Different unit sizes will control heat stages differently based on the amount of heating capacity included. These staging patterns are selected based on the unit model number. The selection of a set of staging patterns is controlled via the heat stage type configuration parameter ***Configuration→HEAT→SG.CF→HT.ST***. Setting ***HT.ST*** to 3, 4, or 5 configures the unit for Modulating Gas Heat. The selection of ***HT.ST = 3, 4, or 5*** is based on the unit size and heat size. See Table 46.

As the heating capacity rises and falls based on demand, the modulating gas control logic will stage the heat relay patterns up and down respectively (***Run Status→VIEW→HT.ST***) and set the capacity of the Modulating Gas section (***Outputs →HEAT→H1.CP***). The Heat Stage Type configuration selects one of the staging patterns that the modulating gas control will use. In addition to the staging patterns, the capacity for each stage is also determined by the modulating gas heating PID algorithm. Therefore, choosing the heat relay outputs and setting the modulating gas section capacity is a function of the capacity desired, the available heat staging patterns configured with heat stage type (***HT.ST***), and the capacity range presented by each staging pattern.

As the modulating gas control desired capacity rises, it is continually checked against the capacity ranges of the next higher staging patterns. Since each stage has a range of capacities, and the capacities of some stages overlap, the control selects the highest stage with sufficient minimum capacity.

Similarly, as the modulating gas control desired capacity drops, it is continually checked against the capacity ranges of the next lower stages. The control selects the lowest stage with sufficient maximum capacity.

The first two modulating gas heat outputs are located on the MBB. Outputs 3, 4, 5, 6, and the analog output that sets the modulating gas section capacity are located on the SCB. The heat stage selected (***Run Status→VIEW→HT.ST***) is clamped between 0 and the maximum number of stages possible (***Run Status→VIEW→H.MAX***). See Tables 50-52.

SCR Electric Heat Staging — Different unit sizes will control heat stages differently based on the amount of heating capacity included. These staging patterns are selected based on the unit model number. The selection of a set of staging patterns is controlled via the heat stage type configuration parameter ***Configuration→HEAT→SG.CF→HT.ST***. Setting ***HT.ST*** to 6,7 or 8 configures the unit for SCR Electric Heat. The selection of ***HT.ST = 6,7 or 8*** is based on the unit size and heat size. See Table 53.

For ***HT.ST***=6 there is only 1 heat stage. Whenever the heat is energized, all heaters will be active will be modulated through the SCR control.

On 2 stage heat patterns (***HT.ST***=7 or 8), as the heating capacity rises and falls based on demand, the SCR electric heat control logic will stage the heat relay patterns up and down respectively (***Run Status→VIEW→HT.ST***) and set the capacity of the SCR Electric Heat section (***Outputs→HEAT→H1.CP***). The Heat Stage Type configuration selects one of the staging patterns that the SCR electric heat control will use. In addition to the staging patterns, the capacity for each stage is also determined by the SCR electric heating PID algorithm.

Therefore, choosing the heat relay outputs and setting the SCR electric heat section capacity is a function of the capacity desired, the available heat staging patterns configured with heat stage type (***HT.ST***), and the capacity range presented by each staging pattern.

As SCR electric heat control desired capacity rises, it is continually checked against the capacity ranges of the next higher staging patterns. Since each stage has a range of capacities, and the capacities of some stages overlap, the control selects the highest stage with sufficient minimum capacity.

Similarly, as the SCR electric heat control desired capacity drops, it is continually checked against the capacity ranges of the next lower stages. The control selects the lowest stage with sufficient maximum capacity.

Table 47 — Staged Gas Heat Control Steps (*HT.ST* = 0)

STAGE	RELAY OUTPUT						CAPACITY %
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6	
	MBB-RLY8	MBB-RLY7	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4	
	IGC1	MGV1	IGC2	MGV2	IGC3	MGV3	
0	OFF	OFF	OFF	OFF	OFF	OFF	0
1	ON	OFF	OFF	OFF	OFF	OFF	75
2	ON	ON	OFF	OFF	OFF	OFF	100

Table 48 — Staged Gas Heat Control Steps (*HT.ST* = 1)

STAGE	RELAY OUTPUT						CAPACITY %
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6	
	MBB-RLY8	MBB-RLY7	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4	
	IGC1	MGV1	IGC2	MGV2	IGC3	MGV3	
0	OFF	OFF	OFF	OFF	OFF	OFF	0
1	ON	OFF	OFF	OFF	OFF	OFF	37
2	ON	ON	OFF	OFF	OFF	OFF	50
3	ON	OFF	ON	OFF	OFF	OFF	75
4	ON	ON	ON	OFF	OFF	OFF	87
5	ON	ON	ON	ON	OFF	OFF	100

Table 49 — Staged Gas Heat Control Steps (*HT.ST* = 2)

STAGE	RELAY OUTPUT						CAPACITY %
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6	
	MBB-RLY8	MBB-RLY7	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4	
	IGC1	MGV1	IGC2	MGV2	IGC3	MGV3	
0	OFF	OFF	OFF	OFF	OFF	OFF	0
1	ON	OFF	OFF	OFF	OFF	OFF	25
2	ON	ON	OFF	OFF	OFF	OFF	33
3	ON	OFF	ON	OFF	OFF	OFF	50
4	ON	ON	ON	OFF	OFF	OFF	58
5	ON	ON	ON	ON	OFF	OFF	67
6	ON	OFF	ON	OFF	ON	OFF	75
7	ON	OFF	ON	ON	ON	OFF	83
8	ON	ON	ON	ON	ON	OFF	92
9	ON	ON	ON	ON	ON	ON	100

Table 50 — Modulating Gas Heat Control Steps (*HT.ST* = 3)

STAGE	RELAY OUTPUT						CAPACITY %	
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6		
	MBB-RLY8	TR1-CR	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4		
	IGC2	MGV2	IGC1	MGV1	IGC3	MGV3	MIN	MAX
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	OFF	OFF	28	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

Table 51 — Modulating Gas Heat Control Steps (*HT.ST* = 4)

STAGE	RELAY OUTPUT						CAPACITY %	
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6		
	MBB-RLY8	TR1-CR	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4		
	IGC2	MGV2	IGC1	MGV1	IGC3	MGV3	MIN	MAX
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	OFF	OFF	14	50
2	ON	OFF/ON*	ON	OFF	OFF	OFF	52	88
3	ON	OFF/ON*	ON	ON	OFF	OFF	64	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

Table 52 — Modulating Gas Heat Control Steps (*HT.ST* = 5)

STAGE	RELAY OUTPUT						CAPACITY %	
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6		
	MBB-RLY8	TR1-CR	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4		
	IGC2	MGV2	IGC1	MGV1	IGC3	MGV3	MIN	MAX
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	OFF	OFF	9	33
2	ON	OFF/ON*	ON	OFF	OFF	OFF	34	58
3	ON	OFF/ON*	ON	ON	OFF	OFF	43	67
4	ON	OFF/ON*	ON	OFF	ON	OFF	59	83
5	ON	OFF/ON*	ON	ON	ON	OFF	68	92
6	ON	OFF/ON*	ON	ON	ON	ON	76	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

The electric heat outputs are located on the MBB. The analog output that sets the SCR electric heat section capacity is located on the SCB. The heat stage selected (***Run Status→VIEW→HT.ST***) is clamped between 0 and the maximum number of stages possible (***Run Status→VIEW→H.MAX***). See Tables 54-56.

Limit Switch Temperature Monitoring (***LIM.M***) — Variable air volume applications in the low heat or tempering mode can experience low airflow and as a result it is possible for nuisance trips of the gas heat limit switch, thereby shutting off all gas stages. In order to achieve consistent heating in a tempering mode, a thermistor (***Temperatures→AIR.T→S.G.LS***) is placed next to the limit switch and monitored for overheating. In order to control a tempering application where the limit switch temperature has risen above either the upper or lower configuration parameters (***SW.L.T, SW.H.T***), the staged gas control will respond by clamping or dropping gas stages.

Table 53 — SCR Electric Heat

NUMBER OF STAGES	HT.ST CONFIG	UNIT SIZE 50P	HEAT SIZE	VOLTAGE
1	6	030-070	Low, Medium	208/230
	6	030-070	All	380,460,575
2	7	030-050	High	208/230
	8	055-070	High	208/230

Table 54 — SCR Electric Heat Control Steps (HT.ST=6)

STAGE	RELAY OUTPUT		CAPACITY (%)	
	Heat1	Heat2	Min.	Max.
0	OFF	OFF	0	0
1	ON	ON	0	100

Table 55 — SCR Electric Heat Control Steps (HT.ST=7)

STAGE	RELAY OUTPUT		CAPACITY (%)	
	Heat1	Heat2	Min.	Max.
0	OFF	OFF	0	0
1	ON	OFF	0	67
2	ON	ON	0	100

Table 56 — SCR Electric Heat Control Steps (HT.ST=8)

STAGE	RELAY OUTPUT		CAPACITY (%)	
	Heat1	Heat2	Min.	Max.
0	OFF	OFF	0	0
1	ON	OFF	0	50
2	ON	ON	50	100

If the Limit Switch Monitoring configuration parameter (***LIM.M***) is set to YES, all the modes will be monitored. If set to NO, then only LAT Cutoff mode and Capacity Clamp mode for ***RISE*** will be monitored.

If ***S.G.LS*** rises above ***SW.L.T*** or if (LAT – LAT last time through the capacity calculation) is greater than (***RISE***) degrees F per second, the control will not allow the capacity routine to add stages and will turn on the Capacity Clamp mode.

If ***S.G.LS*** rises above ***SW.H.T*** the control will run the capacity routine immediately and drop all heat stages and will turn on the Limiting mode.

If ***S.G.LS*** falls below ***SW.L.T*** the control will turn off both Capacity Clamp mode and Limiting mode with one exception. If (LAT – LAT last time through the capacity calculation) is greater than "***RISE***" degrees F per second, the control will stay in the Capacity Clamp mode.

If control is in the Limiting mode and then ***S.G.LS*** falls below ***SW.L.T***, and LAT is not rising quickly, the control will run the capacity calculation routine immediately and allow a full stage to come back on if desired this first time through upon recovery. This will effectively override the "max capacity stage" clamp.

In addition to the above checks, it is also possible at low cfm for the supply-air temperature to rise and fall radically between capacity calculations, thereby impacting the limit switch temperature. In the case where supply-air temperature (LAT) rises above the control point (***HT.C.P***) + the cutoff point (***LAT.L***) the control will run the capacity calculation routine immediately and drop a stage of heat. Thereafter, every time the capacity calculation routine runs, provided the control is still in the LAT cutoff mode condition, a stage will drop each time through. Falling back below the cutoff point will turn off the LAT cutoff mode.

CONTROL BOARD INFORMATION

Integrated Gas Control (IGC) — One IGC is provided with each bank of gas heat exchangers. One is used on low heat size 030-050 units. Two are used on high heat size 030-050 units and low heat 055-100 units. Three are used on high heat 055-100 units. The IGC controls the direct spark ignition system and monitors the rollout switch, limit switches, and induced-draft motor Hall Effect switch. For units equipped with modulating gas heat, the IGC in the modulating gas section uses a pressure switch in place of the Hall Effect sensor. The IGC is equipped with a LED (light-emitting diode) for diagnostics. See Table 57.

Integrated Gas Control Board Logic — This board provides control for the ignition system for the gas heat sections.

When a call for gas heat is initiated, power is sent to W on the IGC boards. For standard 2-stage heat, all boards are wired in parallel. For staged gas heat, each board is controlled separately. When energized, an LED on the IGC board will be turned on. See Table 57 for LED explanations.

Each board will ensure that the rollout switch and limit switch are closed. The induced-draft motor is then energized. For units equipped with 2-stage or staged gas heat the speed of the motor is proven with a Hall Effect sensor on the motor. For units equipped with modulating gas heat the motor function is proven with a pressure switch. When the motor speed or function is proven, the ignition activation period begins. The burners ignite within 5 seconds. If the burners do not light, there is a 22-second delay before another 5-second attempt is made. If the burners still do not light, this sequence is repeated for 15 minutes. After 15 minutes have elapsed and the burners have not ignited then heating is locked out. The control will reset when the request for W (heat) is temporarily removed.

When ignition occurs, the IGC board will continue to monitor the condition of the rollout switch, limit switches, Hall Effect sensor or pressure switch, and the flame sensor. Forty-five seconds after ignition has occurred, the IGC will request that the indoor fan be turned on.

The IGC fan output (IFO) is connected to the indoor fan input on the MBB which will indicate to the controls that the indoor fan should be turned on (if not already on). If for some reason the overtemperature limit switch trips prior to the start of the indoor fan blower, on the next attempt the 45-second delay will be shortened by 5 seconds. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan delay will not change back to 45 seconds unless power is reset to the control.

The IGC boards only control the first stage of gas heat on each gas valve. The second stages are controlled directly from the MBB board for staged gas. For units equipped with modulating gas heat, the second stage is controlled from the timer relay board (TR1). The IGC board has a minimum on-time of 1 minute.

In modes such as Service Test where long minimum on times are not enforced, the 1-minute timer on the IGC will still be followed and the gas will remain on for a minimum of 1 minute.

Staged Gas Heat Board (SCB) — When optional staged or modulating gas heat is used, the SCB board is installed and controls additional stages of gas heat. The SCB also provides additional sensors for monitoring of the supply-air and limit switch temperatures. For units equipped with modulating gas heat, the SCB provides the 4 to 20 mA signal to the SC30 board that sets the modulating gas section capacity. This board is located in the main unit control box.

Timer Relay Control Board (TR1) — The TR1 is used on modulating gas heat equipped units only. It is located in the gas heat section and is used in combination with the SC30 to provide control of the modulating gas heat section. The TR1 receives an input from the IGC, initiates a start-up sequence, powers the SC30, sets the induced-draft motor speed, and provides the main gas valve high fire input. When the start-up sequence is complete, the TR1 checks the input from the SC30 to determine which state to command the induced-draft motor and main gas valve. See Table 58.

Signal Conditioner Control Board (SC30) — The SC30 is used on modulating gas heat equipped units only. It is located in the gas heat section and is used in combination with the TR1 to provide control of the modulating gas heat section. The SC30 is powered by an output from the TR1. It receives a capacity input from the SCB, provides a capacity output to the modulating gas valve, and provides an output to the TR1 to determine which state to command the induced-draft motor and main gas valve. See Table 58.

Modulating Gas Control Boards (SC30 and TR1) Logic — All gas modulating units are equipped with one timer relay board (TR1) and one signal conditioner board (SC30), regardless of the unit size. The boards provide control for variable heating output for the gas heat section.

Similar to the staged gas heat option, each IGC board is controlled separately. The IGC functions are not affected by the modulating gas control logic. When a call for gas heat is initiated, W on the IGC board and the timer relay board (TR1) are energized. The LED on TR1 board will be turned on. See Table 58 for LED explanation.

When TR1 receives an input from the IGC board, the relay board starts Timer no. 1 or start-up sequence: sets the gas valve stage and the inducer motor speed, and enables the signal conditioner board SC30. During Timer no. 1, the SC30 board keeps a fixed heating output. When Timer no. 1 expires, the modulating gas control boards start Timer no. 2. Throughout the duration of Timer no. 2, the boards determine which state to adjust the capacity output to satisfy the heat demand. When Timer no. 2 expires, the boards receive a capacity input from the SCB board and continuous modulate the heat output until the mode selection sensor is satisfied.

Table 57 — IGC LED Indicators

ERROR CODE	LED INDICATION
Normal Operation	On
Hardware Failure	Off
Fan On/Off Delay Modified	1 Flash
Limit Switch Fault	2 Flashes
Fame Sense Fault	3 Flashes
Five Consecutive Limit Switch Faults	4 Flashes
Ignition Lockout Fault	5 Flashes
Ignition Switch Fault	6 Flashes
Rollout Switch Fault	7 Flashes
Internal Control Fault	8 Flashes
Software Lockout	9 Flashes

NOTES:
1. There is a 3-second pause between error code displays.
2. If more than one error code exists, all applicable error codes will be displayed in numerical sequence.
3. Error codes on the IGC will be lost if power to the unit is interrupted.

Table 58 — TR1 Board LED Indicators

LED DESIGNATION	RESULT/ACTION
ON	24 VAC Supplied to TR1
SR	Input received from IGC2, starts timer no. 1
MR	Modulating Gas Valve modulated except during fixed output delay time
FR	IDM2 operates at high speed
CR	Modulating Gas Valve operates in high pressure stage

The IGC boards only control the first stage of gas heat on each gas valve. The second stages are controlled directly from the MBB board. The IGC board has a minimum on-time of 1 minute.

In modes such as Service Test where long minimum on times are not enforced, the 1-minute timer on the IGC will still be followed and the gas will remain on for a minimum of 1 minute.

RELOCATE SAT FOR HEATING-LINKAGE APPLICATIONS — If ***Configuration→HEAT→LAT.M*** is set to YES, the supply air temperature thermistor (***Temperatures→AIR.T → SAT***) must be relocated downstream of the installed heating device. This only applies to two-stage gas or electric heating types (***Configuration→HEAT→ HT.CF***=1 or 2).

Determine a location in the supply duct that will provide a fairly uniform airflow. Typically this would be a minimum of 5 equivalent duct diameters downstream of the unit. Also, care should be taken to avoid placing the thermistor within a direct line-of-sight of the heating element to avoid radiant effects.

Run a new two-wire conductor cable from the control box through the low voltage conduit into the space inside the building and route the cable to the new sensor location.

Installing a New Sensor — Procure a duct-mount temperature sensor (Carrier P/N 33ZCSENPAT or equivalent 10,000 ohms at 25C NTC [negative temperature coefficient] sensor). Install the sensor through the side wall of the duct and secure.

Re-Using the Factory SAT Sensor — The factory sensor is attached to the left-hand side of the supply fan housing. Disconnect the sensor from the factory harness. Fabricate a mounting method to insert the sensor through the duct wall and secure in place.

Attach the new conductor cable to the sensor leads and terminate in an appropriate junction box. Connect the opposite end inside the unit control box at the factory leads from MBB J8 terminals 11 and 12 (PNK) leads. Secure the unattached PNK leads from the factory harness to ensure no accidental contact with other terminals inside the control box.

TEMPERING MODE — In a vent or cooling mode, the economizer at minimum position may send extremely cold outside air down the ductwork of the building. Therefore it may be necessary to bring heat on to counteract this low supply-air temperature. This is referred to as the tempering mode.

Setting up the System — The relevant set points for tempering are located at the local display under ***Setpoints***:

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
T.PRG	Tempering Purge SASP	–20-80	dF	TEMPPURG	50
T.CL	Tempering in Cool Offset	5-75	^F	TEMPCOOL	5
T.V.OC	Tempering Vent Occ SASP	–20-80	dF	TEMPVOCC	65
T.V.UN	Tempering Vent Unocc. SASP	–20-80	dF	TEMPVUNC	50

Operation — First, the unit must be in a vent mode, a low cool, or a high cool HVAC mode to be considered for a tempering mode. Secondly, the tempering mode is only allowed when the rooftop is configured for staged gas, modulating gas, SCR electric heat, or hydronic heating (***Configuration→HEAT →HT.CF***=3 or 4). Also, if OAT is above the chosen tempering set point, tempering will not be allowed. Additionally, tempering mode is locked out if any stages of mechanical cooling are present.

If the control is configured for staged gas, modulating gas, SCR electric heat, or hydronic heating and the control is in a vent, low cool, or high cool HVAC mode, and the rooftop control is in a situation where the economizer must maintain a minimum position/minimum cfm, then the evaporator discharge temperature (EDT) will be monitored. If the EDT falls below a particular trip point then tempering mode may be called out.

HVAC mode = "Tempering Vent"
HVAC mode = "Tempering LoCool"
HVAC mode = "Tempering HiCool"

The decision making/selection process for the tempering trip set point is as follows:

If an HVAC cool mode is in effect, then the tempering cool point is ***SASP – T.CL***.

If not in effect and unit is in a pre-occupied purge mode (***Operating Modes→MODE→IAQ.P***=ON), then the trip point is ***T.PRG***.

If not in effect and unit is in an occupied mode (***Operating Modes→MODE→IAQ.P***=ON), then the trip point is TEMPVOCC.

For all other cases, the trip point is TEMPVUNC.

NOTE: The unoccupied economizer free cooling does not qualify as a HVAC cool mode as it is an energy saving feature and has its own OAT lockout already. The unoccupied free cooling mode (HVAC mode = Unocc. Free Cool) will override any unoccupied vent mode from triggering a tempering mode.

A minimum amount of time must pass before calling out any tempering mode. In effect, the EDT must fall below the trip point value –1°F continuously for a minimum of 2 minutes. Also, at the end of a mechanical cooling cycle, a 10 minutes delay will be enforced before considering a tempering during vent mode in order to allow any residual cooling to dissipate from the evaporator coil.

If the above conditions are met, the algorithm is free to select the tempering mode (MODETEMP).

If a tempering mode becomes active, the modulating heat source (staged gas, modulating gas, SCR electric heat, or hot water) will attempt to maintain leaving-air temperature (LAT) at the tempering set point used to trigger the tempering mode. The technique for modulation of set point for staged gas, modulating gas, SCR electric heat, and hydronic heat is the same as in a heat mode. More information regarding the operation of heating can be referenced in the Heating Control section.

Recovery from a tempering mode (MODETEMP) will occur when the EDT rises above the trip point. On any change in HVACMODE, the tempering routine will re-assess the tempering set point which may cause the control to continue or exit tempering mode.

Static Pressure Control — Variable air volume (VAV) air-conditioning systems must provide varying amounts of air to the conditioned space. As air terminals downstream of the unit modulate their flows, the unit must simply maintain control over duct static pressure in order to accommodate the needs of the terminals, and therefore, to meet the varying combined airflow requirement. The unit design includes two alternative optional means of accommodating this requirement. This section describes the technique by which this control takes place.

A unit intended for use in a VAV system can be equipped with an optional variable frequency drive (VFD) for the supply fan. The speed of the fan can be controlled directly by the *Comfort*Link controls. A transducer is used to measure duct static pressure. The signal from the transducer is received by the RXB board and is then used in a PID control routine to determine the required fan speed. The required speed is then communicated to the VFD.

Generally only VAV systems utilize static pressure control. It is required because as the system VAV terminals modulate closed when less air is required, there must be a means of controlling airflow from the unit, thereby effectively preventing overpressurization and its accompanying problems.

The static pressure control routine is also used on CV units with VFD for staged air volume. The fan is controlled at discrete speeds through the VFD by the unit *Comfort*Link controls based on the operating mode of the unit.

The four most fundamental configurations for most applications are ***Configuration→SP→SP.CF***, which is the static pressure control type, ***Configuration→SP→SP.SV***, used to indicate CV unit with VFD, staged air volume control, ***Configuration→SP→SP.S***, used to enable the static pressure sensor, and ***Configuration→SP→SP.SP***, the static pressure set point to be maintained.

OPERATION FOR VAV — On VAV units equipped with a VFD and a proper static pressure sensor, when ***SP.CF***, ***SP.S*** and ***SP.SP*** are configured, a PID routine periodically measures the duct static pressure and calculates the error from set point. This error at any point in time is simply the duct static pressure set point minus the measured duct static. The error becomes the basis for the Proportional term of the PID. The routine also calculates the integral of the error over time, and the derivative (rate of change) of the error. A value is calculated as a result of this PID routine, and this value is then used to create an output signal used to adjust the VFD to maintain the static pressure set point.

Static pressure reset is the ability to force a lowering of the static pressure set point through an external control signal. Explained in detail further below, the control supports this in two separate ways; through a 4 to 20 mA signal input wired to TB202 terminals 6 and 7 (thereby facilitating third party control), or via CCN controls.

In the latter case, this feature leverages the communications capabilities of VAV systems employing ComfortID™ terminals under linkage. The system dynamically determines and maintains an optimal duct static pressure set point based on the actual load conditions in the space. This can result in a significant reduction in required fan energy by lowering the set point to only the level required to maintain adequate airflow throughout the system.

OPERATION FOR CV — On CV units equipped with a VFD (staged air volume) when ***SP.CF***, ***SP.SV***, and ***SP.S*** are configured, the *Comfort*Link control will control the speed of the supply fan based on the operating mode of the unit. The VFD speed setting points are ***SP.MN***, ***SP.MX***. When in LOW COOL mode and the compressor stage is less than 50%, fan will be at ***SP.MN*** minimum speed. When greater than 50% capacity, the fan will be at ***SP.MX*** maximum speed. In VENT mode, the fan speed will be at ***SP.MN*** minimum speed. In HEATING mode, the fan will operate at 75% speed when the heating stage is 75% or less and at 100% speed when the heating stage is greater than 75%. On units configured for 2 stage thermostat operation, the fan will be at 100% on a call for W2 at 75% on a call for only W1.

SETTING UP THE SYSTEM — The options for static pressure control are found under the Local Display Mode ***Configuration→SP***. See Table 59.

Static Pressure Configuration (***SP.CF***) — This variable is used to configure the use of *Comfort*Link controls for static pressure control.

When set to disable, there is no static pressure control by *Comfort*Link controls. This would be used for a constant volume (CV) application when static pressure control is not required or for a VAV application if there will be third-party control of the VFD. In this latter case, a suitable means of control must be field installed.

When set to enable, this will enable the use of *Comfort*Link controls for static pressure control via a supply fan VFD. On CV units with VFD, staged air volume, this must be set to disable.

Staged Air Volume Control (***SP.SV***) — This variable enabled the use of a CV unit with VFD for staged air volume control.

Static Pressure Sensor (***SP.S***) — This variable enables the use of a supply duct static pressure sensor. This must be enabled to use *Comfort*Link controls for static pressure control. If using a third-party control for the VFD or IGV, this should be disabled. Not used when ***SP.SV*** is enabled.

Static Pressure Low Range (***SP.LO***) — This is the minimum static pressure that the sensor will measure. For most sensors this will be 0 in. wg. The *Comfort*Link controls will map this value to a 4 mA sensor input.

Static Pressure High Range (***SP.HI***) — This is the maximum static pressure that the sensor will measure. Commonly this will be 5 in. wg. The *Comfort*Link controls will map this value to a 20 mA sensor input.

Static Pressure Set Point (***SP.SP***) — This is the static pressure control point. It is the point against which the *Comfort*Link controls compares the actual measured supply duct pressure for determination of the error that is used for PID control. Generally one would set ***SP.SP*** to the minimum value necessary for proper operation of air terminals in the conditioned space at all load conditions. Too high of a value will cause unnecessary fan motor power consumption at part-load conditions and/or noise problems. Too low a value will result in insufficient airflow. Additional information will be found on page 69, under Static Pressure Reset.

VFD Minimum Speed (***SP.MN***) — This is the minimum speed for the supply fan VFD. Typically the value is chosen to maintain a minimum level of ventilation.

NOTE: Most VFDs have a built-in minimum speed adjustment which must be configured for 0% when using *Comfort*Link controls for static pressure control. When ***SP.SV*** is enabled, the range is 33 to 67% with the default setting of 67%.

VFD Maximum Speed (***SP.MX***) — This is the maximum speed for the supply fan VFD. This is usually set to 100%.

VFD Fire Speed Override (***SP.FS***) — This is the speed that the supply fan VFD will use during the fire modes; pressurization, evacuation and purge. This is usually set to 100%.

Static Pressure Reset Configuration (***SP.RS***) — This option is used to configure the static pressure reset function. When ***SP.RS*** = 0, there is no static pressure reset via an analog input. When ***SP.RS*** = 1, there is static pressure reset based on the CEM 4-20MA input and ranged from 0 to 3 in. wg. When ***SP.RS*** = 2, there is static pressure reset based on RAT and defined by ***SP.RT*** and ***SP.LM***. When ***SP.RS*** = 3, there is static pressure reset based on SPT and defined by ***SP.RT*** and ***SP.LM***. When ***SP.RS*** = 4, there is VFD speed control where 0 mA = 0% speed and 20 mA = 100% (***SP.MN*** and ***SP.MX*** will override).

Static Pressure Reset Ratio (***SP.RT***) — This option defines the reset ratio in terms of static pressure versus temperature. The reset ratio determines how much the static pressure is reduced for every degree below set point for RAT or SPT.

Static Pressure Reset Limit (***SP.LM***) — This option defines the maximum amount of static pressure reset that is allowed. This is sometimes called a "clamp."

NOTE: Resetting static pressure via RAT and SPT is primarily a constant volume application which utilizes a VFD. The reasoning is that there is significant energy savings in slowing down a supply fan as opposed to running full speed with supply air reset. Maintaining the supply air set point and slowing down the fan has the additional benefit of working around dehumidification concerns.

Static Pressure Reset Economizer Position (***SP.EC***) — This option effectively resets ECONOMIN to fully occupied ventilation position, to account for the drop in static pressure during static pressure reset control. The static pressure reset for the calculation cannot be larger than the supply air static set point (***SP.SP***).

The calculation is as follows:

(Static Pressure Reset/***SP.SP***) x (ECONOSPR – ECONOMIN)

As an example, the static pressure set point (***SP.SP***) = 1.5 in. wg. The current static pressure reset is set to 0.5 in. wg. The settings for ECONOSPR = 50% and ECONOMIN = 20%.

Therefore, the amount to add to the economizer's ECONOMIN configuration is: (0.5/1.5) x (50-20) = 10%. In effect, for the positioning of the economizer, ECONOMIN would now be replaced by ECONOMIN + 10%.

Table 59 — Static Pressure Control Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SP	SUPPLY STATIC PRESS.CFG.				
SP.CF	Static Pressure Config	Enable/Disable		STATICFG	Disable
SP.SV	Staged Air Volume Control	Enable/Disable		STGAVCFG	Disable
SP.S	Static Pressure Sensor	Enable/Disable		SPSENS	Disable
SP.LO	Static Press. Low Range	–10 - 0	in. W.C.	SP_LOW	0
SP.HI	Static Press. High Range	0 - 10	in. W.C.	SP_HIGH	5
SP.SP	Static Pressure Setpoint	0 - 5	in. W.C.	SPSP	1.5
SP.MN	VFD Minimum Speed	0 - 100	%	STATPMIN	20
SP.MX	VFD Maximum Speed	0 - 100	%	STATPMAX	100
SP.FS	VFD Fire Speed Over.	0 - 100	%	STATPFSO	100
SP.RS	Stat. Pres. Reset Config	0 - 4		SPRSTCFG	0
SP.RT	SP Reset Ratio ("/dF)	0 - 2.00		SPRRATIO	0.2
SP.LM	SP Reset Limit in iwc (")	0 - 2.00		SPRLIMIT	0.75
SP.EC	SP Reset Econo.Position	0 - 100	%	ECONOSPR	5
S.PID	STAT.PRESS.PID CONFIGS				
SP.TM	Static Press. PID Run Rate	5 - 120	sec	SPIDRATE	15
SP.P	Static Press. Prop. Gain	0 - 5		STATP_PG	0.5
SP.I	Static Pressure Intg. Gain	0 - 2		STATP_IG	0.5
SP.D	Static Pressure Derv. Gain	0 - 5		STATP_DG	0.3

Static Pressure PID Config (***S.PID***) — Static pressure PID configuration can be accessed under this heading in the ***Configuration→SP*** submenu. Under most operating conditions the control PID factors will not require any adjustment and the factory defaults should be used. If persistent static pressure fluctuations are detected, small changes to these factors may improve performance. Decreasing the factors generally reduce the responsiveness of the control loop, while increasing the factors increase its responsiveness. Note the existing settings before making changes, and seek technical assistance from Carrier before making significant changes to these factors.

*Static Pressure PID Run Rate (**S.PID→SP.TM**)* — This is the number of seconds between duct static pressure readings taken by the *Comfort*Link PID routine.

*Static Pressure Proportional Gain (**S.PID→SP.P**)* — This is the proportional gain for the static pressure control PID control loop.

*Static Pressure Integral Gain (**S.PID→SP.I**)* — This is the integral gain for the static pressure control PID control loop.

*Static Pressure Derivative Gain (**S.PID→SP.D**)* — This is the derivative gain for the static pressure control PID control loop.

STATIC PRESSURE RESET — The configuration for Static Pressure Reset is found under ***Configuration→SP***.

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULT
SP.RS	Static Press. Reset Sensor.	Enable/Disable	SPRSTSEN	Disable

Static Pressure Reset Sensor — If the outdoor air quality sensor is not configured (***Configuration→IAQ→AQ.CF →OQ.A.C***=0), then it is possible to use the outdoor air quality sensor location on the CEM board to perform static pressure reset via an external 4 to 20 mA input. Enabling this sensor will give the user the ability to reset from 0 to 3-in. wg of static pressure. The reset will apply to the supply static pressure set point (***Configuration→SP→SP.SP***), where 4 mA = 0-in. wg and 20 mA = 3-in. wg.

As an example, the static pressure reset input is measuring 6 mA, and the input is resetting 2 mA of its 16 mA control range. The 4 to 20 mA range corresponds directly to the 0 to 3 in. wg of reset. Therefore, 2 mA reset is 2/16 * 3-in. wg = 0.375-in. wg of reset. If the static pressure set point (***SP.SP***) = 1.5-in. wg, then the static pressure control point for the system will be reset 1.5 – 0.375 = 1.125-in. wg.

For third party 4 to 20 mA SP reset, wire the input to TB202 terminals 6 and 7.

For reset via a connected ComfortID™ system, the Linkage Coordinator terminal monitors the primary-air damper position of all the terminals in the system. It then calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop). This is a dynamic calculation, which occurs every two minutes whenever the system is operating. It ensures that the supply static is sufficient to supply the required airflow at the worst case terminal but not more than necessary, so that the air terminals do not have to operate with a pressure drop greater than required to maintain the airflow set point of each individual terminal in the system. As the system operates, if the most open damper opens more than 90%, the system recalculates the pressure reduction variable and ***Configuration →SP→SP.RS***, the amount of reset, is reduced. If the most open damper closes to less than 60%, the system recalculates the pressure reduction variable and ***SP.RS*** is increased.

With this system, one needs to enter as the static pressure set point ***SP.SP*** either a maximum duct design pressure or maximum equipment pressure, whichever is less. The system will determine the actual set point required and deliver the required airflow to every terminal under the current load conditions. As the conditions and airflow requirements at each terminal change throughout the operating period, so will ***SP.RS*** and the unit's effective static pressure set point.

In the unlikely chance that both static pressure reset control signals are simultaneously present, the CCN signal will take precedence.

RELATED POINTS — These points represent static pressure control and static pressure reset inputs and outputs. See Table 60.

Static Pressure mA (***SP.M***) — This variable reflects the value of the static pressure sensor signal received by the *Comfort*Link controls. It may in some cases be helpful in troubleshooting.

Static Pressure mA Trim (***SP.M.T***) — This input allows a modest amount of trim to the 4 to 20 mA static pressure transducer signal, and can be used to calibrate a transducer.

Static Pressure Reset mA (***SP.R.M***) — This input reflects the value of a 4 to 20 mA static pressure reset signal applied to TB202 terminals 6 and 7, from a third party control system.

Table 60 — Static Pressure Reset Related Points

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
Inputs					
→ ***4-20*** → ***SP.M***	Static Pressure mA	4-20	mA	SP_MA	
→ ***4-20*** → ***SP.M.T***	Static Pressure mA Trim	-2.0 → +2.0	mA	SPMATRIM	
→ ***4-20*** →***SP.R.M***	Static Pressure Reset mA	4-20	mA	SPRST_MA	0.0
→ ***RSET*** →***SP.RS***	Static Pressure Reset	0.0-3.0	in. wg	SPRESET	0.0
Outputs					
→ ***FANS*** → ***S.VFD***	Supply Fan VFD Speed	0-100	%	SFAN_VFD	

Static Pressure Reset (***SP.RS***) — This variable reflects the value of a static pressure reset signal applied from a CCN system. The means of applying this reset is by forcing the value of the variable SPRESET through CCN.

Supply Fan VFD Speed (***S.VFD***) — This output can be used to check on the actual speed of the VFD. This may be helpful in some cases for troubleshooting.

Fan Status Monitoring

GENERAL — The P Series *Comfort*Link controls offer the capability to detect a failed supply fan through either a duct static pressure transducer or an accessory discrete switch. The fan status switch accessory (part no. CRFANSTATUS001A00) allows for the discrete monitoring of the ON/OFF status of the the unit supply fan. The switch closes when the delta pressure across the switch rises above a configurable threshold value. The switch connects to plug PL34, which is located in the supply fan compartment. See Carrier accessory literature for more details. For any unit with a factory-installed duct static pressure sensor, it is possible to measure duct pressure rise directly, which removes the need for a differential switch. Any unit with an installed supply fan VFD will have the duct static pressure sensor as standard.

SETTING UP THE SYSTEM — The fan status monitoring configurations are located in ***Configuration→UNIT***. See Table 61.

Table 61 — Fan Status Monitoring Configuration

ITEM	EXPANSION	RANGE	CCN POINT
SFS.S	Fan Fail Shuts Down Unit	Yes/No	SFS_SHUT
SFS.M	Fan Stat Monitoring Type	0 - 2	SFS_MON

Fan Stat Monitoring Type (***SFS.M***) — This configuration selects the type of fan status monitoring to be performed.

0 - NONE — No switch or monitoring
1 - SWITCH — Use of the fan status switch
2 - SP RISE — Monitoring of the supply duct pressure.

Fan Fail Shuts Down Unit (***SFS.S***) — This configuration will configure the unit to shut down on a supply fan status fail or simply alert the condition and continue to run. When configured to YES, the control will shut down the unit if supply fan status monitoring fails and send out an alarm. If set to no, the control will not shut down the unit if supply fan status monitoring fails but send out an alert.

SUPPLY FAN STATUS MONITORING LOGIC — Regardless of whether the user is monitoring a discrete switch or is monitoring static pressure, the timings for both techniques are the same and rely upon the configuration of static pressure control. The configuration that determines static pressure control is ***Configuration→SP→SP.CF***. If this configuration is set to 0 (none), a fan failure condition must wait 60 continuous seconds before taking action. If this configuration is 1 (VFD), a fan failure condition must wait 3 continuous minutes before taking action.

If the unit is configured to monitor a fan status switch (***SFS.M*** = 1), and if the supply fan commanded state does not match the supply fan status switch for 3 continuous minutes, then a fan status failure has occurred.

If the unit is configured for supply duct pressure monitoring (***SFS.M*** = 2), then

- If the supply fan is requested ON and the static pressure reading is not greater than 0.2 in. wg for 3 continuous minutes, a fan failure has occurred.
- If the supply fan is requested OFF and the static pressure reading is not less than 0.2-in. wg for 3 continuous minutes, a fan failure has occurred.

Dirty Filter Switch — The unit can be equipped with a field-installed accessory dirty filter switch. The switch is located in the filter section. If a dirty filter switch is not installed, the switch input is configured to read "clean" all the time.

To enable the sensor for dirty filter monitoring set ***Configuration→UNIT→SENS→FLT.S*** to ENABLE. The state of the filter status switch can be read at ***Inputs→GEN.I→FLT.S***. See Table 62.

Monitoring of the filter status switch is disabled in the Service Test mode and when the supply fan is not commanded on. If the fan is on and the unit is not in a test mode and the filter status switch reads "dirty" for 2 continuous minutes, an alert is generated. Recovery from this alert is done through a clearing of all alarms or after cleaning the filter and the switch reads "clean" for 30 seconds.

NOTE: The filter switch should be adjusted to allow for the operating cfm and the type of filter. Refer to the accessory installation instructions for information on adjusting the switch.

Table 62 — Dirty Filter Switch Points

ITEM	EXPANSION	RANGE	CCN POINT
Configuration→UNIT →SENS→FLT.S	Filter Stat.Sw.Enabled ?	Enable/ Disable	FLTS_ENA
Inputs→GEN.I →FLT.S	Filter Status Input	DRTY/CLN	FLTS

Economizer — The economizer control is used to manage the outside and return air dampers of the unit to provide ventilation air as well as free cooling based on several configuration options. This section contains a description of the economizer and its ability to provide free cooling. See the section on indoor air quality for more information on setting up and using the economizer to perform demand controlled ventilation (DCV). See the Third Party Control section for a description on how to take over the operation of the economizer through external control.

The economizer system also permits this unit to perform smoke control functions based on external control switch inputs. Refer to the Smoke Control Modes section for detailed discussions.

Economizer control can be based on automatic control algorithms using unit-based set points and sensor inputs. This economizer control system can also be managed through external logic systems.

The economizer system is a factory-installed option. This option includes a factory-installed enthalpy control device to determine the changeover condition that permits free cooling operation. This unit can also have the following devices installed to enhance economizer control:

- Outside air humidity sensor
- Return air humidity sensor
- Outside airflow control

NOTE: All these options require the controls expansion module (CEM).

The P Series economizer damper is managed by a communicating actuator motor(s). This provides the ability of the control system to monitor, diagnose and report the health and operation of the actuator and damper system to the local display and CCN network, thus providing extensive diagnostic tools to servicers.

ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) CONTROL — The Economizer Fault Detection and Diagnostics control can be divided into two tests: test for mechanically disconnected actuator and test for stuck/jammed actuator.

Mechanically Disconnected Actuator — The test for a mechanically disconnected actuator shall be performed by monitoring SAT as the actuator position changes and the damper blades modulate. As the damper opens, it is expected SAT will drop and approach OAT when the damper is at 100%. As the damper closes, it is expected SAT will rise and approach RAT when the damper is at 0%. The basic test shall be as follows:

1. With supply fan running take a sample of SAT at current actuator position.
2. Modulate actuator to new position.
3. Allow time for SAT to stabilize at new position.
4. Take sample of SAT at new actuator position and determine:
   a. If damper has opened, SAT should have decreased.
   b. If damper has closed, SAT should have increased.
5. Use current SAT and actuator position as samples for next comparison after next actuator move.

The control shall test for a mechanically disconnected damper if all the following conditions are true:

1. An economizer is installed.
2. The supply fan is running.
3. Conditions are good for economizing.
4. The difference between RAT and OAT > ***E.SOD***. It is necessary for there to be a large enough difference between RAT and OAT in order to measure a change in SAT as the damper modulates.
5. The actuator has moved at least ***EC.ST*** %. A very small change in damper position may result in a very small (or non-measurable) change in SAT.
6. At least part of the economizer movement is within the range ***ET.MN***% to ***ET.MX***%. Because the mixing of outside air and return air is not linear over the entire range of damper position, near the ends of the range even a large change in damper position may result in a very small (or non-measurable) change in SAT.

Furthermore, the control shall test for a mechanically disconnected actuator after ***E.CHD*** minutes have expired when any of the following occur (this is to allow the heat/cool cycle to dissipate and not influence SAT):

1. The supply fans switches from OFF to ON.
2. Mechanical cooling switches from ON to OFF.
3. Reheat switches from ON to OFF.
4. The SAT sensor has been relocated downstream of the heating section and heat switches from ON to OFF.

The economizer shall be considered moving if the reported position has changed at least ± ***EC.MD*** %. A very small change in position shall not be considered movement.

The determination of whether the economizer is mechanically disconnected shall occur SAT.T/2 seconds after the economizer has stopped moving. The control shall log a “damper not modulating” alert if:

1. SAT has not decreased by ***S.CHG*** degrees F SAT_SET/2 seconds after opening the economizer at least ***EC.ST***%, taking into account whether the entire movement has occurred within the range 0-***ET.MN***%.
2. SAT has not increased by ***S.CHG*** degrees F SAT_SET/2 seconds after closing the economizer at least ***EC.ST***%, taking into account whether the entire movement has occurred within the range ***ET.MX***-100%.
3. Economizer reported position <=5% and SAT is not approximately equal to RAT. SAT not approximately equal to RAT shall be determined as follows:
   a. SAT<RAT-(2*2(thermistor accuracy) + 2 (SAT increase due to fan)) or
   b. SAT>RAT+(2*2(thermistor accuracy) + 2 (SAT increase due to fan))
4. Economizer reported position >=95% and SAT is not approximately equal to OAT. SAT not approximately equal to OAT shall be determined as follows:
   a. SAT<OAT-(2*2(thermistor accuracy) + 2 (SAT increase due to fan)) or
   b. SAT>OAT+(2*2(thermistor accuracy) + 2 (SAT increase due to fan))

Except when run as part of a self-test, the control shall not automatically clear “damper not modulating” alerts on units with more than one actuator (when ECON_TWO=YES) - the alert shall have to be manually cleared.

Test for stuck/jammed actuator — The control shall test for a jammed actuator as follows:

- If the actuator has stopped moving and the reported position (ECONxPOS, where x is 1,2) is not within ± EC_FLGAP% of the command position (ECONOCMD) after EC_FLTMR seconds, a “damper stuck or jammed” alert shall be logged, i.e., abs (ECONxPOS - ECONODMD) > ***E.GAP*** for a continuous time period EC_FLTMR seconds.
- If the actuator jammed while opening (i.e., reported position < commanded position), a “not economizing when it should” alert shall be logged.
- If the actuator jammed while closing (i.e., reported position > command position), the “economizing when it should not” and “too much outside air” alerts shall be logged.

The control shall automatically clear the jammed actuator alerts as follows:

- If the actuator moves at least 1%, the alerts shall be cleared.

Alternate Excess Outdoor Air Test — For units configured with outdoor air measuring stations (OCFMSENS=YES):

Configuration→ECON→CFM.C→OCF.S=YES

Under the following conditions:

1. Unit is not performing free cooling
2. OACFM sensor is detected as good
3. IAQ is not overriding CFM
4. Purge is not overriding CFM

If OACFM > (ECMINCFM + EX_ARCFM) for EX_ARTMR seconds the “excess outside air” alert shall be logged.

DIFFERENTIAL DRY BULB CUTOFF CONTROL

Differential Dry Bulb Changeover — As both return air and outside air temperature sensors are installed as standard on these units, the user may select this option, ***E.SEL*** = 1, to perform a qualification of return and outside air in the enabling/disabling of free cooling. If this option is selected the outside air temperature shall be compared to the return-air temperature to dis-allow free cooling as shown in Table 63.

Table 63 — Differential Dry Bulb Cutoff Control

E.SEL (ECON_SEL)	DDB.C (EC_DDBCO)	OAT/RAT Comparison	DDBC (DDBCSTAT)
NONE, OUTDR.ENTH, DIF.ENTHALPY	N/A	N/A	NO
DIFF.DRY BULB	0 degF	OAT>RAT	YES
		OAT≤RAT	NO
	–2 degF	OAT>RAT-2	YES
		OAT≤RAT-2	NO
	–4 degF	OAT>RAT-4	YES
		OAT≤RAT-4	NO
	–6 degF	OAT>RAT-6	YES
		OAT≤RAT-6	NO

The status of differential dry bulb cutoff shall be visible under ***Run Status→ECON→DISA→DDBC***.

There shall be hysteresis where OAT must fall 1°F lower than the comparison temperature when transitioning from DDBCSTAT=YES to DDBSTAT=NO.

ECONOMIZER SELF-TEST — The unit has some configurations with two actuators (when ECON_TWO=YES). Because it is possible for one actuator to become mechanically disconnected while the other(s) continue to work properly, the following self-test utilizes fan characteristics and motor power measurements to determine whether the dampers are properly modulating. A fan that is moving more air uses additional power than a fan that is moving a lesser quantity of air. In this test, each actuator/damper assembly is commanded independently while the fan and motor characteristics are monitored.

It shall be possible to manually start the self-test:
- In Navigator, this test shall be located at ***Service Test→FANS→E.TST***.
- Running the test shall require setting ***Service Test→TEST***=ON

The test shall also automatically run based on ***EC.DY*** and ***EC.TM***:
- If conditions are acceptable to run the self-test (see below), the test shall be automatically started on the configured day ***EC.DY*** at the configured time ***EC.TM***.
- If conditions are not acceptable to run the self-test, it shall be re-scheduled for 24 hours later.

The economizer self-test shall only be allowed run if all of the following conditions are valid:

1. The economizer is enabled.
2. The second economizer actuator is enabled.
3. No actuators are detected as stuck.
4. No actuators are detect as unavailable.
5. RCB1 is properly communicating.
6. The unit not down due to failure (A152).
7. The unit has a supply fan VFD and the fan is not in bypass mode.
8. If configured for building pressure, the unit has an return fan VFD and the fan is not in bypass mode.

In addition to the above conditions, the economizer self-test shall not be automatically run if any of the following conditions are valid:

1. Unit not in OFF or VENT mode.

The Test screen should be similar to the following:

EC.TR	ON
EC.DT	WAITING
S.VFD	20.0 %
TORQ	17.5 %
ECN.P	20 %
EC2.P	0 %
EC3.P	0 %
EC.ST	RUNNING

Setting ***EC.TS***=ON shall perform the following:

1. Command all actuators and dampers to the closed position.
2. Run the fan at T24SFSPD for T24ACMRT minutes and take a baseline torque (VFD1TMAV) measurement. With the dampers closed, there will be the least amount of airflow, and therefore the least amount of motor torque.
3. Modulate a single actuator/damper assembly open to T24ACOPN. This will increase the airflow.
4. Let the motor run for one minute. If the torque has increased by ***VF.PC*** % over the baseline measurement from step 2, the current torque is set as the new baseline measurement and proceed to Step 5. If the torque has not increased by ***VF.PC*** % continue to run the fan for a total of ***AC.MR*** minutes. If, after ***AC.MR*** minutes total, the torque has not increased by ***VF.PC*** % over the Step 2 baseline measurement, a fault is logged, and the test is ended.
5. Modulate the actuator/damper assembly closed.
6. Let the motor run for one minute. If the torque has decreased by ***VF.PC*** % over the baseline measurement from step 4, the current torque is set as the new baseline measurement and proceed to Step 7. If the torque has not decreased by ***VF.PC*** % continue to run the fan for a total of ***AC.MR*** minutes. If, after ***AC.MR*** minutes total, the torque has not decreased by ***VF.PC*** % below the Step 4 baseline measurement, a fault is logged, and the test is ended.
7. Repeat Steps 1-5 for each additional actuator/damper assembly.
8. Command actuators/dampers to “normal” positions.

If the torque increases and decreases properly, ***EC.ST***="PASS," otherwise ***EC.ST***="FAIL."

If ***EC.ST*** is set to pass, any existing “damper not modulating” alert shall be automatically cleared.

If ***EC.ST*** is set to fail, the “damper not modulating” alert shall be logged.

If at any point in the test the fan does not reach the command speed or an actuator does not reach the command position within five minutes, the test shall be stopped and the status set to “NOT RUN.”

FAULT DETECTION DIAGNOSTIC CONFIGURATION POINTS

Log Title 24 Faults (***LOG.F***) — Defines when Title 24 mechanically disconnected actuator faults should be logged. When set to YES it will attempt to detect and log mechanically disconnect actuator. When set to NO it will not attempt to detect and log mechanically disconnect actuator. Default is NO.

T24 Econ Move Detect (***EC.MD***) — The amount of change required in economizer reported position before economizer is detected as moving. The range is between 1 and 10. Default is 1.

T24 Econ Move SAT Test (***EC.ST***) — The minimum amount economizer must move in order to trigger the test for a change in SAT, i.e., the economizer must move at least T24ECSTS % before the control will attempt to determine whether the actuator is mechanically disconnected. The range is between 10 and 20. Default is 10.

T24 Econ Move SAT Change (***S.CHG***) — The minimum amount (in degrees F) SAT is expected to change based on economizer position change of T24ECSTS with a range of 0 to 5. Default is 0.2.

T24 Econ RAT-OAT Diff (***E.SOD***) — The minimum difference (in degrees F) between RAT (if available) or SAT (with economizer closed and fan on) and OAT to perform mechanically disconnected actuator testing with a range of 5 to 20. Default is 15.

T24 Heat/Cool End Delay (***E.CHD***) — The amount of time (in minutes) to wait after mechanical cooling or heating has ended before testing for mechanically disconnected actuator. This is to allow SAT to stabilize at conclusion of mechanical cooling or heating. The range is 0 to 60, default is 25.

SAT Settling Time (***SAT.T***) — SAT_SET/2 is the amount of time (in seconds) economizer reported position must remain unchanged (±***EC.MD***) before the control will attempt to detect a mechanically disconnected actuator. This is to allow SAT to stabilize at the current economizer position. This configuration sets the settling time of the supply-air temperature (SAT). This typically tells the control how long to wait after a stage change before trusting the SAT reading, and has been reused for Title 24 purposes. The range is 10 to 900, default is 240.

T24 Test Minimum Position (***ET.MN***) — Minimum position below which tests for a mechanically disconnected actuator will not be performed. For example, if the actuator moves entirely within the range 0 to ***ET.MN*** a determination of whether the actuator is mechanically disconnected will not be made. This is due to the fact that at the extreme ends of the actuator movement, a change in position may not result in a detectable change in temperature. When the actuator stops in the range 0 to 2% (the actuator is considered to be closed), a test shall be performed where SAT is expected to be approximately equal to RAT. If SAT is not determined to be approximately equal to RAT, a "damper not modulating" alert shall be logged. Range is 0 to 50, default is 15.

T24 Test Maximum Position (***ET.MX***) — Maximum position above which tests for a mechanically disconnected actuator will not be performed. For example, if the actuator moves entirely within the range ***ET.MX*** to 100 a determination of whether the actuator is mechanically disconnected will not be made. This is due to the fact that at the extreme ends of the actuator movement, a change in position may not result in a detectable change in temperature. When the actuator stops in the range 98 to 100% (the actuator is considered to be open), a test shall be performed where SAT is expected to be approximately equal to OAT. If SAT is not determined to be approximately equal to OAT, a "damper not modulating" alert shall be logged. Range is 50 to 100, default is 85.

Economizer Deadband Temp (***AC.EC***) — The allowed deadband between measured SAT and calculated SAT when performing economizer self-test. Range is 0 to 10, default is 4.

Econ Fault Detect Gap (***E.GAP***) — The discrepancy between actuator command and reported position in %. Used to detect actuator stuck/jammed. Range is 2 to 100, default is 5.

Econ Fault Detect Timer (***E.TMR***) — The timer for actuator fault detection in seconds. Used to detect actuator stuck/jammed. Range is 10 to 240, default is 20.

Excess Air CFM (***X.CFM***) — The max allowed excess air in CFM. Used to detect excess outside air. Range is 400 to 4000, default is 800.

Excess Air Detect Timer (***X.TMR***) — The timer for excess air detection with a range of 30 to 240. Default is 150.

Econ Auto-Test Day (***EC.DY***) — The day on which to perform automatic economizer test. Range=NEVER, MON, TUE, WED, THR, FRI, SAT, SUN. Default is SAT.

Econ Auto-Test Time (***EC.TM***) — The time at which to perform automatic economizer test. The range is 0 to 23, default is 2.

T24 AutoTest SF Run Time (***AC.MR***) — Amount of time to run supply fan before sampling torque or making torque comparison. Range is 1 to 10, default is 2.

T24 Auto-Test VFD Speed (***AC.SP***) — Speed to run VFD during economizer auto-component test. Range is 10 to 50, default is 20.

T24 Auto-Test Econ % Opn (***AC.OP***) — Amount to open each economizer during auto-component test. Range is 1 to 100. Default is 50.

T24 Auto-Test VFD % Chng (***VF.PC***) — Expected change in torque when damper opens from 0 to ***AC.OP*** and then from ***AC.OP*** to 0. Range is 1 to 20, default is 10.

SETTING UP THE SYSTEM — The economizer configuration options are under the Local Display Mode ***Configuration →ECON***. See Table 64.

Economizer Installed? (***EC.EN***) — If an economizer is not installed or is to be completely disabled the configuration option ***EC.EN*** may be set to No. Otherwise in the case of an installed economizer, this option must be set to Yes.

Economizer Actuator 2 Installed? (***EC2.E***) — For 48/50P055-100 units, a second economizer actuator is required. For sizes 055-100, set this configuration to Yes.

Economizer Minimum Position (***EC.MN***) — The configuration option ***EC.MN*** is the economizer minimum position. See the section on indoor air quality for further information on how to reset the economizer further to gain energy savings and to more carefully monitor IAQ problems.

Economizer Maximum Position (***EC.MX***) — The upper limit of the economizer may be limited by setting ***EC.MX***. It defaults to 98% to avoid problems associated with slight changes in the economizer damper's end stop over time. Typically this will not need to be adjusted.

Economizer Trim for Sum Z? (***E.TRM***) — Sum Z is the adaptive cooling control algorithm used for multiple stages of mechanical cooling capacity. The configuration option ***E.TRM*** is typically set to Yes, and allows the economizer to modulate to the same control point (Sum Z) that is used to control capacity staging. The advantage is lower compressor cycling coupled with tighter temperature control. Setting this option to No will cause the economizer, if it is able to provide free cooling, to open to the Economizer Max. Position (***EC.MX***) during mechanical cooling.

ECONOMIZER OPERATION — There are four potential elements which are considered concurrently which determine whether the economizer is able to provide free cooling:

1. Dry bulb changeover (outside-air temperature qualification)
2. Enthalpy switch (discrete control input monitoring)
3. Economizer changeover select (***E.SEL*** economizer changeover select configuration option)
4. Outdoor dewpoint limit check (requires an installed outdoor relative humidity sensor installed)

Dry Bulb Changeover — Outside-air temperature may be viewed under ***Temperatures→AIR.T→OAT***. The control constantly compares its outside-air temperature reading against the high temperature OAT lockout (***OAT.L***). If the temperature reads above ***OAT.L***, the economizer will not be allowed to perform free cooling.

NOTE: If the user wishes to disable the enthalpy switch from running concurrently, a field-supplied jumper must be installed between TB201 terminals 3 and 4.

Enthalpy Switch — The state of the enthalpy switch can be viewed under ***Inputs→GEN.I→ENTH***. Enthalpy switches are installed as standard on all P Series rooftops. When the switch reads high, free cooling will be disallowed.

The enthalpy switch opens (reads high) when the outdoor enthalpy is above 24 Btu/lb or dry bulb temperature is above 70°F and will close when the outdoor enthalpy is below 23 Btu/lb or the dry bulb temperature is below 69.5°F.

NOTE: The enthalpy switch has both a low and a high output. To use this switch as designed the control must be connected to the low output. Additionally there is a switch logic setting for the enthalpy switch under ***Configuration→SW.LG→ENT.L***. This setting must be configured to closed (CLSE) to work properly when connected to the low output of the enthalpy switch.

There are two jumpers under the cover of the enthalpy switch. One jumper determines the mode of the enthalpy switch/receiver. The other is not used. For the enthalpy switch, the factory setting is M1 and should not need to be changed. See Fig. 10 for a diagram showing the settings on the enthalpy switch.

The enthalpy switch may also be field converted to a differential enthalpy switch by field installing an enthalpy sensor (33CSENTSEN or HH57ZC001). The enthalpy switch/receiver remains installed in its factory location to sense outdoor air enthalpy. The additional enthalpy sensor (33CSENTSEN) is mounted in the return airstream to measure return air enthalpy.

The enthalpy control jumper must be changed from M1 to M2 for differential enthalpy control. For the 2-wire return air enthalpy sensor, connect power to the Vin input and signal to the 4 to 20 mA loop input. See Fig. 10 for diagram showing the settings and inputs on the enthalpy switch.

There is another way to accomplish differential enthalpy control when both an outdoor and return air relative humidity sensor are present. See Economizer Changeover Select section below for further information.

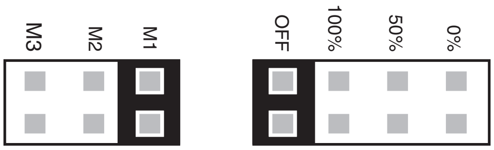


Fig. 10 — Enthalpy Switch Jumper Positions

ECONOMIZER CHANGEOVER SELECT (***E.SEL***) — The control is capable of performing any one of the following changeover types in addition to both the dry bulb lockout and the standard external input:

E.SEL = 0 none

E.SEL = 1 Differential Dry Bulb Changeover

E.SEL = 2 Outdoor Enthalpy Changeover

E.SEL = 3 Differential Enthalpy Changeover

<u>Differential Dry Bulb Changeover</u> — As both return air and outside air temperature sensors are installed as standard on these units, the user may select this option, ***E.SEL*** = 1, to perform a qualification of return and outside air in the enabling/disabling of free cooling. If this option is selected and outside-air temperature is greater than return-air temperature, free cooling will not be allowed.

<u>Outdoor Enthalpy Changeover</u> — This option should be used in climates with higher humidity conditions. The P Series control can use an enthalpy switch or enthalpy sensor, or the standard installed outdoor dry bulb sensor and an accessory relative humidity sensor to calculate the enthalpy of the air.

Setting ***Configuration→ECON→E.SEL*** = 2 requires that the user configure ***Configuration→ECON→OA.E.C***, the Outdoor Enthalpy Changeover Select, and install an outdoor relative humidity sensor. A control expansion module (CEM) is required. Once the sensor and board are installed, enable ***Configuration→ECON→ORH.S***, the outdoor relative humidity sensor configuration option. This will automatically enable the CEM board, if it is not enabled already.

If the user selects one of the Honeywell curves, A,B,C or D, then ***OA.E.C*** options 1-4 should be selected. See Fig. 11 for a diagram of these curves on a psychrometric chart.

OA.E.C = 1 Honeywell A Curve

OA.E.C = 2 Honeywell B Curve

OA.E.C = 3 Honeywell C Curve

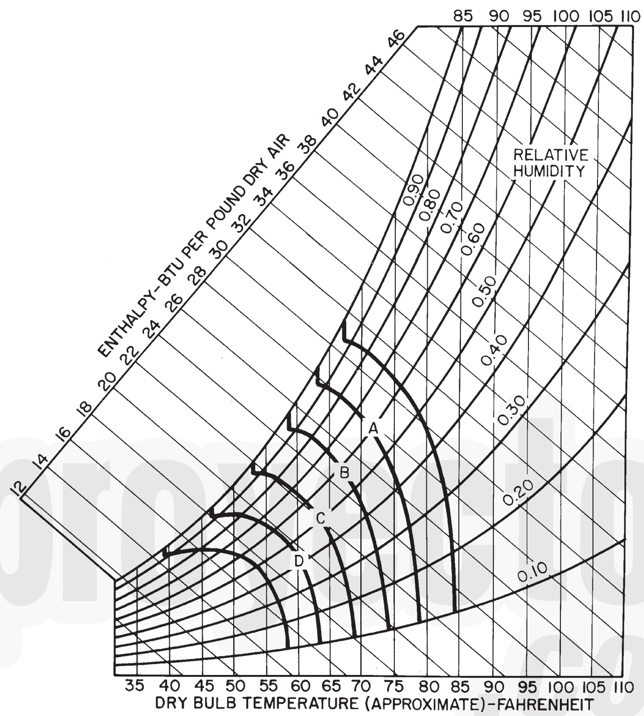
OA.E.C = 4 Honeywell D Curve

OA.E.C = 5 custom enthalpy curve

If the user selects ***OA.E.C*** = 5, a direct compare of outdoor enthalpy versus an enthalpy set point is done. This outdoor enthalpy set point limit is configurable, and is called ***Configuration→ECON→OA.EN***.

Depending on what ***Configuration→ECON→OA.E.C*** is configured for, if the outdoor enthalpy exceeds the Honeywell curves or the outdoor enthalpy compare value (***Configuration →ECON→OA.EN)***, then free cooling will not be allowed.

NOTE: If the user wishes to disable the standard enthalpy control from running concurrently, a field-supplied jumper must be installed between TB201 terminals 5 and 6.



CONTROL CURVE	CONTROL POINT (approx Deg) AT 50% RH
A	73
B	68
C	63
D	58

Fig. 11 — Psychrometric Chart for Enthalpy Control

Table 64 — Economizer Configuration Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
EC.EN	Economizer Installed?	Yes/No		ECON_ENA	Yes
EC2.E	Econ.Act.2 Installed?	Yes/No		ECON_TWO	No
EC.MN	Economizer Min.Position	0 - 100	%	ECONOMIN	5
EC.MX	Economizer Max.Position	0 - 100	%	ECONOMAX	98
E.TRM	Economzr Trim For SumZ ?	Yes/No		ECONTRIM	Yes
E.SEL	Econ ChangeOver Select	0 - 3		ECON_SEL	0
DDB.C	Diff Dry Bulb RAT Offset	0 - 3	Deg F	EC_DDBCO	0
OA.E.C	OA Enthalpy ChgOvr Selct	1 - 5		OAEC_SEL	4
OA.EN	Outdr.Enth Compare Value	18 - 28		OAEN_CFG	24
OAT.L	High OAT Lockout Temp	-40 - 120	dF	OAT_LOCK	60
O.DEW	OA Dewpoint Temp Limit	50 - 62	dF	OADEWCFG	55
ORH.S	Outside Air RH Sensor	Enable/Disable		OARHSENS	Disable
CFM.C	OUTDOOR AIR CFM CONTROL				
OCF.S	Outdoor Air CFM Sensor	Enable/Disable		OCFMSENS	Disable
O.C.MX	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000
O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0
O.C.DB	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400
E.CFG	ECON.OPERATION CONFIGS				
E.P.GN	Economizer Prop.Gain	0.7 - 3.0		EC_PGAIN	1
E.RNG	Economizer Range Adjust	0.5 - 5	^F	EC_RANGE	2.5
E.SPD	Economizer Speed Adjust	0.1 - 10		EC_SPEED	0.75
E.DBD	Economizer Deadband	0.1 - 2	^F	EC_DBAND	0.5
UEFC	UNOCC.ECON.FREE COOLING				
FC.CF	Unoc Econ Free Cool Cfg	0-2		UEFC_CFG	0
FC.TM	Unoc Econ Free Cool Time	0 - 720	min	UEFCTIME	120
FC.L.O	Un.Ec.Free Cool OAT Lock	40 - 70	dF	UEFCNTLO	50
ACT.C	ECON.ACTUATOR CONFIGS				
SN.1.1	Econ Serial Number 1	0 - 9999		ECON_SN1	0
SN.1.2	Econ Serial Number 2	0 - 6		ECON_SN2	0
SN.1.3	Econ Serial Number 3	0 - 9999		ECON_SN3	0
SN.1.4	Econ Serial Number 4	0 - 254		ECON_SN4	0
C.A.L1	Econ Ctrl Angle Lo Limit	0 - 90		ECONCALM	85
SN.2.1	Econ 2 Serial Number 1	0 - 9999		ECN2_SN1	0
SN.2.2	Econ 2 Serial Number 2	0 - 6		ECN2_SN2	0
SN.2.3	Econ 2 Serial Number 3	0 - 9999		ECN2_SN3	0
SN.2.4	Econ 2 Serial Number 4	0 - 254		ECN2_SN4	0
C.A.L2	Econ 2 Ctrl Angle Lo Limit	0 - 90		ECN2CALM	85
T.24.C	TITLE 24 CONFIGS				
LOG.F	Log Title 24 Faults	Yes/No		T24LOGFL	No
EC.MD	T24 Econ Move Detect	1 - 10		T24ECMDB	1
EC.ST	T24 Econ Move SAT Test	10 - 20		T24ECSTS	10
S.CHG	T24 Econ Move SAT Change	0 - 5		T24SATMD	0.2
E.SOD	T24 Econ RAT-OAT Diff	5 - 20		T24RATDF	15
E.CHD	T24 Heat/Cool End Delay	0 - 60		T24CHDLY	25
ET.MN	T24 Test Minimum Pos.	0 - 50		T24TSTMN	15
ET.MX	T24 Test Maximum Pos.	50 - 100		T24TSTMX	85
SAT.T	SAT Settling Time	10 - 900		SAT_SET	240
AC.EC	Economizer Deadband Temp	0 - 10		AC_EC_DB	4
E.GAP	Econ Fault Detect Gap	2 - 100		EC_FLGAP	5
E.TMR	Econ Fault Detect Timer	10 - 240		EC_FLTMR	20
X.CFM	Excess Air CFM	400 - 4000		EX_ARCFM	800
X.TMR	Excess Air Detect Timer	30 - 240		EX_ARTMR	150
AC.MR	T24 AutoTest SF Run Time	1 - 10		T24ACMRT	2
AC.SP	T24 Auto-Test VFD Speed	10 - 50		T24ACSPD	20
AC.OP	T24 Auto-Test Econ % Opn	1 - 100		T24ACOPN	50
VF.PC	T24 Auto-Test VFD % Chng	1 - 20		T24VFDPC	10
EC.DY	T24 Econ Auto-Test Day	0=Never, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday		T24_ECDY	6=Saturday
EC.TM	T24 Econ Auto-Test Time	0 - 23		T24_ECTM	2

Differential Enthalpy Changeover — This option compares the outdoor-air enthalpy to the return air enthalpy and chooses the option with the lowest enthalpy. This option should be used in climates with high humidity conditions. This option uses both humidity sensors and dry bulb sensors to calculate the enthalpy of the outdoor and return air. An accessory outdoor air humidity sensor (***ORH.S***) and return air humidity sensor (***RRH.S***) are used. The outdoor air relative humidity sensor config (***ORH.S***) and return air humidity sensor config (***Configuration→UNIT→SENS→RRH.S***) must be enabled.

NOTE: If the user wishes to disable the standard enthalpy control from running concurrently, a field-supplied jumper must be installed between TB201 terminals 5 and 6.

Outdoor Dewpoint Limit Check — If an outdoor relative humidity sensor is installed, the control is able to calculate the outdoor air dewpoint temperature and will compare this temperature against the outside air dewpoint temperature limit configuration (***Configuration→ECON→O.DEW***). If the outdoor air dewpoint temperature is greater than ***O.DEW***, free cooling will not be allowed. Fig. 12 shows a horizontal limit line in the custom curve of the psychrometric chart. This is the outdoor air dewpoint limit boundary.

Custom Psychrometric Curves — Refer to the psychrometric chart and the standard Honeywell A-D curves in Fig. 11. The curves start from the bottom and rise vertically, angle to the left and then fold over. This corresponds to the limits imposed by dry bulb changeover, outdoor enthalpy changeover and outdoor dewpoint limiting respectively. Therefore, it is now possible to create any curve desired with the addition of one outdoor relative humidity sensor and the options for changeover now available. See Fig. 12 for an example of a custom curve constructed on a psychrometric chart.

Control Angle Alarm Configuration — The economizer actuator determines its end stops through a calibration at the factory. Field-installed actuators may be calibrated in the Service Test mode. When an actuator learns its end stops through calibration, it also determines its control angle. The actuator will resolve this control angle and express its operation in a percent (%) of this learned range.

If the economizer has not learned a sufficient control angle during calibration, the economizer damper will be unable to control ventilation and free cooling. For this reason the economizer actuator used in the P Series control system has a configurable control angle alarm low limit (***Configuration→ECON→ACT.C→C.A.L1*** or ***C.A.L2***). If the control angle learned through calibration is less than ***C.A.L1*** or ***C.A.L2***, an alert will occur and the actuator will not function.

NOTE: This configuration does not typically need adjustment. It is configurable for the small number of jobs which may require a custom solution or workaround.

UNOCCUPIED ECONOMIZER FREE COOLING — This Free Cooling function is used to start the supply fan and use the economizer to bring in outside air when the outside temperature is cool enough to pre-cool the space. This is done to delay the need for mechanical cooling when the system enters the occupied period. This function requires the use of a space temperature sensor.

When configured, the economizer will modulate during an unoccupied period and attempt to maintain space temperature to the occupied cooling set point. Once the need for cooling has been satisfied during this cycle, the fan will be stopped.

Configuring the economizer for Unoccupied Economizer Free Cooling is done in the ***UEFC*** group. There are three configuration options, ***FC.CF***, ***FC.TM*** and ***FC.LO***.

Unoccupied Economizer Free Cooling Configuration (***FC.CF***) — This option is used to configure the type of unoccupied economizer free cooling control that is desired.

0 = disable unoccupied economizer free cooling

1 = perform unocc. economizer free cooling as available during the entire unoccupied period.

2 = perform unocc. economizer free cooling as available, ***FC.TM*** minutes before the next occupied period.

Unoccupied Economizer Free Cooling Time Configuration (***FC.TM***) — This option is a configurable time period, prior to the next occupied period, that the control will allow unoccupied economizer free cooling to operate. This option is only applicable when ***FC.CF*** = 2.

Unoccupied Economizer Free Cooling Outside Lockout Temperature (***FC.LO***) — This configuration option allows the user to select an outside-air temperature below which unoccupied free cooling is not allowed. This is further explained in the logic section.

Unoccupied Economizer Free Cooling Logic — The following qualifications that must be true for unoccupied free cooling to operate:

- Unit configured for an economizer
- Space temperature sensor enabled and sensor reading within limits
- Unit in the unoccupied mode
- ***FC.CF*** set to 1 or ***FC.CF*** set to 2 and control is within ***FC.TM*** minutes of the next occupied period
- Not in the Temperature Compensated Start mode
- Not in a cooling mode
- Not in a heating mode
- Not in a tempering mode
- Outside-air temperature sensor reading within limits
- Economizer would be allowed to cool if the fan were requested and in a cool mode
- OAT > ***FC.LO*** (1.0°F hysteresis applied)
- Unit not in a fire smoke mode
- No fan failure when configured for unit to shut down on a fan failure

If all of the above conditions are satisfied:

Unoccupied Economizer Free Cooling will start when both of the following conditions are true:

{SPT > (OCSP + 2)} **AND** {SPT > (OAT + 8)}

The Unoccupied Economizer Free Cooling Mode will stop when either of the following conditions are true:

{SPT < OCSP} **OR** {SPT < (OAT + 3)} where SPT = Space Temperature and OCSP = Occupied Cooling Set Point.

When the Unoccupied Economizer Free Cooling mode is active, the supply fan is turned on and the economizer damper modulated to control to the supply air set point (***Setpoints→SASP***) plus any supply air reset that may be applied (***Inputs→RSET→SA.S.R***).

OUTDOOR AIR CFM CONTROL — If an outdoor air cfm flow station has been installed, the economizer is able to provide minimum ventilation based on cfm, instead of damper position. The outdoor air cfm reading can be found in ***Inputs→CFM→O.CFM***. During cfm control, the economizer must guarantee a certain amount of cfm at any time for ventilation purposes. If the outdoor air cfm measured is less than the current calculated cfm minimum position, then the economizer will attempt to open until the outdoor air cfm is greater than or equal to this cfm minimum position. The following options are used to program outside air cfm control.

Outdoor Air Cfm Sensor Enable ***(OCF.S)*** — If this option is enabled, the outdoor air cfm sensor will be read and outside air cfm control will be enabled.

Economizer Minimum Flow Rate ***(O.C.MX)*** — This option replaces the Economizer Minimum Position (***Configuration→ECON→EC.MN***) when the outdoor air cfm sensor is enabled.

IAQ Demand Vent Minimum Flow Rate ***(O.C.MN)*** — This option replaces the IAQ Demand Ventilation Minimum Position (***Configuration→IAQ→DCV.C→IAQ.M***) when the outdoor air cfm sensor is enabled.

Economizer Minimum Flow Deadband ***(O.C.DB)*** — This option defines the deadband of the cfm control logic.

The configurable deadband is added to the economizer's minimum cfm position and creates a range (ECMINCFM to ECMINCFM ± OACFM_DB) where the economizer will not attempt to adjust to maintain the minimum cfm position. Increasing this deadband value may help to slow down excessive economizer movement when attempting to control to a minimum position at the expense of bringing in more ventilation air than desired.

ECONOMIZER OPERATION CONFIGURATION — The configuration items in the ***E.CFG*** menu group affect how the economizer modulates when attempting to follow an economizer cooling set point. Typically, they will not need adjustment. In fact, it is strongly advised not to adjust these configuration items from their default settings without first consulting a service engineering representative.

In addition, the economizer cooling algorithm is designed to automatically slow down the economizer actuator's rate of travel as outside air temperature decreases.

ECONOMIZER DIAGNOSTIC HELP — Because there are so many conditions which might disable the economizer from being able to provide free cooling, the control has a display table to identify these potentially disabling sources. The user can check ***ACTV***, the "Economizer Active" flag. If this flag is set to Yes there is no reason to check ***DISA*** (Economizer Disabling Conditions). If the flag is set to No, this means that at least one or more of the flags under the group ***DISA*** are set to Yes and the user can discover what is preventing the economizer from performing free cooling by checking the table.

The economizer's reported and commanded positions are also viewable, as well as outside air temperature, relative humidity, enthalpy and dew point temperature.

The following information can be found under the Local Display Mode ***Run Status→ECON***. See Table 65.

Economizer Control Point Determination Logic — Once the economizer is allowed to provide free cooling, the economizer must determine exactly what set point it should try to maintain. The set point the economizer attempts to maintain when "free cooling" is located at ***Run Status→VIEW→EC.C.P***. This is the economizer control point.

The control selects set points differently, based on the control type of the unit. This control type can be found at ***Configuration→UNIT→C.TYP***. There are 4 types of control.

C.TYP = 1 VAV-RAT

C.TYP = 2 VAV-SPT

C.TYP = 3 TSTAT Multi-Staging

C.TYP = 4 SPT Multi-Staging

If the economizer is not allowed to do free cooling, then ***EC.C.P*** = 0.

If the economizer is allowed to do free cooling and the Unoccupied Free Cooling Mode is ON, then ***EC.C.P = Setpoints→SASP + Inputs→RSET→SA.S.R***.

If the economizer is allowed to do free cooling and the Dehumidification mode is ON, then ***EC.C.P*** = the Cooling Control Point (***Run Status→VIEW→CL.C.P***).

NOTE: To check the current cooling stage go to ***Run Status →COOL→CUR.S***.

If the ***C.TYP*** is either 1,2,3 or 4, and the unit is in a cool mode, then ***EC.C.P*** = the Cooling Control Point (***Run Status→ VIEW→CL.C.P***).

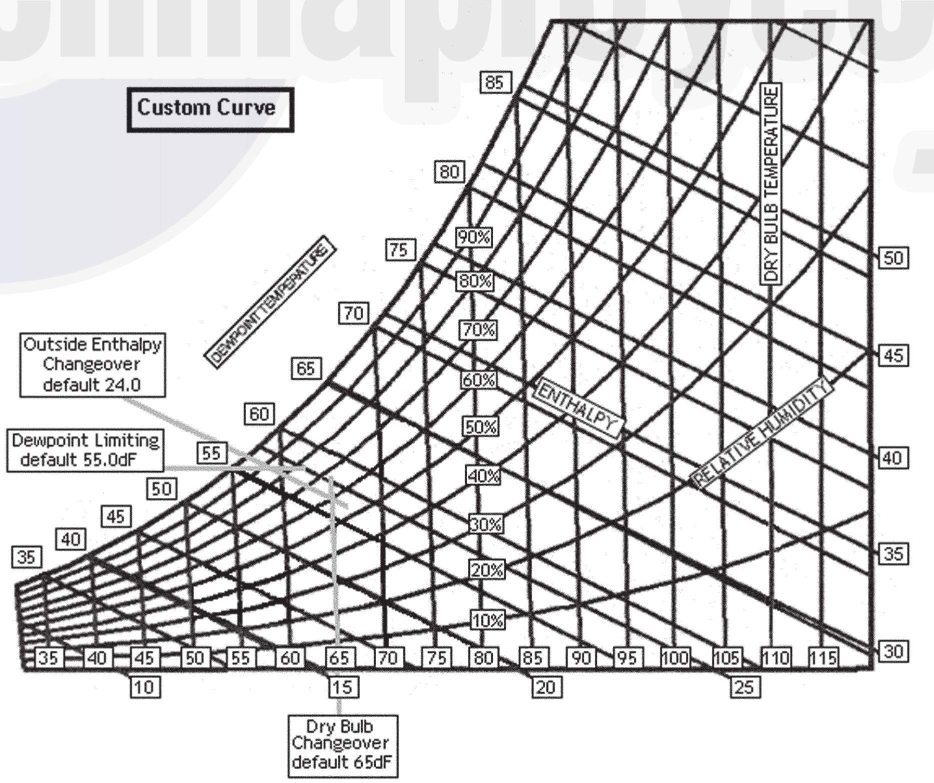


Fig. 12 — Custom Changeover Curve Example

Table 65 — Economizer Run Status Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
ECN.P	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS	
EC2.P	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS	
ECN.C	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
ACTV	Economizer Active ?	YES/NO		ECACTIVE	
DISA	ECON DISABLING CONDITIONS				
UNV.1	Econ Act. Unavailable?	YES/NO		ECONUNAV	
UNV.2	Econ2 Act. Unavailable?	YES/NO		ECN2UNAV	
ENTH	Enth. Switch Read High ?	YES/NO		ENTH	
DBC	DBC - OAT Lockout?	YES/NO		DBC_STAT	
DEW	DEW - OA Dewpt.Lockout?	YES/NO		DEW_STAT	
DDBC	DDBD- OAT > RAT Lockout?	YES/NO		DDBCSTAT	
OAEC	OAEC- OA Enth Lockout?	YES/NO		OAECSTAT	
DEC	DEC - Diff.Enth.Lockout?	YES/NO		DEC_STAT	
EDT	EDT Sensor Bad?	YES/NO		EDT_STAT	
OAT	OAT Sensor Bad ?	YES/NO		OAT_STAT	
FORC	Economizer Forced ?	YES/NO		ECONFORC	
SFON	Supply Fan Not On 30s ?	YES/NO		SFONSTAT	
CLOF	Cool Mode Not In Effect?	YES/NO		COOL_OFF	
OAQL	OAQ Lockout in Effect ?	YES/NO		OAQLOCKD	
HELD	Econ Recovery Hold Off?	YES/NO		ECONHELD	
DH.DS	Dehumid. Disabled Econ.?	YES/NO		DHDISABL	
O.AIR	OUTSIDE AIR INFORMATION				
OAT	Outside Air Temperature		dF	OAT	forcible
OA.RH	Outside Air Rel. Humidity		%	OARH	forcible
OA.E	Outside Air Enthalpy			OAE	
OA.D.T	Outside Air Dewpoint Temp		dF	OADEWTMP	

Building Pressure Control — This control sequence provides control of the building pressure through the modulating flow rate functions of one of the modulating power exhaust options or through management of the return fan option. This function also provides control of the constant volume 2-stage power exhaust option. See below for available power exhaust options for each unit model.

UNIT	CONSTANT VOLUME 2-STAGE	MODULATING POWER EXHAUST	S.O. VFD*	HIGH CAPACITY POWER EXHAUST†	RETURN/ EXHAUST†
48/50P2,P4	X	X	S.O.	X*	X*
48/50P3,P5	NA	X	S.O.	X*	X*

LEGEND

X — Available as Factory Option
S.O. — Available as Special Order
NA — Not Available on this Unit
VFD — Variable Frequency Drive

* Sizes 075-100 only.
† Factory-installed option only.

BUILDING PRESSURE CONFIGURATION — The building pressure configurations are found at the local display under ***Configuration→BP***. See Table 66.

Building Pressure Config (***BP.CF***) — This configuration selects the type of building pressure control.

- ***BP.CF*** = 0, No building pressure control
- ***BP.CF*** = 1, constant volume two-stage exhaust based on economizer position
- ***BP.CF*** = 2, Modulating building pressure control based on building pressure sensor
- ***BP.CF*** = 3, VFD controlling two exhaust fan motors
- ***BP.CF*** = 4, VFD control of one of the two exhaust fan motors (sizes 075-100 with high-capacity exhaust option)
- ***BP.CF*** = 5, used on sizes 075-100 with return fan option

Building Pressure Sensor (***BP.S***) — This configuration allows the reading of a building pressure sensor when enabled. This is automatically enabled when ***BP.CF*** = 2, 3, 4 or 5.

Building Pressure (+/–) Range (***BP.R***) — This configuration establishes the range in in. wg that a 4 to 20 mA sensor will be scaled to. The control only allows sensors that measure both positive and negative pressure.

Building Pressure SETP (***BP.SP***) — This set point is the building pressure control set point. If the unit is configured for a type of modulating building pressure control, then this is the set point that the control will control to.

BP Setpoint Offset (***BP.SO***) — For building pressure configurations ***BP.CF***=2, 3, and 4, this is the offset below the building pressure set point that the building pressure must fall below to turn off power exhaust control.

Power Exhaust on Setp.1 (***BP.P1***) — When configured for building pressure control type ***BP.CF*** = 1 (constant volume two-stage control), the control will turn on the first power exhaust fan when the economizer's position exceeds this set point.

Power Exhaust on Setp.2 (***BP.P2***) — When configured for building pressure control type ***BP.CF*** = 1 (constant volume two-stage control), the control will turn on the second power exhaust fan when the economizer's position exceeds this set point.

VFD/Act. Fire Speed/Pos (***BP.FS***) — For ***BP.CF*** = 2, 3, 4, and 5, this configuration is the VFD speed/actuator position override when the control is in the purge and evacuation smoke control modes.

VFD/Act. Min Speed/Pos (***BP.MN***) — For ***BP.CF*** = 2, 3, 4, and 5, this configuration is the minimum VFD speed/actuator position during building pressure control.

VFD Maximum Speed/Pos (***BP.MX***) — For ***BP.CF*** = 3 and 5, this configuration is the maximum VFD speed during building pressure control.

BP 1 Actuator Max Pos. (***BP.1M***) — For ***BP.CF*** = 2, this configuration is the maximum actuator no. 1 position during building pressure control.

BP 2 Actuator Max Pos. (***BP.2M***) — For ***BP.CF*** = 2, this configuration is the maximum actuator no. 2 position during building pressure control.

BP Hi Cap VFD Clamp Val. (***BP.CL***) — For ***BP.CF*** = 4, this configuration is a limit which creates a deadband which controls the action of the second power exhaust relay.

Fan Track Learn Enable (***FT.CF***) — For ***BP.CF*** = 5, this return/exhaust control configuration selects whether the fan tracking algorithm will make corrections over time and add a learned offset to ***FT.ST***. If this configuration is set to No, the unit will try to control the delta cfm value between the supply and return VFDs only based on ***FT.ST***.

Table 66 — Building Pressure Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
BP	BUILDING PRESS. CONFIGS				
BP.CF	Building Press. Config	0 - 5		BLDG_CFG	0*
BP.S	Building Pressure Sensor	Enable/Disable		BPSENS	Disable*
BP.R	Bldg. Press. (+/-) Range	0.10 - 0.25	" H2O	BP_RANGE	0.25
BP.SP	Building Pressure Setp.	-0.25 - 0.25	" H2O	BPSP	0.05
BP.SO	BP Setpoint Offset	0 - 0.5	" H2O	BPSO	0.05
BP.P1	Power Exhaust On Setp.1	0 - 100	%	PES1	25
BP.P2	Power Exhaust On Setp.2	0 - 100	%	PES2	75
B.V.A	VFD/ACTUATOR CONFIG				
BP.FS	VFD/Act. Fire Speed/Pos.	0 - 100	%	BLDGPFSO	100
BP.MN	VFD/Act. Min.Speed/Pos.	0 - 50	%	BLDGPMIN	10
BP.MX	VFD Maximum Speed	50 - 100	%	BLDGPMAX	100
BP.1M	BP 1 Actuator Max Pos.	85 - 100	%	BP1SETMX	100
BP.2M	BP 2 Actuator Max Pos.	85 - 100	%	BP2SETMX	100
BP.CL	BP Hi Cap VFD Clamp Val.	5 - 25	%	BLDGCLMP	10
FAN.T	FAN TRACKING CONFIG				
FT.CF	Fan Track Learn Enable	Yes/No		DCFM_CFG	No
FT.TM	Fan Track Learn Rate	5-60	min	DCFMRATE	15
FT.ST	Fan Track Initial DCFM	-20000 - 20000	CFM	DCFMSTRT	2000
FT.MX	Fan Track Max Clamp	0 - 20000	CFM	DCFM_MAX	4000
FT.AD	Fan Track Max Correction	0 -20000	CFM	DCFM_ADJ	1000
FT.OF	Fan Track Internl EEPROM	-20000 - 20000	CFM	DCFM_OFF	0
FT.RM	Fan Track Internal RAM	-20000 - 20000	CFM	DCFM_RAM	0
FT.RS	Fan Track Reset Internal	Yes/No		DCFMRSET	No
SCF.C	Supply Air CFM Config	1 - 2		SCFM_CFG	1
B.PID	BLDG.PRESS.PID CONFIGS				
BP.TM	Bldg.Pres.PID Run Rate	5 - 120	sec	BPIDRATE	10
BP.P	Bldg.Press. Prop. Gain	0 - 5		BLDGP_PG	0.5
BP.I	Bldg.Press. Integ. Gain	0 - 2		BLDGP_IG	0.5
BP.D	Bldg.Press. Deriv. Gain	0 - 5		BLDGP_DG	0.3
ACT.C	BLDG.PRES. ACTUATOR CFGS				
BP.1	BLDG.PRES. ACT.1 CONFIGS				
SN.1	BP 1 Serial Number 1	0 - 9999		BP_1_SN1	0
SN.2	BP 1 Serial Number 2	0 - 6		BP_1_SN2	0
SN.3	BP 1 Serial Number 3	0 - 9999		BP_1_SN3	0
SN.4	BP 1 Serial Number 4	0 - 254		BP_1_SN4	0
C.A.LM	BP1 Cntrl Angle Lo Limit	0-90		BP1_CALM	35
BP.2	BLDG.PRES. ACT.2 CONFIGS				
SN.1	BP 2 Serial Number 1	0 - 9999		BP_2_SN1	0
SN.2	BP 2 Serial Number 2	0 - 6		BP_2_SN2	0
SN.3	BP 2 Serial Number 3	0 - 9999		BP_2_SN3	0
SN.4	BP 2 Serial Number 4	0 - 254		BP_2_SN4	0
C.A.LM	BP2 Cntrl Angle Lo Limit	0-90		BP2_CALM	35

*Some configurations are model number dependent.

Fan Track Initial DCFM (***FT.ST***) — For ***BP.CF*** = 5, this return/exhaust control configuration is the start point upon which corrections (offset) are made over time when ***FT.CF*** = Yes. It is the constant control point for delta cfm control when ***FT.CF*** = No.

Fan Track Max Clamp (***FT.MX***) — For ***BP.CF*** = 5, this return/exhaust control configuration is the maximum positive delta cfm control value allowed unless outdoor air cfm control is available and then the delta cfm control value would be clamped to the outdoor air cfm value directly (see the Economizer section for a description of outdoor air cfm configuration).

Fan Track Max Correction (***FT.AD***) — For ***BP.CF*** = 5, this return/exhaust control configuration is the maximum correction allowed every time a correction is made based on ***FT.TM***. This configuration is only valid when ***FT.CF*** = Yes.

Fan Track Internal EEPROM (***FT.OF***) — For ***BP.CF*** = 5, this return/exhaust control internal EEPROM value is a learned correction that is stored in non-volatile RAM and adds to the offset when ***FT.CF*** = Yes. This value is stored once per day after the first correction. This configuration is only valid when ***FT.CF*** = Yes.

Fan Track Internal Ram (***FT.RM***) — For ***BP.CF*** = 5, this return/exhaust control internal value is not a configuration but a run time correction that adds to the offset throughout the day when ***FT.CF*** = Yes. This value is only valid when ***FT.CF*** = Yes.

Fan Track Reset Internal (***FT.RS***) — This option is a one time reset of the internal RAM and internal EEPROM stored offsets. If the system is not set up correctly and the offsets are incorrect, this learned value can be reset.

Supply Air Cfm Config (***SCF.C***) — For ***BP.CF*** = 5, this configuration is set at the factory depending on whether an air foil or forward curve supply air fan is being used. This information is then used by the control to determine the correct cfm tables to be used when measuring supply air cfm.

Building Pressure Run Rate (***BP.TM***) — For ***BP.CF*** = 2,3,4, and 5, this configuration is the PID run time rate.

Building Pressure Proportional Gain (***BP.P***) — For ***BP.CF*** = 2,3,4, and 5, this configuration is the PID Proportional Gain.

Building Pressure Integral Gain (***BP.I***) — For ***BP.CF*** = 2,3,4, and 5, this configuration is the PID Integral Gain.

Building Pressure Derivative Gain (***BP.D***) — For ***BP.CF*** = 2,3,4, and 5, this configuration is the PID Derivative Gain.

BUILDING PRESSURE CONTROL OPERATION

Configuration→BP→BP.CF* = 1** (Constant Volume 2-Stage Control) — Two exhaust fan relays will be turned on and off based on economizer position to maintain building pressure control. The two trip set points are ***Configuration→BP→BP.P1 and ***Configuration→BP→BP.P2***. If the economizer position is greater than or equal to ***BP.P1***, then power exhaust relay 1 is energized, turning on the first stage. A 60-second timer is initialized. If the economizer falls 5% below the ***BP.P1***, then the power exhaust fan relay is turned off. If the economizer position is less than ***BP.P1*** and the 60-second timer has expired, the power exhaust fan relay is turned off. The same logic applies to the second power exhaust fan relay, except the ***BP.P2*** trip point is monitored. If the economizer position is greater than or equal to ***BP.P2***, then power exhaust relay 2 is energized, turning on the second stage. A 60-second timer is initialized. If the economizer is 5% below the ***BP.P2*** the second power exhaust fan relay is turned off. If the economizer is less than ***BP.P2*** and the 60-second timer has expired, the power exhaust fan relay is turned off.

Configuration→BP→BP.CF* = 2** (Modulating Power Exhaust) — Control is accomplished with two Belimo MP communicating actuators in tandem and 2 exhaust fan relays. If building pressure (Pressures→AIR.P→BP***) rises above the building pressure set point (***BP.SP***) and the supply fan is on, building pressure control is initialized. Thereafter, if the supply fan relay goes off or if the building pressure drops below the ***BP.SP*** minus the building pressure set point offset (***BP.SO***) for 5 continuous minutes, building pressure control will be stopped. Any time building pressure control becomes active, the exhaust fan relay turns on, starting the dual exhaust fan motors. After the exhaust fan relay turns on, control is performed with a PID loop where:

Error = *BP* – ***BP.SP***

K = 1000 * ***BP.TM*** / 60 (normalize the PID control for run rate)

P = K * ***BP.P*** * (error)

I = K * ***BP.I*** * (error) + "I" calculated last time through the PID

D = K * ***BP.D*** * (error – error computed last time through the PID)

Power exhaust control signal (limited between ***BP.MN*** and (***BP.1M***/***BP.2M***) %) = P + I + D

Configuration→BP→BP.CF* = 3** (VFD Controlling Exhaust Fan Motors) — The VFD controlling power exhaust consists of an exhaust fan VFD (Outputs→FANS→ E.VFD***) enabled by one power exhaust relay (***Outputs→FANS →P.E.1***). If building pressure (***Pressures→AIR.P→BP***) rises above the building pressure set point (***BP.SP***) and the supply fan is on, then building pressure control is initialized. Thereafter, if the supply fan relay goes off or if the building pressure drops below the ***BP.SP*** minus the building pressure set point offset (***BP.SO***) for 5 continuous minutes, building pressure control will be stopped. The 5-minute timer will continue to re-initialize while the VFD is commanded to a position > 0%. If the building pressure falls below the set point, the VFD will slow down automatically. Any time building pressure control becomes active, the exhaust fan relay turns on which energizes the exhaust fan VFD. Control is performed with a PID loop where:

Error = *BP* – ***BP.SP***

K = 1000 * ***BP.TM***/60 (normalize the PID control for run rate)

P = K * ***BP.P*** * (error)

I = K * ***BP.I*** * (error) + "I" calculated last time through the PID

D = K * ***BP.D*** * (error – error computed last time through the PID)

VFD control signal (clamped between ***BP.MN*** and ***BP.MX***%) = P + I + D

NOTE: Do not change values of PID set point without approval from Carrier.

BP.CF* = 4** (High-Capacity Exhaust Control) — Control is accomplished with a VFD and two exhaust fan relays. High-capacity power exhaust consists of an exhaust fan VFD (Outputs→FANS→E.VFD***) enabled by one power exhaust relay (***Outputs→FANS→P.E.1***) and a second power exhaust relay (***Outputs→FANS→P.E.2***) which controls a single speed fan which is equal in capacity to the VFD running at full speed.

Controlling high-capacity power exhaust differs from normal power exhaust in the following ways:

- The integral term is not used. The percentile commanded speed of the VFD is used instead.
- A "clamp percent" configuration is added (***BP.CL***) to create a deadband that will assist the algorithm in controlling the second power exhaust relay.

If building pressure (BP) rises above the building pressure set point (***BP.SP***) and the supply fan is on, building pressure control is initiated. Thereafter if the supply fan relay goes off or if the building pressure drops below the ***BP.SP*** minus the building pressure set point offset (***BP.SO***) for 5 continuous minutes, building pressure control will be stopped. The 5-minute timer will continue to reset while the VFD is commanded to a position > 0%. If the building pressure falls below the set point, the VFD will shut down automatically. Any time building pressure control becomes active, the exhaust fan relay turns on which energizes the exhaust fan VFD.

After the exhaust fan relay turns on, PID control ensues without an "I" term:

Error = BP – ***BP.SP***

K = 1000 * ***BP.TM*** / 60 (normalize the PID control for run rate)

P = K * ***BP.P*** * (error)

D = K * ***BP.D*** * (error - error computed last time through the PID)

VFD control signal (clamped between 0 and 100%) = VFD Output last time through + (P + D)

NOTE: The sum of P + D will be clamped on any timed calculation to an internally calculated value which guarantees the VFD is not commanded more or less an amount, than it cannot achieve before the next time VFD capacity is again calculated. Bringing the single speed fan (***P.E.2***) ON and OFF is coordinated with the VFD speed. When building pressure first becomes active, ***P.E.2*** is OFF, ***P.E.1*** is ON and the VFD is allowed to climb to 100%. ***BP.CL*** will be used to act as hysteresis so that when the P + D term is evaluated and it exceeds ***BP.CL***, the control will go through a one-minute period hold off time where the VFD is commanded to ***BP.CL***, and ***P.E.2*** is brought on. After the transition to ***P.E.2*** ON is complete, the control will continue to control the VFD from ***BP.CL***%. If BP rises, the control will speed up the VFD. Should the VFD drop to 0%, and the next time through the PID the P + D term calculation is less than – ***BP.CL***, the control will go through another one-minute PID hold off period where ***P.E.2*** is commanded OFF and the VFD is commanded to 100 – ***BP.CL***.

Configuration→BP→BP.CF* =5** (Return/Exhaust Control) — Fan tracking is the method of control used on plenum return fan option. The fan tracking algorithm controls the exhaust/return fan VFD and the exhaust fan relay. The *Comfort*Link controls use a flow station to measure the flow of both the supply and the return fans. The speed of the return fan is controlled by maintaining a delta cfm (usually with supply airflow being greater of the two) between the two fans. The building pressure is controlled by maintaining this delta cfm between the two fans. In general, the greater the delta between supply airflow and return airflow, the higher the building pressure will be. Conversely, as the return airflow quantity increases above the supply airflow, the lower the building pressure will be. Whenever there is a request for the supply fan (or there is the presence of the IGC feedback on gas heat units), the return fan is started. The delta cfm is defined as ***S.CFM – ***R.CFM***. The return fan VFD is controlled by a PID on the error of delta cfm actual from delta cfm set point. If the error is positive the drive will increase speed. If the error is negative the drive will decrease speed.

NOTE: These configurations are used only if Fan Tracking Learning is enabled. When Fan Tracking Learning is enabled, the control will adjust the delta cfm (***FT.ST***) between the supply and return fan if the building pressure deviates from the Building Pressure Set Point (***BP.SP***). Periodically, at the rate set by the fan track learn rate (***FT.TM***), the delta cfm is adjusted upward or downward with a maximum adjustment at a given instance to be no greater than fan track max correction (***FT.AD***). The delta cfm cannot ever be adjusted greater than or less than the fan track initial delta cfm (***FT.ST***) than by the Fan Track Max Clamp (***FT.MX***).

CONFIGURING THE BUILDING PRESSURE ACTUATORS (***BP.CF*** = 2) TO COMMUNICATE VIA ACTUATOR SERIAL NUMBER — Every actuator used in the P Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator. These serial numbers are programmed at the factory and should not need changing. Should field replacement of an actuator become necessary, it will be necessary to configure the serial numbers of the new actuator. Four individual numbers make up each serial number and these can be programmed to match the serial number of the actuators in the building pressure actuator configurations group, ***ACT.C.→BP.1*** and ***BP.2*** (***SN.1, SN.2, SN.3, SN.4***).

NOTE: The serial numbers can be found inside the control doors of the unit as well as on the actuator itself. If an actuator is replaced in the field, it is a good idea to remove the additional peel-off serial number sticker on the actuator and cover up the old one inside the control doors.

CONTROL ANGLE ALARM CONFIGURATION (***C.ALM)*** (***BP.CF*** = 2) — The building pressure actuators learn what its end stops are though a calibration at the factory. Field-installed actuators may be calibrated in the Service Test mode. When an actuator learns its end stops through calibration, it stores the control angle. The actuator will resolve this control angle and express its operation in a percent (%) of this learned range.

If a building pressure actuator has not learned a sufficient control angle during calibration, the actuator will be unable to control building pressure. For this reason the building pressure actuators used in the P Series control system have configurable control angle alarm low limits in the Building Pressure Actuator Configurations group, ***ACT.C→BP.1*** and ***BP.2.*** (***C.A.LM***). If the control angle learned through calibration is less than ***C.A.LM***, an alert will occur and the actuator will not function.

NOTE: This configuration does not typically need adjustment. It is configurable for the small number of jobs which may require a custom solution or workaround.

Smoke Control Modes — There are four smoke control modes that can be used to control smoke within areas serviced by the unit: Pressurization mode, Evacuation mode, Smoke Purge mode, and Fire Shutdown. Evacuation, Pressurization and Smoke Purge modes require the controls expansion board (CEM). The Fire Shutdown input is located on the main base board (MBB) on terminals TB201-1 and 2. The unit may also be equipped with factory-installed return/supply air smoke detector that is wired to TB201-1,2 and will shut the unit down if a smoke condition is determined. Field-monitoring wiring can be connected to terminal TB201-1 and 2 to monitor the smoke detector. Inputs on the CEM board can be used to put the unit in the Pressurization, Evacuation, and Smoke Purge modes. These switches or inputs are connected to TB202: Pressurization — TB202-18 and 19, Evacuation — TB202-16 and 17, and Smoke Purge — TB202-14 and 15. Refer to Major System Components section starting on page 124 for wiring diagrams.

Each mode must be energized individually on discrete inputs and the corresponding alarm is initiated when a mode is activated. The fire system provides a normally closed dry contact closure. Multiple smoke control inputs, sensed by the control will force the unit into a Fire Shutdown mode.

FIRE SMOKE INPUTS — These discrete inputs can be found on the local display under ***Inputs→FIRE***.

ITEM	EXPANSION	RANGE	CCN POINT	WRITE STATUS
FIRE	FIRE-SMOKE INPUTS			
FSD	Fire Shutdown Input	ALRM/NORM	FSD	forcible
PRES	Pressurization Input	ALRM/NORM	PRES	forcible
EVAC	Evacuation Input	ALRM/NORM	EVAC	forcible
PURG	Smoke Purge Input	ALRM/NORM	PURG	forcible

Fire Shutdown Mode — This mode will cause an immediate and complete shutdown of the unit.

Pressurization Mode — This mode attempts to raise the pressure of a space to prevent smoke infiltration from an adjacent space. Opening the economizer (thereby closing the return air damper), shutting down power exhaust and turning the indoor fan on will increase pressure in the space.

Evacuation Mode — This mode attempts to lower the pressure of the space to prevent infiltrating an adjacent space with its smoke. Closing the economizer (thereby opening the return-air damper), turning on the power exhaust and shutting down the indoor fan decrease pressure in the space.

Smoke Purge Mode — This mode attempts to draw out smoke from the space after the emergency condition. Opening the economizer (thereby closing the return-air damper), turning on both the power exhaust and indoor fan will evacuate smoke and bring in fresh air.

AIRFLOW CONTROL DURING THE FIRE/SMOKE MODES — All non-smoke related control outputs will get shut down in the fire/smoke modes. Those related to airflow will be controlled as explained below. The following matrix specifies all actions the control shall undertake when each mode occurs (outputs are forced internally with CCN priority number 1 - “Fire”):

DEVICE	PRESSURIZATION	PURGE	EVACUATION	FIRE SD
Economizer	100%	100%	0%	0%
Indoor Fan — VFD/	ON/FSO*	ON/FSO*	OFF	OFF
Power Exhaust VFD-Actuator	OFF	ON/FSO*	ON/FSO*	OFF
Heat Interlock Relay	ON	ON	OFF	OFF

*“FSO” refers to the supply and exhaust VFD fire speed override configurable speed.

RELEVANT ITEMS:

The economizer’s commanded output can be found in ***Outputs→ACTU→ECN.C***.

The configurable fire speed override for supply fan VFD is in ***Configuration→SP→SP.FS***.

The supply fan relay’s commanded output can be found in ***Outputs→FANS→S.FAN***.

The supply fan VFD’s commanded speed can be found in ***Outputs→FANS→S.VFD***.

The configurable fire speed override for exhaust VFD/actuator is in ***Configuration→BP→B.V.A→BP.FS***.

The exhaust fan VFD’s commanded speed can be found in ***Outputs→FANS→E.VFD***.

The power exhaust actuators command positions can be found in ***Outputs→ACTU→BPx.C***.

Indoor Air Quality Control — The indoor air quality (IAQ) function will admit fresh air into the space whenever space air quality sensors detect high levels of CO_2.

When a space or return air CO_2 sensor is connected to the unit control, the unit's IAQ routine allows a demand-based control for ventilation air quantity, by providing a modulating outside air damper position that is proportional to CO_2 level. The ventilation damper position is varied between a minimum ventilation level (based on internal sources of contaminants and CO_2 levels other than from the effect of people) and the maximum design ventilation level (determined at maximum populated status in the building). Demand controlled ventilation (DCV) is also available when the *Comfort*Link unit is connected to a CCN system using ComfortID™ terminal controls.

This function also provides alternative control methods for controlling the amount of ventilation air being admitted, including fixed outdoor air ventilation rates (measured as cfm), external discrete sensor switch input and externally generated proportional signal controls.

The IAQ function requires the installation of the factory-option economizer system. The DCV sequences also require the connection of accessory (or field-supplied) space or return air CO_2 sensors. Fixed cfm rate control requires the factory-installed outdoor air cfm option. External control of the ventilation position requires supplemental devices, including a 4 to 20 mA signal, a 10,000 ohms potentiometer, or a discrete switch input, depending on the method selected. Outside air CO_2 levels may also be monitored directly and high CO_2 economizer restriction applied when an outdoor air CO_2 sensor is connected. (The outdoor CO_2 sensor connection requires installation of the controls expansion module [CEM].)

The *Comfort*Link controls have the capability of DCV using an IAQ sensor. The indoor air quality (IAQ) is measured using a CO_2 sensor whose measurements are displayed in parts per million (ppm). The IAQ sensor can be field-installed in the return duct. There is also an accessory space IAQ sensor that can be installed directly in the occupied space. The sensor must provide a 4 to 20 mA output signal. The sensor connects to TB201 terminals 7 and 8. Be sure to leave the 182-ohm resistor in place on terminals 7 and 8.

OPERATION — The unit's indoor air quality algorithm modulates the position of the economizer damper between two user configurations depending upon the relationship between the *IAQ* and the outdoor air quality (*OAQ*). Both of these values can be read at the ***Inputs→AIR.Q*** submenu. The lower of these two configurable positions is referred to as the IAQ Demand Vent Min Position (***IAQ.M***), while the higher is referred to as Economizer Minimum Position (***EC.MN***). The ***IAQ.M*** should be set to an economizer position that brings in enough fresh air to remove contaminants and CO_2 generated by sources other than people. The ***EC.MN*** value should be set to an economizer position that brings in enough fresh air to remove contaminants and CO_2 generated by all sources including people. The ***EC.MN*** value is the design value for maximum occupancy.

The logic that is used to control the dampers in response to IAQ conditions is shown in Fig. 13. The *Comfort*Link controls will begin to open the damper from the ***IAQ.M*** position when the IAQ level begins to exceed the OAQ level by a configurable amount, which is referred to as Differential Air Quality Low Limit (***DAQ.L***).

If OAQ is not being measured, OAQ can be manually configured. It should be set at around 400 to 450 ppm or measured with a handheld sensor during the commissioning of the unit. The OAQ reference level can be set using the OAQ Reference Set Point (***OAQ.U***). When the differential between IAQ and OAQ reaches the configurable Diff. Air Quality Hi Limit (***DAQ.H***), then the economizer position will be ***EC.MN***.

When the IAQ–OAQ differential is between ***DAQ.L*** and ***DAQ.H***, the control will modulate the damper between ***IAQ.M*** and ***EC.MN*** as shown in Fig. 13. The relationship is a linear relationship but other non-linear options can be used. The damper position will never exceed the bounds specified by ***IAQ.M*** and ***EC.MN*** during IAQ control.

If the building is occupied and the indoor fan is running and the differential between IAQ and OAQ is less than ***DAQ.L***, the economizer will remain at ***IAQ.M***. The economizer will not close completely. The damper position will be 0 when the fan is not running or the building is unoccupied. The damper position may exceed ***EC.MN*** in order to provide free cooling.

The *Comfort*Link controls are configured for air quality sensors which provide 4 mA at 0 ppm and 20 mA at 2000 ppm. If a sensor has a different range, these bounds must be reconfigured. These pertinent configurations for ranging the air quality sensors are ***IQ.R.L, IQ.R.H, OQ.R.L*** and ***OQ.R.H***. The bounds represent the PPM corresponding to 4 mA (low) and 20 mA (high) for IAQ and OAQ, respectively.

If OAQ exceeds the OAQ Lockout Value (***OAQ.L***), then the economizer will remain at ***IAQ.M***. This is used to limit the use of outside air which outdoor air CO_2 levels are above the ***OAQ.L*** limit. Normally a linear control of the damper vs. the IAQ control signal can be used, but the control also supports non-linear control. Different curves can be used based on the Diff.IAQ Responsiveness Variable (***IAQ.R***). See Fig. 14.

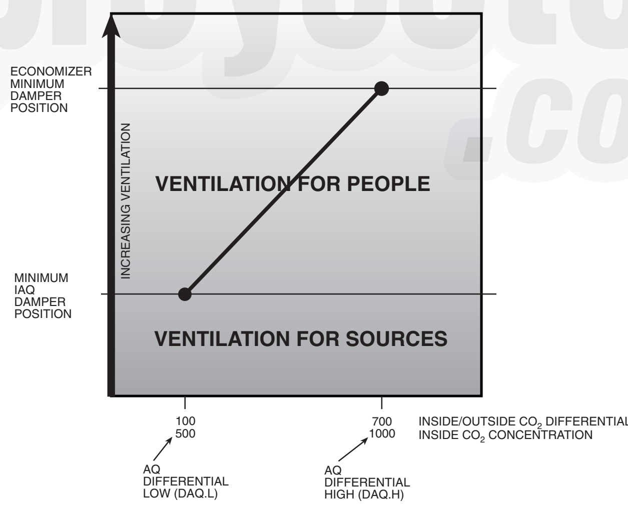
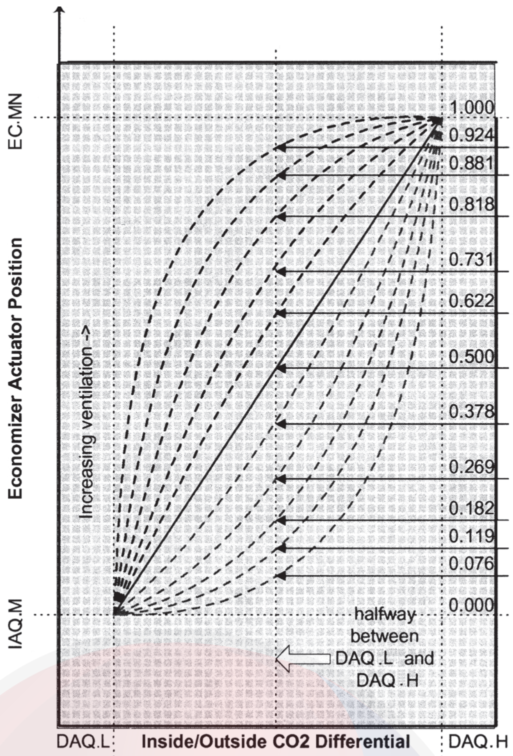


Fig. 13 — IAQ Control



NOTE: Calculating the IAQ.M and EC.MN damper position based on differential IAQ measurement.

Based on the configuration parameter IAQREACT, the reaction to damper positioning based on differential air quality ppm can be adjusted.

IAQREACT = 1 to 5 (more responsive)
IAQREACT = 0 (linear)
IAQREACT = –1 to –5 (less responsive)

Fig. 14 — IAQ Response Curve

SETTING UP THE SYSTEM — The IAQ configuration options are under the Local Display Mode ***Configuration→IAQ***. See Table 67.

IAQ Analog Sensor Config (***Configuration→IAQ→AQ.CF→IQ.A.C***) — This is used to configure the type of IAQ position control. It has the following options:

- ***IQ.A.C*** = 0 (No analog input). If there is no other minimum position control, the economizer minimum position will be ***Configuration→IAQ→EC.MN*** and there will be no IAQ control.
- ***IQ.A.C*** = 1 (IAQ analog input). An indoor air (space or return air) CO_2 sensor is installed. If an outdoor air CO_2 sensor is also installed, or OAQ is broadcast on the CCN, or if a default OAQ value is used, then the unit can perform IAQ control.
- ***IQ.A.C*** = 2 (IAQ analog input with minimum position override) — If the differential between IAQ and OAQ is above ***Configuration→IAQ→AQ.SP→DAQ.H***, the economizer minimum position will be the IAQ override position (***Configuration→IAQ→AQ.SP→IQ.O.P***).
- ***IQ.A.C*** = 3 (4 to 20 mA minimum position) — With a 4 to 20 mA signal connected to TB201 terminal 7 and 8, the economizer minimum position will be scaled linearly from 0% (4 mA) to ***EC.MN*** (20 mA).
- ***IQ.A.C*** = 4 (10K potentiometer minimum position) — With a 10K linear potentiometer connected to TB201 terminal 7 and 8, the economizer minimum position will be scaled linearly from 0% (0 ohms) to ***EC.MN*** (10,000 ohms).

IAQ Analog Fan Config (***Configuration→IAQ→AQ.CF→IQ.A.F***) — This configuration is used to configure the control of the indoor fan. If this option is used then the IAQ sensor must be in the space and not in the return duct. It has the following configurations:

- ***IQ.A.F*** = 0 (No Fan Start) — IAQ demand will never override normal indoor fan operation during occupied or unoccupied period and turn it on.
- ***IQ.A.F*** = 1 (Fan On If Occupied) — IAQ demand will override normal indoor fan operation and turn it on (if off) only during the occupied period (CV operation with automatic fan).
- ***IQ.A.F*** = 2 (Fan On Occupied/Unoccupied) — IAQ demand will always override normal indoor fan operation and turn it on (if off) during both the occupied and unoccupied period. For ***IQ.A.F*** = 1 or 2, the fan will be turned on as described above when DAQ is above the DAQ Fan On Set Point (***Configuration→IAQ→AQ.SP→D.F.ON***). The fan will be turned off when DAQ is below the DAQ Fan Off Set Point (***Configuration→IAQ→AQ.SP→D.F.OF***). The control can also be set up to respond to a discrete IAQ input. The discrete input is connected to TB202 terminal 12 and 13.

IAQ Discrete Input Config (***Configuration→IAQ→AQ.CF→IQ.I.C***) — This configuration is used to set the type of IAQ sensor. The following are the options:

- ***IQ.I.C*** = 0 (No Discrete Input) — This is used to indicate that no discrete input will be used and the standard IAQ sensor input will be used.
- ***IQ.I.C*** = 1 (IAQ Discrete Input) — This will indicate that the IAQ level (high or low) will be indicated by the discrete input. When the IAQ level is low, the economizer minimum position will be ***Configuration→IAQ→DCV.C→IAQ.M***.
- ***IQ.I.C*** = 2 (IAQ Discrete Input with Minimum Position Override.) This will indicate that the IAQ level (high or low) will be indicated by the discrete input and the economizer minimum position will be the IAQ override position, ***IQ.O.P*** (when high). It is also necessary to configure how the fan operates when using the IAQ discrete input.

IAQ Discrete Fan Config (***Configuration→IAQ→AQ.CF→IQ.I.F***) — This is used to configure the operation of the fan during an IAQ demand condition. It has the following configurations:

- ***IQ.I.F*** = 0 (No Fan Start) — IAQ demand will never override normal indoor fan operation during occupied or unoccupied period and turn it on.
- ***IQ.I.F*** = 1 (Fan On If Occupied) — IAQ demand will override normal indoor fan operation and turn it on (if off) only during the occupied period (CV operation with automatic fan).
- ***IQ.I.F*** = 2 (Fan On Occupied/Unoccupied) — IAQ demand will always override normal indoor fan operation and turn it on (if off) during both the occupied and unoccupied period.

Economizer Min Position (***Configuration→IAQ→DCV.C→EC.MN***) — This is the fully occupied minimum economizer position.

IAQ Demand Vent Min Pos. (***Configuration→IAQ→DCV.C→IAQ.M***) — This configuration will be used to set the minimum damper position in the occupied period when there is no IAQ demand.

IAQ Econo Override Pos (***Configuration→IAQ→AQ.SP→IQ.O.P***) — This configuration is the position that the economizer goes to when override is in effect.

Table 67 — Indoor Air Quality Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
DCV.C	DCV ECONOMIZER SETPOINTS				
EC.MN	Economizer Min.Position	0 - 100	%	ECONOMIN	5
IAQ.M	IAQ Demand Vent Min.Pos.	0 - 100	%	IAQMINP	0
O.C.MX	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000
O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0
O.C.DB	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400
AQ.CF	AIR QUALITY CONFIGS				
IQ.A.C	IAQ Analog Sensor Config	0 - 4		IAQANCFG	0
IQ.A.F	IAQ 4-20 ma Fan Config	0 - 2		IAQANFAN	0
IQ.I.C	IAQ Discrete Input Config	0 - 2		IAQINCFG	0
IQ.I.F	IAQ Disc.In. Fan Config	0 - 2		IAQINFAN	0
OQ.A.C	OAQ 4-20ma Sensor Config	0 - 2		OAQANCFG	0
AQ.SP	AIR QUALITY SETPOINTS				
IQ.O.P	IAQ Econo Override Pos.	0 - 100	%	IAQOVPOS	100
IQ.O.C	IAQ Override Flow	0 - 31000	CFM	IAQOVCFM	10000
DAQ.L	Diff.Air Quality LoLimit	0 - 1000		DAQ_LOW	100
DAQ.H	Diff. Air Quality HiLimit	100 - 2000		DAQ_HIGH	700
D.F.OF	DAQ PPM Fan Off Setpoint	0 - 2000		DAQFNOFF	200
D.F.ON	DAQ PPM Fan On Setpoint	0 - 2000		DAQFNON	400
IAQ.R	Diff. AQ Responsiveness	-5 - 5		IAQREACT	0
OAQ.L	OAQ Lockout Value	0 - 2000		OAQLOCK	0
OAQ.U	User Determined OAQ	0 - 5000		OAQ_USER	400
AQ.S.R	AIR QUALITY SENSOR RANGE				
IQ.R.L	IAQ Low Reference	0 - 5000		IAQREFL	0
IQ.R.H	IAQ High Reference	0 - 5000		IAQREFH	2000
OQ.R.L	OAQ Low Reference	0 - 5000		OAQREFL	0
OQ.R.H	OAQ High Reference	0 - 5000		OAQREFH	2000
IAQ.P	IAQ PRE-OCCUPIED PURGE				
IQ.PG	IAQ Purge	Yes/No		IAQPURGE	No
IQ.P.T	IAQ Purge Duration	5 - 60	min	IAQPTIME	15
IQ.P.L	IAQ Purge LoTemp Min Pos	0 - 100	%	IAQPLTMP	10
IQ.P.H	IAQ Purge HiTemp Min Pos	0 - 100	%	IAQPHTMP	35
IQ.L.O	IAQ Purge OAT Lockout	35 - 70	dF	IAQPNTLO	50

OAQ Lockout Value (***Configuration→IAQ→AQ.SP→OAQ.L***) — This is the maximum OAQ level above which demand ventilation will be disabled.

Diff. Air Quality Lo Limit (***Configuration→IAQ→ AQ.SP→DAQ.L***) — This is the differential CO_2 level at which IAQ control of the dampers will be initiated.

Diff. Air Quality Hi Limit (***Configuration→IAQ→ AQ.SP→DAQ.H***) — This is the differential CO_2 level at which IAQ control of the dampers will be at maximum and the dampers will be at the ***Configuration→IAQ→DCV.C→EC.MN***.

DAQ ppm Fan On Set Point (***Configuration→IAQ→AQ.SP→D.F.ON***) — This is the CO_2 level at which the indoor fan will be turned on.

DAQ ppm Fan Off Set Point (***Configuration→IAQ→AQ.SP→D.F.OF***) — This is the CO_2 level at which the indoor fan will be turned off.

IAQ Low Reference (***Configuration→IAQ→AQ.S.R→IQ.R.L***) — This is the reference that will be used with a to non-Carrier IAQ sensor that may have a different characteristic curve. It represents the CO_2 level at 4 mA.

IAQ High Reference (***Configuration→IAQ→AQ.SR→IQ.R.H***) — This is the reference that will be used with a non-Carrier IAQ sensor that may have a different characteristic curve. It represents the CO_2 level at 4 mA.

OAQ Low Reference (***Configuration→IAQ→AQ.S.R→OQ.R.L***) — This is the reference that will be used with a non-Carrier OAQ sensor that may have a different characteristic curve. It represents the CO_2 level at 4 mA.

OAQ High Reference (***Configuration→IAQ→AQ.S.R→OQ.R.H***) — This is the reference that will be used with a non-Carrier OAQ sensor that may have a different characteristic curve. It represents the CO_2 level at 4 mA.

Diff. IAQ Responsiveness (***Configuration→IAQ→AQ.SP→IAQ.R***) — This is the configuration that is used to select the IAQ response curves as shown in Fig. 14.

PRE-OCCUPANCY PURGE — The control has the option for a pre-occupancy purge to refresh the air in the space prior to occupancy.

This feature is enabled by setting ***Configuration→IAQ→IAQ.P→IQ.PG*** to Yes.

The IAQ Purge will operate under the following conditions:

- ***IQ.PG*** is enabled
- the unit is in the unoccupied state
- Current Time is valid
- Next Occupied Time is valid
- time is within two hours of the next occupied period
- time is within the purge duration (***Configuration→IAQ→IAQ.P→IQ.P.T***)

If all of the above conditions are met, the following logic is used:

If OAT ≥ ***IQ.L.O*** and OAT ≤ OCSP and economizer is available then purge will be enabled and the economizer will be commanded to 100%.

Else, if OAT < ***IQ.L.O*** then the economizer will be positioned to the IAQ Purge LO Temp Min Pos (***Configuration→IAQ→IAQ.P→IQ.P.L***)

If neither of the above are true then the dampers will be positioned to the IAQ Purge HI Temp Min Pos (***Configuration→IAQ→IAQ.P→IQ.P.H***)

If this mode is enabled the indoor fan and heat interlock relay (VAV) will be energized.

IAQ Purge (***Configuration→IAQ→IAQ.P→IQ.PG***) — This is used to enable IAQ pre-occupancy purge.

IAQ Purge Duration (***Configuration→IAQ→IAQ.P→IQ.P.T***) — This is the maximum amount of time that a purge can occur.

IAQ Purge Lo Temp Min Pos (***Configuration→IAQ→IAQ.P→IQ.P.L***) — This is used to configure a low limit for damper position to be used during the purge mode.

IAQ Purge Hi Temp Min Pos (***Configuration→IAQ→IAQ.P→IQ.P.H***) — This is used to configure a maximum position for the dampers to be used during the purge cycle.

IAQ Purge OAT Lockout Temp (***Configuration→IAQ→IAQ.P→IQ.L.O***) — Nighttime lockout temperature below which the purge cycle will be disabled.

OPTIONAL AIRFLOW STATION — The *Comfort*Link controls are capable of working with a factory-installed optional airflow station that measures the amount of outdoor air entering the economizer. This flow station is intended to measure ventilation airflows and has a limitation as to the maximum flow rate it can measure. The limits are 18,000 cfm for sizes 030-050 and 31,000 cfm for sizes 055-100.

All configurations for the outdoor airflow station can be found in the ***Configuration→ECON→CFM.C***, sub-menu. For this algorithm to function, the Outdoor Air Cfm Sensor Configuration (***OCF.S.***) must be enabled.

There are three set point configurations:

O.C.MN — Econ OACFM DCV Min Flow

O.C.MX — Econ OACFM DCV Max Flow

O.C.DB — Econ OACFM MinPos Deadbd

When the outdoor air cfm sensor is enabled, the Economizer Min.Position (***Configuration→IAQ→DCV.C→EC.MN***) and the IAQ Demand Vent Min.Pos (***Configuration→IAQ→DCV.C→IAQ.M***) will no longer be used. During vent periods, the control will modulate the damper to maintain the outdoor air intake quantity between ***O.C.MX*** and ***O.C.MN***. The indoor air quality algorithm will vary the cfm between these two values depending on ***Configuration→IAQ→AQ.SP→DAQ.L*** and the ***Configuration→IAQ→AQ.SP→DAQ.H*** set points and upon the relationship between the IAQ and the outdoor air quality (OAQ).

The economizer's OA CFM Minimum Position Deadband (***O.C.DB***) is the deadband range around the outdoor cfm control point at where the damper control will stop, indicating the control point has been reached. See the Economizer section for more information.

Humidification — The P Series *Comfort*Link controls can control a field-supplied and installed humidifier device. The *Comfort*Link controls provide two types of humidification control: A discrete stage control (via a relay contact) and a proportional control type (communicating to a LEN actuator). The discrete stage control is used to control a single-stage humidifier, (typically a spray pump). The proportional control type is typically used to control a proportional steam valve serving a steam grid humidifier.

The *Comfort*Link controls must be equipped with a controls expansion module and an accessory space or return air relative humidity sensor.

If a humidifier using a proportional steam valve is selected, the Carrier actuator (Carrier Part No. HF23BJ050) must be adapted to the humidifier manufacturer's steam valve. Contact Belimo Aircontrols for information on actuator linkage adapter packages required to mount the actuator on the specific brand and type of steam valve mounted by the humidifier manufacturer.

The actuator address must be programmed into the *Comfort*Link unit's humidifier actuator serial number variables.

SETTING UP THE SYSTEM — These humidity configuration are located in the local displays under ***Configuration→HUMD***. See Table 68. Related points are shown in Table 69.

Humidifier Control Configuration (***HM.CF***) — The humidifier control can be set to the following configurations:

- ***HM.CF*** = 0 — No humidity control.
- ***HM.CF*** = 1 — Discrete control based on space relative humidity.
- ***HM.CF*** = 2 — Discrete control based on return air relative humidity.
- ***HM.CF*** = 3 — Analog control based on space relative humidity.
- ***HM.CF*** = 4 — Analog control based on return air relative humidity.

Humidity Control Set Point (***HM.SP***) — The humidity control set point has a range of 0 to 100%.

Humidifier PID Run Rate (***HM.TM***) — This is the PID run time rate.

Humidifier Proportional Gain (***HM.P***) — This configuration is the PID Proportional Gain.

Humidifier Integral Gain (***HM.I***) — This configuration is the PID Integral Gain.

Humidifier Derivative Gain (***HM.D***) — This configuration is the PID Derivative Gain.

OPERATION — For operation, PID control will be utilized. The process will run at the rate defined by the ***Configuration→HUMD→H.PID→HM.TM***. The first part of humidity control tests the humidity control configuration and will turn on corresponding configurations to read space or return air relative humidity. If the supply fan has been ON for 30 seconds and the space is occupied, then the humidification is started.

Actuator Control — Control is performed with a generic PID loop where:

Error = ***HM.SP*** – humidity sensor value (***SP.RH*** or ***RA.RH***, depending on configuration).

The PID terms are calculated as follows:

P = K * ***HM.P*** * error

I = K * ***HM.I*** * error + "I" last time through

D = K * ***HM.D*** * (error – error last time through)

Where K = ***HM.TM***/60 to normalize the effect of changing the run time rate

Relay Output Control — If the humidity sensor reading is greater than the humidity set point then the humidity relay (***Outputs→GEN.O→HUM.R***) is closed. The relay will open when the humidity is 2% less than the humidity set point.

CONFIGURING THE HUMIDIFIER ACTUATOR — Every actuator used in the P Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator. The actuator serial number is located on a two-part sticker affixed to the side of the actuator housing. Remove one of the actuator's serial number labels and paste it onto the actuator serial number records label located inside the left-hand access panel at the unit's control panel. Four individual numbers make up this serial number. Program the serial number of the actuator in its Humidifier Actuator Configurations group, ***ACT.C*** (***SN.1, SN.2, SN.3, SN.4***).

NOTE: The serial numbers for all actuators can be found inside the control doors of the unit as well as on the actuator itself. If an actuator is replaced in the field, it is a good idea to remove the additional peel-off serial number sticker on the actuator and cover up the old one inside the control doors.

Control Angle Alarm ***(Configuration→HUMD→ACTC→C.A.LM)*** — The humidifier actuator learns what its end stops are though a calibration at the factory. Field-installed actuators may be calibrated in the Service Test mode. When an actuator learns its end stops through calibration, it determines its control angle. The actuator will resolve this control angle and express its operation in a percent (%) of this learned range.

Table 68 — Humidity Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HUMD	HUMIDITY CONFIGURATION				
HM.CF	Humidifier Control Cfg.	0 - 4		HUMD_CFG	0
HM.SP	Humidifier Setpoint	0 - 100	%	HUSP	40
H.PID	HUMIDIFIER PID CONFIGS				
HM.TM	Humidifier PID Run Rate	10 - 120	sec	HUMDRATE	30
HM.P	Humidifier Prop. Gain	0 - 5		HUMID_PG	1
HM.I	Humidifier Integral Gain	0 - 5		HUMID_IG	0.3
HM.D	Humidifier Deriv. Gain	0 - 5		HUMID_DG	0.3
ACT.C	HUMIDIFIER ACTUATOR CFGS				
SN.1	Humd Serial Number 1	0 - 9999		HUMD_SN1	0
SN.2	Humd Serial Number 2	0 - 6		HUMD_SN2	0
SN.3	Humd Serial Number 3	0 - 9999		HUMD_SN3	0
SN.4	Humd Serial Number 4	0 - 254		HUMD_SN4	0
C.A.LM	Humd Ctrl Angle Lo Limit	0-90		HUMDCALM	85

Table 69 — Related Humidity Points

ITEM	EXPANSION	UNITS	CCN POINT	WRITE STATUS
Config→UNIT→SENS→SRH.S	Space Air RH Sensor		SPRHSENS	
Config→UNIT→SENS→RRH.S	Return Air RH Sensor		RARHSENS	
Inputs→REL.H→RA.RH	Return Air Rel. Humidity	%	RARH	forcible
Inputs→REL.H→SP.RH	Space Relative Humidity	%	SPRH	forcible
Outputs→ACTU→HMD.P	Humidifier Act.Curr.Pos.	%	HUMDRPOS	
Outputs→ACTU→HMD.C	Humidifier Command Pos.	%	HUMDCPOS	
Outputs→GEN.O→HUM.R	Humidifier Relay		HUMIDRLY	

If the humidifier actuator has not learned a sufficient control angle during calibration, the actuator will be unable to control humidity. For this reason, the humidifier actuator has a configurable control angle alarm low limit (***C.A.LM***). If the control angle learned through calibration is less than ***C.A.LM***, an alert will occur and the actuator will not function.

NOTE: This configuration does not typically need adjustment. It is configurable for the small number of jobs which may require a custom solution or workaround.

Dehumidification and Reheat — The Dehumidification function will override comfort condition set points based on dry bulb temperature and deliver cooler air to the space in order to satisfy a humidity set point at the space or return air humidity sensor. The Reheat function will energize a suitable heating system concurrent with dehumidification sequence should the dehumidification operation result in excessive cooling of the space condition.

The dehumidification sequence requires the installation of a space or return air humidity sensor or a discrete switch input. A CEM (option or accessory) is required to accommodate an RH (relative humidity) sensor connection. Reheat is possible when multiple-step staged gas or modulating gas control option or hydronic heat (option or field-installed coil) is installed. Reheat is also possible using a heat reclaim coil (field-supplied and installed) or a hot gas reheat coil (special order, factory-installed). Reheat is not possible with electric heat.

Dehumidification and reheat control are allowed during Cooling and Vent modes in the Occupied period.

On constant volume units using thermostat inputs (***C.TYP*** = 3), the discrete switch input must be used as the dehumidification control input. The commercial Thermidistat™ device is the recommended accessory device.

SETTING UP THE SYSTEM — The settings for dehumidification can be found at the local display at ***Configuration→ DEHU***. See Table 70.

Dehumidification Configuration (***D.SEL***) — The dehumidification configuration can be set for the following settings:

- ***D.SEL*** = 0 — No dehumidification and reheat.
- ***D.SEL*** = 1 — The control will perform both dehumidification and reheat with modulating valve (hydronic).
- ***D.SEL*** = 2 — The control will perform dehumidification and reheat with staged gas only.
- ***D.SEL*** = 3 — The control will perform both dehumidification and reheat with third party heat via an alarm relay. In the case of ***D.SEL***=3, during dehumidification, the alarm relay will close to convey the need for reheat. A typical application might be to energize a 3-way valve to perform hot gas reheat.
- ***D.SEL*** = 4 — The control will use the Humidi-MiZer® adaptive dehumidification system.

Dehumidification Sensor (***D.SEN***) — The sensor can be configured for the following settings:

- ***D.SEN*** = 1 — Initiated by return air relative humidity sensor.
- ***D.SEN*** = 2 — Initiated by space relative humidity sensor.
- ***D.SEN*** = 3 — Initiated by discrete input.

Economizer Disable in Dehum Mode (***D.EC.D***) — This configuration determines economizer operation during Dehumidification mode.

- ***D.EC.D*** = YES — Economizer disabled during dehumidification (default).
- ***D.EC.D*** = NO — Economizer not disabled during dehumidification.

Vent Reheat Set Point Select (***D.V.CF***) — This configuration determines how the vent reheat set point is selected.

- ***D.V.CF*** = 0 — Reheat follows an offset subtracted from return air temperature (***D.V.RA***).
- ***D.V.CF*** = 1 — Reheat follows a dehumidification heat set point (***D.V.HT***).

Vent Reheat RAT Offset (***D.V.RA***) — Set point offset used only during the vent mode. The air will be reheated to return-air temperature less this offset.

Vent Reheat Set Point (***D.V.HT***) — Set point used only during the vent mode. The air will be reheated to this set point.

Dehumidify Cool Set Point (***D.C.SP***) — This is the dehumidification cooling set point.

Dehumidity RH Set Point (***D.RH.S***) — This is the dehumidification relative humidity trip point.

OPERATION — Dehumidification and reheat can only occur if the unit is equipped with either staged gas or hydronic heat. Dehumidification without reheat can be done on any unit but ***Configuration→DEHU→D.SEL*** must be set to 2.

If the machine's control type is a TSTAT type (***Configuration→UNIT→C.TYP***=3) and the discrete input selection for the sensor is not configured (***D.SEN*** not equal to 3), dehumidification will be disabled.

If the machine's control type is a TSTAT type (***Configuration→UNIT→C.TYP***=3) and the economizer is able to provide cooling, a dehumidification mode may be called out, but the control will not request mechanical cooling.

NOTE: Configuring ***Configuration→DEHU→D.SEN*** to 1, 2 or 3 will enable the CEM board along with the sensor selected for control.

NOTE: If ***Configuration→DEHU→D.SEL*** = 1 or 2, then either staged gas or hot water valve control will be automatically enabled (***Configuration→HEAT→HT.CF*** will be set to either 3 or 4).

If a tempering, unoccupied or "mechanical cooling locked out" HVAC mode is present, dehumidification will be disabled. An HVAC: Off, Vent or Cool mode must be in effect to launch either a Reheat or Dehumidification mode.

If an associated sensor responsible for dehumidification fails, dehumidification will not be attempted (***SPRH, RARH***).

Initiating a Reheat or Dehumidification Mode — To call out a Reheat mode in the Vent or the Off HVAC mode, or to call out a Dehumidification mode in a Cool HVAC mode, one of the following conditions must be true:

- The space is occupied and the humidity is greater than the relative humidity trip point (***D.RH.S***).
- The space is occupied and the discrete humidity input is closed.

Dehumidification and Reheat Control — If a dehumidification mode is initiated, the rooftop will attempt to lower humidity as follows:

- Economizer Cooling — The economizer, if allowed to perform free cooling, will have its control point (***Run Status→VIEW→EC.C.P***) set to ***Configuration→DEHU →D.C.SP***. If ***Configuration→DEHU→D.EC.D*** is disabled, the economizer will always be disabled during dehumidification.
- Cooling — For all cooling control types: A High Cool HVAC mode will be requested internally to the control to maintain diagnostics, although the end user will see a Dehumidification mode at the display. In addition, for multi-stage cooling units the cooling control point will be set to ***Configuration→DEHU→D.C.SP*** (no SASP reset is applied).
- Reheat When Cooling Demand is Present — For reheat control during dehumidification: If reheat follows an offset subtracted from return-air temperature (***Configuration→DEHU→D.SEL*** = 2), then no heating will be initiated and the alarm relay will be energized. If ***Configuration→DEHU→D.SEL*** = 1 and ***Configuration→HEAT→HT.CF*** = staged gas or hot water valve, then the selected heating control type will operate in the low heat/modulating mode.
- The heating control point will be whatever the actual cooling set point would have been (without any supply air reset applied).
- Reheat During Vent Mode — If configured ***(Configuration→DEHU→D.V.CF*** = 0), the heating control point will be equal to RAT - ***D.V.RA***. If configured (***Configuration→DEHU→D.V.CF=1***), the heating control point will be equal to the ***D.V.HT*** set point.

Ending Dehumidification and Reheat Control — When either the humidity sensor fall 5% below the set point (***Configuration→DEHU→D.RH.S)*** or the discrete input reads "LOW", the Dehumidification mode will end.

Table 70 — Dehumidification Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
DEHU	DEHUMIDIFICATION CONFIG.				
D.SEL	Dehumidification Config	0-4		DHSELECT	0
D.SEN	Dehumidification Sensor	1-3		DHSENSOR	1
D.EC.D	Econ disable in DH mode?	Yes/No		DHECDISA	Yes
D.V.CF	Vent Reheat Setpt Select	0-1		DHVHTCFG	0
D.V.RA	Vent Reheat RAT offset	0-8	deltaF	DHVRAOFF	0
D.V.HT	Vent Reheat Setpoint	55-95	dF	DHVHT_SP	70
D.C.SP	Dehumidify Cool Setpoint	40-55	dF	DHCOOLSP	45
D.RH.S	Dehumidify RH Setpoint	10-90	%	DHRELHSP	55
HZ.RT	Humidi-MiZer Adjust Rate	5-120	sec	HMZRRATE	30
HZ.PG	Humidi-MiZer Prop. Gain	0-10		HMZR_PG	0.8

Humidi-MiZer® Adaptive Dehumidification System — Units with the factory-equipped Humidi-MiZer option are capable of providing multiple modes of improved dehumidification as a variation of the normal cooling cycle. The design of the Humidi-MiZer system allows for two humidity control modes of operation of the rooftop unit, utilizing a common subcooling/reheat dehumidification coil located downstream of the standard evaporator coil. This allows the rooftop unit to operate in both a Dehumidification (Subcooling) mode and a hot gas Reheat Mode for maximum system flexibility. The Humidi-MiZer package is factory installed and will operate whenever there is a dehumidification requirement present. The Humidi-MiZer system is initiated based on input from a factory-installed return air humidity sensor to the large rooftop unit controller. Additionally, the unit controller may receive an input from a space humidity sensor, a discrete input from a mechanical humidistat, or third-party controller. Dehumidification and reheat control are allowed during Cooling and Vent modes in the occupied period.

SET UP THE SYSTEM — The settings for Humidi-MiZer system can be found at the local display at ***Configuration→DEHU***. See Table 70.

Dehumidification Configuration (***D.SEL***) — The dehumidification configuration for Humidi-MiZer is ***D.SEL*** = 4 (DH – HUMDZR).

Dehumidification Sensor (***D.SEN***) — The sensor can be configured for the following settings:

- ***D.SEN*** = 1 — Initiated by return air relative humidity sensor.
- ***D.SEN*** = 2— Initiated by space relative humidity sensor.
- ***D.SEN*** = 3 — Initiated by discrete input.

The default sensor is the return air relative humidity sensor (***D.SEN*** = 1). Units ordered with the Humidi-MiZer option will have factory-installed return air relative humidity sensors.

Economizer Disable in Humidi-MiZer Mode (***D.EC.D***) — When ***D.SEL*** = 4 (DH – HUMDZR), this configuration is automatically set to ***D.EC.D*** = YES (Economizer disabled during dehumidification).

Vent Reheat Set Point Select (***D.V.CF***) — This configuration determines how the vent reheat set point is selected. This set point becomes the supply air set point when the Humidi-MiZer function is initiated and the unit enters a Reheat Mode (relative humidity above set point with no cooling demand).

D.V.CF = 0 — Reheat follows an offset subtracted from return air temperature (***D.V.RA***).

D.V.CF = 1 — Reheat follows a dehumidification heat set point (***D.V.HT***).

Vent Reheat RAT Offset (***D.V.RA***) — Set point offset used only when the Humidi-MiZer function is initiated and the unit enters a Reheat Mode. This occurs when the relative humidity is above set point with no cooling demand. The air will be reheated to return-air temperature less this offset.

Vent Reheat Set Point (***D.V.HT***) — Set point used only when the Humidi-MiZer function is initiated and the unit enters a Reheat Mode. This occurs when the relative humidity is above set point with no cooling demand. When ***D.V.CF*** = 0, the supply air will be reheated to ***D.V.HT*** minus ***D.V.RA***. When ***D.V.CF*** = 1, the supply air will be reheated to ***D.V.HT***.

Dehumidify Cool Set Point (***D.C.SP***) — This is the Humidi-MiZer cooling set point used to determine the temperature the air will be cooled to prior to it being reheated to the desired supply air temperature. This set point is used during the Humidi-MiZer dehumidification and reheat modes of operation.

Dehumidify RH Set Point (***D.RH.S***) — This is the Humidi-MiZer relative humidity trip point.

HumidiMiZer Adjust Rate (***HZ.RT***) — This is the rate (seconds) at which corrections are made in the position of the modulating valves (***C.EXV*** and ***B.EXV***) to maintain supply air set point.

HumidiMiZer Proportional Gain (***HZ.PG***) — This is the proportional gain used in calculating the required valve position change for supply air temperature control. It is essentially the percentage of total reheat capacity adjustment that will be made per degree Fahrenheit of supply air temperature error.

OPERATION

Mode Qualifications — An HVAC: Off, Vent or Cool mode must be in effect to launch a Humidi-MiZer mode.

Sensor Failure — If an associated sensor responsible for controlling Humidi-MiZer fails, dehumidification will not be attempted (***SPRH***, ***RARH***).

Initiating a Humidi-MiZer Reheat or Dehumidification Mode — To call out a Reheat mode in the “Vent” or the “Off” HVAC mode, or to call out a Dehumidification mode in a “Cool” HVAC mode, one of the following must be true:

- The space is occupied and the humidity is greater than the relative humidity trip point (***D.RH.S***).
- The space is occupied and the discrete humidity input is closed.

Ending a Humidi-MiZer Reheat or Dehumidification Mode — When either the humidity sensor falls 5% below the set point (***Configuration→DEHU→D.RH.S***) or the discrete input reads “LOW”, the Humidi-MiZer mode will end.

Relevant Outputs — The Humidi-MiZer 3-way valve (reheat valve) commanded output can be found in ***Outputs→COOL→RHV***.

The Humidi-MiZer Condenser Modulating Valve (Condenser EXV) position output can be found in ***Outputs→COOL→C.EXV***. The condenser position will be provided as percent open.

The Humidi-MiZer Bypass Modulating Valve (Bypass EXV) position output can be found in ***Outputs→COOL→B.EXV***. The bypass position will be provided as percent open.

HUMIDI-MIZER MODES

Dehumidification Mode (Subcooling) — This mode will be engaged to satisfy part load type conditions when there is a space call for cooling and dehumidification. Although the temperature may have dropped and decreased the sensible load in the space, the outdoor and/or space humidity levels may have risen. A typical scenario might be when the outside air is 85°F and 70 to 80% relative humidity (RH). Desired SHR for equipment in this scenario is typically from 0.4 to 0.7. The Humidi-MiZer unit will initiate Dehumidification mode when the space temperature and humidity are both above the temperature and humidity set points, and attempt to meet both set point requirements. Once the humidity requirement is met, the unit can continue to operate in normal cooling mode to meet any remaining sensible capacity load. Alternatively, if the sensible load is met and humidity levels remain high the unit can switch to Hot Gas Reheat mode to provide neutral, dehumidified air.

Reheat Mode — This mode is used when dehumidification is required without a need for cooling, such as when the outside air is at a neutral temperature but high humidity exists. This situation requires the equipment to operate at a low SHR of 0.0 to 0.2. With no cooling requirement and a call for dehumidification, the P Series Humidi-MiZer adaptive dehumidification system will cycle on enough compressors to meet the latent load requirement, while simultaneously adjusting refrigerant flow to the Humidi-MiZer coil to reheat the air to the desired neutral air set point. The P Series Humid-MiZer system controls allow for the discharge air to be reheated to either the return-air temperature minus a configurable offset or to a configurable Reheat set point (default 70°F). The hot gas reheat mode will be initiated when only the humidity is above the humidity set point, without a demand for cooling.

System Control — The essential difference between the Dehumidification mode and the Reheat mode is in the supply air set point. In Dehumidification mode, the supply air set point is the temperature required to provide cooling to the space. This temperature is whatever the cooling control point would have been in a normal cooling mode. In Reheat mode, the supply air set point will be either an offset subtracted from return air temperature (***D.V.RA***) or the Vent Reheat Set Point (***D.V.HT***). Both values are configurable. For both Dehumidification mode and Reheat mode, the unit compressor staging will decrease the evaporator discharge temperature to the Dehumidify Cool Set Point (***D.C.SP COOL***) in order to meet the latent load and reheat the air to the required cooling or reheat set point. There is a thermistor array called ***Temperatures→AIR.T→CCT*** connected to the RCB. This thermistor array serves as the evaporator discharge temperature (EDT). See Fig. 15.

The P-Series Humid-MiZer® system uses refrigerant flow modulation valves that provide accurate control of the leaving air temperature as the evaporator discharge temperature is decreased to meet the latent load. As the refrigerant leaves the compressor, the modulating valves vary the amount of refrigerant that enters and/or bypasses the condenser coil. As the bypassed and hot refrigerant liquid, gas or two-phase mixture passes through the Humidi-MiZer coil, it is exposed to the cold supply airflow coming from the evaporator coil. The refrigerant is subcooled in this coil to a temperature approaching the evaporator leaving air temperature. The liquid refrigerant then enters a thermostatic expansion valve (TXV) where the refrigerant pressure is decreased. The refrigerant enters the TXV and evaporator coil at a temperature lower than in standard cooling operation. This lower temperature increases the latent capacity of the evaporator. The refrigerant passes through the evaporator and is turned into a superheated vapor. The air passing over the evaporator coil will become colder than during normal operation. However, as this same air passes over the Humidi-MiZer reheat coil, it will be warmed to meet the supply air set point temperature requirement. See Fig. 16.

Temperature Compensated Start — This logic is used when the unit is in the unoccupied state. The control will calculate early Start Bias time based on Space Temperature deviation from the occupied cooling and heating set points. This will allow the control to start the unit so that the space is at conditioned levels when the occupied period starts. This is required for ASHRAE 90.1-2013 compliance. A space sensor is required for non-linkage applications.

SETTING UP THE SYSTEM — The settings for temperature compensated start can be found in the local display under ***Configuration→UNIT***.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
TCS.C	Temp.Cmp.Strt.Cool Factr	0 - 60	min	TCSTCOOL
TCS.H	Temp.Cmp.Strt.Heat Factr	0 - 60	min	TCSTHEAT

TCST-Cool Factor (***TCS.C***) — This is the factor for the start time bias equation for cooling.

TCST-Heat Factor (***TCS.H***) — This is the factor for the start time bias equation for heating.

NOTE: Temperature compensated start is disabled when these factors are set to 0.

TEMPERATURE COMPENSATED START LOGIC — The following conditions must be met for the algorithm to run:
- Unit is in unoccupied state.
- Next occupied time is valid.
- Current time of day is valid.
- Valid space temperature reading is available (sensor or DAV-Linkage).

The algorithm will calculate a Start Bias time in minutes using the following equations:

If (space temperature > occupied cooling set point)

Start Bias Time = (space temperature – occupied cooling set point)* ***TCS.C***

If (space temperature < occupied heating set point)

Start Bias Time = (occupied heating set point – space temperature)****TCS.H***

- When the Start Bias Time is greater than zero the algorithm will subtract it from the next occupied time to calculate the new start time. When the new start time is reached, the Temperature Compensated Start mode is set (***Operating Modes→MODE→ T.C.ST***), the fan is started and the unit controlled as in an occupied state. Once set, Temperature Compensated mode will stay on until the unit goes into the Occupied mode. The Start Bias Time will be written into the CCN Linkage Equipment Table if the unit is controlled in DAV mode. If the Unoccupied Economizer Free Cool mode is active (***Operating Modes→HVAC*** = "UNOCC FREE COOL") when temperature compensated start begins, the Unoccupied Free Cool mode will be stopped.

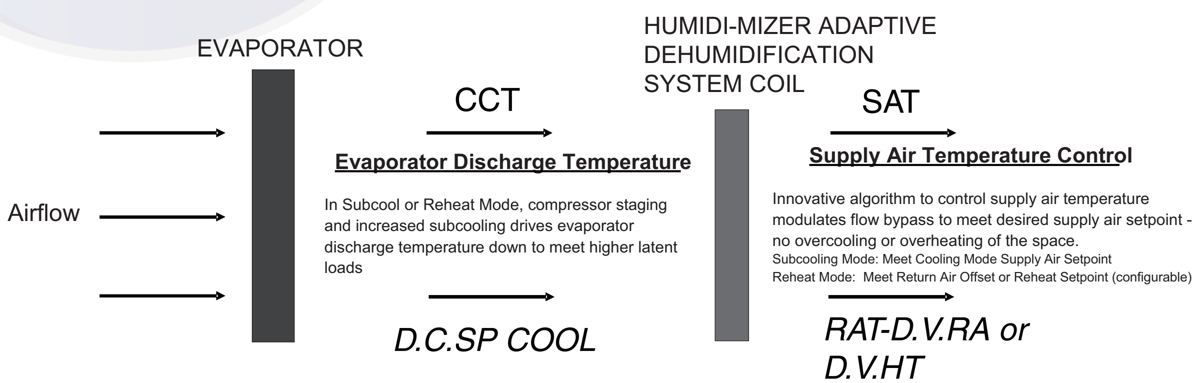


Fig. 15 — Humidi-MiZer® System Control

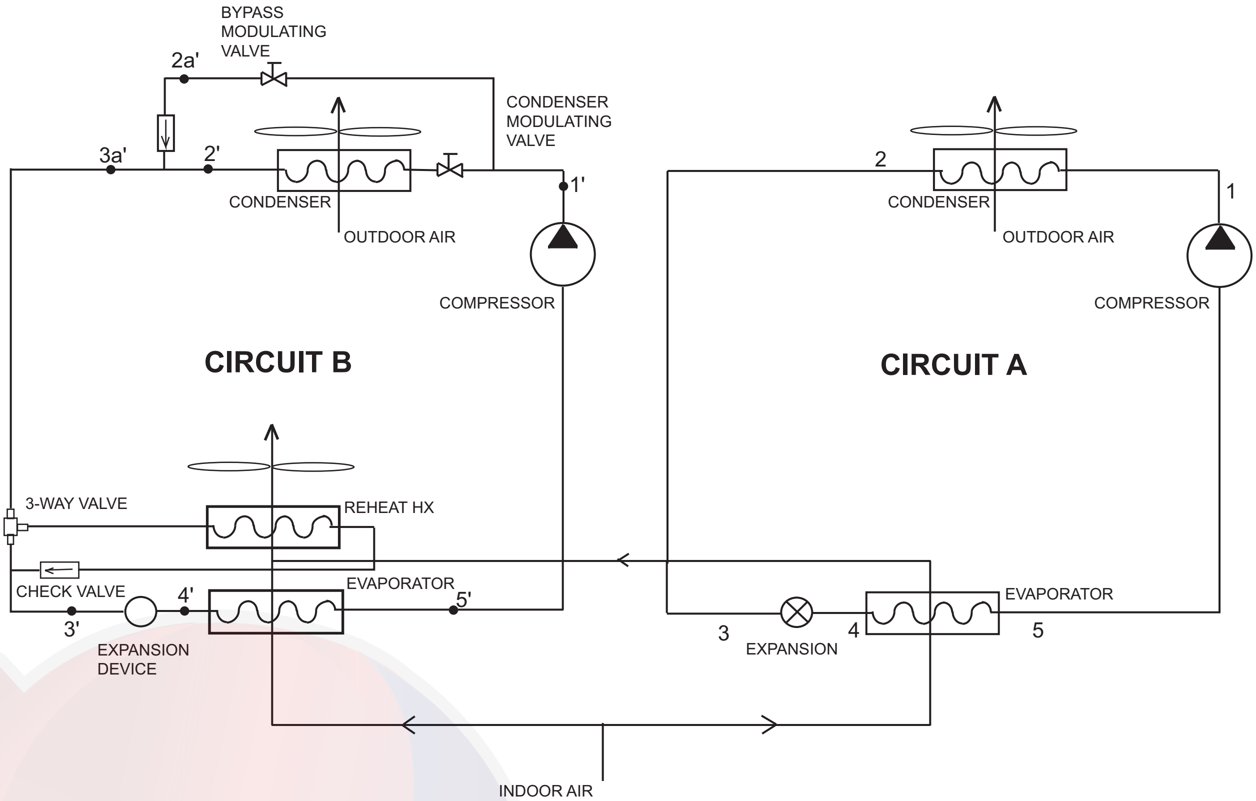


Fig. 16 — Humidi-MiZer® System Diagram

Carrier Comfort Network® (CCN) — It is possible to configure the *Comfort*Link controls to participate as an element of the Carrier Comfort Network (CCN) system directly from the local display. This section will deal with explaining the various programmable options which are found under the ***CCN*** sub-menu in the ***Configuration*** mode.

The major configurations for CCN programming are located in the local displays at ***Configuration→CCN***. See Table 71.

CCN Address (***CCNA***) — This configuration is the CCN address the rooftop is assigned.

CCN Bus Number (***CCNB***) — This configuration is the CCN bus the rooftop is assigned.

CCN Baud Rate (***BAUD***) — This configuration is the CCN baud rate.

CCN Time/Date Broadcast (***TM.DT***) — If this configuration is set to ON, the control will periodically send the time and date out onto the CCN bus once a minute. If this device is on a CCN network then it will be 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.

NOTE: Only the time and date broadcaster can perform daylight savings time adjustments. Even if the rooftop is stand alone, the user may want to set this to ON to accomplish the daylight/savings function.

CCN OAT Broadcast (***OAT.B***) — If this configuration is set to ON, the control will periodically broadcast its outside-air temperature at a rate of once every 30 minutes.

CCN OARH Broadcast (***ORH.B***) — If this configuration is set to ON, the control will periodically broadcast its outside air relative humidity at a rate of once every 30 minutes.

CCN OAQ Broadcast (***OAQ.B***) — If this configuration is set to ON, the control will periodically broadcast its outside air quality reading at a rate of once every 30 minutes.

Global Schedule Broadcast (***G.S.B***) — If this configuration is set to ON and the schedule number (***SCH.N***) is between 65 and 99, then the control will broadcast the internal time schedule once every 2 minutes.

CCN Broadcast Acknowledger (***B.ACK***) — If this configuration is set to ON, then when any broadcasting is done on the bus, this device will respond to and acknowledge. Only one device per bus can be configured for this option.

Schedule Number (***SCH.N***) — This configuration determines what schedule the control may follow.

SCH.N = 0 — The control is always occupied.

SCH.N = 1 — The control follows its internal time schedules. The user may enter any number between 1 and 64 but it will be overwritten to “1” by the control as it only has one internal schedule.

SCH.N = 65-99 — The control is either set up to receive to a broadcasted time schedule set to this number or the control is set up to broadcast its internal time schedule (***G.S.B***) to the network and this is the global schedule number it is broadcasting. If this is the case, then the control still follows its internal time schedules.

Accept Global Holidays? (***HOL.T***) — If a device is broadcasting the time on the bus, it is possible to accept the time yet not accept the global holiday from the broadcast message.

Override Time Limit (***O.T.L***) — This configuration allows the user to decide how long an override occurs when it is initiated. The override may be configured from 1 to 4 hours. If the time is set to 0, the override function will become disabled.

Timed Override Hours (***OV.EX***) — This displays the current number of hours left in an override. It is possible to cancel an override in progress by writing “0” to this variable, thereby removing the override time left.

SPT Override Enabled? (***SPT.O***) — If a space sensor is present, then it is possible to override an unoccupied period by pushing the override button on the T55 or T56 sensor. This option allows the user to disable this function by setting this configuration to NO.

T58 Override Enabled? (***T58.O***) — The T58 sensor is a CCN device that allows cooling/heating set points to be adjusted, space temperature to be written to the rooftop unit, and the ability to initiate a timed override. This option allows the user to disable the override initiated from the T58 sensor by setting this option to NO.

Global Schedule Override? (***GL.OV***) — If the control is set to receive global schedules then it is also possible for the global schedule broadcaster to call out an override condition as well. This configuration allows the user to disable the global schedule broadcaster from overriding the control.

Alert Limit Configuration — The ALLM submenu is used to configure the alert limit set points. A list is shown in Table 72.

SPT Low Alert Limit/Occ (***SP.L.O***) — If the space temperature is below the configurable occupied SPT Low Alert Limit (***SP.L.O***), then Alert 300 will be generated and the unit will be stopped. The alert will automatically reset.

SPT High Alert Limit/Occ (***SP.H.O***) — If the space temperature is above the configurable occupied SPT High Alert Limit (***SP.H.O***), then Alert 301 will be generated and the unit will be stopped. The alert will automatically reset.

SPT Low Alert Limit/Unocc (***SP.L.U***) — If the space temperature is below the configurable unoccupied SPT Low Alert Limit (***SP.L.U***), then Alert 300 will be generated and the unit will be stopped. The alert will automatically reset.

SPT High Alert Limit/Unocc (***SP.H.U***) — If the space temperature is above the configurable unoccupied SPT High Alert Limit (***SP.H.U***), then Alert 301 will be generated and the unit will be stopped. The alert will automatically reset.

EDT Low Alert Limit/Occ (***SA.L.O***) — If the space temperature is below the configurable occupied evaporator discharge temperature (EDT) Low Alert Limit (***SA.L.O***), then Alert 302 will be generated and cooling operation will be stopped but heating operation will continue. The alert will automatically reset.

EDT High Alert Limit/Occ (***SA.H.O***) — If the space temperature is above the configurable occupied EDT High Alert Limit (***SA.H.O***), then Alert 303 will be generated and heating operation will be stopped but cooling operation will continue. The alert will automatically reset.

EDT Low Alert Limit/Unocc (***SA.L.U***) — If the space temperature is below the configurable unoccupied EDT Low Alert Limit (***SA.L.U***), then Alert 302 will be generated and cooling operation will be stopped but heating operation will continue. The alert will automatically reset.

EDT High Alert Limit/Unocc (***SA.H.U***) — If the space temperature is above the configurable unoccupied EDT High Alert Limit (***SA.H.U***), then Alert 303 will be generated and heating operation will be stopped but cooling operation will continue. The alert will automatically reset.

RAT Low Alert Limit/Occ (***RA.L.O***) — If the return-air temperature is below the configurable occupied RAT Low Alert Limit (***RA.L.O***), then Alert 304 will be generated and internal routines will be modified. Unit operation will continue but VAV heating operation will be disabled. The alert will automatically reset.

RAT High Alert Limit/Occ (***RA.H.O***) — If the return-air temperature is above the configurable occupied RAT High Alert Limit (***RA.H.O***), then Alert 305 will be generated and operation will continue. The alert will automatically reset.

RAT Low Alert Limit/Unocc (***RA.L.U***) — If the return-air temperature is below the configurable unoccupied RAT Low Alert Limit (***RA.L.U***), then Alert 304 will be generated. Unit operation will continue but VAV heating operation will be disabled. The alert will automatically reset.

RAT High Alert Limit/Unocc (***RA.H.U***) — If the return-air temperature is above the configurable unoccupied RAT High Alert Limit (***RA.H.U***), then Alert 305 will be generated. Operation will continue. The alert will automatically reset.

OAT Low Alert Limit (***OAT.L***) — If the outside-air temperature measured by the OAT thermistor is below the configurable OAT Low Alert Limit (***OAT.L***) then alert T316 will be generated.

OAT High Alert Limit (***OAT.H***) — If the outside-air temperature measured by the OAT thermistor is above the configurable OAT High Alert Limit (***OAT.H***) then alert T317 will be generated.

Table 71 — CCN Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
CCN	CCN CONFIGURATION				
CCNA	CCN Address	1 - 239		CCNADD	1
CCNB	CCN Bus Number	0 - 239		CCNBUS	0
BAUD	CCN Baud Rate	1 - 5		CCNBAUDD	3
BROD	CCN BROADCST DEFINITIONS				
TM.DT	CCN Time/Date Broadcast	ON/OFF		CCNBC	On
OAT.B	CCN OAT Broadcast	ON/OFF		OATBC	Off
ORH.B	CCN OARH Broadcast	ON/OFF		OARHBC	Off
OAQ.B	CCN OAQ Broadcast	ON/OFF		OAQBC	Off
G.S.B	Global Schedule Broadcst	ON/OFF		GSBC	Off
B.ACK	CCN Broadcast Ack'er	ON/OFF		CCNBCACK	Off
SC.OV	CCN SCHEDULES-OVERRIDES				
SCH.N	Schedule Number	0 - 99		SCHEDNUM	1
HOL.T	Accept Global Holidays?	YES/NO		HOLIDAYT	No
O.T.L.	Override Time Limit	0 - 4	HRS	OTL	1
OV.EX	Timed Override Hours	0 - 4	HRS	OVR_EXT	0
SPT.O	SPT Override Enabled ?	YES/NO		SPT_OVER	Yes
T58.O	T58 Override Enabled ?	YES/NO		T58_OVER	Yes
GL.OV	Global Sched. Override ?	YES/NO		GLBLOVER	No

Table 72 — Alert Limit Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SP.L.O	SPT lo alert limit/occ	-10-245	dF	SPLO	60
SP.H.O	SPT hi alert limit/occ	-10-245	dF	SPHO	85
SP.L.U	SPT lo alert limit/unocc	-10-245	dF	SPLU	45
SP.H.U	SPT hi alert limit/unocc	-10-245	dF	SPHU	100
SA.L.O	EDT lo alert limit/occ	-40-245	dF	SALO	40
SA.H.O	EDT hi alert limit/occ	-40-245	dF	SAHO	100
SA.L.U	EDT lo alert limit/unocc	-40-245	dF	SALU	40
SA.H.U	EDT hi alert limit/unocc	-40-245	dF	SAHU	100
RA.L.O	RAT lo alert limit/occ	-40-245	dF	RALO	60
RA.H.O	RAT hi alert limit/occ	-40-245	dF	RAHO	90
RA.L.U	RAT lo alert limit/unocc	-40-245	dF	RALU	40
RA.H.U	RAT hi alert limit/unocc	-40-245	dF	RAHU	100
OAT.L	OAT lo alert limit	-40-245	dF	OATL	-40
OAT.H	OAT hi alert limit	-40-245	dF	OATH	150
R.RH.L	RARH low alert limit	0-100	%	RRHL	0
R.RH.H	RARH high alert limit	0-100	%	RRHH	100
O.RH.L	OARH low alert limit	0-100	%	ORHL	0
O.RH.H	OARH high alert limit	0-100	%	ORHH	100
SP.L	SP low alert limit	0-5	" H2O	SPL	0
SP.H	SP high alert limit	0-5	" H2O	SPH	2
BP.L	BP lo alert limit	-0.25-0.25	" H2O	BPL	-0.25
BP.H	BP high alert limit	-0.25-0.25	" H2O	BPH	0.25
IAQ.H	IAQ high alert limit	0-5000		IAQH	1200

RARH Low Alert Limit (***R.RH.L***) — If the unit is configured to use a return air relative humidity sensor (***Configuration→UNIT→SENS→RRH.S***), and the measured level is below the configurable RH Low Alert Limit (***R.RH.L***), then Alert 308 will occur. The unit will continue to run and the alert will automatically reset.

RARH High Alert Limit (***R.RH.H***) — If the unit is configured to use a return air relative humidity sensor (***Configuration→UNIT→SENS→RRH.S***), and the measured level is above the configurable RARH High Alert Limit (***R.RH.H***), then Alert 309 will occur. The unit will continue to run and the alert will automatically reset.

OARH Low Alert Limit (***O.RH.L***) — If the unit is configured to use an outdoor air relative humidity sensor (***Configuration→ECON→ORH.S***) and the measured level is below the configurable OARH Low Alert Limit (***O.RH.L***), then economizer operation will be disabled. The unit will continue to run and the alert will automatically reset.

OARH High Alert Limit (***O.RH.H***) — If the unit is configured to use a return air relative humidity sensor (***Configuration→ECON→ORH.S***) and the measured level is above the configurable OARH High Alert Limit (***O.RH.H***), then economizer operation will be disabled. The unit will continue to run and the alert will automatically reset.

Supply Duct Pressure Low Alert Limit (***SP.L***) — If the unit is a VAV unit with a supply duct pressure sensor and the measured supply duct static pressure is below the configurable SP Low Alert Limit (***SP.L***), then Alert 310 will occur. The unit will continue to run and the alert will automatically reset.

Supply Duct Pressure High Alert Limit (***SP.H***) — If the unit is a VAV unit with a supply duct pressure sensor and the measured supply duct static pressure is above the configurable SP High Alert Limit (***SP.H***), then Alert 311 will occur. The unit will continue to run and the alert will automatically reset.

Building Pressure Low Alert Limit (***BP.L***) — If the unit is configured to use modulating power exhaust then a building static pressure limit can be configured using the BP Low Alert Limit (***BP.L***). If the measured pressure is below the limit then Alert 312 will occur.

Building Pressure High Alert Limit (***BP.H***) — If the unit is configured to use modulating power exhaust then a building static pressure limit can be configured using the BP Hi Alert Limit (***BP.H***). If the measured pressure is above the limit, then Alert 313 will occur.

Indoor Air Quality High Alert Limit (***IAQ.H***) — If the unit is configured to use a CO_2 sensor and the level is above the configurable IAQ High Alert Limit (***IAQ.H***) then the alert will occur. The unit will continue to run and the alert will automatically reset.

Sensor Trim Configuration — The TRIM submenu is used to calibrate the sensor trim settings. The trim settings are used when the actual measured reading does not match the sensor output. The sensor can be adjusted to match the actual measured reading with the trim function. A list is shown in Table 73.

> IMPORTANT: Sensor trim must not be used to extend unit operation past the allowable operating range. Doing so may impair or negatively affect the Carrier product warranty.

Air Temperature Leaving Supply Fan Sensor (***SAT.T***) — This variable is used to adjust the supply fan temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Return Air Temperature Sensor Trim (***RAT.T***) — This variable is used to adjust the return air temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Outdoor Air Temperature Sensor Trim (***OAT.T***) — This variable is used to adjust the outdoor air temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Space Temperature Sensor Trim (***SPT.T***) — This variable is used to adjust the space temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Limit Switch Trim (***L.SW.T***) — This variable is used to adjust the limit switch temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Air Temperature Leaving Evaporator Trim (***CCT.T***) — This variable is used to adjust the leaving evaporator temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

A1 Discharge Temperature (***DTA.1***) — This variable is used to adjust the A1 compressor discharge temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

NOTE: Due to the resolution of the control board analog input, temperature readings less than 50°F will become increasingly inaccurate as the temperature decreases.

Suction Pressure Circuit A Trim (***SP.A.T***) — This variable is used to adjust the suction pressure sensor reading for circuit A. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Suction Pressure Circuit B Trim (***SP.B.T***) — This variable is used to adjust the suction pressure sensor reading for circuit B. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Discharge Pressure Circuit A Trim (***DP.A.T***) — This variable is used to adjust the discharge pressure sensor reading for circuit A. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Discharge Pressure Circuit B Trim (***DP.B.T***) — This variable is used to adjust the discharge pressure sensor reading for circuit B. The sensor reading can be adjusted ±50 psig to match the actual measured pressure.

4 to 20 mA Inputs — There are a number of 4 to 20 mA inputs which may be calibrated. These inputs are located in ***Inputs→4-20***. They are:

- ***SP.M.T*** — static pressure milliamp trim
- ***BP.M.T*** — building pressure milliamp trim
- ***OA.M.T*** — outside air cfm milliamp trim
- ***RA.M.T*** — return air cfm milliamp trim
- ***SA.M.T*** — supply air cfm milliamp trim

Discrete Switch Logic Configuration — The ***SW.LG*** submenu is used to configure the normally open/normally closed settings of switches and inputs. This is used when field-supplied switches or input devices are used instead of Carrier devices. The normally open or normally closed setting may be different on a field-supplied device. These points are used to match the control logic to the field-supplied device.

The defaults for this switch logic section will not normally need changing. However, if a field-installed switch is used that is different from the Carrier switch, these settings may need adjustment.

IMPORTANT: Many of the switch inputs to the control can be configured to operate as normally open or normally closed.

Settings for switch logic are found at the local displays under the ***Configuration→SW.LG*** submenu. See Table 74.

Filter Status Input — Clean (***FTS.L***) — The filter status input for clean filters is set for normally open. If a field-supplied filter status switch is used that is normally closed for a clean filter, change this variable to closed.

IGC Feedback — Off (***IGC.L***) — The input for IGC feedback is set for normally open for off. If a field-supplied IGC feedback switch is used that is normally closed for feedback off, change this variable to closed.

Remote Switch — Off (***RMI.L***) — The remote switch is set for normally open when off. If a field-supplied control switch is used that is normally closed for an off signal, change this variable to closed.

Enthalpy Input — Low (***ENT.L***) — The enthalpy input is set for normally closed when low. If a field-supplied enthalpy switch is used that is normally open when low, change this variable to open.

Table 73 — Sensor Trim Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
TRIM	SENSOR TRIM CONFIG.				
SAT.T	Air Temp Lvg SF Trim	-10 - 10	^F	SAT_TRIM	0
RAT.T	RAT Trim	-10 - 10	^F	RAT_TRIM	0
OAT.T	OAT Trim	-10 - 10	^F	OAT_TRIM	0
SPT.T	SPT Trim	-10 - 10	^F	SPT_TRIM	0
L.SW.T	Limit Switch Trim	-10 - 10	^F	LSW_TRIM	0
CCT.T	Air Temp Lvg Evap Trim	-10 - 10	^F	CCT_TRIM	0
DTA.1	A1 Discharge Temp Trim	-10 - 10	^F	DTA1TRIM	0
SP.A.T	Suct.Press.Circ.A Trim	-50 - 50	PSIG	SPA_TRIM	0
SP.B.T	Suct.Press.Circ.B Trim	-50 - 50	PSIG	SPB_TRIM	0
DP.A.T	Dis.Press.Circ.A Trim	-50 - 50	PSIG	DPA_TRIM	0
DP.B.T	Dis.Press.Circ.B Trim	-50 - 50	PSIG	DPB_TRIM	0

Table 74 — Switch Logic Configuration

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULT
SW.LG	SWITCH LOGIC: NO / NC			
FTS.L	Filter Status Inpt-Clean	Open/Close	FLTSLOGC	Open
IGC.L	IGC Feedback - Off	Open/Close	GASFANLG	Open
RMI.L	RemSw Off-Unoc-Strt-NoOv	Open/Close	RMTINLOG	Open
ENT.L	Enthalpy Input - Low	Open/Close	ENTHLOGC	Close
SFS.L	Fan Status Sw. - Off	Open/Close	SFSLOGIC	Open
DL1.L	Dmd.Lmt.Sw.1 - Off	Open/Close	DMD_SW1L	Open
DL2.L	Dmd.Lmt.Sw.2 - Off	Open/Close	DMD_SW2L	Open
IAQ.L	IAQ Disc.Input - Low	Open/Close	IAQINLOG	Open
FSD.L	Fire Shutdown - Off	Open/Close	FSDLOGIC	Open
PRS.L	Pressurization Sw. - Off	Open/Close	PRESLOGC	Open
EVC.L	Evacuation Sw. - Off	Open/Close	EVACLOGC	Open
PRG.L	Smoke Purge Sw. - Off	Open/Close	PURGLOGC	Open
DH.LG	Dehumidify Sw. - Off	Open/Close	DHDISCLG	Open

Fan Status Switch — Off (***SFS.L***) — The fan status switch input is set for normally open for off. If a field-supplied fan status switch is used that is normally closed, change this variable to closed.

Demand Limit Switch 1 — Off (***DL1.L***) — The demand limit switch no. 1 input is set for normally open for off. If a field-supplied demand limit switch is used that is normally closed, change this variable to closed.

Demand Limit Switch 2 — Off (***DL2.L***) — The demand limit switch no. 2 input is set for normally open for off. If a field-supplied demand limit switch is used that is normally closed, change this variable to closed.

IAQ Discrete Input — Low (***IAQ.L***) — The IAQ discrete input is set for normally open when low. If a field-supplied IAQ discrete input is used that is normally closed, change this variable to closed.

Fire Shutdown — Off (***FSD.L***) — The fire shutdown input is set for normally open when off. If a field-supplied fire shutdown input is used that is normally closed, change this variable to closed.

Pressurization Switch — Off (***PRS.L***) — The pressurization input is set for normally open when off. If a field-supplied pressurization input is used that is normally closed, change this variable to closed.

Evacuation Switch — Off (***EVC.L***) — The evacuation input is set for normally open when off. If a field-supplied evacuation input is used that is normally closed, change this variable to closed.

Smoke Purge — Off (***PRG.L***) — The smoke purge input is set for normally open when off. If a field-supplied smoke purge input is used that is normally closed, change this variable to closed.

Dehumidify Switch — Off (***DH.LG***) — The dehumidify input is set for normally open when off. If a field-supplied dehumidify input is used that is normally closed, change this variable to closed.

Display Configuration — The ***DISP*** submenu is used to configure the local display settings. A list is shown in Table 75.

Test Display LEDs (***TEST***) — This is used to test the operation of the *Comfort*Link display.

Metric Display (***METR***) — This variable is used to change the display from English units to Metric units.

Language Selection (***LANG***) — This variable is used to change the language of the *Comfort*Link display. At this time, only English is available.

Password Enable (***PAS.E***) — This variable enables or disables the use of a password. The password is used to restrict use of the control to change configurations.

Service Password (***PASS***) — This variable is the 4-digit numeric password that is required if enabled.

VFD Configurations — There are two sub-menus under the Configuration menu, ***Configuration→S.VFD*** and ***Configuration→E.VFD***. These configurations are for units equipped with optional supply fan or exhaust fan variable frequency drives (VFDs). These sub-menus contain the configurations required for the Supply Fan and Exhaust Fan VFDs. This section defines the configurations in these sub-menus. See Tables 76 and 77. Further information on VFD configurations can be found in Appendix D.

SUPPLY FAN VFD CONFIGURATION — The sub-menu that contains these configurations is located at the local display under ***Configuration→S.VFD***.

VFD1 Nominal Motor Volts (***N.VLT***) — This configuration defines the nominal motor voltage. This value must equal the value on the motor rating plate. This value sets the maximum drive output voltage supplied to the motor.

NOTE: The VFD cannot supply the motor with a greater voltage than the voltage supplied to the input of the VFD. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor Amps (***N.AMP***) — This configuration defines the nominal motor current. This value must equal the value defined in the Supply Fan Motor Limitations Table 26 or Table 27. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor Freq (***N.FRQ***) — This configuration defines the nominal motor frequency. This value must equal the value on the motor rating plate. This value sets the frequency at which the output voltage equals the Nominal Motor Volts (***N.VLT***). Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor RPM (***N.RPM***) — This configuration defines the nominal motor speed. This value must equal the value on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor HPwr (***N.PWR***) — This configuration defines the nominal motor power. This value must equal the value on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Motor Direction (***M.DIR***) — This configuration sets the direction of motor rotation. Motor direction change occurs immediately upon a change to this configuration. Power to the VFD need NOT be cycled for a change to this configuration to take effect.

VFD1 Acceleration Time (***ACCL***) — This configuration sets the acceleration time from zero to maximum output frequency. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Deceleration Time (***DECL***) — This configuration sets the deceleration time from maximum output frequency to zero. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Switching Frequency (***SW.FQ***) — This configuration sets the switching frequency for the drive. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Type (***TYPE***) — This configuration sets the type of VFD communication. This configuration should not be changed without first consulting a Carrier service engineering representative.

EXHAUST FAN VFD CONFIGURATION — The sub-menu that contains these configurations is located at the local display under ***Configuration→E.VFD***.

VFD2 Nominal Motor Volts (***N.VLT***) — This configuration defines the nominal motor voltage. This value must equal the value on the motor rating plate. This value sets the maximum drive output voltage supplied to the motor.

NOTE: The VFD cannot supply the motor with a greater voltage than the voltage supplied to the input of the VFD. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor Amps (***N.AMP***) — This configuration defines the nominal motor current. This value must equal the value defined in:

- the High-Capacity Power Exhaust Systems Motor Limitations table (Table 28) if ***BP.CF***=4
- the Supply Fan Motor Limitations table (Table 26) if ***BP.CF***=5
- the Optional VFD Power Exhaust Motor Limitations table (Table 78) if ***BP.CF***=3

Table 75 — Display Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
TEST	Test Display LEDs	ON/OFF		TEST	Off
METR	Metric Display	ON/OFF		DISPUNIT	Off
LANG	Language Selection	0-1(multi-text strings)		LANGUAGE	0
PAS.E	Password Enable	ENABLE/DISABLE		PASS_EBL	Enable
PASS	Service Password	0000-9999		PASSWORD	1111

Table 76 — Supply Fan VFD Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
S.VFD	SUPPLY FAN VFD CONFIG				
N.VLT	VFD1 Nominal Motor Volts	0 to 999	Volts	VFD1NVLT	460*
N.AMP	VFD1 Nominal Motor Amps	0 to 999	Amps	VFD1NAMP	55.0*
N.FRQ	VFD1 Nominal Motor Freq	10 to 500	Hz	VFD1NFRQ	60
N.RPM	VFD1 Nominal Motor RPM	50 to 30000	RPM	VFD1NRPM	1750
N.PWR	VFD1 Nominal Motor HPwr	0 to 500	HP	VFD1NPWR	40*
M.DIR	VFD1 Motor Direction	0=FWD, 1=REV		VFD1MDIR	0
ACCL	VFD1 Acceleration Time	0 to 1800	sec	VFD1ACCL	30
DECL	VFD1 Deceleration Time	0 to 1800	sec	VFD1DECL	30
SW.FQ	VFD1 Switching Frequency	0=1kHz, 1=4kHz, 2=8kHz, 3=12kHz		VFD1SWFQ	2
TYPE	VFD1 Type	0=LEN, 1=ANALOG		VFD1TYPE	0

*This default is model number dependent.

Table 77 — Exhaust Fan VFD Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULTS
E.VFD	EXHAUST FAN VFD CONFIG				
N.VLT	VFD2 Nominal Motor Volts	0 to 999	Volts	VFD2NVLT	460*
N.AMP	VFD2 Nominal Motor Amps	0 to 999	Amps	VFD2NAMP	28.7*
N.FRQ	VFD2 Nominal Motor Freq	10 to 500	Hz	VFD2NFRQ	60
N.RPM	VFD2 Nominal Motor RPM	50 to 30000	RPM	VFD2NRPM	1750
N.PWR	VFD2 Nominal Motor HPwr	0 to 500	H.P.	VFD2NPWR	20*
M.DIR	VFD2 Motor Direction	0=FWD, 1=REV		VFD2MDIR	0
ACCL	VFD2 Acceleration Time	0 to 1800	sec	VFD2ACCL	30
DECL	VFD2 Deceleration Time	0 to 1800	sec	VFD2DECL	30
SW.FQ	VFD2 Switching Frequency	0=1kHz, 1=4kHz, 2=8kHz, 3=12kHz		VFD2SWFQ	2
TYPE	VFD2 Type	0=LEN, 1=ANALOG		VFD2TYPE	0

*This default is model number dependent.

Table 78 — Optional VFD Power Exhaust (PE) Motor Limitations (FLA)

Power Exhaust HP	UNIT VOLTAGE			
	208/230	380	460	575
High Efficiency PE				
6	20.4	10.0	9.6	7.6
10	30.6	18.2	12.8	10.2
15	44.8	24.4	19.4	15.6
20	58.6	32.4	26.8	20.6
Premium Eficiency PE				
6	16.0	—	8.0	—
10	29.4	—	13.6	—
15	43.0	—	19.4	—
20	56.0	—	25.2	—

Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor Freq (***N.FRQ***) — This configuration defines the nominal motor frequency. This value must equal the value on the motor rating plate. This value sets the frequency at which the output voltage equals the Nominal Motor Volts (***N.VLT***). Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor RPM (***N.RPM***) — This configuration defines the nominal motor speed. This value must equal the value on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor HPwr (***N.PWR***) — This configuration defines the nominal motor power. This value must equal the value of the combined HP of both motors. Motor HP is found on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Motor Direction (***M.DIR***) — This configuration sets the direction of motor rotation. Motor direction change occurs immediately upon a change to this configuration. Power to the VFD need **NOT** be cycled for a change to this configuration to take effect.

VFD2 Acceleration Time (***ACCL***) — This configuration sets the acceleration time from zero to maximum output frequency. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Deceleration Time (***DECL***) — This configuration sets the deceleration time from maximum output frequency to zero. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Switching Frequency (***SW.FQ***) — This configuration sets the switching frequency for the drive. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Type (***TYPE***) — This configuration sets the type of VFD communication. This configuration should not be changed without first consulting a Carrier service engineering representative.

Remote Control Switch Input — The remote switch input is located on the RXB board and connected to TB201 terminals 3 and 4. The switch can be used for several remote control functions. See Table 79.

Remote Input State (***Inputs→GEN.I→REMT***) — This is the actual real time state of the remote input.

Table 79 — Remote Switch Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
REMT	Remote Input State	ON/OFF		RMTIN
RM.CF	Remote Switch Config	0 - 3		RMTINCFG
RMI.L	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG

Remote Switch Config (***Configuration→UNIT→ RM.CF***) — This is the configuration that allows the user to assign different types of functionality to the remote discrete input.

- 0 — NO REMOTE SW — The remote switch will not be used.
- 1 — OCC-UNOCC SW — The remote switch input will control the occupancy state. When the remote switch input is ON, the unit will forced into the occupied mode. When the remote switch is OFF, the unit will be forced into the unoccupied mode.
- 2 — STRT/STOP — The remote switch input will start and stop the unit. When the unit is commanded to stop, any timeguards in place on compressors will be honored first. When the remote switch is ON, the unit will be commanded to stop. When the remote switch is OFF the unit will be enabled to operate.
- 3 — OVERRIDE SW — The remote switch can be used to override any internal or external time schedule being used by the control and force the unit into an occupied mode when the remote input state is ON. When the remote switch is ON, the unit will be forced into an occupied state. When the remote switch is OFF, the unit will use its internal or external time schedules.

Remote Switch Logic Configuration (***Configuration→ SW.LG→RMI.L***) — The control allows for the configuration of a normally open/closed status of the remote input switch via ***RMI.L***. If this variable is configured OPEN, then when the switch is open, the remote input switch perceives the logic state as OFF. Correspondingly, if ***RMI.L*** is set to CLOSED, the remote input switch will perceive a closed switch as meaning OFF. See Table 80.

Hot Gas Bypass — The *Comfort*Link control system supports the use of an optional minimum load hot gas bypass valve (MLV) that is directly controlled by the *Comfort*Link control system. This provides an additional stage of capacity as well as low load coil freeze protection. Hot gas bypass is an active part of the P-Series *Comfort*Link capacity staging and minimum evaporator load protection functions. It is controlled though the Minimum Load Valve function. The hot gas bypass option consists of a solenoid valve with a fixed orifice sized to provide a nominal 3-ton evaporator load bypass. A hot gas refrigerant line routes the bypassed hot gas from the discharge line of circuit A to the suction line of circuit A. An additional thermistor in the suction line allows the unit control to monitor suction superheat. When the unit control calls for hot gas bypass, the hot gas bypasses the evaporator and adds refrigeration load to the compressor circuit to reduce the cooling effect from Circuit A.

The hot gas bypass system is a factory-installed option installed on Circuit A only. This function is enabled at ***Configuration→COOL→MLV***. When this function is enabled, an additional stage of cooling capacity is provided by the unit control staging sequences (see Appendix C).

Space Temperature Offset — Space Temperature Offset corresponds to a slider on a T56 sensor that allows the occupant to adjust the space temperature by a configured range during an occupied period. This sensor is only applicable to units that are configured as Multi-Stage SPT control (***Configuration→UNIT→C.TYP*** = 4).

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

Space Temperature Offset Sensor (***Configuration→UNIT →SENS→SP.O.S***) — This configuration disables the reading of the offset slider.

Space Temperature Offset Range (***Configuration →UNIT→SENS→SP.O.R***) — This configuration establishes the range, in degrees F, that the T56 slider can affect ***SPTO*** when adjusting the slider from the far left (-***SP.O.R***) to the far right (+***SP.O.R***). The default is 5°F.

Space Temperature Offset Value (***Temperatures→AIR.T →SPTO***) — The Space Temperature Offset Value is the reading of the slider potentiometer in the T56 that is resolved to delta degrees based on ***SP.O.R***.

Table 80 — Remote Switch Logic Configuration

REMOTE SWITCH LOGIC CONFIGURATION (RMI.L)	SWITCH STATUS	REMOTE INPUT STATE (REMT)	REMOTE SWITCH CONFIGURATION (RM.CF)			
			0	1	2	3
			No Remote Switch	Occ-Unocc Switch	Start/Stop	Override
OPEN	OPEN	OFF (0)	xxxxx	Unoccupied	Start	No Override
	CLOSED	ON (1)	xxxxx	Occupied	Stop	Override
CLOSED	OPEN	ON (0)	xxxxx	Occupied	Stop	Override
	CLOSED	OFF (1)	xxxxx	Unoccupied	Start	No Override

TIME CLOCK CONFIGURATION

This section describes each Time Clock menu item. Not every point will need to be configured for every unit. Refer to the Controls Quick Start section for more information on what set points need to be configured for different applications. The Time Clock menu items are discussed in the same order that they are displayed in the Time Clock table. The Time Clock table is shown in Table 81.

Hour and Minute (*HH.MM*) — The hour and minute of the time clock are displayed in 24-hour, military time. Time can be adjusted manually by the user.

When connected to the CCN, the unit can be configured to transmit time over the network or receive time from a network device. All devices on the CCN should use the same time. Only one device on the CCN should broadcast time or problems will occur.

Month of Year (*MNTH*) — This variable is the current month of the calendar year.

Day of Month (*DOM*) — This variable is the current day (1 to 31) of the month.

Day of Week (*DAY*) — This variable is the current day of the week (Monday through Sunday).

Year (*YEAR*) — This variable is the current year (for example, 2012).

Local Time Schedule (*SCH.L*) — This submenu is used to program the time schedules. There are 8 periods (***PER.1*** through ***PER.8***). Each time period can be used to set up a local schedule for the unit. Refer to the Programming Operating Schedules section on page 34 for more information.

MONDAY IN PERIOD (***PER.X→DAYS→MON***) — This variable is used to include or remove Monday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Monday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Monday. This variable can be set for Periods 1 through 8.

TUESDAY IN PERIOD (***PER.X→DAYS→TUE***) — This variable is used to include or remove Tuesday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Tuesday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Tuesday. This variable can be set for Periods 1 through 8.

WEDNESDAY IN PERIOD (***PER.X→DAYS→WED***) — This variable is used to include or remove Wednesday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Wednesday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Wednesday. This variable can be set for Periods 1 through 8.

THURSDAY IN PERIOD (***PER.X→DAYS→THU***) — This variable is used to include or remove Thursday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Thursday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Thursday. This variable can be set for Periods 1 through 8.

FRIDAY IN PERIOD (***PER.X→DAYS→FRI***) — This variable is used to include or remove Friday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Friday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Friday. This variable can be set for Periods 1 through 8.

SATURDAY IN PERIOD (***PER.X→DAYS→SAT***) — This variable is used to include or remove Saturday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Saturday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Saturday. This variable can be set for Periods 1 through 8.

SUNDAY IN PERIOD (***PER.X→DAYS→SUN***) — This variable is used to include or remove Sunday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then Sunday will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on Sunday. This variable can be set for Periods 1 through 8.

HOLIDAY IN PERIOD (***PER.X→DAYS→HOL***) — This variable is used to include or remove a Holiday from the schedule. Each period is assigned an occupied on and off time. If this variable is set to YES, then holidays will be included in that period's occupied time schedule. If this variable is set to NO, then the period's occupied time schedule will not be used on holidays. This variable can be set for Periods 1 through 8.

OCCUPIED FROM (***PER.X→OCC***) — This variable is used to configure the start time of the Occupied period. All days in the same period set to YES will enter into Occupied mode at this time.

OCCUPIED TO (***PER.X→UNC***) — This variable is used to configure the end time of the Occupied period. All days in the same period set to YES will exit Occupied mode at this time.

Local Holiday Schedules (*HOL.L*) — This submenu is used to program the local holiday schedules. Up to 30 holidays can be configured. When a holiday occurs, the unit will follow the occupied schedules that have the HOLIDAY IN PERIOD point set to YES.

Holiday Start Month (***HD.01*** to ***HD.30→ MON***) — This is the start month for the holiday. The numbers 1 to 12 correspond to the months of the year (e.g., January = 1).

Holiday Start Day (***HD.01*** to ***HD.30→DAY***) — This is the start day of the month for the holiday. The day can be set from 1 to 31.

Holdiay Duration (***HD.01*** to ***HD.30→LEN***) — This is the length in days of the holiday. The holiday can last up to 99 days.

Daylight Savings Time (*DAY.S*) — The daylight savings time function is used in applications where daylight savings time occurs. The function will automatically correct the clock on the days configured for daylight savings time.

DAYLIGHT SAVINGS START (***DS.ST***) — This submenu configures the start date and time for daylight savings.

Daylight Savings Start Month (***DS.ST→ST.MN***) — This is the start month for daylight savings time. The numbers 1 to 12 correspond to the months of the year (e.g., January = 1).

Daylight Savings Start Week (***DS.ST→ST.WK***) — This is the start week of the month for daylight savings. The week can be set from 1 to 5.

Daylight Savings Start Day (***DS.ST→ST.DY***) — This is the start day of the week for daylight savings. The day can be set from 1 to 7 (Sunday=1, Monday=2, etc.).

Daylight Savings Minutes To Add (***DS.ST→MIN.A***) — This is the amount of time that will be added to the time clock for daylight savings.

DAYLIGHT SAVINGS STOP (***DS.SP***) — This submenu configures the end date and time for daylight savings.

Daylight Savings Stop Month (***DS.SP→SP.MN***) — This is the stop month for daylight savings time. The numbers 1 to 12 correspond to the months of the year (e.g., January = 1).

Table 81 — Time Clock Menu

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULT
TIME	**TIME OF DAY**			
HH.MM	Hour and Minute	00:00	TIME	
DATE	**MONTH,DATE,DAY AND YEAR**			
MNTH	Month of Year	multi-text strings	MOY	
DOM	Day of Month	0-31	DOM	
DAY	Day of Week	multi-text strings	DOWDISP	
YEAR	Year	e.g. 2012	YOCDISP	
SCH.L	**LOCAL TIME SCHEDULE**			
PER.1	PERIOD 1			
PER.1→DAYS	DAY FLAGS FOR PERIOD 1			Period 1 only
PER.1→DAYS→MON	Monday in Period	YES/NO	PER1MON	Yes
PER.1→DAYS→TUE	Tuesday in Period	YES/NO	PER1TUE	Yes
PER.1→DAYS→WED	Wednesday in Period	YES/NO	PER1WED	Yes
PER.1→DAYS→THU	Thursday in Period	YES/NO	PER1THU	Yes
PER.1→DAYS→FRI	Friday in Period	YES/NO	PER1FRI	Yes
PER.1→DAYS→SAT	Saturday in Period	YES/NO	PER1SAT	Yes
PER.1→DAYS→SUN	Sunday in Period	YES/NO	PER1SUN	Yes
PER.1→DAYS→HOL	Holiday in Period	YES/NO	PER1HOL	Yes
PER.1→OCC	Occupied from	00:00	PER1_OCC	00:00
PER.1→UNC	Occupied to	00:00	PER1_UNC	24:00
Repeat for periods 2-8				
HOL.L	**LOCAL HOLIDAY SCHEDULES**			
HD.01	HOLIDAY SCHEDULE 01			
HD.01→MON	Holiday Start Month	0-12	HOL_MON1	
HD.01→DAY	Start Day	0-31	HOL_DAY1	
HD.01→LEN	Duration (Days)	0-99	HOL_LEN1	
Repeat for holidays 2-30				
DAY.S	**DAYLIGHT SAVINGS TIME**			
DS.ST	DAYLIGHT SAVINGS START			
DS.ST→ST.MN	Month	1 - 12	STARTM	4
DS.ST→ST.WK	Week	1 - 5	STARTW	1
DS.ST→ST.DY	Day	1 - 7	STARTD	7
DS.ST→MIN.A	Minutes to Add	0 - 90	MINADD	60
DS.SP	**DAYLIGHTS SAVINGS STOP**			
DS.SP→SP.MN	Month	1 - 12	STOPM	10
DS.SP→SP.WK	Week	1 - 5	STOPW	5
DS.SP→SP.DY	Day	1 - 7	STOPD	7
DS.SP→MIN.S	Minutes to Subtract	0 - 90	MINSUB	60

Daylight Savings Stop Week (***DS.SP→SP.WK***) — This is the stop week of the month for daylight savings. The week can be set from 1 to 5.

Daylight Savings Stop Day (***DS.SP→SP.DY***) — This is the stop day of the week for daylight savings. The day can be set from 1 to 7 (Sunday=1, Monday=2, etc.).

Daylight Savings Minutes To Subtract (***DS.SP→MIN.S***) — This is the amount of time that will be removed from the time clock after daylight savings ends.

TROUBLESHOOTING

The scrolling marquee display shows the actual operating conditions of the unit while it is running. If there are alarms or there have been alarms, they will be displayed in either the current alarm list or the history alarm list. The Service Test mode allows operation of the compressors, fans, and other components to be checked while the unit is not operating.

Complete Unit Stoppage — There are several conditions that can cause the unit to not provide heating or cooling. If an alarm is active which causes the unit to shut down, diagnose the problem using the information provided in the Alarms and Alerts section on page 114, but also check for the following:

- Cooling and heating loads are satisfied.
- Programmed schedule.
- General power failure.
- Tripped control circuit transformers circuit breakers.
- Tripped compressor circuit breakers.
- Unit is turned off through the CCN network.

Single Circuit Stoppage — If a single circuit stops incorrectly, there are several possible causes. The problem should be investigated using information from the alarm and alert list.

Service Analysis — Detailed service analysis can be found in Tables 82-85 and Fig. 17.

Restart Procedure — Before attempting to restart the machine, check the alarm list to determine the cause of the shutdown. If a shutdown alarm for a particular circuit has occurred, determine and correct the cause before allowing the unit to run under its own control again. When there is problem, the unit should be diagnosed in Service Test mode. The alarms must be reset before the circuit can operate in either Normal mode or Service Test mode.

Humidi-MiZer® Troubleshooting — Use the unit scrolling marquee or a CCN device to view the status display and the diagnostic display for information concerning cooling operation with the Humidi-MiZer system. Check the Current Alarms and Alarm History for for any unresolved alarm codes and correct. Verify Humidi-MiZer configuration settings are correct for the site requirements. If alarm conditions are corrected and cleared, then operation of the compressors, fans, and Humidi-MiZer valves may be verified by using the Service Test mode. See page 35. In addition to the Cooling Service

Analysis (Table 82), see the Humidi-MiZer Service Analysis (Table 83) for more information.

Thermistor Troubleshooting — The OAT, SAT, RAT, CCT, T55, T56, and T58 temperature sensors use 10K thermistors. Resistances at various temperatures are listed in Tables 86 and 87. The DTT uses an 86K thermistor. See Table 88. The RGTA uses a 5K thermistor. See Tables 89 and 90.

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

1. With the unit powered down, remove the terminal strip of the thermistor being diagnosed from the appropriate control board (MBB-J8 or RCB-J6). Connect the digital ohmmeter across the appropriate thermistor terminals in the terminal strip.
2. Using the resistance reading obtained, read the sensor temperature from the appropriate sensor table.
3. To check thermistor accuracy, measure the temperature at the thermistor location with an accurate thermocouple–type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. The temperature measured by the thermocouple and the temperature determined from the thermistor resistance reading should be within 5°F (3°C) if care was taken in applying thermocouple and taking readings.

If a more accurate check is required, unit must be powered down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) by measuring the resistance of the thermistor with the terminal strip removed from the control board. With the terminal strip plugged back into the control board and the unit powered up, compare the temperature determined from the resistance measurement with the value displayed by the control in the Temperatures menu using the scrolling marquee display.

Table 82 — Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and Fan Will Not Start.	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped. Check CB1, CB2, and CB3.	Replace fuse or reset circuit breaker.
	Disconnect off.	Power disconnect.
	Compressor time guard to prevent short cycling.	Check using *Comfort*Link scrolling marquee.
	Thermostat or occupancy schedule set point not calling for Cooling.	Check using *Comfort*Link scrolling marquee.
	Outdoor temperature too low.	Check Compressor Lockout Temperature (MC.LO) using *Comfort*Link scrolling marquee.
	Active alarm.	Check active alarms using *Comfort*Link scrolling marquee.
Compressor Cycles (Other Than Normally Satisfying Thermostat).	Insufficient line voltage.	Determine cause and correct.
	Active alarm.	Check active alarms using *Comfort*Link scrolling marquee.
Compressors Operates Continuously.	Unit undersized for load.	Decrease load or increase of size of unit.
	Thermostat or occupancy schedule set point too low.	Reset thermostat or schedule set point.
	Dirty air filters.	Replace filters.
	Low refrigerant charge.	Check pressure, locate leak, repair evacuate, and recharge.
	Condenser coil dirty or restricted.	Clean coil or remove restriction.
Excessive Head Pressures.	Loose condenser thermistors.	Tighten thermistors.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharge.	Recover excess refrigerant.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line and insulate. 2. Replace TXV (and filter drier) if stuck open or closed.
	Condenser air restricted or air short cycling.	Determine cause and correct.
	Restriction in liquid tube.	Remove restriction.
Condenser Fans Not Operating.	No Power to contactors.	Fuse blown or plug at motor loose.
Excessive Suction Pressure.	High heat load.	Check for sources and eliminate
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line and insulate. 2. Replace TXV (and filter drier) if stuck open or closed.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction Pressure Too Low.	Dirty air filters.	Replace air filters.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line and insulate. 2. Replace TXV (and filter drier) if stuck open or closed.
	Insufficient evaporator airflow.	Check belt tension. Check for other restrictions.
	Temperature too low in conditioned area (low return-air temperature).	Reset thermostat or occupancy schedule.

LEGEND

CB — Circuit Breaker
TXV — Thermostatic Expansion Valve

Table 83 — Humidi-MiZer® Service Analysis

PROBLEM	CAUSE	REMEDY
Subcooling Mode Will Not Activate	Circuit B compressors unavailable	Check alarm history for general cooling mode operation problems. See Table 82.
		Check for Circuit B compressors locked out.
	General Cooling Mode problem	See Table 82.
	Humidi-MiZer relative humidity sensor not functioning - RARH, SPRH, or field-installed RH sensor	Check that a relative humidity sensor is connected and that the appropriate sensor is configured in the unit software, (***Configuration→DEHU→D.SEN).*** See page 88.
		Check for 24VDC from CEM (RARH, SPRH).
		Check 4-20 ma signal from sensor.
	Humidi-MiZer temperature sensors not functioning - SAT, CCT	See “Thermistor Troubleshooting,” see page 99.
	No Dehumidification demand	See “No Dehumidification Demand, below.
	3-way valve malfunction	See “3-Way valve malfunction,” below.
	Unit control software is not configured for Humidi-MiZer system	Check that the unit is configured for Humidi-MiZer ***(Configuration→DEHU→D.SEL)***.
Reheat Mode Will Not Activate	Circuit B compressors unavailable	Check alarm history for general cooling mode operation problems. See Table 82.
		Check for Circuit B compressors locked out.
	Humidi-MiZer relative humidity sensor not functioning - RARH, SPRH, or field-installed RH sensor	Check that a relative humidity sensor is connected and that the appropriate sensor is configured in the unit software, ***(Configuration→DEHU→D.SEN***). See page 88.
		Check for 24 VDC from CEM (RARH, SPRH).
		Check 4-20 mA signal from sensor.
	No Dehumidification demand	See “No Dehumidification Demand,” below.
	3-way valve malfunction	See “3-Way Valve Malfunction.”
	Unit control software is not configured for Humidi-MiZer system	Check that the unit is configured for Humidi-MiZer ***(Configuration→DEHU→D.SEL)***.
No Dehumidification Demand	Relative Humidity setpoint is too low - discrete input (Humidistat, Thermidistat, etc.)	Check/reduce setting on discrete humidity input device.
	Relative Humidity setpoint is too low - RH sensor	Check the dehumidification relative humidity trip point (***Configuration→DEHU→D.RH.S)***
	Software configuration error for the type of relative humidity sensor being used	Check that the unit software is configured for the correct relative humidity sensor ***(Configuration→DEHU→D.SEN***). ***D.SEN =*** 1: RARH, 2:SPRH, 3: Discrete Input. See page 88.
	No humidity signal	Check wiring and sensor.
3-Way Valve Malfunction	No 24V signal to input terminals	Check using Service Test mode.
		Check wiring.
		Check transformer and circuit breakers.
		Check RCB relay output.
	Solenoid coil burnout	Check continuous over-voltage is less than 10%.
		Check continuous under-voltage is less than 15%.
		Check for missing coil assembly parts.
		Replace solenoid coil.
	Stuck valve	Replace valve. Replace filter drier.
Unit Initiates a Humidi-mizer Reheat Mode, but Supply Air Temperature is Overheating/ Overcooling the Space	Humid-MiZer Vent Reheat Set Point is too low	Check the Vent Reheat Set Point Selection ***(Configuration →DEHU→D.V.CF)*** and Vent Reheat Setpoint ***(Configuration →DEHU→ D.V.HT).*** If used, check the Vent Reheat RAT Offset also ***(Configuration→DEHU→D.V.RA).*** See page 88 for Humid-MiZer controls set-up.
	Evaporator discharge temperature (CCT) or Supply air temperature (SAT) thermistor is reading incorrectly.	See “Thermistor Troubleshooting,” page 99.
		Check if SAT thermistor is in a location that is measuring stratified air.
	Valve controlling gas bypass around the condenser is not functioning properly	See “Modulating Valves Not Functioning Properly.”
	Valve controlling refrigerant flow to the condenser is not functioning properly	See “Modulating Valves Not Functioning Properly.”
	Modulating valves are not calibrated properly	Run valve calibration through Service Test.
	Unit control software indicates a Humidi-MiZer Reheat Mode, but the 3-way valve is not functioning properly	See “3-Way Valve Malfunction.”
	Unit is not sized to meet the load at the current entering air and outdoor conditions.	Check product data tables or ECAT for rated capacity at current entering air and outdoor conditions.

Table 83 — Humidi-MiZer Service Analysis (cont)

PROBLEM	CAUSE	REMEDY
Unit Initiates a Humidi-MiZer Dehumidification Mode, but Supply Air Temperature is Overheating/Overcooling the Space	Supply air setpoint for cooling is too high/low	Check the unit supply air set point for cooling operation. This is the temperature that the valves will modulate to meet during a dehumidification mode.
	Evaporator discharge temperature (CCT) or supply air temperature (SAT) thermistor is reading incorrectly.	See "Thermistor Troubleshooting" on page 99.
		Check if SAT thermistor is in a location that is measuring stratified air.
	Valve controlling gas bypass around the condenser is not functioning properly	See "Modulating Valves Not Functioning Properly."
	Valve controlling refrigerant flow to the condenser is not functioning properly	See "Modulating Valves Not Functioning Properly."
	Modulating valves are not calibrated properly	See "Modulating Valves Not Functioning Properly."
	Unit control software indicates a Humidi-MiZer Reheat Mode, but the 3-way valve is not functioning properly	See "3-Way Valve Malfunction."
	Unit is not sized to meet the load at the current entering air and outdoor conditions.	Check product data tables or ECAT for rated capacity at current entering air and outdoor conditions.
Low Sensible Capacity in Normal Cooling Mode	Valve controlling gas bypass around the condenser is stuck in an open position or leaking	See "Modulating Valves Not Functioning Properly."
	Valve controlling refrigerant flow to the condenser is stuck in a position less than 100% open	See "Modulating Valves Not Functioning Properly."
	General cooling mode problem	See Table 82.
Modulating Valves Not Functioning Properly	Faulty wire connections	Check that the valve wiring is properly connected from the valve, entering the control box and at the EXV board.
	EXV board malfunction	Check alarm history for A169 (Expansion Valve Control Board Comm Failure).
	Valve is stuck open/closed	Use Service Test to manually manipulate the valve position and confirm supply air temperature changes during operation.
		Run valve calibration through Service Test.
		Check valve motor for open or short circuited windings. Shut down power to the unit and connect ohmmeter probes across the black and white terminals. Resistance should measure 75 Ohms ±10%. Next, connect ohmmeter probes across the red and green terminals. Resistance should measure 75 Ohms ±10%. The meter should not show an "open" or a "short" when a winding leg is measured. If either occurs, replace the valve.
	Valve is not calibrated properly	Run valve calibration through Service Test.

Transducer Troubleshooting — The electronic control uses 2 suction pressure transducers to measure the suction pressure of circuits A and B. The pressure/voltage characteristics of these transducers are in shown in Tables 91 and 92. The accuracy of these transducers can be verified by connecting an accurate pressure gage to the second refrigerant port in the suction line.

Forcing Inputs and Outputs — Many of variables may be forced both from the CCN and directly at the local display. This can be useful during diagnostic testing and also during operation, typically as part of an advanced third party control scheme. See Appendix A and B.

NOTE: In the case of a power reset, any force levels in effect at the time of the power reset will be cleared.

CONTROL LEVEL FORCING — If any of the following points are forced with a priority level of 7 (consult CCN literature for a description of priority levels), the software clears the force from the point if it has not been written to or forced again within the timeout periods defined below:

Temperatures→AIR.T→OAT	Outside Air Temperature	30 minutes
Temperatures→AIR.T→RAT	Return Air Temperature	3 minutes
Temperatures→AIR.T→SPT	Space Temperature	3 minutes
Inputs→RSET→SP.RS	Static Pressure Reset	30 minutes
Inputs→REL.H→OA.RH	Outside Air Relative Humidity	30 minutes
Inputs→AIR.Q→OAQ	Outside Air Quality	30 minutes

Run Status Menu — The Run Status menu provides the user important information about the unit. The Run Status table can be used to troubleshoot problems and to help determine how and why the unit is operating.

AUTO VIEW OF RUN STATUS — The Auto View of Run Status display table provides the most important unit information. The HVAC Mode (***Run Status→VIEW→ HVAC***) informs the user what HVAC mode the unit is currently in. Refer to the Modes section on page 40 for information on HVAC modes. The occupied status, unit temperatures, unit set points, and stage information can also be shown. See Table 93.

Run Status→VIEW→HVAC — Displays the current HVAC Mode(s) by name. HVAC Modes include:

OFF	VENT	HIGH HEAT
STARTING UP	HIGH COOL	FIRE SHUT DOWN
SHUTTING DOWN	LOW COOL	PRESSURIZATION
DISABLED	UNOCC FREE COOL	EVACUATION
SOFTSTOP REQUEST	TEMPERING HICOOL	SMOKE PURGE
REM SW DISABLE	TEMPERING LOCOOL	DEHUMIDIFICATION
COMP STUCK ON	TEMPERING VENT	RE-HEAT
TEST	LOW HEAT	

Run Status→VIEW→OCC — Displays the current occupancy status of the control.

Run Status→VIEW→MAT — Displays the current value for mixed-air temperature. This value is calculated based on return-air and outside-air temperatures and economizer damper position.

Table 84 — Gas Heating Service Analysis

PROBLEM	CAUSE	REMEDY
Burners Will Not Ignite.	Active alarm.	Check active alarms using *Comfort*Link scrolling marquee.
	No power to unit.	Check power supply, fuses, wiring, and circuit breakers.
	No power to IGC (Integrated Gas Control).	Check fuses and plugs.
	Heaters off due to time guard to prevent short cycling.	Check using *Comfort*Link scrolling marquee.
	Thermostat or occupancy schedule set point not calling for Cooling.	Check using *Comfort*Link scrolling marquee.
	No gas at main burners.	Check gas line for air and purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before attempting to re-light unit.
	Water in gas line.	Drain water and install drip.
Inadequate Heating.	Dirty air filters.	Replace air filters.
	Gas input too low.	Check gas pressure at manifold. Refer to gas system adjustment in this manual.
	Thermostat or occupancy schedule set point only calling for W1.	Allow time for W2 to energize.
	Unit undersized for load.	Decrease load or increase of size of unit.
	Restricted airflow.	Remove restriction.
	Too much outdoor air.	Check economizer position and configuration. Adjust minimum position using *Comfort*Link scrolling marquee.
	Limit switch cycles main burners.	Check rotation of blower, thermostat heat anticipator settings, and temperature rise of unit. Adjust as needed.
Poor Flame Characteristics.	Incomplete combustion (lack of combustion air) results in: Aldehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary.
		Cracked heat exchanger, replace.
		Unit is over-fired, reduce input. Adjust gas line or manifold pressure.
		Check vent for restriction. Clean as necessary.
		Check orifice to burner alignment.
Burners Will Not Turn Off.	Unit is in Minimum on-time.	Check using *Comfort*Link scrolling marquee.
	Unit running in Service Test Mode.	Check using *Comfort*Link scrolling marquee.

Table 85 — Electric Heat Service Analysis

PROBLEM	CAUSE	REMEDY
No Heat.	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped. Check CB1, CB2, and CB3.	Replace fuse or reset circuit breaker.
	Thermostat occupancy schedule set point not calling for Heating.	Check using *Comfort*Link scrolling marquee.
	No 24 vac at primary contactor.	Check transformer and circuit breaker.
	No power (high voltage) to L2 of primary contactor.	Check safety switches “one-shot” backup and auto limit.
	Bad electrical elements.	Power off unit and remove high voltage wires. Check resistance of heater, replace if open.

Table 86 — 10K Thermistor vs Resistance (T55, T56, T58, OAT, SAT, RAT, CCT, LAT Sensors) (F)

TEMP (F)	RESISTANCE (Ohms)
–25	196,453
–24	189,692
–23	183,300
–22	177,000
–21	171,079
–20	165,238
–19	159,717
–18	154,344
–17	149,194
–16	144,250
–15	139,443
–14	134,891
–13	130,402
–12	126,183
–11	122,018
–10	118,076
–9	114,236
–8	110,549
–7	107,006
–6	103,558
–5	100,287
–4	97,060
–3	94,020
–2	91,019
–1	88,171
0	85,396
1	82,729
2	80,162
3	77,662
4	75,286
5	72,940
6	70,727
7	68,542
8	66,465
9	64,439
10	62,491
11	60,612
12	58,781
13	57,039
14	55,319
15	53,693
16	52,086
17	50,557
18	49,065
19	47,627
20	46,240
21	44,888
22	43,598
23	42,324
24	41,118
25	39,926
26	38,790
27	37,681
28	36,610
29	35,577
30	34,569
31	33,606
32	32,654
33	31,752
34	30,860
35	30,009
36	29,177
37	28,373
38	27,597
39	26,838
40	26,113

TEMP (F)	RESISTANCE (Ohms)
41	25,396
42	24,715
43	24,042
44	23,399
45	22,770
46	22,161
47	21,573
48	20,998
49	20,447
50	19,903
51	19,386
52	18,874
53	18,384
54	17,904
55	17,441
56	16,991
57	16,552
58	16,131
59	15,714
60	15,317
61	14,925
62	14,549
63	14,180
64	13,824
65	13,478
66	13,139
67	12,814
68	12,493
69	12,187
70	11,884
71	11,593
72	11,308
73	11,031
74	10,764
75	10,501
76	10,249
77	10,000
78	9,762
79	9,526
80	9,300
81	9,078
82	8,862
83	8,653
84	8,448
85	8,251
86	8,056
87	7,869
88	7,685
89	7,507
90	7,333
91	7,165
92	6,999
93	6,838
94	6,683
95	6,530
96	6,383
97	6,238
98	6,098
99	5,961
100	5,827
101	5,698
102	5,571
103	5,449
104	5,327
105	5,210

TEMP (F)	RESISTANCE (Ohms)
106	5,095
107	4,984
108	4,876
109	4,769
110	4,666
111	4,564
112	4,467
113	4,370
114	4,277
115	4.185
116	4,096
117	4,008
118	3,923
119	3,840
120	3,759
121	3,681
122	3,603
123	3,529
124	3,455
125	3,383
126	3,313
127	3,244
128	3,178
129	3,112
130	3,049
131	2,986
132	2,926
133	2,866
134	2,809
135	2,752
136	2,697
137	2,643
138	2,590
139	2,539
140	2,488
141	2,439
142	2,391
143	2,343
144	2,297
145	2,253
146	2,209
147	2,166
148	2,124
149	2,083
150	2,043
151	2,003
152	1,966
153	1,928
154	1,891
155	1,855
156	1,820
157	1,786
158	1,752
159	1,719
160	1,687
161	1,656
162	1,625
163	1,594
164	1,565
165	1,536
166	1,508
167	1,480
168	1,453
169	1,426
170	1,400

TEMP (F)	RESISTANCE (Ohms)
171	1,375
172	1,350
173	1,326
174	1,302
175	1,278
176	1,255
177	1,233
178	1,211
179	1,190
180	1,169
181	1,148
182	1,128
183	1,108
184	1,089
185	1,070
186	1,052
187	1,033
188	1,016
189	998
190	981
191	964
192	947
193	931
194	915
195	900
196	885
197	870
198	855
199	841
200	827
201	814
202	800
203	787
204	774
205	762
206	749
207	737
208	725
209	714
210	702
211	691
212	680
213	670
214	659
215	649
216	639
217	629
218	620
219	610
220	601
221	592
222	583
223	574
224	566
225	557

Table 87 — 10K Thermistor vs Resistance (T55, T56, T58, OAT, SAT, RAT, CCT, LAT Sensor) (C)

TEMP (C)	RESISTANCE (Ohms)	TEMP (C)	RESISTANCE (Ohms)	TEMP (C)	RESISTANCE (Ohms)	TEMP (C)	RESISTANCE (Ohms)
–32	200,510	6	24,171	44	4,544	82	1,177
–31	188,340	7	23,013	45	4,370	83	1,140
–30	177,000	8	21,918	46	4,203	84	1,104
–29	166,342	9	20,883	47	4,042	85	1,070
–28	156,404	10	19,903	48	3,889	86	1,037
–27	147,134	11	18,972	49	3,743	87	1,005
–26	138,482	12	18,090	50	3,603	88	974
–25	130,402	13	17,255	51	3,469	89	944
–24	122,807	14	16,474	52	3,340	90	915
–23	115,710	15	15,714	53	3,217	91	889
–22	109,075	16	15,000	54	3,099	92	861
–21	102,868	17	14,323	55	2,986	93	836
–20	97,060	18	13,681	56	2,878	94	811
–19	91,588	19	13,071	57	2,774	95	787
–18	86,463	20	12,493	58	2,675	96	764
–17	81,662	21	11,942	59	2,579	97	742
–16	77,162	22	11,418	60	2,488	98	721
–15	72,940	23	10,921	61	2,400	99	700
–14	68,957	24	10,449	62	2,315	100	680
–13	65,219	25	10,000	63	2,235	101	661
–12	61,711	26	9,571	64	2,157	102	643
–11	58,415	27	9,164	65	2,083	103	626
–10	55,319	28	8,776	66	2,011	104	609
–9	52,392	29	8,407	67	1,943	105	592
–8	49,640	30	8,056	68	1,876	106	576
–7	47,052	31	7,720	69	1,813	107	561
–6	44,617	32	7,401	70	1,752		
–5	42,324	33	7,096	71	1,693		
–4	40,153	34	6,806	72	1,637		
–3	38,109	35	6,530	73	1,582		
–2	36,182	36	6,266	74	1,530		
–1	34,367	37	6,014	75	1,480		
0	32,654	38	5,774	76	1,431		
1	31,030	39	5,546	77	1,385		
2	29,498	40	5,327	78	1,340		
3	28,052	41	5,117	79	1,297		
4	26,686	42	4,918	80	1,255		
5	25,396	43	4,727	81	1,215		

Table 88 — 86K Thermistor vs Resistance (DTT)

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

Table 89 — 5K Thermistor vs. Resistance (RGTA) (F)

TEMP (F)	RESISTANCE (Ohms)
–25	98,010
–24	94,707
–23	91,522
–22	88,449
–21	85,486
–20	82,627
–19	79,871
–18	77,212
–17	74,648
–16	72,175
–15	69,790
–14	67,490
–13	65,272
–12	63,133
–11	61,070
–10	59,081
–9	57,162
–8	55,311
–7	53,526
–6	51,804
–5	50,143
–4	48,541
–3	46,996
–2	45,505
–1	44,066
0	42,679
1	41,339
2	40,047
3	38,800
4	37,596
5	36,435
6	35,313
7	34,231
8	33,185
9	32,176
10	31,202
11	30,260
12	29,351
13	28,473
14	27,624
15	26,804
16	26,011
17	25,245
18	24,505
19	23,789
20	23,096
21	22,427
22	21,779
23	21,153
24	20,547
25	19,960
26	19,393
27	18,843
28	18,311
29	17,796
30	17,297
31	16,814
32	16,346
33	15,892
34	15,453
35	15,027
36	14,614
37	14,214
38	13,826
39	13,449
40	13,084
41	12,730
42	12,387
43	12,053
44	11,730
45	11,416
46	11,112
47	10,816
48	10,529
49	10,250
50	9,979
51	9,717
52	9,461
53	9,213
54	8,973
55	8,739
56	8,511
57	8,291
58	8,076
59	7,686
60	7,665
61	7,468
62	7,277
63	7,091
64	6,911
65	6,735
66	6,564
67	6,399
68	6,238
69	6,081
70	5,929
71	5,781
72	5,637
73	5,497
74	5,361
75	5,229
76	5,101
77	4,976
78	4,855
79	4,737
80	4,622
81	4,511
82	4,403
83	4,298
84	4,196
85	4,096
86	4,000
87	3,906
88	3,814
89	3,726
90	3,640
91	3,556
92	3,474
93	3,395
94	3,318
95	3,243
96	3,170
97	3,099
98	3,031
99	2,964
100	2,898
101	2,835
102	2,773
103	2,713
104	2,655
105	2,597
106	2,542
107	2,488
108	2,436
109	2,385
110	2,335
111	2,286
112	2,239
113	2,192
114	2,147
115	2,103
116	2,060
117	2,018
118	1,977
119	1,937
120	1,898
121	1,860
122	1,822
123	1,786
124	1,750
125	1,715
126	1,680
127	1,647
128	1,614
129	1,582
130	1,550
131	1,519
132	1,489
133	1,459
134	1,430
135	1,401
136	1,373
137	1,345
138	1,318
139	1,291
140	1,265
141	1,240
142	1,214
143	1,190
144	1,165
145	1,141
146	1,118
147	1,095
148	1,072
149	1,050
150	1,029
151	1,007
152	986
153	965
154	945
155	925
156	906
157	887
158	868
159	850
160	832
161	815
162	798
163	782
164	765
165	750
166	734
167	719
168	705
169	690
170	677
171	663
172	650
173	638
174	626
175	614
176	602
177	591
178	581
179	570
180	561
181	551
182	542
183	533
184	524
185	516
186	508
187	501
188	494
189	487
190	480
191	473
192	467
193	461
194	456
195	450
196	445
197	439
198	434
199	429
200	424
201	419
202	415
203	410
204	405
205	401
206	396
207	391
208	386
209	382
210	377
211	372
212	367
213	361
214	356
215	350
216	344
217	338
218	332
219	325
220	318
221	311
222	304
223	297
224	289
225	282

Table 90 — 5K Thermistor vs. Resistance (RGTA) (C)

TEMP (C)	RESISTANCE (Ohms)
–32	100,260
–31	94,165
–30	88,480
–29	83,170
–28	78,125
–27	73,580
–26	69,250
–25	65,205
–24	61,420
–23	57,875
–22	54,555
–21	51,450
–20	48,536
–19	45,807
–18	43,247
–17	40,845
–16	38,592
–15	38,476
–14	34,489
–13	32,621
–12	30,866
–11	29,216
–10	27,633
–9	26,202
–8	24,827
–7	23,532
–6	22,313
–5	21,163
–4	20,079
–3	19,058
–2	18,094
–1	17,184
0	16,325
1	15,515
2	14,749
3	14,026
4	13,342
5	12,696
6	12,085
7	11,506
8	10,959
9	10,441
10	9,949
11	9,485
12	9,044
13	8,627
14	8,231
15	7,855
16	7,499
17	7,161
18	6,840
19	6,536
20	6,246
21	5,971
22	5,710
23	5,461
24	5,225
25	5,000
26	4,786
27	4,583
28	4,389
29	4,204
30	4,028
31	3,861
32	3,701
33	3,549
34	3,404
35	3,266
36	3,134
37	3,008
38	2,888
39	2,773
40	2,663
41	2,559
42	2,459
43	2,363
44	2,272
45	2,184
46	2,101
47	2,021
48	1,944
49	1,871
50	1,801
51	1,734
52	1,670
53	1,609
54	1,550
55	1,493
56	1,439
57	1,387
58	1,337
59	1,290
60	1,244
61	1,200
62	1,158
63	1,118
64	1,079
65	1,041
66	1,006
67	971
68	938
69	906
70	876
71	836
72	805
73	775
74	747
75	719
76	693
77	669
78	645
79	623
80	602
81	583
82	564
83	547
84	531
85	516
86	502
87	489
88	477
89	466
90	456
91	446
92	436
93	427
94	419
95	410
96	402
97	393
98	385
99	376
100	367
101	357
102	346
103	335
104	324
105	312
106	299
107	285

Table 91 — Suction Pressure Transducer (psig) vs. Voltage (SSP-A, SSP-B)

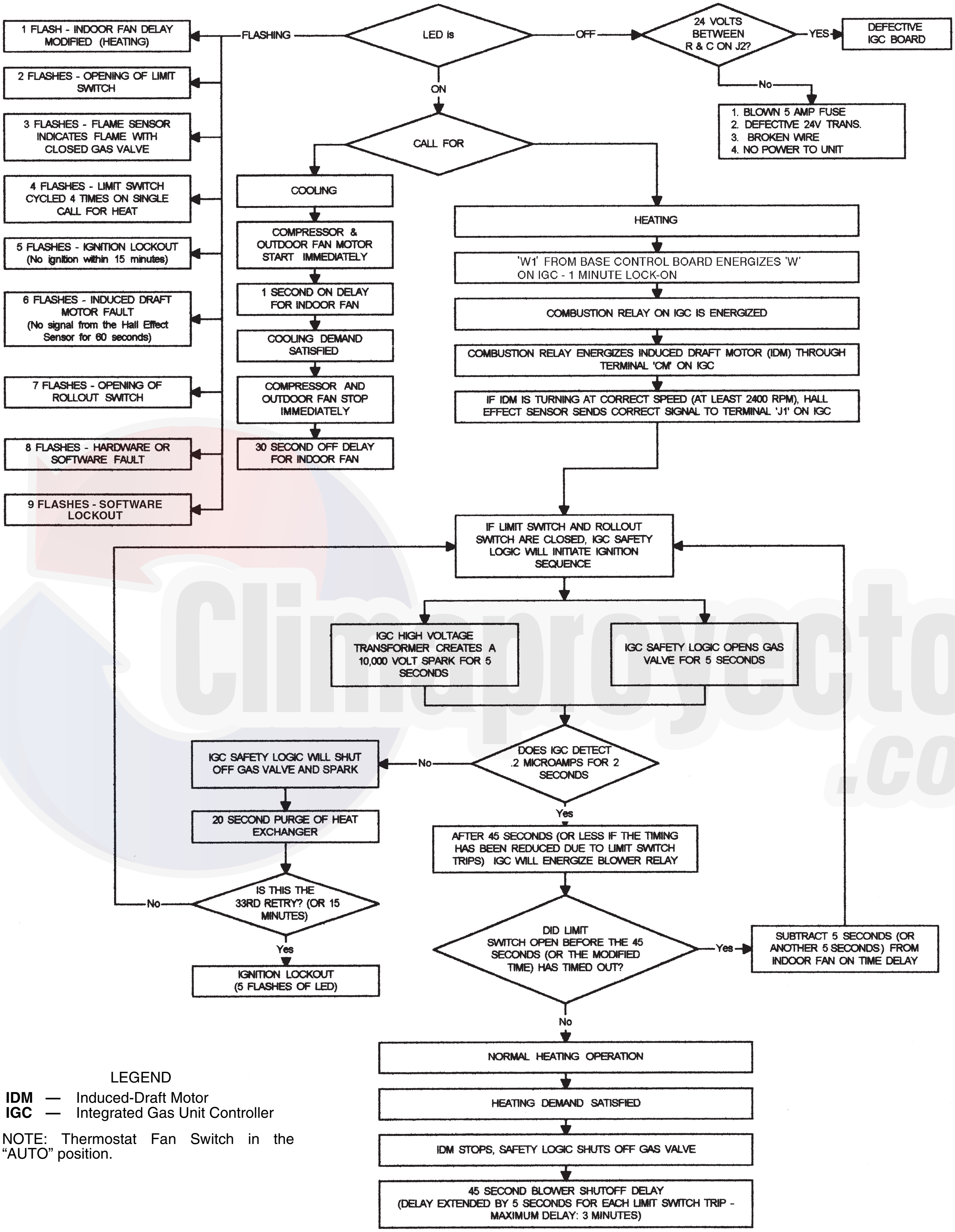
PRESSURE (PSIG)	VOLTAGE DROP (V)
0	0.466
1	0.476
2	0.486
3	0.495
4	0.505
5	0.515
6	0.525
7	0.535
8	0.545
9	0.554
10	0.564
11	0.574
12	0.584
13	0.594
14	0.604
15	0.614
16	0.623
17	0.633
18	0.643
19	0.653
20	0.663
21	0.673
22	0.682
23	0.692
24	0.702
25	0.712
26	0.722
27	0.732
28	0.741
29	0.751
30	0.761
31	0.771
32	0.781
33	0.791
34	0.801
35	0.810
36	0.820
37	0.830
38	0.840
39	0.850
40	0.860
41	0.869
42	0.879
43	0.889
44	0.899
45	0.909
46	0.919
47	0.928
48	0.938
49	0.948
50	0.958
51	0.968
52	0.978
53	0.988
54	0.997
55	1.007
56	1.017
57	1.027
58	1.037
59	1.047
60	1.056
61	1.066
62	1.076
63	1.086
64	1.096
65	1.106
66	1.116
67	1.125
68	1.135
69	1.145
70	1.155
71	1.165
72	1.175
73	1.184
74	1.194
75	1.204
76	1.214
77	1.224
78	1.234
79	1.243
80	1.253
81	1.263
82	1.273
83	1.283
84	1.293
85	1.303
86	1.312
87	1.322
88	1.332
89	1.342
90	1.352
91	1.362
92	1.371
93	1.381
94	1.391
95	1.401
96	1.411
97	1.421
98	1.430
99	1.440
100	1.450
101	1.460
102	1.470
103	1.480
104	1.490
105	1.499
106	1.509
107	1.519
108	1.529
109	1.539
110	1.549
111	1.558
112	1.568
113	1.578
114	1.588
115	1.598
116	1.608
117	1.618
118	1.627
119	1.637
120	1.647
121	1.657
122	1.667
123	1.677
124	1.686
125	1.696
126	1.706
127	1.716
128	1.726
129	1.736
130	1.745
131	1.755
132	1.765
133	1.775
134	1.785
135	1.795
136	1.805
137	1.814
138	1.824
139	1.834
140	1.844
141	1.854
142	1.864
143	1.873
144	1.883
145	1.893
146	1.903
147	1.913
148	1.923
149	1.932
150	1.942
151	1.952
152	1.962
153	1.972
154	1.982
155	1.992
156	2.001
157	2.011
158	2.021
159	2.031
160	2.041
161	2.051
162	2.060
163	2.070
164	2.080
165	2.090
166	2.100
167	2.110
168	2.120
169	2.129
170	2.139
171	2.149
172	2.159
173	2.169
174	2.179
175	2.188
176	2.198
177	2.208
178	2.218
179	2.228
180	2.238
181	2.247
182	2.257
183	2.267
184	2.277
185	2.287
186	2.297
187	2.307
188	2.316
189	2.326
190	2.336
191	2.346
192	2.356
193	2.366
194	2.375
195	2.385
196	2.395
197	2.405
198	2.415
199	2.425
200	2.434
201	2.444
202	2.454
203	2.464
204	2.474
205	2.484
206	2.494
207	2.503
208	2.513
209	2.523
210	2.533
211	2.543
212	2.553
213	2.562
214	2.572
215	2.582
216	2.592
217	2.602
218	2.612
219	2.622
220	2.631
221	2.641
222	2.651
223	2.661
224	2.671
225	2.681
226	2.690
227	2.700
228	2.710
229	2.720
230	2.730
231	2.740
232	2.749
233	2.759
234	2.769
235	2.779
236	2.789
237	2.799
238	2.809
239	2.818
240	2.828
241	2.838
242	2.848
243	2.858
244	2.868
245	2.877
246	2.887
247	2.897
248	2.907
249	2.917
250	2.927
251	2.936
252	2.946
253	2.956
254	2.966
255	2.976
256	2.986
257	2.996
258	3.005
259	3.015
260	3.025
261	3.035
262	3.045
263	3.055
264	3.064
265	3.074
266	3.084
267	3.094
268	3.104
269	3.114
270	3.124
271	3.133
272	3.143
273	3.153
274	3.163
275	3.173
276	3.183
277	3.192
278	3.202
279	3.212
280	3.222
281	3.232
282	3.242
283	3.251
284	3.261
285	3.271
286	3.281
287	3.291
288	3.301
289	3.311
290	3.320
291	3.330
292	3.340
293	3.350
294	3.360
295	3.370
296	3.379
297	3.389
298	3.399
299	3.409
300	3.419
301	3.429
302	3.438
303	3.448
304	3.458
305	3.468
306	3.478
307	3.488
308	3.498
309	3.507
310	3.517
311	3.527
312	3.537
313	3.547
314	3.557
315	3.566
316	3.576
317	3.586
318	3.596
319	3.606
320	3.616
321	3.626
322	3.635
323	3.645
324	3.655
325	3.665
326	3.675
327	3.685
328	3.694
329	3.704
330	3.714
331	3.724
332	3.734
333	3.744
334	3.753
335	3.763
336	3.773
337	3.783
338	3.793
339	3.803
340	3.813
341	3.822
342	3.832
343	3.842
344	3.852
345	3.862
346	3.872
347	3.881
348	3.891
349	3.901
350	3.911
351	3.921
352	3.931
353	3.940
354	3.950
355	3.960
356	3.970
357	3.980
358	3.990
359	4.000
360	4.009
361	4.019
362	4.029
363	4.039
364	4.049
365	4.059
366	4.068
367	4.078
368	4.088
369	4.098
370	4.108
371	4.118
372	4.128
373	4.137
374	4.147
375	4.157
376	4.167
377	4.177
378	4.187
379	4.196
380	4.206
381	4.216
382	4.226
383	4.236
384	4.246
385	4.255
386	4.265
387	4.275
388	4.285
389	4.295
390	4.305
391	4.315
392	4.324
393	4.334
394	4.344
395	4.354
396	4.364
397	4.374
398	4.383
399	4.393
400	4.403
401	4.413
402	4.423
403	4.433
404	4.442
405	4.452
406	4.462
407	4.472
408	4.482
409	4.492
410	4.502
411	4.511
412	4.521
413	4.531
414	4.541
415	4.551
416	4.561
417	4.570
418	4.580
419	4.590
420	4.600

Table 92 — Discharge Pressure Transducer (psig) vs. Voltage

PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)
14.5	0.500	**95**	0.993	**176**	1.490	**257**	1.987
16	0.509	**96**	1.000	**177**	1.496	**258**	1.993
17	0.515	**97**	1.006	**178**	1.502	**259**	1.999
18	0.521	**98**	1.012	**179**	1.508	**260**	2.005
19	0.528	**99**	1.018	**180**	1.515	**261**	2.011
20	0.534	**100**	1.024	**181**	1.521	**262**	2.017
21	0.540	**101**	1.030	**182**	1.527	**263**	2.023
22	0.546	**102**	1.036	**183**	1.533	**264**	2.029
23	0.552	**103**	1.043	**184**	1.539	**265**	2.036
24	0.558	**104**	1.049	**185**	1.545	**266**	2.042
25	0.564	**105**	1.055	**186**	1.551	**267**	2.048
26	0.570	**106**	1.061	**187**	1.557	**268**	2.054
27	0.577	**107**	1.067	**188**	1.564	**269**	2.060
28	0.583	**108**	1.073	**189**	1.570	**270**	2.066
29	0.589	**109**	1.079	**190**	1.576	**271**	2.072
30	0.595	**110**	1.085	**191**	1.582	**272**	2.079
31	0.601	**111**	1.092	**192**	1.588	**273**	2.085
32	0.607	**112**	1.098	**193**	1.594	**274**	2.091
33	0.613	**113**	1.104	**194**	1.600	**275**	2.097
34	0.620	**114**	1.110	**195**	1.606	**276**	2.103
35	0.626	**115**	1.116	**196**	1.613	**277**	2.109
35	0.626	**116**	1.122	**197**	1.619	**278**	2.115
36	0.632	**117**	1.128	**198**	1.625	**279**	2.121
37	0.638	**118**	1.134	**199**	1.631	**280**	2.128
38	0.644	**119**	1.141	**200**	1.637	**281**	2.134
39	0.650	**120**	1.147	**201**	1.643	**282**	2.140
40	0.656	**121**	1.153	**202**	1.649	**283**	2.146
41	0.662	**122**	1.159	**203**	1.656	**284**	2.152
42	0.669	**123**	1.165	**204**	1.662	**285**	2.158
43	0.675	**124**	1.171	**205**	1.668	**286**	2.164
44	0.681	**125**	1.177	**206**	1.674	**287**	2.170
45	0.687	**126**	1.184	**207**	1.680	**288**	2.177
46	0.693	**127**	1.190	**208**	1.686	**289**	2.183
47	0.699	**128**	1.196	**209**	1.692	**290**	2.189
48	0.705	**129**	1.202	**210**	1.698	**291**	2.195
49	0.711	**130**	1.208	**211**	1.705	**292**	2.201
50	0.718	**131**	1.214	**212**	1.711	**293**	2.207
51	0.724	**132**	1.220	**213**	1.717	**294**	2.213
52	0.730	**133**	1.226	**214**	1.723	**295**	2.220
53	0.736	**134**	1.233	**215**	1.729	**296**	2.226
54	0.742	**135**	1.239	**216**	1.735	**297**	2.232
55	0.748	**136**	1.245	**217**	1.741	**298**	2.238
56	0.754	**137**	1.251	**218**	1.747	**299**	2.244
57	0.761	**138**	1.257	**219**	1.754	**300**	2.250
58	0.767	**139**	1.263	**220**	1.760	**301**	2.256
59	0.773	**140**	1.269	**221**	1.766	**302**	2.262
60	0.779	**141**	1.275	**222**	1.772	**303**	2.269
61	0.785	**142**	1.282	**223**	1.778	**304**	2.275
62	0.791	**143**	1.288	**224**	1.784	**305**	2.281
63	0.797	**144**	1.294	**225**	1.790	**306**	2.287
64	0.803	**145**	1.300	**226**	1.797	**307**	2.293
65	0.810	**146**	1.306	**227**	1.803	**308**	2.299
66	0.816	**147**	1.312	**228**	1.809	**309**	2.305
67	0.822	**148**	1.318	**229**	1.815	**310**	2.311
68	0.828	**149**	1.325	**230**	1.821	**311**	2.318
69	0.834	**150**	1.331	**231**	1.827	**312**	2.324
70	0.840	**151**	1.337	**232**	1.833	**313**	2.330
71	0.846	**152**	1.343	**233**	1.839	**314**	2.336
72	0.852	**153**	1.349	**234**	1.846	**315**	2.342
73	0.859	**154**	1.355	**235**	1.852	**316**	2.348
74	0.865	**155**	1.361	**236**	1.858	**317**	2.354
75	0.871	**156**	1.367	**237**	1.864	**318**	2.361
76	0.877	**157**	1.374	**238**	1.870	**319**	2.367
77	0.883	**158**	1.380	**239**	1.876	**320**	2.373
78	0.889	**159**	1.386	**240**	1.882	**321**	2.379
79	0.895	**160**	1.392	**241**	1.888	**322**	2.385
80	0.902	**161**	1.398	**242**	1.895	**323**	2.391
81	0.908	**162**	1.404	**243**	1.901	**324**	2.397
82	0.914	**163**	1.410	**244**	1.907	**325**	2.403
83	0.920	**164**	1.416	**245**	1.913	**326**	2.410
84	0.926	**165**	1.423	**246**	1.919	**327**	2.416
85	0.932	**166**	1.429	**247**	1.925	**328**	2.422
86	0.938	**167**	1.435	**248**	1.931	**329**	2.428
87	0.944	**168**	1.441	**249**	1.938	**330**	2.434
88	0.951	**169**	1.447	**250**	1.944	**331**	2.440
89	0.957	**170**	1.453	**251**	1.950	**332**	2.446
90	0.963	**171**	1.459	**252**	1.956	**333**	2.452
91	0.969	**172**	1.466	**253**	1.962	**334**	2.459
92	0.975	**173**	1.472	**254**	1.968	**335**	2.465
93	0.981	**174**	1.478	**255**	1.974	**336**	2.471
94	0.987	**175**	1.484	**256**	1.980	**337**	2.477

Table 92 — Discharge Pressure Transducer (psig) vs. Voltage (cont)

PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)
338	2.483	**421**	2.992	**504**	3.501	**587**	4.010
339	2.489	**422**	2.998	**505**	3.507	**588**	4.016
340	2.495	**423**	3.004	**506**	3.513	**589**	4.022
341	2.502	**424**	3.010	**507**	3.519	**590**	4.028
342	2.508	**425**	3.016	**508**	3.525	**591**	4.034
343	2.514	**426**	3.023	**509**	3.531	**592**	4.040
344	2.520	**427**	3.029	**510**	3.538	**593**	4.046
345	2.526	**428**	3.035	**511**	3.544	**594**	4.052
346	2.532	**429**	3.041	**512**	3.550	**595**	4.059
347	2.538	**430**	3.047	**513**	3.556	**596**	4.065
348	2.544	**431**	3.053	**514**	3.562	**597**	4.071
349	2.551	**432**	3.059	**515**	3.568	**598**	4.077
350	2.557	**433**	3.066	**516**	3.574	**599**	4.083
351	2.563	**434**	3.072	**517**	3.580	**600**	4.089
352	2.569	**435**	3.078	**518**	3.587	**601**	4.095
353	2.575	**436**	3.084	**519**	3.593	**602**	4.102
354	2.581	**437**	3.090	**520**	3.599	**603**	4.108
355	2.587	**438**	3.096	**521**	3.605	**604**	4.114
356	2.593	**439**	3.102	**522**	3.611	**605**	4.120
357	2.600	**440**	3.108	**523**	3.617	**606**	4.126
358	2.606	**441**	3.115	**524**	3.623	**607**	4.132
359	2.612	**442**	3.121	**525**	3.629	**608**	4.138
360	2.618	**443**	3.127	**526**	3.636	**609**	4.144
361	2.624	**444**	3.133	**527**	3.642	**610**	4.151
362	2.630	**445**	3.139	**528**	3.648	**611**	4.157
363	2.636	**446**	3.145	**529**	3.654	**612**	4.163
364	2.643	**447**	3.151	**530**	3.660	**613**	4.169
365	2.649	**448**	3.157	**531**	3.666	**614**	4.175
366	2.655	**449**	3.164	**532**	3.672	**615**	4.181
367	2.661	**450**	3.170	**533**	3.679	**616**	4.187
368	2.667	**451**	3.176	**534**	3.685	**617**	4.193
369	2.673	**452**	3.182	**535**	3.691	**618**	4.200
370	2.679	**453**	3.188	**536**	3.697	**619**	4.206
371	2.685	**454**	3.194	**537**	3.703	**620**	4.212
372	2.692	**455**	3.200	**538**	3.709	**621**	4.218
373	2.698	**456**	3.206	**539**	3.715	**622**	4.224
374	2.704	**457**	3.213	**540**	3.721	**623**	4.230
375	2.710	**458**	3.219	**541**	3.728	**624**	4.236
376	2.716	**459**	3.225	**542**	3.734	**625**	4.243
377	2.722	**460**	3.231	**543**	3.740	**626**	4.249
378	2.728	**461**	3.237	**544**	3.746	**627**	4.255
379	2.734	**462**	3.243	**545**	3.752	**628**	4.261
380	2.741	**463**	3.249	**546**	3.758	**629**	4.267
381	2.747	**464**	3.256	**547**	3.764	**630**	4.273
382	2.753	**465**	3.262	**548**	3.770	**631**	4.279
383	2.759	**466**	3.268	**549**	3.777	**632**	4.285
384	2.765	**467**	3.274	**550**	3.783	**633**	4.292
385	2.771	**468**	3.280	**551**	3.789	**634**	4.298
386	2.777	**469**	3.286	**552**	3.795	**635**	4.304
387	2.784	**470**	3.292	**553**	3.801	**636**	4.310
388	2.790	**471**	3.298	**554**	3.807	**637**	4.316
389	2.796	**472**	3.305	**555**	3.813	**638**	4.322
390	2.802	**473**	3.311	**556**	3.820	**639**	4.328
391	2.808	**474**	3.317	**557**	3.826	**640**	4.334
392	2.814	**475**	3.323	**558**	3.832	**641**	4.341
393	2.820	**476**	3.329	**559**	3.838	**642**	4.347
394	2.826	**477**	3.335	**560**	3.844	**643**	4.353
395	2.833	**478**	3.341	**561**	3.850	**644**	4.359
396	2.839	**479**	3.347	**562**	3.856	**645**	4.365
397	2.845	**480**	3.354	**563**	3.862	**646**	4.371
398	2.851	**481**	3.360	**564**	3.869	**647**	4.377
399	2.857	**482**	3.366	**565**	3.875	**648**	4.384
400	2.863	**483**	3.372	**566**	3.881	**649**	4.390
401	2.869	**484**	3.378	**567**	3.887	**650**	4.396
402	2.875	**485**	3.384	**568**	3.893	**651**	4.402
403	2.882	**486**	3.390	**569**	3.899	**652**	4.408
404	2.888	**487**	3.397	**570**	3.905	**653**	4.414
405	2.894	**488**	3.403	**571**	3.911	**654**	4.420
406	2.900	**489**	3.409	**572**	3.918	**655**	4.426
407	2.906	**490**	3.415	**573**	3.924	**656**	4.433
408	2.912	**491**	3.421	**574**	3.930	**657**	4.439
409	2.918	**492**	3.427	**575**	3.936	**658**	4.445
410	2.925	**493**	3.433	**576**	3.942	**659**	4.451
411	2.931	**494**	3.439	**577**	3.948	**660**	4.457
412	2.937	**495**	3.446	**578**	3.954	**661**	4.463
413	2.943	**496**	3.452	**579**	3.961	**662**	4.469
414	2.949	**497**	3.458	**580**	3.967	**663**	4.475
415	2.955	**498**	3.464	**581**	3.973	**664**	4.482
416	2.961	**499**	3.470	**582**	3.979	**665**	4.488
417	2.967	**500**	3.476	**583**	3.985	**666**	4.494
418	2.974	**501**	3.482	**584**	3.991	**667**	4.500
419	2.980	**502**	3.488	**585**	3.997		
420	2.986	**503**	3.495	**586**	4.003		



LEGEND

IDM — Induced-Draft Motor
IGC — Integrated Gas Unit Controller

NOTE: Thermostat Fan Switch in the "AUTO" position.

Fig. 17 — IGC Service Analysis Logic

Table 93 — Auto View of Run Status Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
VIEW	AUTO VIEW OF RUN STATUS				
HVAC	ascii string spelling out the hvac modes			string	
OCC	Occupied ?	YES/NO		OCCUPIED	forcible
MAT	Mixed Air Temperature		dF	MAT	
EDT	Evaporator Discharge Tmp		dF	EDT	
LAT	Leaving Air Temperature		dF	LAT	
EC.C.P	Economizer Control Point		dF	ECONCPNT	
ECN.P	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS	
EC2.P	Economzr2 Act.Curr.Pos.	0-100	%	ECON2POS	
CL.C.P	Cooling Control Point		dF	COOLCPNT	
C.CAP	Current Running Capacity			CAPTOTAL	
CL.ST	Requested Cool Stage			CL_STAGE	
HT.C.P	Heating Control Point		dF	HEATCPNT	
HT.ST	Requested Heat Stage			HT_STAGE	
H.MAX	Maximum Heat Stages			HTMAXSTG	

Run Status→VIEW→EDT — Displays the current evaporator discharge air temperature during Cooling modes. This value is read at the supply air thermistor location (or at cooling coil thermistor array if unit is equipped with hydronic heating coil).

Run Status→VIEW→LAT — Displays the current leaving-air temperature during Vent and Hydronic Heating modes. This value is read at the supply air thermistor location.

Run Status→VIEW→EC.C.P — Displays the current economizer control point value (a target value for air temperature leaving the evaporator coil location).

Run Status→VIEW→ECN.P — Displays the current actual economizer position (in percentage open).

Run Status→VIEW→EC2.P — Displays the current position of actuator no. 2 (in percentage open).

Run Status→VIEW→CL.C.P — Displays the current cooling control point (a target value for air temperature leaving the evaporator coil location).

Run Status→VIEW→C.CAP — Displays the current amount of unit cooling capacity (in percent of maximum). Compare to staging tables in Appendix C.

Run Status→VIEW→CL.ST — Displays the current number of requested cooling stages. Compare to staging tables in Appendix C and to ***C.CAP*** above.

Run Status→VIEW→HT.C.P — Displays the current heating control point, for use with staged gas or modulating gas control option only (a target value for air temperature leaving the supply duct).

Run Status→VIEW→HT.ST — Displays the current number of heating stages active (for staged gas control option only). Compare to following point.

Run Status→VIEW→H.MAX — Displays the maximum number of heat stages available for this model.

ECONOMIZER RUN STATUS — The Economizer Run Status display table provides information about the economizer and can be used to troubleshoot economizer problems. See Table 94. The current position, commanded position, and whether the economizer is active can be displayed. All the disabling conditions for the economizer and outside air information is also displayed.

COOLING INFORMATION — The Cooling Information run status display table provides information on the cooling operation and the Humidi-MiZer® operation of the unit. See Table 95.

Current Running Capacity (***C.CAP***) — This variable represents the amount of capacity currently running as a percent.

Current Cool Stage (***CUR.S***) — This variable represents the cool stage currently running.

Requested Cool Stage (***REQ.S***) — This variable represents the requested cool stage. Cooling relay timeguards in place may prevent the requested cool stage from matching the current cool stage.

Maximum Cool Stages (***MAX.S***) — This variable is the maximum number of cooling stages the control is configured for and capable of controlling.

Active Demand Limit (***DEM.L***) — If demand limit is active, this variable will represent the amount of capacity that the control is currently limited to.

Capacity Load Factor (***SMZ***) — This factor builds up or down over time (–100 to +100) and is used as the means of adding or subtracting a cooling stage during run time. It is a normalized representation of the relationship between "Sum" and "Z". See the SUMZ Cooling Algorithm section on page 50.

Next Stage EDT Decrease (***ADD.R***) — This variable represents (if adding a stage of cooling) how much the temperature should drop in degrees depending on the ***R.PCT*** calculation and how much additional capacity is to be added.

ADD.R = ***R.PCT*** * ***(C.CAP*** – capacity after adding a cooling stage)

For example: If ***R.PCT*** = 0.2 and the control would be adding 20% cooling capacity by taking the next step up, 0.2 times 20 = 4 F ***ADD.R***

Next Stage EDT Increase (***SUB.R***) — This variable represents (if subtracting a stage of cooling) how much the temperature should rise in degrees depending on the ***R.PCT*** calculation and how much capacity is to be subtracted.

SUB.R = ***R.PCT*** * (***C.CAP*** – capacity after subtracting a cooling stage)

For Example: If ***R.PCT*** = 0.2 and the control would be subtracting 30% capacity by taking the next step down, 0.2 times –30 = –6 F ***SUB.R***.

Rise Per Percent Capacity (***R.PCT***) — This is a real time calculation that represents the amount of degrees of drop/rise across the evaporator coil versus percent of current running capacity.

R.PCT = (***MAT*** – ***EDT***)/***C.CAP***

Cap Deadband Subtracting (***Y.MIN***) — This is a control variable used for Low Temp Override (***L.TMP***) and Slow Change Override (***SLOW***).

Y.MIN = –***SUB.R****0.4375

Cap Deadband Adding (***Y.PLU***) — This is a control variable used for High Temp Override (***H.TMP***) and Slow Change Override (***SLOW***).

Y.PLU = –***ADD.R****0.4375

Cap Threshold Subtracting (***Z.MIN***) — This parameter is used in the calculation of *SMZ* and is calculated as follows:

Z.MIN = ***Configuration→COOL→Z.GN*** * (–10 + (4* (–***SUB.R***))) * 0.6

Table 94 — Economizer Run Status Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
ECON	ECONOMIZER RUN STATUS				
ECN.P	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS	
EC2.P	Economzr2 Act.Curr.Pos.	0-100	%	ECON2POS	
ECN.C	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
ACTV	Economizer Active ?	YES/NO		ECACTIVE	
DISA	ECON DISABLING CONDITIONS				
UNV.1	Econ Act. Unavailable?	YES/NO		ECONUNAV	
UNV.2	Econ2 Act. Unavailable?	YES/NO		ECN2UNAV	
ENTH	Enth. Switch Read High ?	YES/NO		ENTH	
DBC	DBC - OAT Lockout?	YES/NO		DBC_STAT	
DEW	DEW - OA Dewpt.Lockout?	YES/NO		DEW_STAT	
DDBC	DDBD- OAT > RAT Lockout?	YES/NO		DDBCSTAT	
OAEC	OAEC- OA Enth Lockout?	YES/NO		OAECSTAT	
DEC	DEC - Diff.Enth.Lockout?	YES/NO		DEC_STAT	
EDT	EDT Sensor Bad?	YES/NO		EDT_STAT	
OAT	OAT Sensor Bad ?	YES/NO		OAT_STAT	
FORC	Economizer Forced ?	YES/NO		ECONFORC	
SFON	Supply Fan Not On 30s ?	YES/NO		SFONSTAT	
CLOF	Cool Mode Not In Effect?	YES/NO		COOL_OFF	
OAQL	OAQ Lockout in Effect ?	YES/NO		OAQLOCKD	
HELD	Econ Recovery Hold Off?	YES/NO		ECONHELD	
DH.DS	Dehumid. Disabled Econ.?	YES/NO		DHDISABL	
O.AIR	OUTSIDE AIR INFORMATION				
OAT	Outside Air Temperature		dF	OAT	forcible
OA.RH	Outside Air Rel. Humidity		%	OARH	forcible
OA.E	Outside Air Enthalpy			OAE	
OA.D.T	OutsideAir Dewpoint Temp		dF	OADEWTMP	

Table 95 — Cooling Information Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
COOL	COOLING INFORMATION				
C.CAP	Current Running Capacity		%	CAPTOTAL	
CUR.S	Current Cool Stage			COOL_STG	
REQ.S	Requested Cool Stage			CL_STAGE	
MAX.S	Maximum Cool Stages			CLMAXSTG	
DEM.L	Active Demand Limit		%	DEM_LIM	forcible
SUMZ	COOL CAP. STAGE CONTROL				
SMZ	Capacity Load Factor	-100 → +100		SMZ	
ADD.R	Next Stage EDT Decrease		^F	ADDRISE	
SUB.R	Next Stage EDT Increase		^F	SUBRISE	
R.PCT	Rise Per Percent Capacity			RISE_PCT	
Y.MIN	Cap Deadband Subtracting			Y_MINUS	
Y.PLU	Cap Deadband Adding			Y_PLUS	
Z.MIN	Cap Threshold Subtracting			Z_MINUS	
Z.PLU	Cap Threshold Adding			Z_PLUS	
H.TMP	High Temp Cap Override			HI_TEMP	
L.TMP	Low Temp Cap Override			LOW_TEMP	
PULL	Pull Down Cap Override			PULLDOWN	
SLOW	Slow Change Cap Override			SLO_CHNG	
HMZR	HUMIDIMIZER				
CAPC	Humidimizer Capacity			HMZRCAPC	
C.EXV	Condenser EXV Position			COND_EXV	
B.EXV	Bypass EXV Position			BYP_EXV	
RHV	Humidimizer 3-Way Valve			HUM3WVAL	
C.CPT	Cooling Control Point			COOLCPNT	
EDT	Evaporator Discharge Tmp			EDT	
H.CPT	Heating Control Point			HEATCPNT	
LAT	Leaving Air Temperature			LAT	

Cap Threshold Adding (***Z.PLU***) — This parameter is used in the calculation of SMZ and is calculated as follows:

Z.PLU = ***Configuration→COOL→Z.GN*** * (10 + (4* (–***ADD.R***))) * 0.6

High Temp Cap Override (***H.TMP***) — If stages of mechanical cooling are on and the error is greater than twice ***Y.PLU***, and the rate of change of error is greater than 0.5°F, then a stage of mechanical cooling will be added every 30 seconds. This override is intended to react to situations where the load rapidly increases.

Low Temp Cap Override (***L.TMP***) — If the error is less than twice ***Y.MIN***, and the rate of change of error is less than –0.5°F, then a mechanical stage will be removed every 30 seconds. This override is intended to quickly react to situations where the load is rapidly reduced.

Pull Down Cap Override (***PULL***) — If the error from set point is above 4°F, and the rate of change is less than –1°F per minute, then pulldown is in effect, and "SUM" is set to 0. This keeps mechanical cooling stages from being added when the error is very large, but there is no load in the space. Pulldown for units is expected to rarely occur, but is included for the rare situation when it is needed. Most likely pulldown will occur when mechanical cooling first becomes available shortly after the control goes into an occupied mode (after a warm unoccupied mode).

Slow Change Cap Override (***SLOW***) — With a rooftop unit, the design rise at 100% total unit capacity is generally around 30°F. For a unit with 4 stages, each stage represents about 7.5°F of change to EDT. If stages could reliably be cycled at very fast rates, the set point could be maintained very precisely. Since it is not desirable to cycle compressors more than 6 cycles per hour, slow change override takes care of keeping the PID under control when "relatively" close to set point.

VFD INFORMATION DISPLAY TABLE — The VFD information display table provides information on the supply fan VFD and exhaust fan VFD. See Table 96.

MODE TRIP HELPER — The Mode Trip Helper table provides information on the unit modes and when the modes start and stop. See Table 97. This information can be used to help determine why the unit is in the current mode.

CCN/LINKAGE DISPLAY TABLE — The CCN/Linkage display table provides information on unit linkage. See Table 98.

COMPRESSOR RUN HOURS DISPLAY TABLE — The Compressor Run Hours Display Table displays the number of run time hours for each compressor. See Table 99.

COMPRESSOR STARTS DISPLAY TABLE — The Compressor Starts Display Table displays the number of starts for each compressor. See Table 100.

SOFTWARE VERSION NUMBERS DISPLAY TABLE — The Software Version Numbers Display Table displays the software version numbers of the unit boards and devices. See Table 101.

Table 96 — VFD Information Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
VFDS	VFD INFORMATION				
S.VFD	SUPPLY FAN VFD (VFD 1)				
SPD	VFD1 Actual Speed %			VFD1_SPD	
RPM	VFD1 Actual Motor RPM			VFD1RPM	
FREQ	VFD1 Actual Motor Freq			VFD1FREQ	
AMPS	VFD1 Actual Motor Amps			VFD1AMPS	
TORQ	VFD1 Actual Motor Torque			VFD1TORQ	
PWR	VFD1 Actual Motor Power			VFD1PWR	
VDC	VFD1 DC Bus Voltage			VFD1VDC	
V.OUT	VFD1 Output Voltage			VFD1VOUT	
TEMP	VFD1 Transistor Temp (C)			VFD1TEMP	
RUN.T	VFD1 Cumulative Run Time			VFD1RUNT	
KWH	VFD1 Cumulative kWh			VFD1KWH	
LFC	VFD1 Last Fault Code			VFD1LFC	
E.VFD	EXHAUST FAN VFD (VFD 2)				
SPD	VFD2 Actual Speed %			VFD2_SPD	
RPM	VFD2 Actual Motor RPM			VFD2RPM	
FREQ	VFD2 Actual Motor Freq			VFD2FREQ	
AMPS	VFD2 Actual Motor Amps			VFD2AMPS	
TORQ	VFD2 Actual Motor Torque			VFD2TORQ	
PWR	VFD2 Actual Motor Power			VFD2PWR	
VDC	VFD2 DC Bus Voltage			VFD2VDC	
V.OUT	VFD2 Output Voltage			VFD2VOUT	
TEMP	VFD2 Transistor Temp (C)			VFD2TEMP	
RUN.T	VFD2 Cumulative Run Time			VFD2RUNT	
KWH	VFD2 Cumulative kWh			VFD2KWH	
LFC	VFD2 Last Fault Code			VFD2LFC	

Table 97 — Mode Trip Helper Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
TRIP	MODE TRIP HELPER				
UN.C.S	Unoccup. Cool Mode Start			UCCLSTRT	
UN.C.E	Unoccup. Cool Mode End			UCCL_END	
OC.C.S	Occupied Cool Mode Start			OCCLSTRT	
OC.C.E	Occupied Cool Mode End			OCCL_END	
TEMP	Ctl.Temp RAT,SPT or Zone			CTRLTEMP	
OC.H.E	Occupied Heat Mode End			OCHT_END	
OC.H.S	Occupied Heat Mode Start			OCHTSTRT	
UN.H.E	Unoccup. Heat Mode End			UCHT_END	
UN.H.S	Unoccup. Heat Mode Start			UCHTSTRT	
HVAC	ascii string spelling out the hvac modes			string	

Table 98 — CCN/Linkage Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
LINK	CCN - LINKAGE				
MODE	Linkage Active - CCN	ON/OFF		MODELINK	
L.Z.T	Linkage Zone Control Tmp		dF	LZT	
L.C.SP	Linkage Curr. Cool Setpt		dF	LCSP	
L.H.SP	Linkage Curr. Heat Setpt		dF	LHSP	

Table 99 — Compressor Run Hours Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
HRS	COMPRESSOR RUN HOURS				
HR.A1	Compressor A1 Run Hours	0-999999	HRS	HOURS_A1	config
HR.A2	Compressor A2 Run Hours	0-999999	HRS	HOURS_A2	config
HR.A3	Compressor A3 Run Hours	0-999999	HRS	HOURS_A3	config
HR.B1	Compressor B1 Run Hours	0-999999	HRS	HOURS_B1	config
HR.B2	Compressor B2 Run Hours	0-999999	HRS	HOURS_B2	config
HR.B3	Compressor B3 Run Hours	0-999999	HRS	HOURS_B3	config

Table 100 — Compressor Starts Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
STRT	COMPRESSOR STARTS				
ST.A1	Compressor A1 Starts	0-999999		CY_A1	config
ST.A2	Compressor A2 Starts	0-999999		CY_A2	config
ST.A3	Compressor A3 Starts	0-999999		CY_A3	config
ST.B1	Compressor B1 Starts	0-999999		CY_B1	config
ST.B2	Compressor B2 Starts	0-999999		CY_B2	config
ST.B3	Compressor B3 Starts	0-999999		CY_B3	config

Table 101 — Software Version Numbers Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
VERS	SOFTWARE VERSION NUMBERS				
MBB	CESR131461-xx-xx			string	
RXB	CESR131465-xx-xx			string	
EXB	CESR131465-xx-xx			string	
CEM	CESR131174-xx-xx			string	
CXB	CESR131173-xx-xx			string	
SCB	CESR131226-xx-xx			string	
VFD1	VERSION-313D			string	
VFD2	VERSION-313D			string	
MARQ	CESR131171-xx-xx			string	
NAVI	CESR130227-xx-xx			string	

Alarms and Alerts — There are a variety of different alerts and alarms in the system.

P — Pre-Alert: Part of the unit is temporarily down. The alarm is not broadcast on the CCN network. The alarm relay is not energized. After an allowable number of retries, if the function does not recover, the pre-alert will be upgraded to an alert or an alarm.

T — Alert: Part of the unit is down, but the unit is still partially able to provide cooling or heating.

A — Alarm: The unit is down and is unable to provide cooling or heating.

All alarms are displayed with a code of AXXX where the A is the category of alarm (Pre-Alert, Alert, or Alarm) and XXX is the number.

The response of the control system to various alerts and alarms depends on the seriousness of the particular alert or alarm. In the mildest case, an alert does not affect the operation of the unit in any manner. An alert can also cause a “strike.” A “striking” alert will cause the circuit to shut down for 15 minutes. This feature reduces the likelihood of false alarms causing a properly working system to be shut down incorrectly. If three strikes occur before the circuit has an opportunity to show that it can function properly, the circuit will strike out, causing the shutdown alarm for that particular circuit. Once activated, the shutdown alarm can only be cleared via an alarm reset.

Circuits with strikes are given an opportunity to reset their strike counter to zero. As discussed above, a strike typically causes the circuit to shut down. Fifteen minutes later, that circuit will once again be allowed to run. If the circuit is able to run for 1 minute, its replacement circuit will be allowed to shut down (if not required to run to satisfy requested stages). However, the "troubled" circuit must run continuously for 5 minutes with no detectable problems before the strike counter is reset to zero.

In addition, the compressors have several diagnostics monitoring the safety of the system which may cause a number of attempts to be re-tried before locking out the system from operation. This feature reduces the likelihood of false alarms causing a properly working system to be shut down incorrectly.

For the compressor and circuit diagnostics, some of these alerts/alarms will not broadcast an initial failure to the CCN network until all attempts to recover have occurred and failed. These alerts will be accessible in the alarm history of the control (***Alarms→HIST***).

All the alarms and alerts are summarized in Table 102.

DIAGNOSTIC ALARM CODES AND POSSIBLE CAUSES

T048 (Ckt A, Oil Return Not Reliable with Only One Comp Available)
T049 (Ckt B, Oil Return Not Reliable with Only One Comp Available) — Alert codes T048 and T049 are for circuits A and B respectively and are active for size 090 and 100 units only. Size 090 and 100 units have 3 compressors per circuit. If load conditions are such that only one compressor is running on a circuit, a second compressor is periodically turned on to equalize compressor oil levels. If a second compressor is unavailable for oil return, the circuit will be shut down, and an alert will be generated. The alert will automatically clear, and the circuit will restart when a second compressor becomes available.

T051 (Circuit A, Compressor 1 Failure)
T052 (Circuit A, Compressor 2 Failure)
T053 (Circuit A, Compressor 3 Failure)
T054 (Circuit B, Compressor 1 Failure)
T055 (Circuit B, Compressor 2 Failure)
T056 (Circuit B, Compressor 3 Failure) — If the current sensor board reads OFF while the compressor relay has been commanded ON for a period of 4 continuous seconds, an alert is generated.

Any time this alert occurs, a strike will be logged on the affected compressor. If three successive strikes occur the compressor will be locked out requiring a manual reset or power reset of the unit.

The clearing of strikes during compressor operation is a combination of 3 complete cycles or 15 continuous minutes of run time operation. So, if there are one or two strikes on the compressor and three short cycles (ON-OFF, ON-OFF, ON-OFF) occur in less than 15 minutes, the strikes will be reset to zero for the affected compressor. Also, if the compressor turns on and runs for 15 minutes straight with no compressor failure, the compressor's strikes are cleared as well.

NOTE: Until the compressor is locked out, for the first two strikes, the alert will not be broadcast to the network, nor will the alarm relay be closed.

The possible causes are:

- High pressure switch open. The high pressure switch for each circuit is wired in series with the compressor contactor coils of each compressor on the circuit to disable compressor operation immediately upon a high discharge pressure condition. If the high pressure switch opens while the MBB or CXB is commanding the compressor ON, the compressor stops and the CSB no longer detects current, causing the control to activate the alert.
- Compressor circuit breaker tripped.
- Failed CSB or wiring error.

To check out alerts T051, T052, T053, T054, T055, T056:

1. Turn on faulty compressor using Service Test mode. If the compressor does not start, then most likely the problem is one of the following: HPS is open, compressor circuit breaker is tripped, incorrect control wiring, or incorrect compressor wiring.
2. If the compressor starts, verify that the indoor and outdoor fans are operating properly.
3. If the CSB is always detecting current, then verify that the compressor is on. If the compressor is ON, check the contactor and the relay on the MBB or CXB. If the compressor is OFF and there is no current, verify the CSB wiring and replace if necessary.
4. Return to Normal mode and observe compressor operation to verify that compressor current sensor is working and condenser fans are energized.

A051 (Circuit A, Compressor 1 Stuck On Failure)
A052 (Circuit A, Compressor 2 Stuck On Failure)
A053 (Circuit A, Compressor 3 Stuck On Failure)
A054 (Circuit B, Compressor 1 Stuck On Failure)
A055 (Circuit B, Compressor 2 Stuck On Failure)
A056 (Circuit B, Compressor 3 Stuck On Failure) — If the current sensor board reads ON while the compressor relay has been commanded OFF for a period of 4 continuous seconds, an alarm is generated and the HVAC Mode will display Compressor Stuck On. These alarms are only monitored for a period of 10 seconds after the compressor relay has been commanded OFF. This is done to facilitate a service technician forcing a relay to test a compressor.

When the HVAC Mode indicates a compressor stuck on condition, the following will occur:

1. The outdoor fans will continue to control head pressure.
2. The supply fan will remain on.
3. Heating will be disabled.

A manual reset or power reset of the unit is required for these alarms.

The possible causes are:

- Compressor contactor has failed closed.
- Relay output on MBB or CXB that drives compressor contactor has failed closed.
- Failed CSB or wiring error.

To check out alerts A051, A052, A053, A054, A055, A056:

1. Place the unit in Service Test mode. All compressors should be OFF.
2. Check for welded compressor contactor.
3. Verify there is not 24 vac across the contactor coil of the compressor in question. If 24 vac is measured across coil, check relay on MBB or CXB and associated wiring.
4. Verify CSB wiring.

T057 (Circuit A, High Pressure Switch Failure Alert)
T058 (Circuit B, High Pressure Switch Failure Alert)
A057 (Circuit A, High Pressure Switch Failure Alarm)
A058 (Circuit B, High Pressure Switch Failure Alarm)
— The high pressure switch for each circuit is wired in series with the compressor contactor coils of each compressor on the circuit to disable compressor operation immediately upon a high discharge pressure condition. The normally closed contacts in the switches are calibrated to open at 650 ± 10 psig which corresponds to a saturated condensing temperature of 155.6 ± 1.3°F. The pressure switches will automatically reset when the discharge pressure is reduced to 500 ± 15 psig which corresponds to a saturated condensing temperature of 134.1 ± 2.4°F.

The output of each high pressure switch is wired to inputs on the RXB to provide the control with an indication of a high pressure switch trip. This alarm could occur when compressors are off if the wiring to the switch is broken or the switch has failed open.

If the high pressure switch trips on a circuit with compressors commanded on, the discharge pressure is recorded. If the recorded discharge pressure is between 630 to 660 psig (saturated condensing temperature between 153.0 and 156.9°F), and is also less than the value recorded on any previous high pressure switch trip, the upper horizontal portion of the compressor operating envelope (see Fig. 18) is lowered 0.4°F (3 psig). The control will not allow the compressor operating envelope to be lowered below 153.0°F (630 psig).

This is done to make a rough calibration of the high pressure switch trip point. In most cases this allows the control to detect a high head pressure condition prior to reaching the high pressure switch trip point.

When the trip occurs, all mechanical cooling on the circuit is shut down until the HPS is cleared for 15 minutes. Any time this alert occurs, a HPS trip strike will be logged on the affected circuit. The alert is issued on HPS trip strikes 1 and 2, and an alarm (A057, A058) is issued on strike 3.

An active alert or alarm will always cause the circuit to be shut down. After 15 minutes, the circuit is allowed to restart if there are fewer than 3 strikes on the affected circuit. If three successive strikes occur the circuit will be locked out, requiring a manual reset or power reset of the unit. The clearing of HPS trip strikes during compressor operation is achieved through 5 continuous minutes of run time on the affected circuit. So, if there are one or two strikes on the circuit and a compressor on the circuit turns on and runs for 5 minutes straight with no failure, the circuit's HPS trip strikes are cleared.

NOTE: This alert/alarm is broadcast to the network.

T068 (Circuit A Return Gas Thermistor Failure) — This alarm trips during a thermistor failure of the return gas temperature sensor. It is used with MLV option only.

T072 (Evaporator Discharge Reset Sensor Failure) — This sensor is responsible for third party reset of the cooling supply air set point. If the unit is configured for "third party reset" (***Configuration→EDT.R→RS.CF***=3) and this alert occurs, no reset will be applied to the cooling supply air set point. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM board.

T073 (Outside Air Temperature Thermistor Failure) — Failure of this thermistor (***Temperatures→AIR.T→OAT***) will disable any elements of the control which requires its use. Economizer control beyond the vent position and the calculation of mixed air temperature for the SumZ algorithm will not be possible. Recovery from this alert is automatic. Reason for error is either a faulty thermistor, wiring error, or damaged input on the MBB control board.

T074 (Space Temperature Thermistor Failure) — Failure of this thermistor (***Temperatures→AIR.T→SPT***) will disable any elements of the control which requires its use. If the unit is configured for SPT 2 stage or SPT multi-stage operation and the sensor fails, no cooling or heating mode may be chosen. Recovery from this alert is automatic. Reason for error is either a faulty thermistor in the T55, T56 or T58 device, wiring error, or damaged input on the MBB control board.

Table 102 — Alert and Alarm Codes

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T048	CktA, Oil Return Not Reliable With Only One Comp Available	Circuit shut down	Automatic
T049	CktB, Oil Return Not Reliable With Only One Comp Available	Circuit shut down	Automatic
T051	Circuit A, Compressor 1 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A051	Circuit A, Compressor 1 Stuck On Failure	Compressor locked off	Manual
T052	Circuit A, Compressor 2 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A052	Circuit A, Compressor 2 Stuck On Failure	Compressor locked off	Manual
T053	Circuit A, Compressor 3 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A053	Circuit A, Compressor 3 Stuck On Failure	Compressor locked off	Manual
T054	Circuit B, Compressor 1 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A054	Circuit B, Compressor 1 Stuck On Failure	Compressor locked off	Manual
T055	Circuit B, Compressor 2 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A055	Circuit B, Compressor 2 Stuck On Failure	Compressor locked off	Manual
T056	Circuit B, Compressor 3 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A056	Circuit B, Compressor 3 Stuck On Failure	Compressor locked off	Manual
T057	Circuit A, High Pressure Switch Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A057	Circuit A, High Pressure Switch Failure	Compressor locked off	Manual
T058	Circuit B, High Pressure Switch Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A058	Circuit B, High Pressure Switch Failure	Compressor locked off	Manual
T068	Circuit A, Return Gas Thermistor Failure	MLV Disabled	Automatic
T072	Evap. Discharge Reset Sensor Failure	No supply air reset applied	Automatic
T073	Outside Air Temperature Thermistor Failure	No OAT functions allowed	Automatic
T074	Space Temperature Thermistor Failure	No SPT functions allowed	Automatic
T075	Return Air Thermistor Failure	No RAT functions allowed	Automatic
T076	Outside Air Relative Humidity Sensor Fail	No outside air RH functions allowed	Automatic
T077	Space Relative Humidity Sensor Failure	No space RH functions allowed	Automatic
T078	Return Air Relative Humidity Sensor Fail	No return air RH functions allowed	Automatic
T082	Space Temperature Offset Sensor Failure	No space temperature offset applied	Automatic
T090	Circ A Discharge Press Transducer Failure	Circuit shut down	Automatic
T091	Circ B Discharge Press Transducer Failure	Circuit shut down	Automatic
T092	Circ A Suction Press Transducer Failure	Circuit shut down	Automatic
T093	Circ B Suction Press Transducer Failure	Circuit shut down	Automatic
T110	Circuit A Loss of Charge	Circuit locked off	Manual

Table 102 — Alert and Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T111	Circuit B Loss of Charge	Circuit locked off	Manual
P120	Circuit A Low Saturated Suction Temp, Comp Shutdown	Circuit staged down	Automatic
T120	Circuit A Low Saturated Suction Temperature Alert	Circuit shut down	Automatic
A120	Circuit A Low Saturated Suction Temperature Alarm	Circuit locked off	Manual
P121	Circuit B Low Saturated Suction Temp, Comp Shutdown	Circuit staged down	Automatic
T121	Circuit B Low Saturated Suction Temperature Alert	Circuit shut down	Automatic
A121	Circuit B Low Saturated Suction Temperature Alarm	Circuit locked off	Manual
T122	Circuit A High Saturated Suction Temperature	Alert Only	Manual
T123	Circuit B High Saturated Suction Temperature	Alert Only	Manual
P126	Circuit A High Head Pressure, Comp Shutdown	Circuit stage down	Automatic
T126	Circuit A High Head Pressure Alert	Circuit shut down	Automatic
A126	Circuit A High Head Pressure Alarm	Circuit locked off	Manual
P127	Circuit B High Head Pressure, Comp Shutdown	Circuit stage down	Automatic
T127	Circuit B High Head Pressure Alert	Circuit shut down	Automatic
A127	Circuit B High Head Pressure Alarm	Circuit locked off	Manual
T128	Digital Scroll High Discharge Temperature Alert	Digital compressor A1 shutdown	Automatic
A128	Digital Scroll High Discharge Temperature Alarm	Digital compressor A1 locked off	Manual
A140	Reverse Rotation Detected	Stop unit	Manual
A150	Unit is in Emergency Stop	Unit shut down	Manual
A152	Unit Down due to Failure	No mechanical cooling available	Automatic
T153	Real Time Clock Hardware Failure	Unit shut down	Automatic
A154	Serial EEPROM Hardware Failure	Unit shut down	Automatic
T155	Serial EEPROM Storage Failure Error	Alert only	Automatic
A156	Critical Serial EEPROM Storage Fail Error	Unit shut down	Automatic
A157	A/D Hardware Failure	Unit shut down	Automatic
A169	Expansion Valve Control Board Comm Failure	Humidimizer control disabled	Automatic
T170	Compressor Expansion Board Comm Failure	Compressors A3 and B3 disabled	Automatic
A171	Staged Gas Control Board Comm Failure	Staged gas control disabled	Automatic
T172	Control Expansion Module Comm Failure	All CEM board functions disabled	Automatic
A173	RXB board Communication Failure	Unit shut down	Automatic
A174	EXB board Communication Failure	All EXB board functions disabled	Automatic
A175	Supply Fan VFD Communication Failure	Unit shut down	Automatic
T176	Exhaust Fan VFD Communication Failure	No building pressure control	Automatic
T177	4-20 mA Demand Limit Failure	No demand limiting	Automatic
T178	4-20 mA Static Pressure Reset Fail	No static pressure reset	Automatic
A200	Linkage Timeout Error - Comm Failure	Resorts to local unit setpoints	Automatic
T210	Building Pressure Transducer Failure	No building pressure control function	Automatic
T211	Static Pressure Transducer Failure	No static pressure control	Automatic
T220	Indoor Air Quality Sensor Failure	No IAQ control	Automatic
T221	Outdoor Air Quality Sensor Failure	OAQ defaults to 400 ppm	Automatic
T229	Economizer Min Pos Override Input Failure	Operate without override	Automatic
T245	Outside Air Cfm Sensor Failure	No OA CFM control	Automatic
T246	Supply Air Cfm Sensor Failure	Unit shut down	Automatic
T247	Return Air Cfm Sensor Failure	Unit shut down	Automatic
T300	Space Temperature Below Limit	Alert only	Automatic
T301	Space Temperature Above Limit	Alert only	Automatic
T302	Supply Temperature Below Limit	Alert only	Automatic
T303	Supply Temperature Above Limit	Alert only	Automatic
T304	Return Temperature Below Limit	Alert only	Automatic
T305	Return Temperature Above Limit	Alert only	Automatic
T308	Return Air Relative Humidity Below Limit	Alert only	Automatic
T309	Return Air Relative Humidity Above Limit	Alert only	Automatic
T310	Supply Duct Static Pressure Below Limit	Alert only	Automatic
T311	Supply Duct Static Pressure Above Limit	Alert only	Automatic
T312	Building Static Pressure Below Limit	Alert only	Automatic
T313	Building Static Pressure Above Limit	Alert only	Automatic
T314	IAQ Above Limit	Alert only	Automatic
T316	OAT Below Limit	Alert only	Automatic
T317	OAT Above Limit	Alert only	Automatic
T335	Excess Outdoor Air	Alert only	Automatic
A400	Hydronic Freeze Stat Trip	Unit in emergency mode	Automatic
A404	Fire Shut Down Emergency Mode (fire-smoke)	Unit shut down	Automatic
A405	Evacuation Emergency Mode	Run evacuation mode	Automatic
A406	Pressurization Emergency Mode	Run pressurization mode	Automatic
A407	Smoke Purge Emergency Mode	Run smoke purge mode	Automatic
T408	Dirty Air Filter	Alert only	Automatic
T409	Supply Fan Status Failure	Alert only	Manual
A409	Supply Fan Status Failure	Unit shut down	Manual
A410	Supply Fan VFD Fault	Unit shut down	Manual
A411	Exhuast Fan VFD Fault	Unit shut down	Manual
T414	Damper Not Modulating	Alert only	Automatic
T421	Thermostat Y2 Input On without Y1 On	Run on Y2	Automatic
T422	Thermostat W2 Input On without W1 On	Run on W2	Automatic
T423	Thermostat Y and W Inputs On	No cooling or heating	Automatic
T424	Thermostat G Input Off On a Cooling Call	Turn fan on and cool	Automatic
T430	Plenum Pressure Safety Switch Trip	Alert only	Automatic
A430	Plenum Pressure Safety Switch Trip	Unit shut down	Manual

Table 102 — Alert and Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T431	Motor Starter Protector Trip	Alert only	Automatic
A432	Motor Starter Protector Lockout	No building pressure control	Automatic
T500	Current Sensor Board Failure - A1	Alert only	Automatic
T501	Current Sensor Board Failure - A2	Alert only	Automatic
T502	Current Sensor Board Failure - B1	Alert only	Automatic
T503	Current Sensor Board Failure - B2	Alert only	Automatic
T504	Current Sensor Board Failure - A3	Alert only	Automatic
T505	Current Sensor Board Failure - B3	Alert only	Automatic
T610	Economizer Actuator Out of Calibration	Alert only	Automatic
T611	Economizer Actuator Comm Failure	No economizer functions	Automatic
T612	Economizer Actuator Control Range Increased	Alert only	Automatic
T613	Econ Actuator Overload, Setpt Not Reached	Alert only	Automatic
T614	Econ Actuator Hunting Excessively	Alert only	Automatic
T615	Econ 1 (Outside) Not Economizing When It Should	Alert only	Automatic
T616	Econ 1 (Outside) Economizing When It Should Not	Alert only	Automatic
T617	Econ 1 (Outside) Damper Stuck Or Jammed	Alert only	Automatic
A620	Economizer 2 Actuator Out of Calibration	Alarm only	Automatic
A621	Economizer 2 Actuator Comm Failure	No IGV functions	Automatic
T622	Economizer 2 Actuator Control Range Increased	Alert only	Automatic
A623	Econ2 Overload, Setpt Not Reached	Alarm only	Automatic
A624	Econ2 Actuator Hunting Excessively	Alert only	Automatic
T625	Econ 2 (Return) Not Economizing When It Should	Alert only	Automatic
T626	Econ 2 (Return) Economizing When It Should Not	Alert only	Automatic
T627	Econ 2 (Return) Damper Stuck Or Jammed	Alert only	Automatic
T630	Humidifier Actuator Out of Calibration	Alert only	Automatic
T631	Humidifier Actuator Communication Failure	No humidifier functions	Automatic
T632	Humidifier Actuator Control Range Increased	Alert only	Automatic
T633	Humidifier Act Overload, Setpt Not Reached	Alert only	Automatic
T634	Humidifier Actuator Hunting Excessively	Alert only	Automatic
A640	Heating Coil Actuator Out of Calibration	Alarm only	Automatic
A641	Heating Coil Actuator Comm Fail	No heating coil functions	Automatic
T642	Heat Coil Actuator Control Range Increased	Alert only	Automatic
A643	Ht Coil Act Ovrload, Setpt Pos Not Reached	Alarm only	Automatic
A644	Heat Coil Actuator Hunting Excessively	alarm only	Automatic
A650	Bldg.Press. Actuator 1 Out of Calibration	Alarm only	Automatic
A651	Bldg.Press. Actuator 1 Comm Failure	No building pressure control	Automatic
T652	Bldg.Press. Act. 1 Control Range Increased	Alert only	Automatic
A653	BP Act. 1 Overload, Setpnt Pos Not Reached	Alarm only	Automatic
A654	Bldg.Press. Actuator 1 Hunting Excessively	Alert only	Automatic
A660	Bldg.Press. Actuator 2 Out of Calibration	Alarm only	Automatic
A661	Bldg.Press. Actuator 2 Comm Failure	No building pressure control	Automatic
T662	Bldg.Press. Act. 2 Control Range Increased	Alert only	Automatic
A663	BP Act. 2 Overload, Setpt Pos Not Reached	Alarm only	Automatic
A664	BP Actuator 2 Hunting Excessively	Alert only	Automatic
A700	Air Temp Lvg Supply Fan Thermistor Failure	Unit shut down	Automatic
T701	Staged Heat 1 Thermistor Failure	Average remaining sensors	Automatic
T702	Staged Heat 2 Thermistor Failure	Average remaining sensors	Automatic
T703	Staged Heat 3 Thermistor Failure	Average remaining sensors	Automatic
A704	Staged Heat Lvg Air Temp Sum Total Failure	No staged heat function	Automatic
T705	Limit Switch Thermistor Failure	No software limit switch function	Automatic
A706	Hydronic Evap Discharge Thermistor Failure	Unit shut down	Automatic
T707	Digital Scroll Discharge Temperature Failure	Digital compressor A1 limited to 50%	Automatic

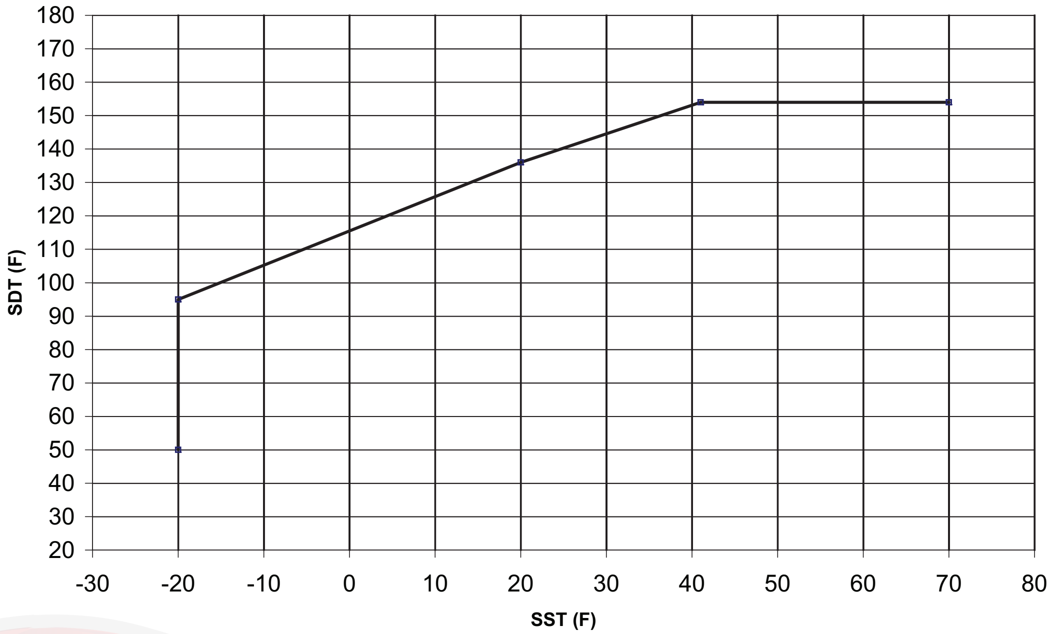


Fig. 18 — High Pressure/SCT Alarm Upper Envelope

T075 (Return Air Thermistor Failure) — Failure of this thermistor (***Temperatures→AIR.T→RAT***) will disable any elements of the control which requires its use. Elements of failure include:

- the calculation of mixed air temperature for sumZ control
- the selection of a mode for VAV units
- economizer differential enthalpy or dry bulb control
- RAT offset control for dehumidification
- return air temperature supply air reset
- fan tracking for building pressure control.

Recovery from this alert is automatic. Reason for error is either a faulty thermistor, wiring error, or damaged input on the MBB control board.

T076 (Outside Air Relative Humidity Sensor Failure) — Failure of this sensor (***Inputs→REL.H→OA.RH***) will disable any elements of the control which requires its use. Elements of failure include: economizer outdoor and differential enthalpy control. Recovery from this alert shall be automatic. Reason for error is either a faulty sensor, wiring error or damaged input on the CEM control board.

T077 (Space Relative Humidity Sensor Failure) — Failure of this sensor (***Inputs→REL.H→SP.RH***) will disable any elements of the control which requires its use. Elements of failure include humidification and dehumidification. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T078 (Return Air Relative Humidity Sensor Fail) — Failure of this sensor (***Inputs→REL.H→RA.RH***) will disable any elements of the control which requires its use. Elements of failure include economizer differential enthalpy control, humidification, and dehumidification. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T082 (Space Temperature Offset Sensor Failure) — When this failure occurs, there is no offset available that may be applied to space temperature. Recovery from this alert is automatic. Reason for error is either a faulty slider potentiometer, wiring error, or damaged input on the MBB control board.

T090 (Circ A Discharge Press Transducer Failure)
T091 (Circ B Discharge Press Transducer Failure) — The associated circuit becomes disabled whenever this transducer (***Pressures→REF.P→DP.A, DP.B***) fails. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the MBB control board.

T092 (Circ A Suction Press Transducer Failure)
T093 (Circ B Suction Press Transducer Failure) — The associated circuit becomes disabled whenever this transducer (***Pressures→REF.P→SP.A, SP.B***) fails. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the MBB control board.

T110 (Circuit A Loss of Charge)
T111 (Circuit B Loss of Charge) — Alert codes 110 and 111 are for circuits A and B respectively. These alerts occur when all the compressors on a circuit are OFF and the suction pressure is less than 18 psig, if the OAT is above –5°F for 1 continuous minute. The alert will automatically clear when the suction pressure transducer reading is valid and greater than 54 psig. The cause of the alert is usually low refrigerant pressure or a faulty suction pressure transducer.

P120 (Circuit A Low Saturated Suction Temp. Comp Shutdown)
T120 (Circuit A Low Saturated Suction Temperature Alert)
A120 (Circuit A Low Saturated Suction Temperature Alarm)
P121 (Circuit B Low Saturated Suction Temp. Comp Shutdown)
T121 (Circuit B Low Saturated Suction Temperature Alert)
A121 (Circuit B Low Saturated Suction Temperature Alarm) — This alert/alarm is used to keep the evaporator coils from freezing and the saturated suction temperature above the low limit for the compressors.

When ***Temperatures→REF.T→SST.A*** or ***Temperatures →REF.T→SST.B*** is less than 20°F for 4 minutes, less than 10°F for 2 minutes, less than 0°F for 1 minute, or less than –20°F for 20 seconds continuously, a compressor of the affected circuit will be shut down with a local pre-alert (P120, P121) and a 15-minute timeguard will be added to the compressor. If the saturated suction temperature continues to be less than 20°F for 4 minutes, less than 10°F for 2 minutes, less than 0°F for 1 minute, or less than –20°F for 20 seconds continuously, another compressor of the affected circuit, if it exists, will be shut down with a local pre-alert (P120, P121) and a 15-minute timeguard will be added to the compressor. This sequence will continue until the last compressor on the circuit is shutdown, at which time the circuit will be shut down with alert (T120, T121).

This failure follows a 3-strike methodology. When the circuit is shutdown entirely, an alert (T120, T121) is generated and a strike is logged on the circuit. The Alert and strikes logged will automatically reset if the saturated suction temperature remains above 29.4°F for 15 minutes. On the third strike, alarm (A120, A121) will be generated which will necessitate a manual reset to get the circuit back running. It is important to note that a strike is called out only if all compressors in the circuit are off at the time of alert.

To prevent nuisance alerts, P120 and P121 show up in the alarm history and locally at the display, but are never broadcast to the network. To recover from these pre-alerts, both a 15 minute hold off timer and saturated suction temperature rising above 29.4°F must occur. If recovery occurs, staging will be allowed on the circuit once again. A strike is tied to the circuit going off entirely, not reducing capacity and recovering. Therefore it is possible that multiple P120 and P121 alerts may be stored in alarm history but not broadcast.

<u>T122 (Circuit A High Saturated Suction Temperature)</u>
<u>T123 (Circuit B High Saturated Suction Temperature)</u> — This alert is for display purposes only. No action is taken by the control when the alert occurs.

When ***Temperatures→REF.T→SST.A*** or ***Temperatures →REF.T→SST.B*** is greater than 70°F for ***Configuration →COOL→H.SST*** minutes, local alert T122 or T123 will occur. The alerts automatically reset when the corresponding saturated suction temperature drops below 70°F.

<u>P126 (Circuit A High Head Pressure, Comp Shutdown)</u>
<u>T126 (Circuit A High Head Pressure Alert)</u>
<u>A126 (Circuit A High Head Pressure Alarm)</u>
<u>P127 (Circuit B High Head Pressure, Comp Shutdown)</u>
<u>T127 (Circuit B High Head Pressure Alert)</u>
<u>A127 (Circuit B High Head Pressure Alarm)</u> — This alert/alarm is used to keep the saturated condensing temperature below the compressor operating envelope outlined in Fig. 18. This alert/alarm also attempts to prevent the saturated condensing temperature from reaching the high pressure switch trip point by reducing the upper horizontal portion of the compressor operating envelope to a level slightly below the saturated condensing temperature recorded upon a high pressure switch trip (T057, T058).

When ***Temperatures→REF.T→SCT.A*** or ***Temperatures →REF.T→SCT.B*** rise above the compressor operating envelope for the corresponding ***Temperatures→REF.T→SST.A*** or ***Temperatures→REF.T→SST.B***, a compressor of the affected circuit will be immediately shut down with pre-alert (P126, P127) and a 10-minute timeguard will be added to the compressor. If the saturated condensing temperature remains above the envelope for 5 more seconds, another compressor of the affected circuit, if it exists, will be shut down with pre-alert (P126, P127) and a 10-minute timeguard will be added to the compressor. This sequence will continue until the last compressor on the circuit is shut down, at which time the circuit will be shut down with alert (T126, T127).

This failure follows a 3 strike methodology. When the circuit is shutdown entirely, an alert (T126, T127) is generated and a strike is logged on the circuit. On the third strike, alarm (A126, A127) will be generated which will necessitate a manual reset to get the circuit back running. It is important to note that a strike is called out only if all compressors in the circuit are off at the time of the alert.

To prevent nuisance alerts, P126 and P127 show up in the alarm history and locally at the display, but are never broadcast to the network. To recover from these alerts, both a 10-minute hold off timer and saturated condensing temperature returning under the compressor envelope must occur. If recovery occurs, staging will be allowed on the circuit once again. Again, a strike is tied to the circuit going off entirely, not reducing capacity and recovering. Therefore it is possible that multiple P126 and P127 alerts may be stored in alarm history but not broadcast.

<u>T128 (Digital Scroll High Discharge Temperature Alert)</u>
<u>A128 (Digital Scroll High Discharge Temperature Alarm)</u>
— This alert/alarm is for units with a digital scroll compressor only. The digital scroll compressor is equipped with a temperature thermistor that is attached to the discharge line of the compressor.

The alert occurs when the discharge temperature thermistor has measured a temperature above 268°F or the thermistor is short circuited. The digital scroll compressor will be shut down and alert T128 will be generated. The compressor will be allowed to restart after a 30-minute delay and after the thermistor temperature is below 250°F.

If five high discharge temperature alerts have occurred within four hours, alarm A128 will be generated which will necessitate a manual reset to start the compressor.

<u>A140 (Reverse Rotation Detected)</u> — This alarm performs a check for correct compressor rotation upon power up of the unit. The method for detecting correct rotation is based on the assumption that there will be a drop in suction pressure upon a compressor start if the compressor is rotating in the correct direction.

A test is made once, on power up, for suction pressure change on the first compressor of the first circuit to start.

Reverse rotation is determined by measuring suction pressure at 3 points in time:

- 5 seconds prior to compressor start.
- At the instant the compressor starts.
- 5 seconds after the compressor starts.

The rate of suction pressure change from 5 seconds prior to compressor start to compressor start (rate prior) is compared to the rate of suction pressure change from compressor start to 5 seconds after compressor start (rate after).

If (rate after) is less than (rate prior minus 1.25), alarm A140 is generated.

This alarm will disable mechanical cooling and will require a manual reset. This alarm may be disabled once the reverse rotation check has been verified by setting ***Configuration →COOL→RR.VF*** = Yes.

It is important to note that in Service Test mode, reverse rotation is checked on every compressor start.

<u>A150 (Unit is in Emergency Stop)</u> — If the CCN point name "EMSTOP" in the System table is set to emergency stop, the unit will shut down immediately and broadcast an alarm back to the CCN indicating that the unit is down. This alarm will clear when the variable is set back to "enable".

<u>A152 (Unit Down Due to Failure)</u> — This alarm occurs whenever both cooling circuits are unavailable to cool. Mechanical cooling is impossible due to a failure in the system explained through other current alarms.

Possible problems are:

- plenum pressure switch trips on a return fan tracking unit
- the supply fan status alarms have been instructed to shut down the unit
- both circuits incapable of cooling due to multiple alerts of compressors and/or pressure alerts
- a hardware failure of the main board's analog to digital converter or EEPROM chip
- a critical storage failure in EEPROM has rendered the unit inoperable
- the unit is configured for inlet guide vanes and the actuator controlling the vanes is in fault.

Reset is automatic.

T153 (Real Time Clock Hardware Failure) — The RTC clock chip on the MBB is not responding. Recovery is automatic but typically board replacement may be necessary.

A154 (Serial EEPROM Hardware Failure) — The unit will be completely shut down. The serial EEPROM chip on the MBB which stores the unit's configurations is not responding. Recovery is automatic but typically board replacement is necessary.

T155 (Serial EEPROM Storage Failure Error) — Configuration data in the serial EEPROM chip cannot be verified which may mean MBB replacement. It is possible a re-initialization of the database or particular storage area(s) may clean up this problem. Reset is automatic.

A156 (Critical Serial EEPROM Storage Fail Error) — The unit is completely shut down. 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.

NOTE: The machine will shut down. This may happen after downloading via the CCN if the device code was corrupted. Try downloading again or use the LEN connection to download.

A157 (A/D Hardware Failure) — The unit will be completely shut down. The analog to digital conversion chip on the MBB has failed. Recovery is automatic but typically board replacement is necessary.

A169 (Expansion Valve Control Board Comm Failure) — Cooling is disabled until communication with the EXV control board is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the control board, or damage to the RS-485 drivers on the LEN bus.

T170 (Compressor Expansion Board Comm Failure) — Compressors A3 and B3 are disabled until communication with the CEB control board is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the control board, or damage to the RS-485 drivers on the LEN bus.

A171 (Staged Gas Control Board Comm Failure) — Staged Heating is disabled until communication with the staged gas control board is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the staged gas control board, or damage to the RS-485 drivers on the LEN bus.

T172 (Control Expansion Module Comm Failure) — Any function associated with a sensor configured for use that resides on the controls expansion module will be disabled until communication is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the control expansion module, or damage to the RS-485 drivers on the LEN bus.

A173 (RXB Board Communication Failure) — As the RXB board is integral to all P Series units, the error will cause a system shutdown until communication is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the RXB board, or damage to the RS-485 drivers on the LEN bus.

A174 (EXB Board Communication Failure) — The EXB board is responsible for building pressure control. Building Pressure control configurations that require this board will cause a complete system shut down when communication failure occurs. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the EXB board, or damage to the RS-485 drivers on the LEN bus.

A175 (Supply Fan VFD Communication Failure) — The supply fan is disabled until communication with the supply fan VFD is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the VFD, or damage to the RS-485 drivers on the LEN bus.

T176 (Exhaust Fan VFD Communication Failure) — The exhaust fan is disabled until communication with the exhaust fan VFD is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the VFD, or damage to the RS-485 drivers on the LEN bus.

T177 (4-20 mA Demand Limit Failure) — If this transducer fails, and the unit is configured to perform demand limiting with this transducer, no capacity limiting will be performed and an alert will be generated. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T178 (4-20 mA Static Pressure Reset Fail) — If this transducer fails, and the unit is configured to perform static pressure reset with this transducer, no static pressure reset will be performed and an alert will be generated. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

A200 (Linkage Timeout Error — Comm Failure) — If linkage is established via the CCN with ComfortID™ terminals, a 5-minute timeout on loss of communication will be monitored. If 5 minutes expires since the last communication from a VAV Linkage Master, the unit will remove the link and flag the alert. When the rooftop loses its link, the temperature and set points are derived locally. Recovery is automatic on re-establishment of communications. Reason for failure may be wiring error, too much bus activity, or damaged RS-485 drivers.

T210 (Building Pressure Transducer Failure) — If the building pressure transducer (***Pressures→AIR.P→BP***) fails, building pressure control fails also. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the RXB control board.

T211 (Static Pressure Transducer Failure) — If the static pressure transducer (***Pressures→AIR.P→SP***) fails, static pressure control fails also. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the RXB control board.

T220 (Indoor Air Quality Sensor Failure) — If the indoor air quality sensor (***Inputs→AIR.Q→IAQ***) fails, demand control ventilation is not possible. The control defaults to the max vent position. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the MBB control board.

T221 (Outdoor Air Quality Sensor Failure) — If the outdoor air quality sensor (***Inputs→AIR.Q→OAQ***) fails, OAQ defaults to 400 ppm and demand control ventilation will continue. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T229 (Economizer Min Pos Override Input Failure) — If the economizer minimum position override input fails, the economizer will operate as if it were not configured for override. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the MBB control board. This error only occurs when the unit is configured for minimum position override and a 4 to 20 mA signal is not present.

T245 (Outside Air Cfm Sensor Failure) — If the outside air cfm sensor (***Inputs→CFM→O.CFM***) fails, the economizer will default to discrete positioning of the economizer (***Configuration→IAQ→DCV.C→IAQ.M***, ***Configuration →ECON→ EC.MN***). Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T246 (Supply Air Cfm Sensor Failure) — If the supply air cfm sensor (***Inputs→CFM→S.CFM***) fails, fan tracking is not possible and the system will shut down. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the EXB control board.

T247 (Return Air Cfm Sensor Failure) — If the return air cfm sensor (***Inputs→CFM→R.CFM***) fails, fan tracking is not possible and the system will shut down. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the EXB control board.

T300 (Space Temperature Below Limit) — If the space temperature is below the configurable SPT Low Alert Limits (occupied [***Configuration→ALLM→SP.L.O***] for 5 minutes or unoccupied [***Configuration→ALLM→SP.L.U***] for 10 minutes), then an alert will be broadcast. The alert will automatically reset.

T301 (Space Temperature Above Limit) — If the space temperature is above the configurable SPT High Alert Limits (occupied [***Configuration→ALLM→SP.H.O***] for 5 minutes or unoccupied [***Configuration→ALLM→SP.H.U***] for 10 minutes), then an alert will be broadcast. The alert will automatically reset.

T302 (Supply Temperature Below Limit) — If the supply-air temperature measured by the supply temperature sensor is below the configurable SAT LO Alert Limit/Occ (***Configuration→ALLM→SA.L.O***) for 5 minutes or the Low Supply air temperature alert limit unoccupied mode (***Configuration→ALLM→SA.L.U***) for 10 minutes, then an alert will be broadcast.

T303 (Supply Temperature Above Limit) — If the supply temperature is above the configurable SAT HI Alert Limit Occ (***Configuration→ALLM→SAH.O***) for 5 minutes or the SAT HI Alert Limit/Unocc (***Configuration→ALLM→SA.H.U***) for 10 minutes, then an alert will be broadcast. The alert will automatically reset.

T304 (Return Air Temperature Below Limit) — If the return air temperature measured by the RAT sensor is below the configurable RAT LO Alert Limit/Occ (***Configuration→ALLM→RA.L.O***) for 5 minutes or RAT HI Alert Limit/Occ (***Configuration→ALLM→RA.L.U***) for 10 minutes, then an alert will be broadcast.

T305 (Return Air Temperature Above Limit) — If the return air temperature is below the RAT HI Alert Limit/Occ (***Configuration→ALLM→RA.H.O***) for 5 minutes or RAT HI Alert Limit/Occ (***Configuration→ALLM→RA.H.U***) for 10 minutes, then an alert will be broadcast. The alert will automatically reset.

T308 (Return Air Relative Humidity Below Limit) — If the unit is configured to use a return air relative humidity sensor through the Return Air RH Sensor (***Configuration→UNIT→SENS→RRH.S***) setting, and the measured level is below the configurable RH Low Alert Limit (***Configuration→ALLM→R.RH.L***) for 5 minutes, then the alert will occur. The unit will continue to run and the alert will automatically reset.

T309 (Return Air Relative Humidity Above Limit) — If the unit is configured to use a return air relative humidity sensor through the Return Air RH Sensor (***Configuration→UNIT→SENS→RRH.S***) setting, and the measured level is above the configurable RH High Alert Limit (***Configuration→ALLM→R.RH.H***) for 5 minutes, then the alert will occur. Unit will continue to run and the alert will automatically reset.

T310 (Supply Duct Pressure Below Limit) — If the unit is a VAV unit with a supply duct pressure sensor and the measured supply duct static pressure (***Pressures→AIR.P→SP***) is below the configurable SP Low Alert Limit (***Configuration→ALLM→SP.L***) for 5 minutes, then the alert will occur. The unit will continue to run and the alert will automatically reset.

T311 (Supply Duct Pressure Above Limit) — If the unit is a VAV unit with a supply duct pressure sensor and the measured supply duct static pressure (***Pressures→AIR.P→SP***) is above the configurable SP Low Alert Limit (***Configuration→ALLM→SP.H***) for 5 minutes, then the alert will occur. The unit will continue to run and the alert will automatically reset.

T312 (Building Static Pressure Below Limit) — If the unit is configured to use modulating power exhaust then a building static pressure limit can be configured using the BP Low Alert Limit (***Configuration→ALLM→BP.L***). If the measured pressure (***Pressures→AIR.P→BP***) is below the limit for 5 minutes then the alert will occur.

T313 (Building Static Pressure Above Limit) — If the unit is configured to use modulating power exhaust then a building static pressure limit can be configured using the BP HI Alert Limit (***Configuration→ALLM→BP.H***). If the measured pressure (***Pressures→AIR.P→BP***) is above the limit for 5 minutes, then the alert will occur.

T314 (IAQ Above Limit) — If the unit is configured to use a CO_2 sensor and the level (***Inputs→AIR.Q→IAQ***) is above the configurable IAQ High Alert Limit (***Configuration→ALLM → IAQ.H***) for 5 minutes then the alert will occur. The unit will continue to run and the alert will automatically reset.

T316 (OAT Below Limit) — If the outside-air temperature measured by the OAT thermistor (***Temperatures→AIR.T→OAT***) is below the configurable OAT Low Alert Limit (***Configuration→ALLM→OAT.L***) for 5 minutes then the alert will be broadcast.

T317 (OAT Above Limit — If the outside-air temperature measured by the OAT thermistor (***Temperatures→AIR.T→OAT***) is above the configurable OAT High Alert Limit (***Configuration→ALLM→OAT.H***) for 5 minutes then the alert will be broadcast.

T335 Excess Outdoor Air — When the control detects a stuck or jammed actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position > commanded position, the alert is set.

A400 (Hydronic Freezestat Trip) — If the freezestat for the hydronic coil trips, the unit goes into emergency mode and does not allow cooling or heating. The economizer goes to 0% open. Supply fan operation is enabled. Recovery is automatic when the switch goes off.

A404 (Fire Shut Down Emergency Mode [fire-smoke]) — If the fire shutdown input is energized (fire shutdown is in effect), or if two fire smoke modes are incorrectly energized at the same time, a Fire Shutdown mode will occur. This is an emergency mode requiring the complete shutdown of the unit. Recovery is automatic when the inputs are no longer on.

A405 (Evacuation Emergency Mode) — If the evacuation input on the CEM is energized, an evacuation mode occurs which flags an alarm. This mode attempts to lower the pressure of the space to prevent smoke from moving into another space. This is the reverse of the *Pressurization Mode*. Closing the economizer, opening the return-air damper, turning on the power exhaust, and shutting down the indoor fan will decrease pressure in the space. Recovery is automatic when the input is no longer on.

A406 (Pressurization Emergency Mode) — If the pressurization input on the CEM is energized, a pressurization mode occurs which flags an alarm. This mode attempts to raise the pressure of a space to prevent smoke infiltration from another space. The space with smoke should be in an *Evacuation Mode* attempting to lower its pressure. Opening the economizer, closing the return air damper, shutting down power exhaust, and turning the indoor fan on will increase pressure in the space. Recovery is automatic when the input is no longer on.

A407 (Smoke Purge Emergency Mode) — If the smoke purge input on the CEM is energized, a smoke purge mode occurs which flags an alarm. This mode attempts to draw out smoke from the space after the emergency condition. Opening the economizer, closing the return-air damper, and turning on both the power exhaust and indoor fan will evacuate smoke and bring in fresh air. Recovery is automatic when the input is no longer on.

T408 (Dirty Air Filter) — If no dirty filter switch is installed, the switch will read “clean filter” all the time. Therefore the dirty filter routine runs continuously and diagnoses the input. Because of the different possible times it takes to generate static pressure, this routine waits 2 minutes after the fan starts before the dirty filter switch is monitored. If the dirty filter switch reads "dirty filter" for 2 continuous minutes, an alert is generated. No system action is taken. This is a reminder that it is time to change the filters in the unit. Recovery from this alert is through a clearing of all alarms (manual) or after the dirty filter switch reads clean for 30 continuous seconds (automatic).

T409 (Supply Fan Commanded On, Sensed Off Failure)
T409 (Supply Fan Commanded Off, Sensed On Failure)
A409 (Supply Fan Commanded On, Sensed Off Failure)
A409 (Supply Fan Commanded Off, Sensed On Failure) — Both the alert and the alarm refer to the same failure. The only difference between the alarm and alert is that in the case where the supply fan status configuration to shut down the unit is set to YES (***Configuration→UNIT→SFS.S***), the alarm will be generated AND the unit will be shut down. It is possible to configure ***Configuration→UNIT→SFS.M*** to either a switch or to monitor a 0.2-in. wg rise in duct pressure if the unit is VAV with duct pressure control (IGV or VFD).

The timings for failure for both are the same and are illustrated in the following table:

UNIT TYPE/MODE	MINIMUM ON TIME WAIT	MINIMUM OFF TIME WAIT
CV (no gas heat)	30 seconds	1 minute
CV (gas heat)	2 minutes	4 minutes
VAV (no gas heat)	1 minute	1 minute
VAV (gas heat)	3 minutes	4 minutes

Recovery is manual. Reason for failure may be a broken fan belt, failed fan relay or failed supply fan status switch.

A410 (Supply Fan VFD Fault) — The MBB has received a fault status from the supply fan VFD. The unit will be shut down, and a manual reset is required. The VFD keypad will indicate which fault has occurred. Reset can be done at the unit control (***Alarms→R.CUR***) or the VFD keypad.

A411 (Exhaust Fan VFD Fault) — The MBB has received a fault status from the exhaust fan VFD. Building pressure control will be stopped and a manual reset is required. The VFD keypad will indicate which fault has occurred. Reset can be done at the unit control (***Alarms→R.CUR***) or the VFD keypad.

T414 Damper Not Modulating — This alert occurs when the supply air temperature does not change as expected when the damper if moved. Check to determine if the damper is no longer mechanically connected to the actuator. Reset is automatic on economizers with only one actuator. Manual reset is required on economizers with two actuators.

T421 (Thermostat Y2 Input On without Y1 On) — If Y2 is on and Y1 is off then this alert condition is initiated. The control continues as if both Y1 and Y2 were requested. Alert recovery will not occur until Y1 is seen. This handles some conditions of an incorrectly wired thermostat and may prevent multiple alerts and recoveries from clogging the alarm histories.

T422 (Thermostat W2 Input On without W1 On) — If W2 is on and W1 is off then this alert condition is initiated. The control continues as if both W1 and W2 were requested. Alert recovery will not occur until W1 is seen. This handles some conditions of an incorrectly wired thermostat and may prevent multiple alerts and recoveries from clogging the alarm histories.

T423 (Thermostat Y and W Inputs On) — Simultaneous calls for heating and cooling are illegal and will be alarmed. Cooling and heating will be locked out. Recovery is automatic when the condition no longer exists.

T424 (Thermostat G Input Off On a Cooling Call) — If G is off and there is a cooling request (Y1 or Y2), then it is possible the G connection has not been made to the unit terminal block. An alert is initiated for this condition as continuous fan operation and manual fan control may not be possible. Cooling is started, if allowed, and the fan is turned on. The controls do not diagnose the fan if a heat request (W1 or W2) is in progress.

T430 (Plenum Pressure Safety Switch Trip)
A430 (Plenum Pressure Safety Switch Trip) — If the unit is configured for fan tracking and the plenum pressure switch trips, the unit will be instructed to shut down immediately. The first 2 times the switch trips, the unit will automatically start up and clear the alert 3 minutes after the switch recovers. The third time the switch trips, the unit shuts down and calls out the alarm. Manual reset of the switch (located in the auxiliary control panel) is required. Software reset is automatic when switch has been reset. Possible causes are blocked exhaust or return dampers causing high pressure at the plenum fan.

T431 (Power Exhaust Motor Starter Protector Trip)
A432 (Power Exhaust Motor Starter Protector Lock) — If the unit is configured for VFD power exhaust (***BP.CF***=3), the unit monitors the status of the (2) Power Exhaust Motor Starter Protectors in the power leads between the PE VFD and the PE Motors. If either one of the Motor Starter Protectors trip, the alert, T431, will be broadcast. The Building Pressure routine will continue to operate but with only one power exhaust fan. Depending on the operating conditions, the unit may not be able to maintain the desired building pressure.

If both of the Motor Starter Protectors trip, the alert, A432, will be broadcast and the Building Pressure Control routine will shut down. Possible causes are overloading of the Power Exhaust Motor(s) or wrong setting for the Motor Starter Protector(s). Software reset is automatic when the switch(es) have been reset.

T500 (Current Sensor Board Failure - A1)
T501 (Current Sensor Board Failure - A2)
T502 (Current Sensor Board Failure - B1)
T503 (Current Sensor Board Failure - B2)
T504 (Current Sensor Board Failure - A3)
T505 (Current Sensor Board Failure - B3) — If the current sensor board malfunctions or is not properly connected to its assigned digital input, an alert will be generated. It takes 2 to 4 seconds to log the alert. If the alert is logged, it stays active for a minimum of 15 seconds to provide the application a reasonable time to catch the failure. Compressors will be not be inhibited by this failure. Recovery is automatic. Reason for failure may be a faulty current sensor board, incorrect wiring, or a damaged input on the MBB control board.

T610 (Economizer Actuator Out of Calibration)
A620 (Economizer 2 Actuator Out of Calibration)
T630 (Humidifier Actuator Out of Calibration)
A640 (Heating Coil Actuator Out of Calibration)
A650 (Bldg.Press. Actuator 1 Out of Calibration)
A660 (Bldg.Press. Actuator 2 Out of Calibration) — Each of the actuators must have a minimum control range to operate. If the actuator, after a calibration, has not learned a control range appropriate for the application, this alarm/alert will be sent. No action will be taken on this error. Recovery is automatic. Reason for failure may be an obstruction or stuck linkage that prevents full range calibration.

T611 (Economizer Actuator Comm Failure)
A621 (Economizer 2 Actuator Comm Failure)
T631 (Humidifier Actuator Communication Failure)
A641 (Heating Coil Actuator Comm Fail)
A651 (Bldg.Press. Actuator 1 Comm Failure)
A661 (Bldg.Press. Actuator 2 Comm Failure) — Each of the actuators communicates over the local equipment network (LEN). If this error occurs, then it is impossible to control the actuator. Depending on the function of the actuator, the control will shut down any process associated with this actuator. Recovery is automatic. Reason for failure may

be incorrect wiring, incorrect serial number configuration, or damaged RS-485 drivers on the LEN bus.

T612 (Economizer Actuator Control Range Increased)
T622 (Economizer 2 Actuator Control Range Increased)
T632 (Humidifier Actuator Control Range Increased)
T642 (Heat Coil Actuator Control Range Increased)
T652 (Bldg.Press. Act. 1 Control Range Increased)
T662 (Bldg.Press. Act. 2 Control Range Increased) — The actuators, once properly calibrated, learn their end stops for movement. During normal operation, if the actuator perceives that the actuator is able to go farther than its learned range of operation, this error will be broadcast. Reason for failure may be a slipping of the linkage and therefore this error may mean that the actuator cannot perform its assigned function. Recovery requires a fix of any slipped linkage and/or a re-calibration.

T613 (Econ Actuator Overload, Setpt Not Reached)
A623 (Econ2 Actuator Overload, Setpt Not Reached)
T633 (Humidifier Act Overload, Setpt Not Reached)
A643 (Ht Coil Act Ovrload, Setpt Pos Not Reached)
A653 (BP Act. 1 Overload, Setpnt Pos Not Reached)
A663 (BP Act. 2 Overload, Setpnt Pos Not Reached) — If an actuator is unable to achieve a commanded position within a reasonable period of time, this alarm or alert will be broadcast. This may be an indication of a stuck actuator. No action is taken. Recovery is automatic.

T614 (Economizer Actuator Hunting Excessively)
A624 (Economizer 2 Actuator Hunting Excessively)
T634 (Humidifier Actuator Hunting Excessively)
A644 (Heat Coil Actuator Hunting Excessively)
A654 (Bldg.Press. Actuator 1 Hunting Excessively)
A664 (Bldg.Press. Actuator 2 Hunting Excessively) — This alert occurs when the commanded actuator position is changing too rapidly. Recovery is automatic.

T615 Econ 1 (Outside) Not Economizing When It Should — When the control detects a stuck actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position < commanded position the alert is set.

T616 Econ 1 (Outside) Economizing When It Should Not — When the control detects a stuck or jammed actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position > commanded position, the alert is set.

T617 Econ 1 (Outside) Damper Stuck Or Jammed — The actuator is no longer moving and the actual position is greater than or less than ***E.GAP***% of the commanded position for ***E.TMR*** seconds. Reset is automatic.

T625 Econ 2 (Return) Not Economizing When It Should — When the control detects a stuck actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position < commanded position the alert is set.

T626 Econ 2 (Return) Economizing When It Should Not — When the control detects a stuck or jammed actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position > commanded position, the alert is set.

T627 Econ 2 (Return) Damper Stuck Or Jammed — The actuator is no longer moving and the actual position is greater than or less than ***E.GAP***% of the commanded position for ***E.TMR*** seconds. Reset is automatic.

A700 (Air Temp Lvg Supply Fan Thermistor Failure) — The failure of this sensor will shut the system down and generate an alarm as this thermistor is a critical component to fundamental operation and diagnosis of the rooftop unit. Recovery is automatic. Reason for failure may be incorrect wiring, a faulty thermistor, or a damaged input on the MBB control board.

T701 (Staged Gas 1 Thermistor Failure)
T702 (Staged Gas 2 Thermistor Failure)
T703 (Staged Gas 3 Thermistor Failure) — If any of the staged gas thermistors (***Temperatures→AIR.T→S.G.L1-3***) fails, an alert will be generated and the remaining thermistors will be averaged together (***Temperatures→AIR.T→S.G.LS***) without the failed thermistor. Recovery is automatic. Reason for failure may be incorrect wiring, faulty thermistor, or a damaged input on the staged gas control board (SCB).

A704 (Staged Heat Lvg Air Temp Sum Total Failure) — If all three staged heat thermistors (***Temperatures→AIR.T→S.G.L1,2,3***) fail, staged heat will be shut down and this alarm will be generated. Recovery is automatic. Reason for failure may be faulty wiring, faulty thermistors, or damaged inputs on the staged gas control board (SCB).

T705 (Limit Switch Thermistor Failure) — A failure of this thermistor (***Temperatures→AIR.T→S.G.LM***) will cause an alert to occur and a disabling of the limit switch monitoring function for the staged gas control board (SCB). Recovery is automatic. Reason for failure may be due to faulty wiring, a faulty thermistor, or a damaged input on the staged gas control board (SCB).

A706 (Hydronic Evap Discharge Thermistor Failure) — If the unit is configured for hot water heating (hydronic), then the unit has a thermistor (***Temperatures→AIR.T→CCT***) installed between the evaporator coil and the hot water coils that functions as the evaporator discharge temperature thermistor for cooling. If this thermistor fails, an alarm will be generated and the system will be shut down. Recovery is automatic. Reason for failure may be due to faulty wiring, a faulty thermistor, or a damaged input on the EXB control board.

T707 (Digital Scroll Discharge Thermistor Failure) — If the RXB control board is not receiving a signal from the discharge temperature thermistor, the alarm is generated. The thermistor may be missing, disconnected, or a wire may be broken.

The alert will be generated and the digital scroll capacity will be locked at 50%. Reset is automatic.

MAJOR SYSTEM COMPONENTS

General — The 48/50P Series package rooftop units with electric cooling and with gas heating (48P units) or electric cooling and electric or hydronic heating (50P units) contain the *Comfort*Link electronic control system that monitors all operations of the rooftop. The control system is composed of several components as listed below. See Fig. 19-26 for typical control and power component schematics. Figures 27-29 show the layout of the control box.

Factory-Installed Components

MAIN BASE BOARD (MBB) — See Fig 30. The MBB is the center of the *Comfort*Link control system. The MBB contains the major portion of the operating software and controls the operation of the unit. The MBB has 22 inputs and 11 outputs. See Table 103 for the inputs and output assignments. The MBB also continuously monitors additional data from the EXB, RXB, SCB, and CEM boards through the LEN communications port. The MBB also communicates with and controls the actuator motors, economizer, power exhaust dampers, VFDs, IGVs, hydronic valves, and humidifier valves. The MBB also interfaces with the Carrier Comfort Network® system through the CCN communications port located on the COMM3 board. The COMM3 board has permanent terminals as well as a J11 jack for temporary connections. The board is located in the main control box.

ROOFTOP CONTROL BOARD (RXB) — The RXB has additional inputs and outputs required for the control of the unit. All units have an RXB board. See Fig. 31. The board has 9 inputs and 8 outputs. Details can be found in Table 104. The RXB board is located in the main control box.

ECONOMIZER CONTROL BOARD (EXB) — The EXB is used on size 075-100 units with optional return fan, optional digital scroll compressor, or accessory humidifier. See Fig. 31. The board has inputs to sense the return fan cfm and supply fan cfm. This board is located in the main control box. Input and output assignments are summarized in Table 105.

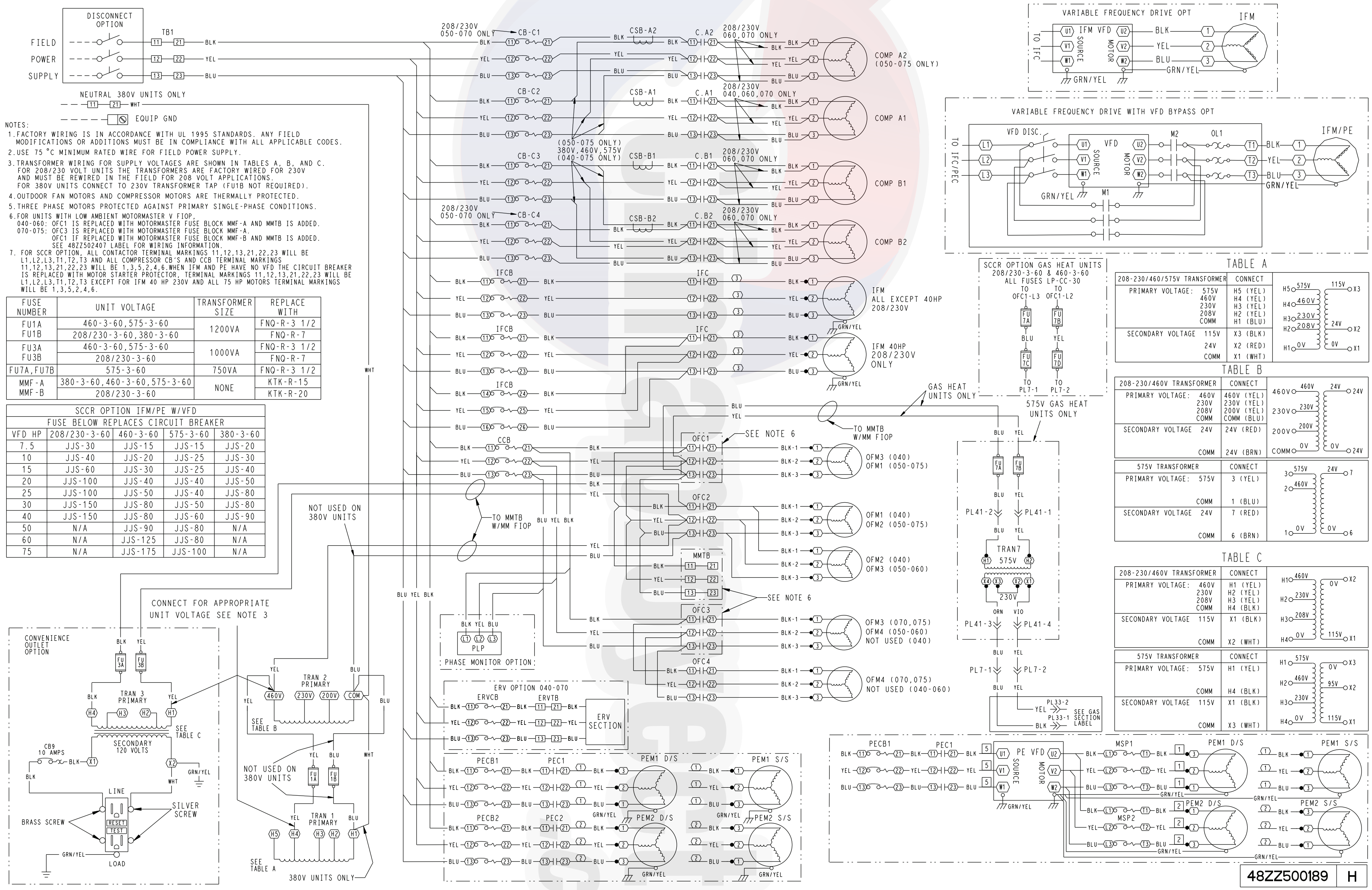
STAGED GAS HEAT BOARD (SCB) — When optional staged or modulating gas heat is used, the SCB board is installed and controls additional stages of gas heat. See Fig. 32. The SCB also provides additional sensors for monitoring of the supply-air and limit switch temperatures. For units equipped with modulating gas heat, the SCB provides the 4 to 20 mA signal to the SC30 board that sets the modulating gas section capacity. This board is located in the main unit control box. The inputs and outputs are summarized in Table 106.

CONTROL EXPANSION MODULE (CEM) — The optional CEM is used to provide inputs for demand limiting, remote set point and other optional inputs typically needed for energy management systems. See Fig. 33. On CCN systems these inputs can be interfaced to through the CCN communications. It is located in the main control box. The CEM also has inputs for accessory relative humidity sensors. This board is also used on units equipped with optional outdoor air CFM monitoring. The inputs and outputs are summarized in Table 107.

The optional (or accessory) CEM is used to accept inputs for additional sensors or control sequence switches, including:

- Smoke control mode field switches
- VAV supply air set point reset using an external 4 to 20 mA signal
- Outdoor air CO_2 sensor
- Space, return and/or outdoor air relative humidity sensors
- IAQ function discrete switch
- Demand limit sequence proportional signals or discrete switches

The CEM is factory-installed when the outdoor air cfm control option is installed.



NOTES:

1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75 °C MINIMUM RATED WIRE FOR FIELD POWER SUPPLY.
3. TRANSFORMER WIRING FOR SUPPLY VOLTAGES ARE SHOWN IN TABLES A, B, AND C. FOR 208/230 VOLT UNITS THE TRANSFORMERS ARE FACTORY WIRED FOR 230V AND MUST BE REWIRED IN THE FIELD FOR 208 VOLT APPLICATIONS. FOR 380V UNITS CONNECT TO 230V TRANSFORMER TAP (FU1B NOT REQUIRED).
4. OUTDOOR FAN MOTORS AND COMPRESSOR MOTORS ARE THERMALLY PROTECTED.
5. THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE-PHASE CONDITIONS.
6. FOR UNITS WITH LOW AMBIENT MOTORMASTER V FIOP,
   040-060: OFC1 IS REPLACED WITH MOTORMASTER FUSE BLOCK MMF-A AND MMTB IS ADDED.
   070-075: OFC3 IS REPLACED WITH MOTORMASTER FUSE BLOCK MMF-A.
   OFC1 IF REPLACED WITH MOTORMASTER FUSE BLOCK MMF-B AND MMTB IS ADDED.
   SEE 48ZZ502407 LABEL FOR WIRING INFORMATION.
7. FOR SCCR OPTION, ALL CONTACTOR TERMINAL MARKINGS 11,12,13,21,22,23 WILL BE L1,L2,L3,T1,T2,T3 AND ALL COMPRESSOR CB'S AND CCB TERMINAL MARKINGS 11,12,13,21,22,23 WILL BE 1,3,5,2,4,6.WHEN IFM AND PE HAVE NO VFD THE CIRCUIT BREAKER IS REPLACED WITH MOTOR STARTER PROTECTOR, TERMINAL MARKINGS 11,12,13,21,22,23 WILL BE L1,L2,L3,T1,T2,T3 EXCEPT FOR IFM 40 HP 230V AND ALL 75 HP MOTORS TERMINAL MARKINGS WILL BE 1,3,5,2,4,6.

FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1A FU1B	460-3-60,575-3-60	1200VA	FNQ-R-3 1/2
	208/230-3-60,380-3-60		FNQ-R-7
FU3A FU3B	460-3-60,575-3-60	1000VA	FNQ-R-3 1/2
	208/230-3-60		FNQ-R-7
FU7A,FU7B	575-3-60	750VA	FNQ-R-3 1/2
MMF-A MMF-B	380-3-60,460-3-60,575-3-60	NONE	KTK-R-15
	208/230-3-60		KTK-R-20

SCCR OPTION IFM/PE W/VFD				
FUSE BELOW REPLACES CIRCUIT BREAKER				
VFD HP	208/230-3-60	460-3-60	575-3-60	380-3-60
7.5	JJS-30	JJS-15	JJS-15	JJS-20
10	JJS-40	JJS-20	JJS-25	JJS-30
15	JJS-60	JJS-30	JJS-25	JJS-40
20	JJS-100	JJS-40	JJS-40	JJS-50
25	JJS-100	JJS-50	JJS-40	JJS-80
30	JJS-150	JJS-80	JJS-50	JJS-80
40	JJS-150	JJS-80	JJS-60	JJS-90
50	N/A	JJS-90	JJS-80	N/A
60	N/A	JJS-125	JJS-80	N/A
75	N/A	JJS-175	JJS-100	N/A

Fig. 19 — Typical Power Schematic (Sizes 040-075 Shown)

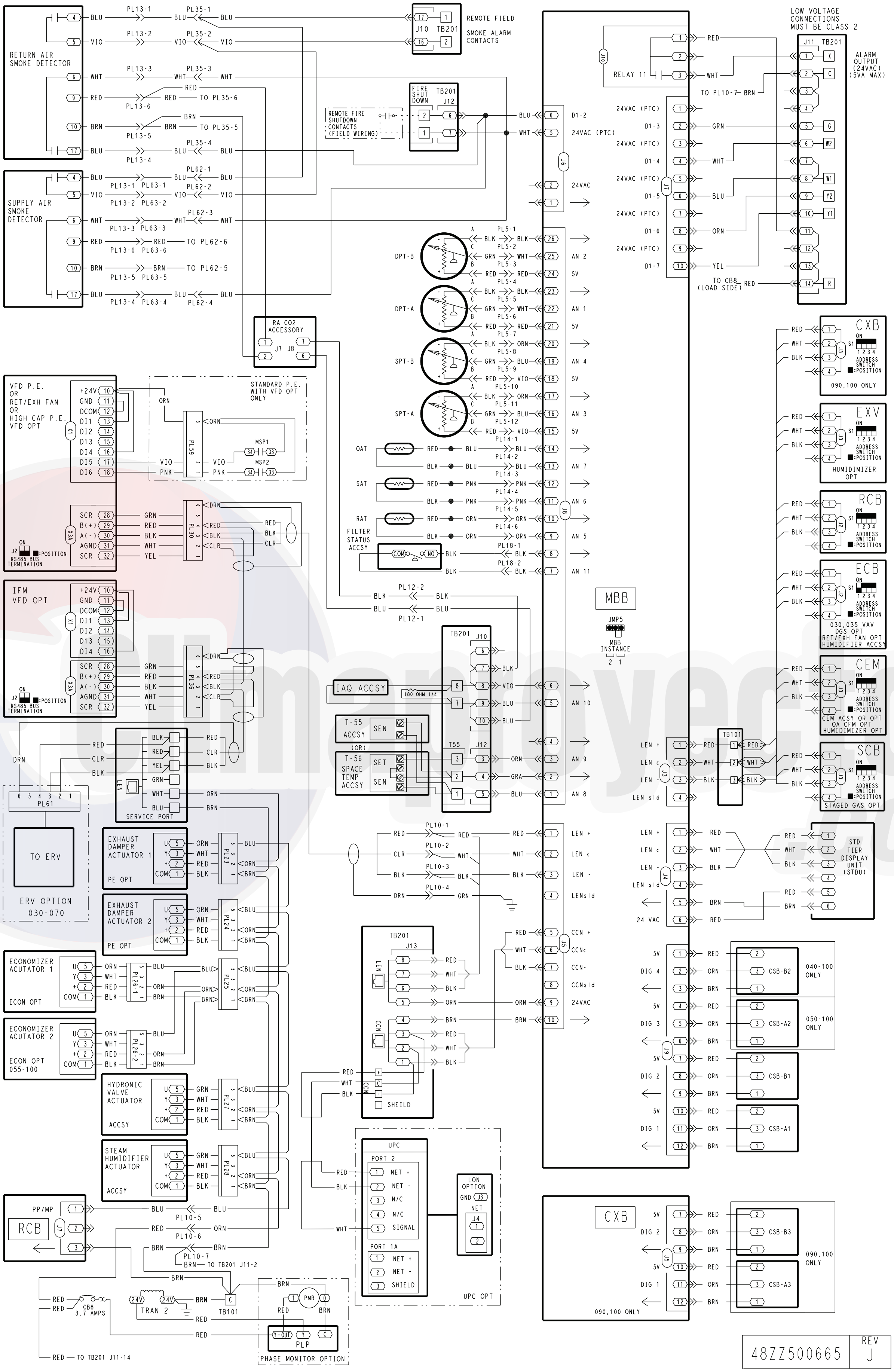


Fig. 20 — Main Base Board Input/Output Connections

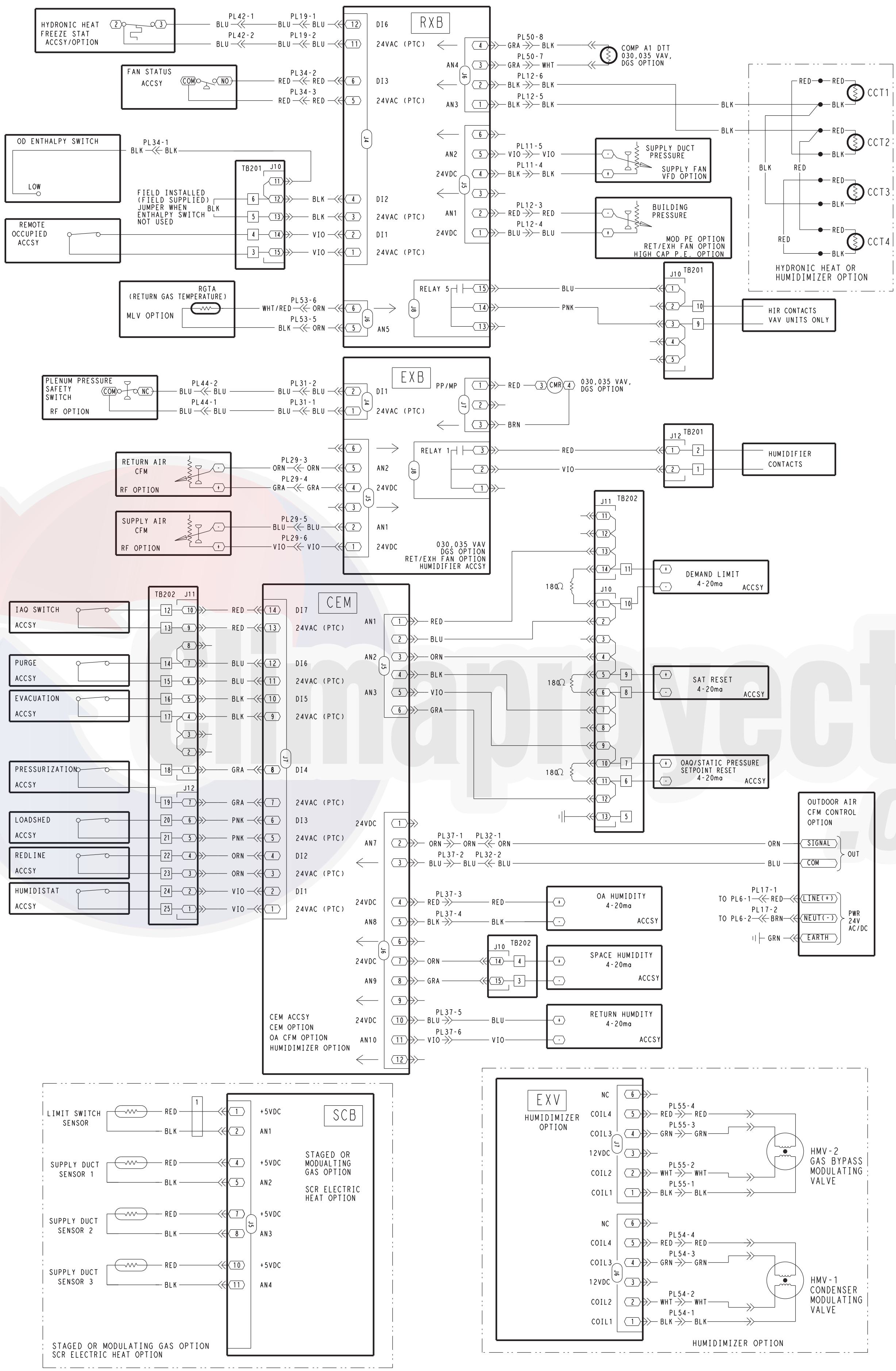


Fig. 21 — RXB, EXB, CEM, SCB Input/Output Connections

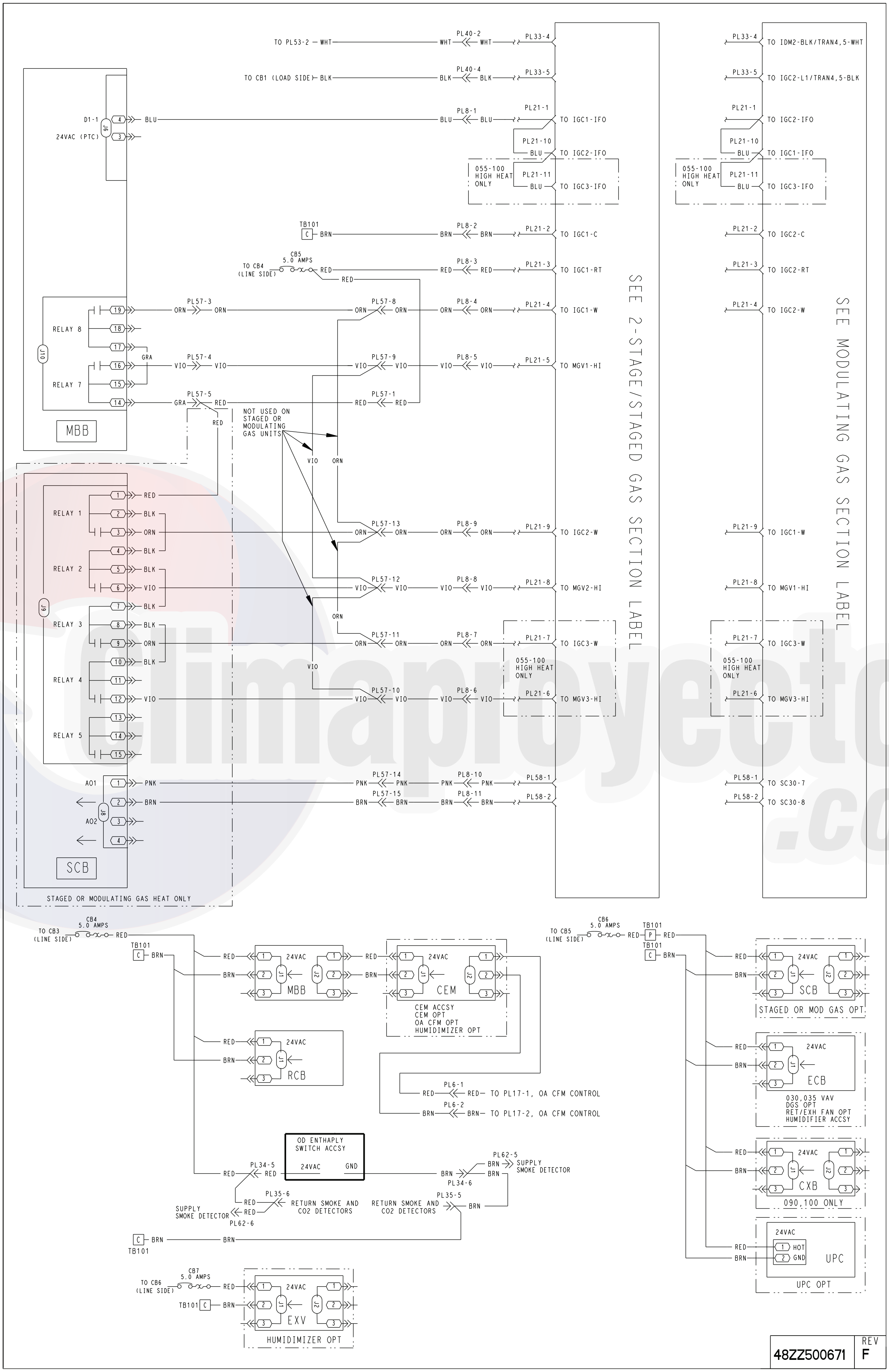


Fig. 22 — Typical Gas Heat Unit Control Wiring (48P030-100 Units Shown)

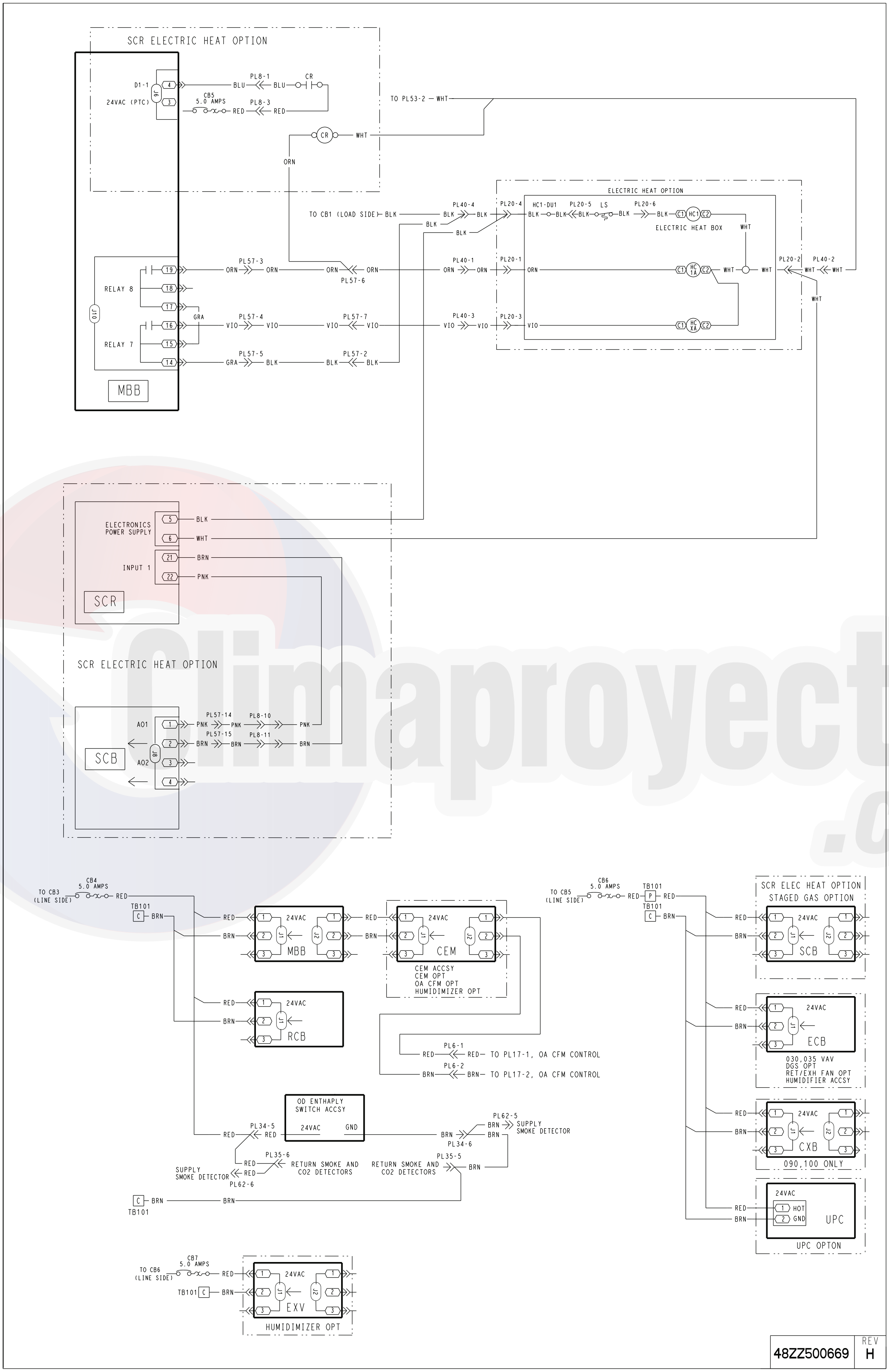


Fig. 23 — Typical Electric Heat Wiring (50P030-100 Units Shown)

NOTES:

1. MP.A1 NOT USED IN THE FOLLOWING UNITS:
   030-040: 460V UNITS WITHOUT DIGITAL SCROLL
   050,055: ALL UNITS
   060-100: 460V UNITS WITHOUT DIGITAL SCROLL
2. MP.A2 NOT USED IN THE FOLLOWING UNITS:
   050,055: ALL UNITS
   060-100: 460V UNITS
3. MP.B1 NOT USED IN THE FOLLOWING UNITS:
   030,035: 460V UNITS
   040-055: ALL UNITS
   060-100: 460V UNITS
4. MP.B2 NOT USED IN THE FOLLOWING UNITS:
   040-055: ALL UNITS
   060-100: 460V UNITS
5. MP.A3 NOT USED IN THE FOLLOWING UNITS:
   090,100: 460V UNITS
6. MP.B3 NOT USED IN THE FOLLOWING UNITS:
   090,100: 460V UNITS
7. JUMPER PLUG REQUIRED WHEN MP NOT USED
8. FOR UNITS WITH LOW AMBIENT MOTORMASTER V FIOP,
   030-060: OFC1 IS REPLACED WITH MOTORMASTER RELAY MMR-A.
   070,075: OFC3 IS REPLACED WITH MOTORMASTER RELAY MMR-A.
   OFC1 IS REPLACED WITH MOTORMASTER RELAY MMR-B.
   090,100: OFC3 IS REPLACED WITH MOTORMASTER RELAY MMR-A.
   OFC2 IS REPLACED WITH MOTORMASTER RELAY MMR-B.
   OFC TERMINAL C1 IS REPLACED WITH MMR TERMINAL A1.
   OFC TERMINAL C2 IS REPLACED WITH MMR TERMINAL A2.
   SEE 48ZZ502407 LABEL FOR WIRING INFORMATION.

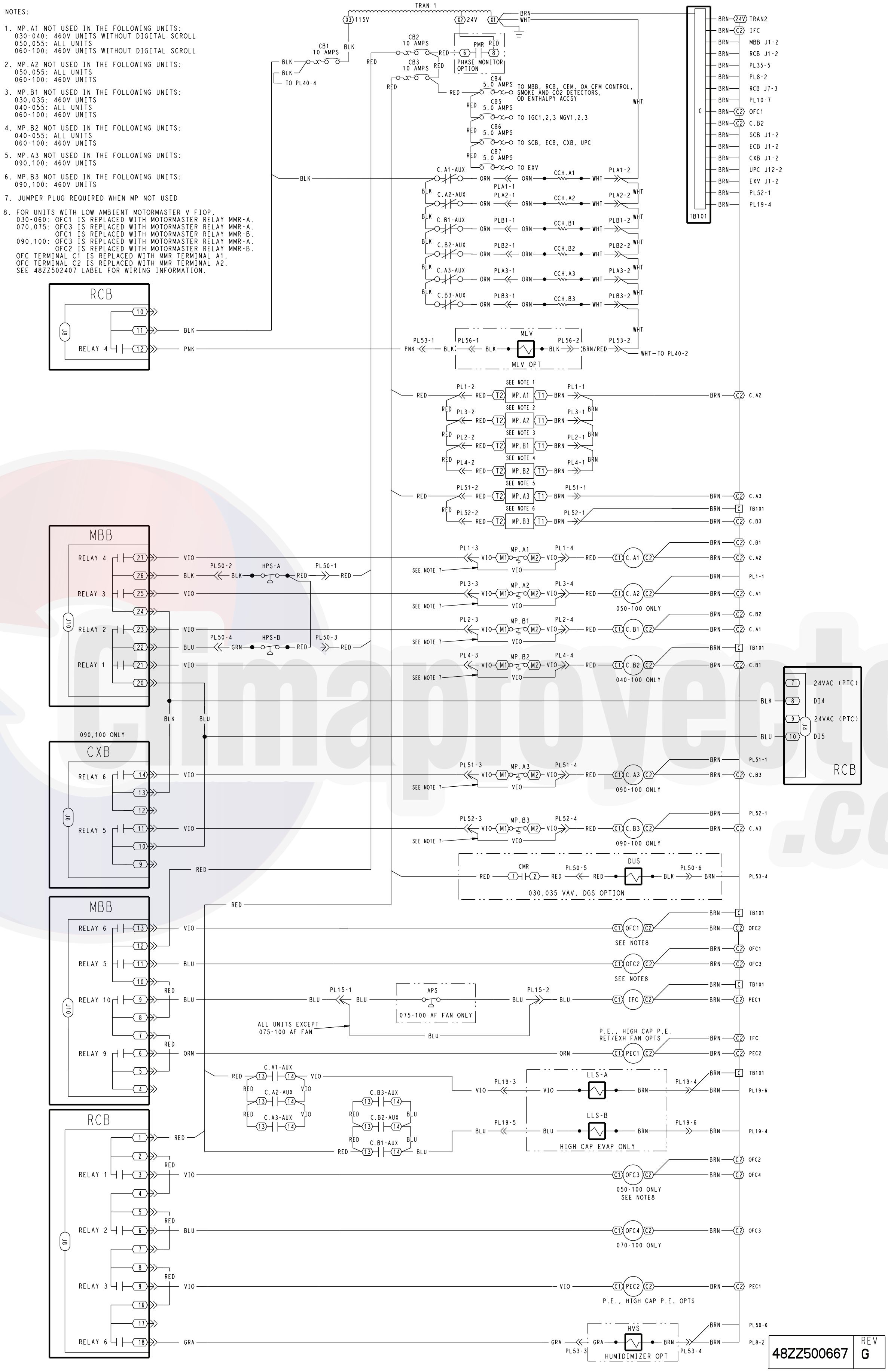


Fig. 24 — Typical Power Wiring (115-V)

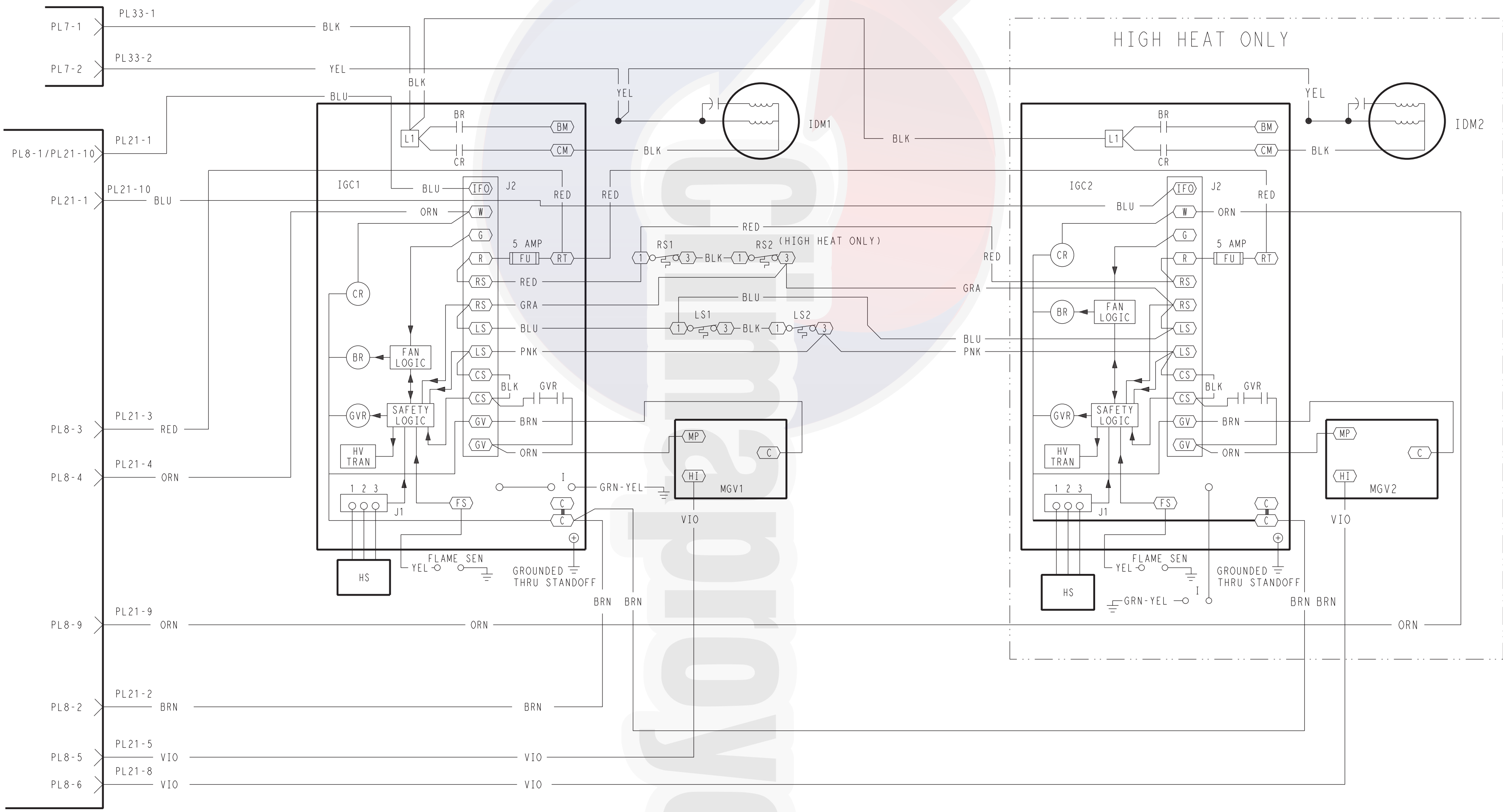


Fig. 25 — Typical Gas Heat Section (Size 030-050 Units Shown)

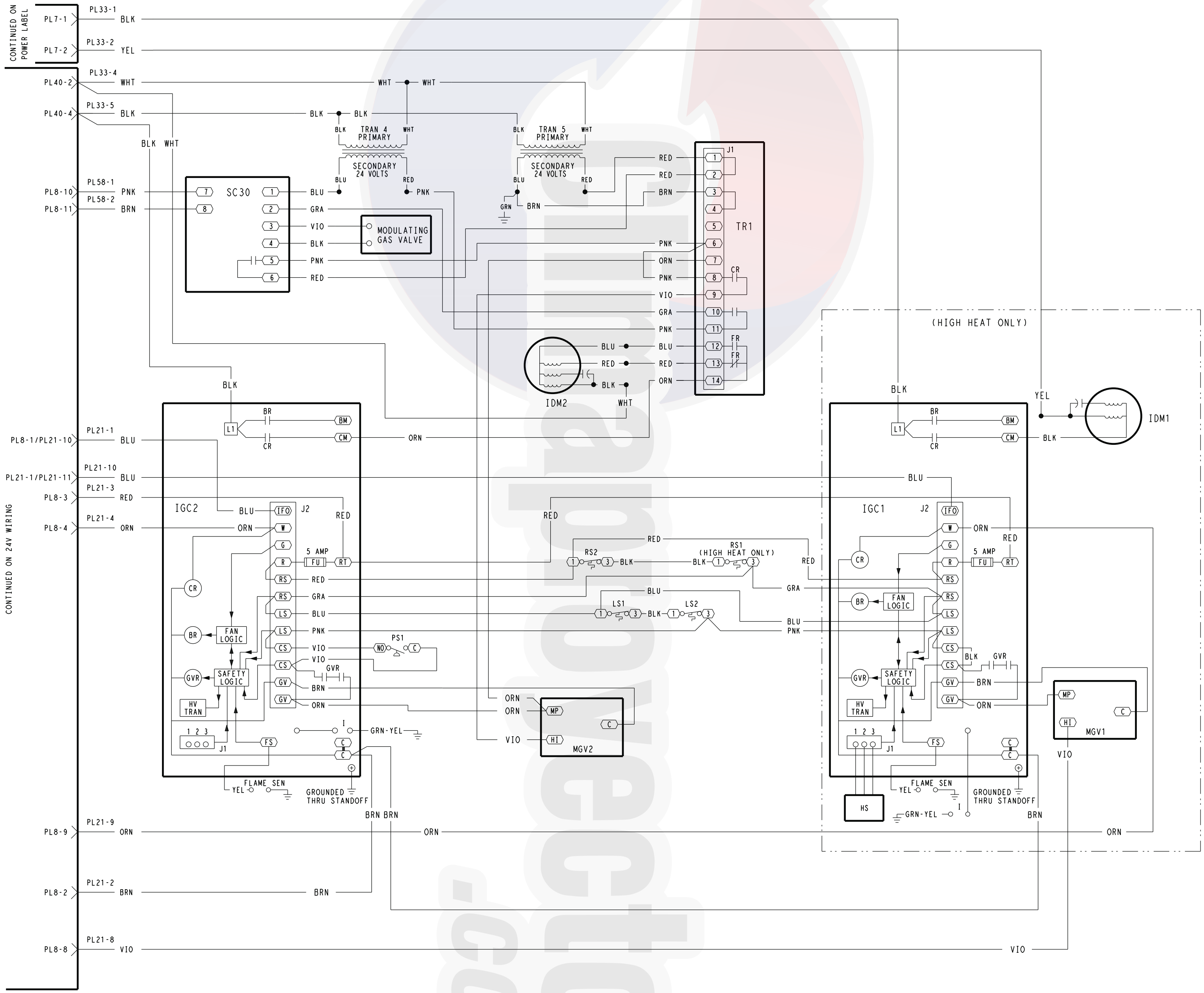


Fig. 26 — Typical Modulating Gas Heat Section (Size 030-050 Units Shown)

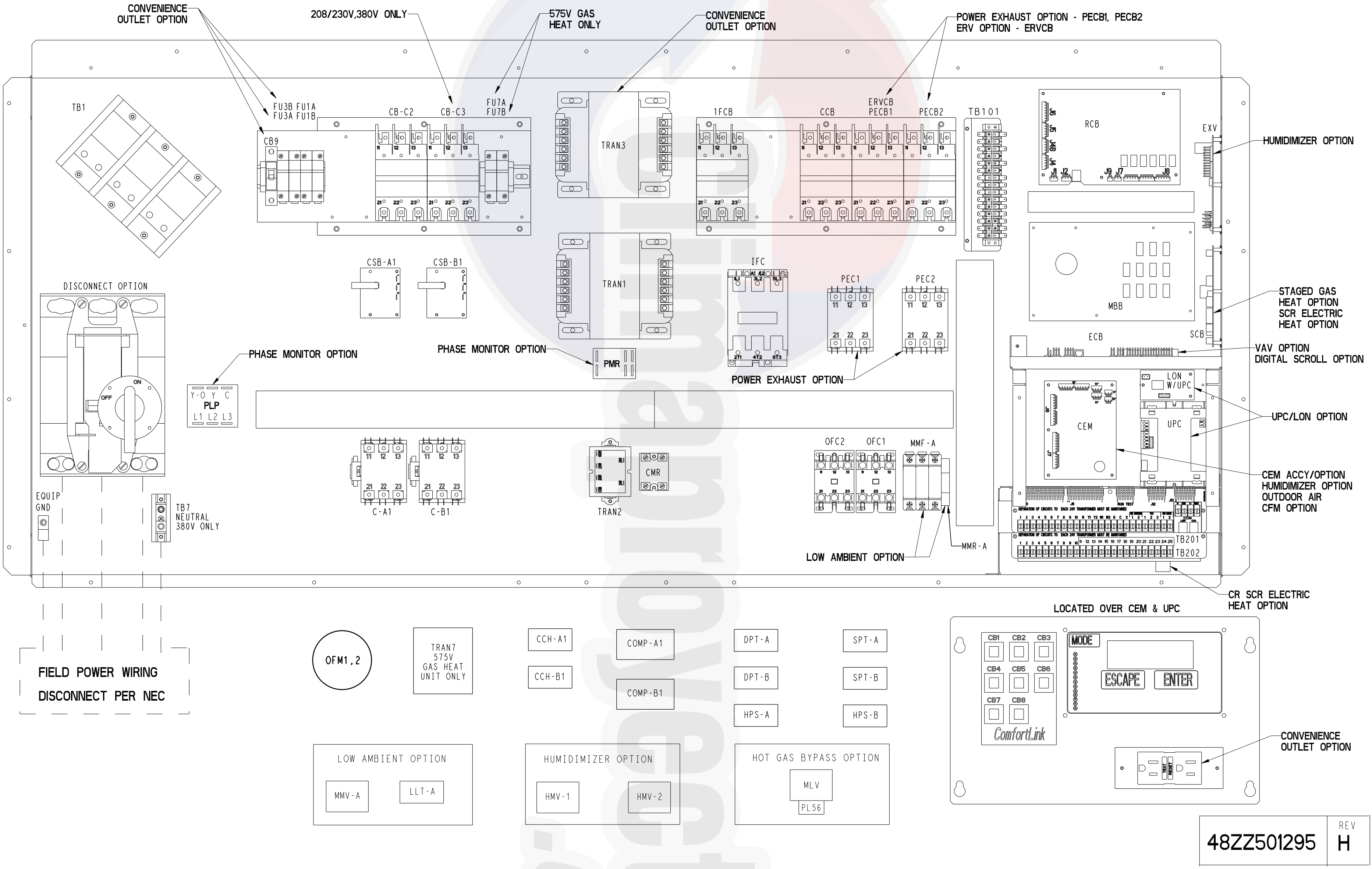


Fig. 27 — Component Arrangement (Size 030,035 Units)

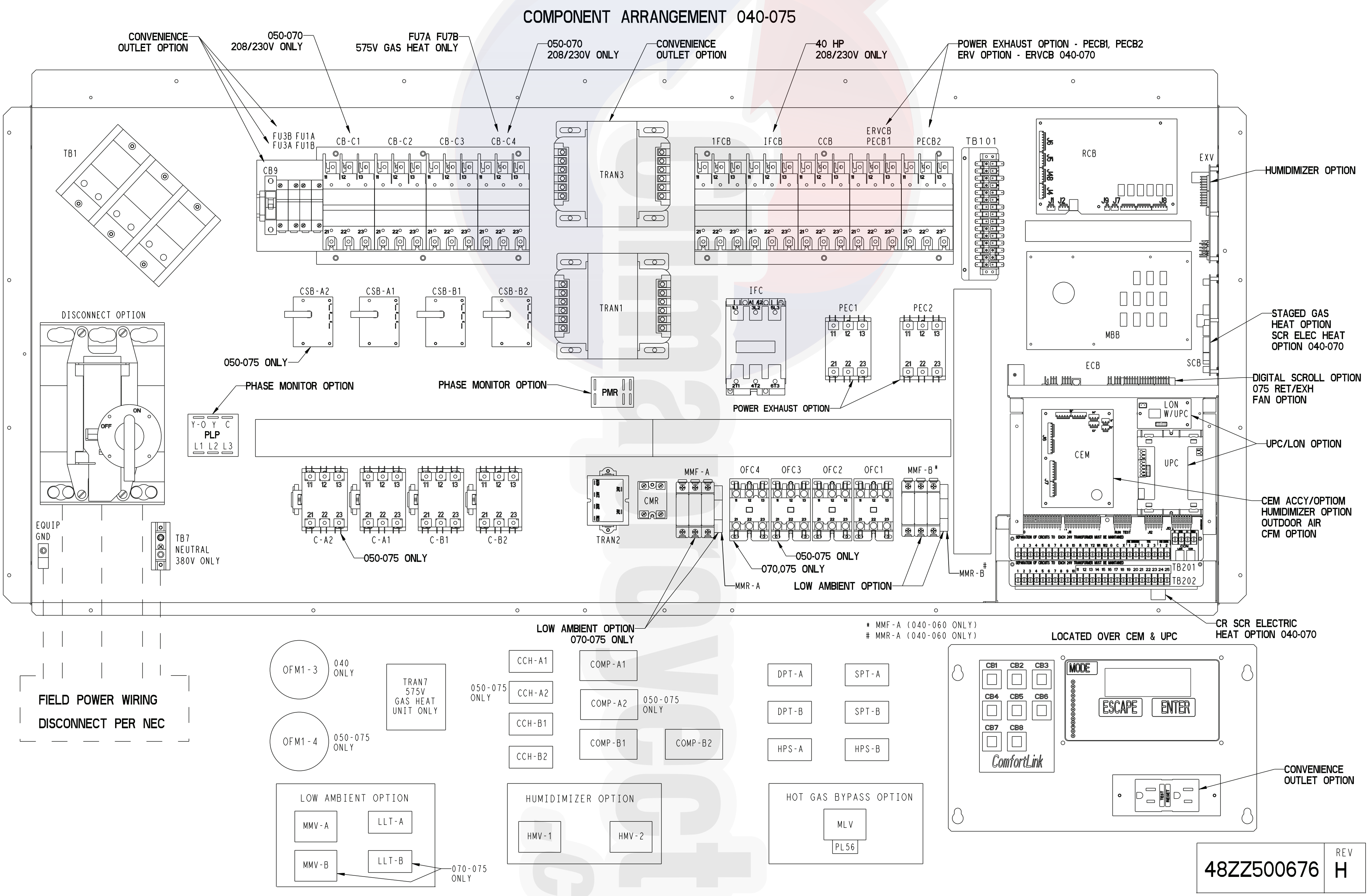


Fig. 28 — Component Arrangement (Size 040-075 Units)

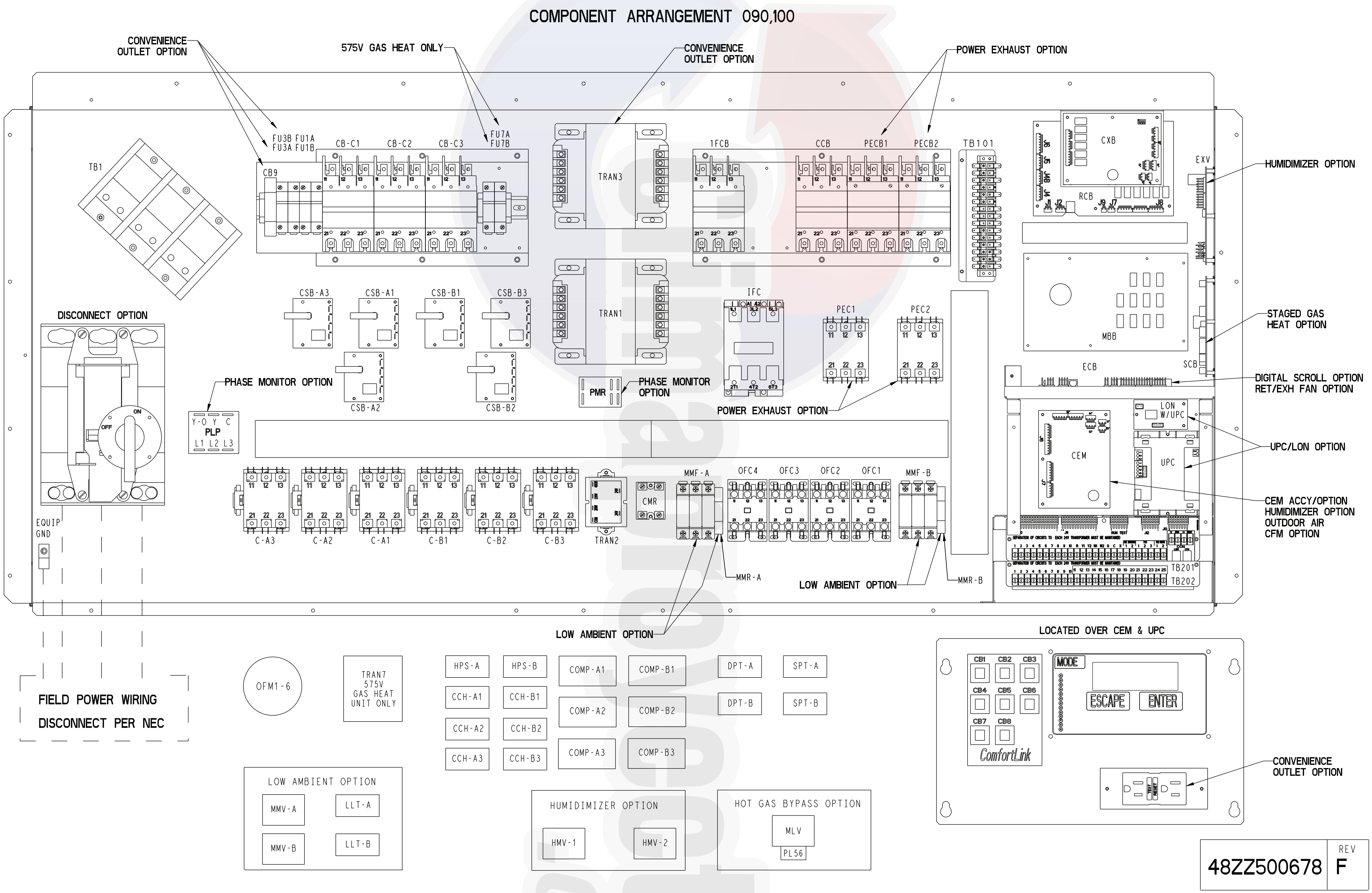


Fig. 29 — Component Arrangement (Size 090,100 Units)

LEGEND FOR FIG. 19-29

ACCSY — Accessory
ACC'Y — Accessory
AN — Analog
APS — Air Pressure Switch
BR — Blower Relay
C — Compressor Contactor
CB — Compressor Circuit Breaker
CCB — Control Circuit Breaker
CCH — Crankcase Heater
CCN — Carrier Comfort Network®
CCT — Cooling Coil Thermistor
CEM — Controls Expansion Module
CMR — Compressor Modulation Relay
COMP — Compressor
CR — Control Relay
CSB — Current Sensor Board
CXB — Compressor Expansion Board
DGS — Discharge Gas Sensor
DI — Digital Input
DPT — Discharge Pressure Transducer
D/S — Downshot (Vertical)
DTT — Discharge Temperature Thermistor
DUS — Digital Unloader Solenoid
ECB — Economizer Control Board
ECON — Economizer
EQUIP — Equipment
ERV — Energy Recovery Ventilation
EXB — Economizer Control Board
EXH — Exhaust
EXV — Electronic Expansion Valve
FIOP — Factory Installed Options
FU — Fuse
GND — Ground
GVR — Gas Valve Relay
HC — Heater Contactor
HIR — Heat Induction Relay
HMV — Humidi-MiZer Valve
HPS — High-Pressure Switch
HS — Hall Effect Sensor
HV — High Voltage
HVS — Humidi-MiZer® Valve Solenoid
I — Ignitor
IAQ — Indoor Air Quality
IDM — Induced Draft Motor
IFC — Indoor Fan Contactor
IFCB — Indoor Fan Circuit Breaker
IFM — Indoor Fan Motor
IFO — IGC Fan Output
IGC — Integrated Gas Controller
LEN — Local Equipment Network
LLS — Liquid Line Solenoid
LLT — Liquid Line Transducer
LON — Local Operating Network
LS — Limit Switch
MBB — Main Base Board
MGV — Main Gas Valve
MLV — Minimum Load Valve
MM — Motormaster®
MMF — MotorMaster V Fuses
MMR — MotorMaster V Relay
MMV — MotorMaster V Control
MP — Communications
MSP — Motor Starter Protector
NEC — National Electrical Code
OA — Outdoor Air
OAQ — Outdoor Air Quality
OAT — Outdoor-Air Thermostat
OD — Outdoor
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
OL — Overload
OPT — Option
PE — Power Exhaust
PEC — Power Exhaust Contactor
PECB — Power Exhaust Circuit Breaker
PEM — Power Exhaust Motor
PLP — Phase Loss Protection
PMO — Phase Monitor Option
PMR — Phase Monitor Relay
PP — Communications
PS — Pressure Switch
PTC — Positive Temperature Coefficient Power Reference
RAT — Return Air Thermistor
RCB — Rooftop Control Board
RET — Return
RF — Return Fan
RS — Rollout Switch
RXB — Rooftop Control Board
SAT — Supply Air Thermistor
SCB — Staged Gas Control Board
SCR — Silicon Controlled Rectifier
SEN — Sensor
SPT — Suction Pressure Transducer
S/S — Side Shot
STDU — Standard Tier Display Unit
TB — Terminal Block
TRAN — Transformer
UPC — Unitary Protocol Converter
VAV — Variable Air Volume
VFD — Variable Frequency Drive

x — Terminal Block
Terminal (Unmarked)
x — Terminal (Marked)
Splice
Factory Wiring
Field Wiring
To indicate common potential only, not to represent wiring.
To indicate factory-installed option or accessory

Table 103 — Main Control Board (MBB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
IGCFAN	IGC IFO input	Switch Input	DI1	J6, 3-4
FSD	Fire Shutdown Switch, RA/SA Smoke Detector	Switch Input	DI2	J6, 5-6
G	Thermostat 'G' Input	Switch Input	DI3	J7, 1-2
W2	Thermostat 'W2' Input	Switch Input	DI4	J7, 3-4
W1	Thermostat 'W1' Input	Switch Input	DI5	J7, 5-6
Y2	Thermostat 'Y2' Input	Switch Input	DI6	J7, 7-8
Y1	Thermostat 'Y1' Input	Switch Input	DI7	J7, 9-10
CSB_A1	Compressor A1 Feedback	Digital Input	DIG1	J9, 10-12
CSB_B1	Compressor B1 Feedback	Digital Input	DIG2	J9, 7-9
CSB_A2	Compressor A2 Feedback	Digital Input	DIG3	J9, 4-6
CSB_B2	Compressor B2 Feedback	Digital Input	DIG4	J9, 1-3
DP_A	Discharge Pressure Circuit A	Thermistor/Transducer (0-5 V)	AN1	J8, 21-23
DP_B	Discharge Pressure Circuit B	Thermistor/Transducer (0-5 V)	AN2	J8, 24-26
SP_A	Suction Pressure Circuit A	Thermistor/Transducer (0-5 V)	AN3	J8, 15-17
SP_B	Suction Pressure Circuit B	Thermistor/Transducer (0-5 V)	AN4	J8, 18-20
RAT	Return Air Temperature	Thermistor	AN5	J8, 9-10
SA_TEMP	Supply Air Temperature	Thermistor	AN6	J8, 11-12
OAT	Outside Air Temperature	Thermistor	AN7	J8, 13-14
SPT	Space Temperature	Thermistor	AN8	J8, 1-2
SPTO	Space Temperature Offset	Thermistor	AN9	J8, 3-4
IAQ, IAQMINOV	IAQ Input	Thermistor	AN10	J8, 5-6
FLTS	Filter Status Switch	Thermistor	AN11	J8, 7-8
OUTPUTS				
CMPB2	Compressor B2	Relay	RLY 1	J10, 20-21
CMPB1	Compressor B1	Relay	RLY 2	J10, 22-23
CMPA2	Compressor A2	Relay	RLY 3	J10, 24-25
CMPA1	Compressor A1	Relay	RLY 4	J10, 26-27
CONDFAN2	Condenser Fan Circuit B	Relay	RLY 5	J10, 10-11
CONDFAN1	Condenser Fan Circuit A	Relay	RLY 6	J10, 12-13
HS2	Heat Relay 2	Relay	RLY 7	J10, 14-16
HS1	Heat Relay 1	Relay	RLY 8	J10, 17-19
PE1	Power Exhaust Relay 1	Relay	RLY 9	J10, 4-6
SFAN	Supply Fan Relay	Relay	RLY 10	J10, 7-9
ALRM	Alarm Relay	Relay	RLY 11	J10, 1-3

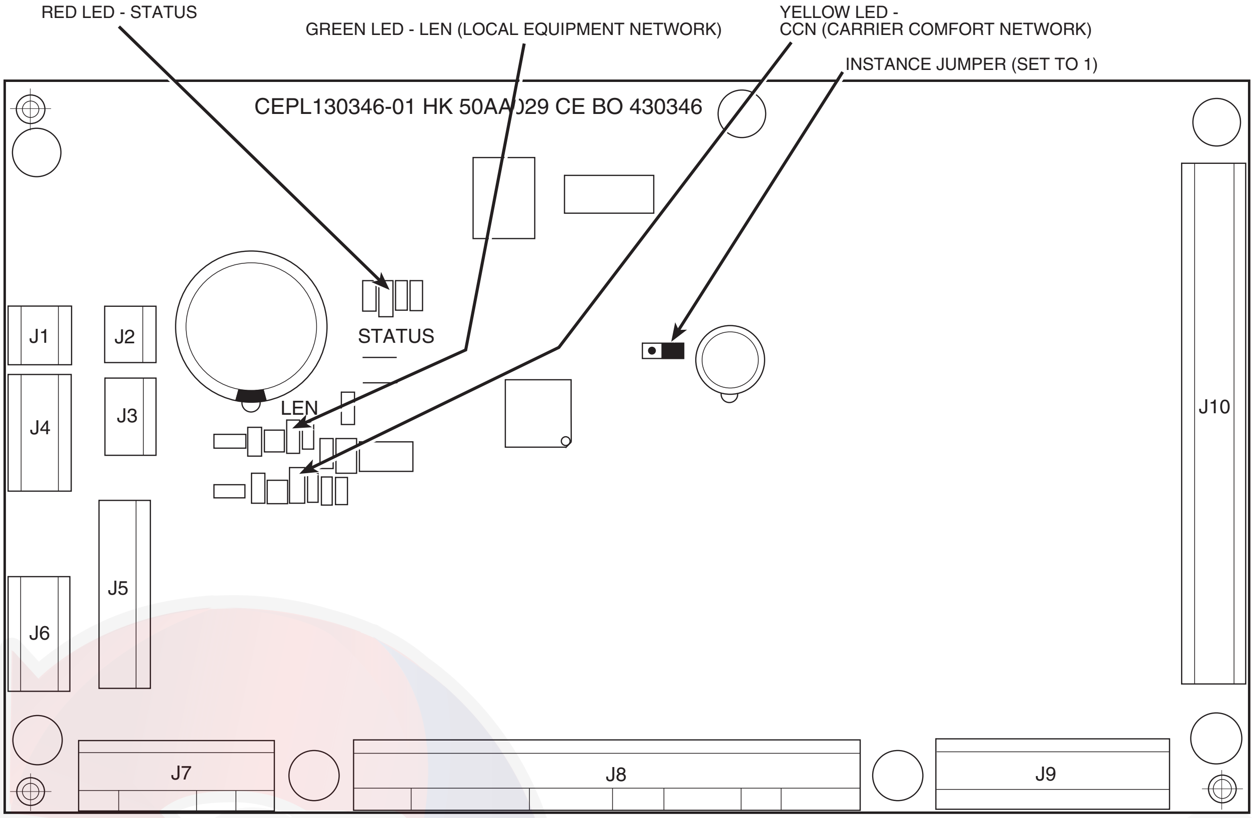


Fig. 30 — Main Base Board (MBB)

Table 104 — Rooftop Control Board (RXB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
RMTIN	Remote Occupancy Switch	Switch Input	DI1	J4, 1-2
ENTH	Outdoor Enthalpy Switch	Switch Input	DI2	J4, 3-4
SFS	Fan Status Switch	Switch Input	DI3	J4, 5-6
CIRCAHPS	Compressor A1 HPS Feedback	Switch Input	DI4	J4, 7-8
CIRCBHPS	Compressor B1 HPS Feedback	Switch Input	DI5	J4, 9-10
FRZ	Hydronic Heat Freeze Stat	Switch Input	DI6	J4, 11-12
BP	Building Pressure	Transducer (4-20 mA)	AN1	J5, 1-3
SP	Supply Duct Pressure	Transducer (4-20 mA)	AN2	J5, 4-6
CCT	Air Temp Leaving Evaporator Coil	Thermistor	AN3	J6, 1-2
DTA1	Compressor A1 Disch Temp	Thermistor	AN4	J6, 3-4
RGTA	Suction Gas Temp Circuit A	Thermistor	AN5	J6, 5-6
Not Used	—	—	AN6	J6, 7-8
OUTPUTS				
Not Used	Not Used	4 - 20 mA	AO1	J9, 1-2
ACT_CMD	BELIMO ACTUATORS	Digital	PP/MP	J7, 1-3
PE_1_POS	Power Exhaust 1 Position			
PE_2_POS	Power Exhaust 2 Position			
ECONOPOS	Economizer Act. Curr. Pos.			
ECON2POS	Economizer 2 Act. Curr. Pos.			
HYDV_POS	Hydronic Valve			
STHUM_POS	Steam Humidifier			
CONDFAN3	Condenser Fan Motor 3	Relay	RLY1	J8, 1-3
CONDFAN4	Condenser Fan Motor 4	Relay	RLY 2	J8, 4-6
PE2	Power Exhaust Relay 2	Relay	RLY 3	J8, 7-9
MLV	Minimum Load Valve	Relay	RLY 4	J8, 10-12
HIR	Heat Interlock Relay	Relay	RLY 5	J8, 13-15
	Humidimizer 3 Way Valve	Relay	RLY 6	J8, 16-18

Table 105 — Economizer Control Board (EXB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
PPS	Plenum Pressure Switch	Switch Input	DI1	J4, 1-2
Not Used	—	—	DI2	J4, 3-4
SACFM	Supply Air CFM 4-20	Transducer (4-20 mA)	AN1	J5, 1-3
RACFM	Return Air CFM 4-20	Transducer (4-20 mA)	AN2	J5, 4-6
OUTPUTS				
Not Used	—	4 - 20 mA	AO1	J9, 1-2
CMPA1CAPHUMID	Compressor A1 Solenoid (0-100%)	Digital	PP/MP	J7, 1-3
RLY	Humidifier Relay	Relay	RLY1	J8, 1-3
Not Used	—	Relay	RLY 2	J8, 4-6
Not Used	—	Relay	RLY 3	J8, 7-9
Not Used	—	Relay	RLY 6	J8, 16-18

Table 106 — Staged Gas Control Board (SCB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
LIMSWTMP	Limit Switch Temp	Thermistor/Transducer (0-5 V)	AN1	J5, 1-3
LAT1SGAS	Supply Air Temp #1	Thermistor/Transducer (0-5 V)	AN2	J5, 4-6
LAT2SGAS	Supply Air Temp #2	Thermistor/Transducer (0-5 V)	AN3	J5, 7-9
LAT3SGAS	Supply Air Temp #3	Thermistor/Transducer (0-5 V)	AN4	J5, 10-12
Not Used	—	Thermistor/Transducer (0-5 V)	AN5	J5, 13-15
Not Used	—	Thermistor/Transducer (0-5 V)	AN8	J6, 1-3
Not Used	—	Thermistor/Transducer (0-5 V)	AN7	J6, 4-6
Not Used	—	Thermistor/Transducer (0-5 V)	AN6	J6, 7-9
Not Used	—	Thermistor	AN9	J7, 1-2
Not Used	—	Thermistor	AN10	J7, 3-4
OUTPUTS				
HTMG.CAP	Modulating Heat Capacity	4 - 20 mA	AO1	J8, 1-2
Not Used	—	4 - 20 mA	AO2	J8, 3-4
HS3	Relay 3 W1 Gas Valve 2	Relay	RLY1	J9, 1-3
HS4	Relay 4 W2 Gas Valve 2	Relay	RLY 2	J9, 4-6
HS5	Relay 5 W1 Gas Valve 3	Relay	RLY 3	J9, 7-9
HS6	Relay 6 W2 Gas Valve 3	Relay	RLY 4	J9, 10-12
Not Used	—	Relay	RLY 5	J9, 13-15

Table 107 — Control Expansion Module (CEM) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
DHDISCIN	Dehumidify Switch Input	Switch	DI 1	J7, 1-2
DMD_SW1	Demand Limit 1 — Redline	Switch	DI 2	J7, 3-4
DMD_SW2	Demand Limit 2 — Loadshed	Switch	DI 3	J7, 5-6
PRES	Pressurization	Switch	DI 4	J7, 7-8
EVAC	Evacuation	Switch	DI 5	J7, 9-10
PURG	Purge	Switch	DI 6	J7, 11-12
IAQIN	IAQ Discrete Input	Switch	DI 7	J7, 13-14
OACFM	Outside Air CFM — 4-20 (VAV)	4 - 20 mA	AN7	J6, 1-3
OARH	Outside Air RH (VAV)	4 - 20 mA	AN8	J6, 4-6
SPRH	Space RH	4 - 20 mA	AN9	J6, 7-9
RARH	Return Air RH	4 - 20 mA	AN10	J6, 10-12
DMDLMTMA	Demand Limit — 4-20	Thermistor	AN1	J5, 1-2
SATRESMA	SAT Reset 4-20 (VAV)	Thermistor	AN2	J5, 3-4
OAQ	OAQ — 4-20	Thermistor	AN3	J5, 5-6
Not Used	—	Thermistor	AN4	J5, 7-8
Not Used	—	Thermistor	AN5	J5, 9-10
Not Used	—	Thermistor	AN6	J5, 11-12

COMPRESSOR EXPANSION BOARD (CXB) — The CXB is used on size 090 and 100 units only to provide additional compressor outputs and CSB inputs. See Table 108.

EXPANSION VALVE CONTROL BOARD (EXV) — The EXV is used on Humidi-MiZer® equipped units only. It is used to provide control of the condenser and bypass modulating valves. See Table 109.

LOW VOLTAGE TERMINAL STRIP — This circuit board provides a connection point between the major control boards and a majority of the field-installed accessories. See Table 110. The circuit breakers for the low voltage control transformers, interface connection for the Carrier Comfort Network® (CCN) communication, and interface connection for the Local Equipment Network (LEN) communication are also located on the low voltage terminal strip.

INTEGRATED GAS CONTROL (IGC) — One IGC is provided with each bank of gas heat exchangers. One is used on low heat size 030-050 units. Two are used on high heat size 030-050 units and low heat 055-100 units. Three are used on high heat 055-100 units. The IGC controls the direct spark ignition system and monitors the rollout switch, limit switches, and induced-draft motor Hall Effect switch.

For units equipped with Modulating Gas heat, the IGC in the Modulating Gas section uses a Pressure Switch in place of the Hall Effect sensor. The IGC is equipped with a LED (light-emitting diode) for diagnostics. See Table 111.

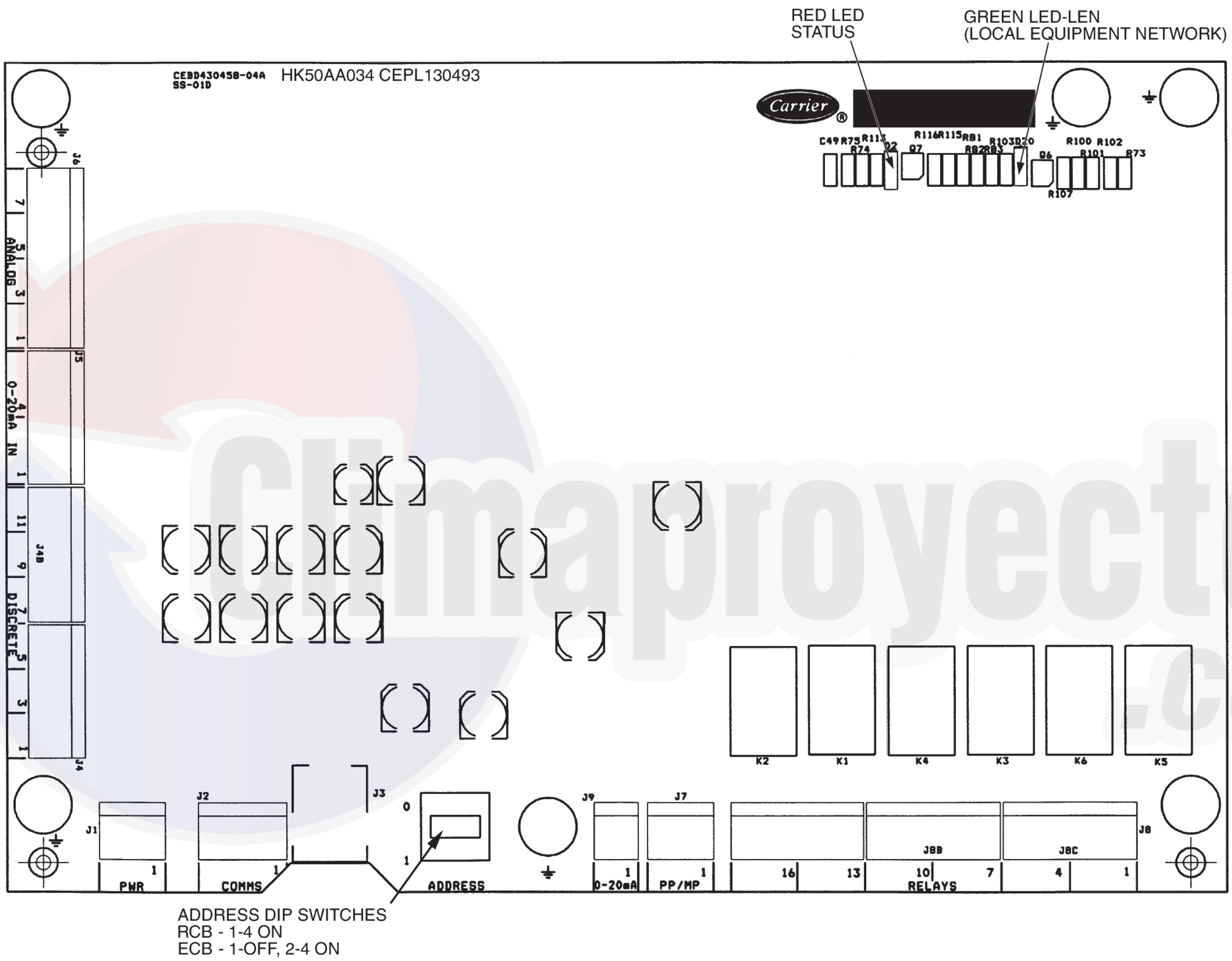


Fig. 31 — Economizer Control Board (EXB) and Rooftop Control Board (RXB)

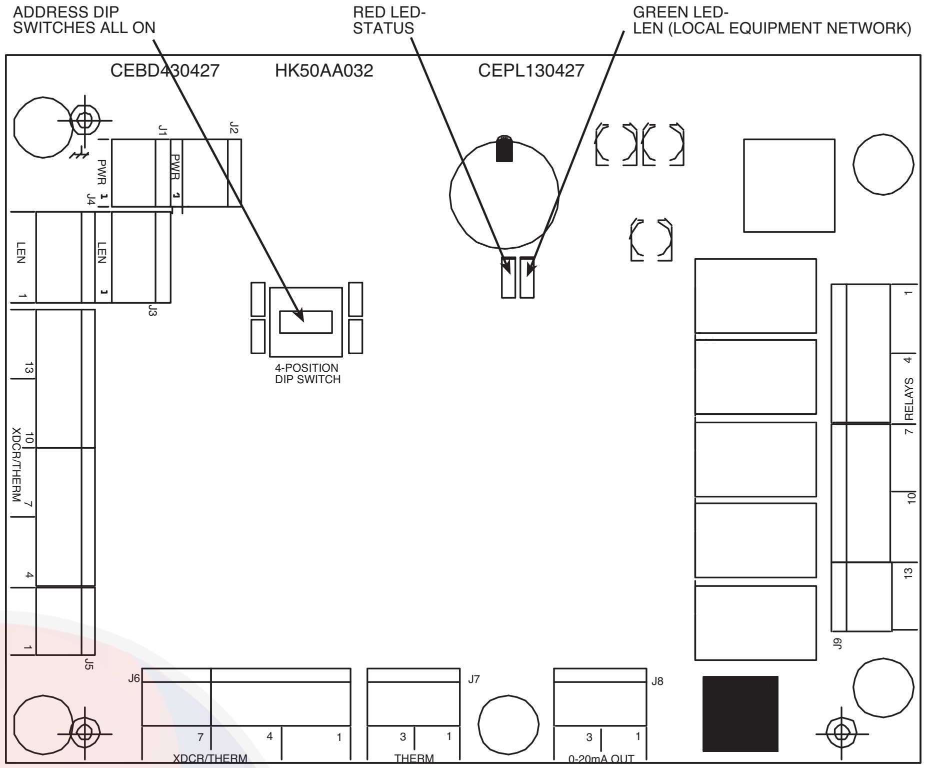


Fig. 32 — Staged Gas Heat Control Board (SCB)

Table 108 — Compressor Expansion Board (CXB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
CSB_A3	Compressor A3 Feedback	Digital Input	DIG1	J9, 10-12
CSB_B3	Compressor B3 Feedback	Digital Input	DIG2	J9, 7-9
Not Used	Not Used	Digital Input	DIG3	J9, 4-6
Not Used	Not Used	Digital Input	DIG4	J9, 1-3
OUTPUTS				
Not Used	Not Used	Relay	RLY1	J6, 1-2
Not Used	Not Used	Relay	RLY2	J6, 3-4
Not Used	Not Used	Relay	RLY3	J6, 5-6
Not Used	Not Used	Relay	RLY4	J6, 7-8
CMPB3	Compressor B3 Relay	Relay	RLY5	J6, 9-11
CMPA3	Compressor A3 Relay	Relay	RLY6	J6, 12-14

Table 109 — Expansion Valve Control Board (EXV) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
Not Used	Not Used	Thermistor	AN1	J5, 5-6
Not Used	Not Used	Thermistor	AN2	J5, 7-8
Not Used	Not Used	Thermistor	AN3	J5, 9-10
Not Used	Not Used	Thermistor	AN4	J5, 11-12
Not Used	Not Used	Transducer (4-20 mA)	AN5	J5, 1-2
Not Used	Not Used	Transducer (4-20 mA)	AN6	J5, 3-4
OUTPUTS				
COND_EXV	Humidimizer Control Valve 1	Stepper Motor	EXV-1	J6, 1-5
BYP_EXV	Humidimizer Control Valve 2	Stepper Motor	EXV-2	J7, 1-5

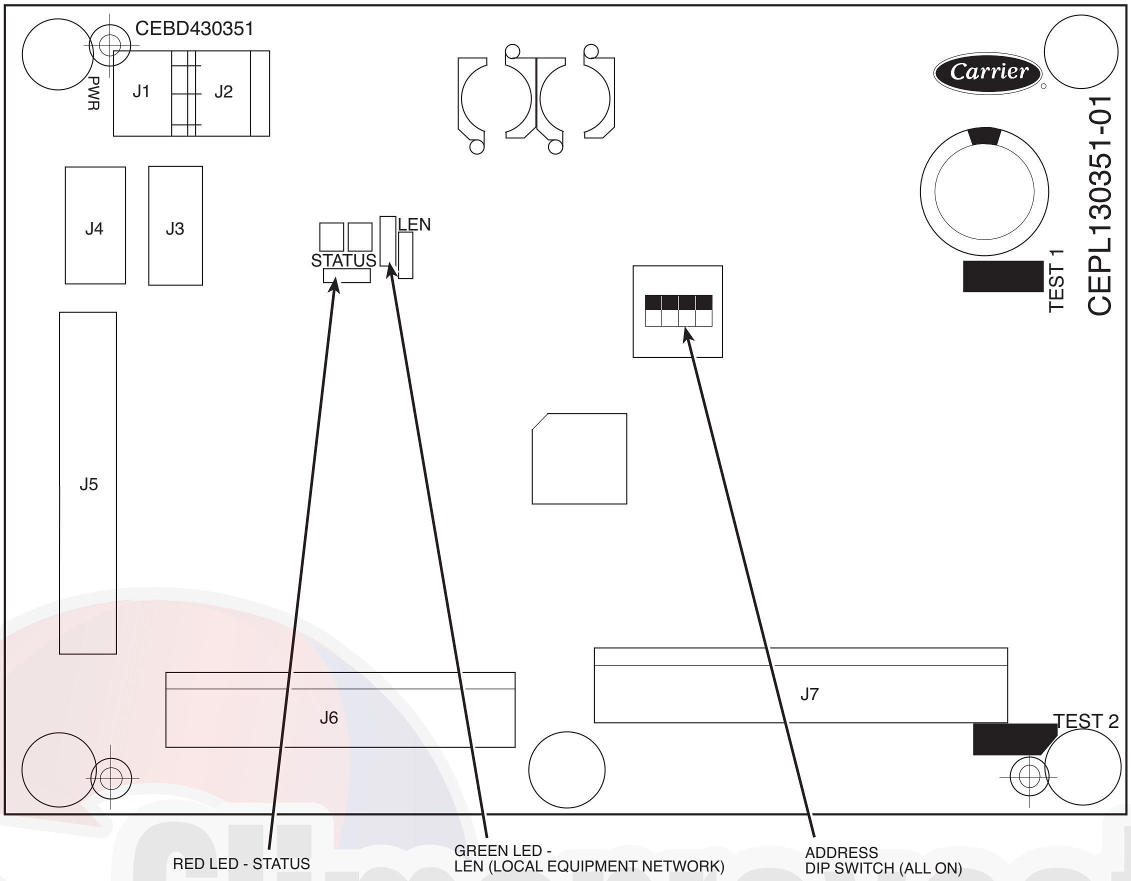


Fig. 33 — Controls Expansion Board (CEM)

Table 110 — Field Terminal Connections

BOARD NO.	TERMINAL NUMBER	DESCRIPTION	TYPE
TB-1 - POWER CONNECTION OR DISCONNECT (in Main Control Box)			
	11	L1 power supply	208-230/460/575/380/-3-60, 400-3-50
TB1	12	L2 power supply	208-230/460/575/380/-3-60, 400-3-50
	13	L3 power supply	208-230/460/575/380/-3-60, 400-3-50
NEUTRAL (in Main Control Box)			
Neutral	1	Neutral Power	
TB201 - FIELD CONNECTIONS (in Main Control Box)			
TB201	1	Smoke Detector Alarm Input	external contact (maximum 24 vac, 3 A)
	2	Smoke Detector Alarm Input	external contact (maximum 24 vac, 3 A)
	3	Remote Occupied/Economizer Enable 24 vac out	24 VAC Output
	4	Remote Occupied/Economizer Enable 24 vac in	24 VAC Input
	5	Outdoor Enthalpy Switch 24 VAC out	24 VAC Output
	6	Outdoor Enthalpy Switch 24 VAC in	24 VAC Input
	7	Indoor Air IAQ Remote Sensor/Remote Pot/Remote 4-20 mA	Thermistor input or externally powered 4 to 20 mA when used with 180 ohm resistor
	8	Indoor Air IAQ Remote Sensor/Remote Pot/Remote 4-20 mA	Thermistor input or externally powered 4 to 20 mA when used with 180 ohm resistor
	9	VAV Heater Interlock Relay	Contact (maximum 24 vac, 3 A)
	10	VAV Heater Interlock Relay	Contact (maximum 24 vac, 3 A)
	R	24 VAC Power	24 VAC Output
	Y1	Thermostat Y1 (1st stage cool)	24 VAC Input
	Y2	Thermostat Y2 (2nd stage cool)	24 VAC Input
	W1	Thermostat W1 (1st stage heat)	24 VAC Input
	W2	Thermostat W2 (2nd stage heat)	24 VAC Input
	G	Thermostat G (Fan)	24 VAC Input
	C	24 VAC Common	24 VAC Output
	X	Alarm Output (NO)	24 VAC Output
	FS1	Fire Shut Down	external contact (maximum 24 vac, 3 A)
	FS2	Fire Shut Down	external contact (maximum 24 vac, 3 A)
	T55-1	Space Sensor TH	Thermistor Input
	T55-2	Space Sensor COM	Thermistor Input
	T55-3	Space Sensor Offset Switch	Thermistor Input
	HUM1	Humidifier Output	Contact (maximum 24 vac, 3 A)
	HUM2	Humidifier Output	Contact (maximum 24 vac, 3 A)
	(+)	CCN +	Communication
	(COM)	CCN Common	Communication
	(-)	CCN -	Communication
	SHIELD	Ground	Ground
	LEN	Local Equipment Network	Communication
	CCN	Carrier Comfort Network	Communication
TB202 - FIELD CONNECTIONS CEM (in Main Control Box)			
TB202	1	Not Used	—
	2	Not Used	—
	3	Space Humidity 4-20 mA (-)	4 - 20 mA signal
	4	Space Humidity 4-20 mA (+)	4 - 20 mA loop power
	5	Ground	Ground
	6	Outdoor Air IAQ 4-20 mA (-)	4 - 20 mA signal
	7	Outdoor Air IAQ 4-20 mA (+)	4 - 20 mA loop power
	8	Supply Air Reset 4-20 mA (-)	4 - 20 mA signal
	9	Supply Air Reset 4-20 mA (+)	4 - 20 mA loop power
	10	Demand Limit 4-20 mA (-)	4 - 20 mA signal
	11	Demand Limit 4-20 mA (+)	4 - 20 mA loop power
	12	IAQ Switch 24 VAC in	external contact (maximum 24 vac, 3 A)
	13	IAQ Switch 24 VAC out	external contact (maximum 24 vac, 3 A)
	14	Fire Smoke Purge 24 VAC in	external contact (maximum 24 vac, 3 A)
	15	Fire Smoke Purge 24 VAC out	external contact (maximum 24 vac, 3 A)
	16	Fire Evacuation 24 VAC in	external contact (maximum 24 vac, 3 A)
	17	Fire Evacuation 24 VAC out	external contact (maximum 24 vac, 3 A)
	18	Fire Pressurization 24 VAC in	external contact (maximum 24 vac, 3 A)
	19	Fire Pressurization 24 VAC out	external contact (maximum 24 vac, 3 A)
	20	Demand Limit Loadshed 24 VAC in	external contact (maximum 24 vac, 3 A)
	21	Demand Limit Loadshed 24 VAC out	external contact (maximum 24 vac, 3 A)
	22	Demand Limit Redline 24 VAC in	external contact (maximum 24 vac, 3 A)
	23	Demand Limit Redline 24 VAC out	external contact (maximum 24 vac, 3 A)
	24	Humidistat	external contact (maximum 24 vac, 3 A)
	25	Humidistat	external contact (maximum 24 vac, 3 A)

LEGEND

IAQ — Indoor Air Quality
VAV — Variable Air Volume

Table 111 — IGC Board Inputs and Outputs

POINT NAME	POINT DESCRIPTION	CONNECTOR PIN NO.
INPUTS		
RT	24 Volt Power Supply	RT,C
W	Heat Demand	2
G	Fan	3
LS	Limit Switch	7,8
RS	Rollout Switch	5,6
SS	Hall Effect Sensor	1,2,3
CS	Centrifugal Switch (Not Used)	9,10
FS	Flame Sense	FS
OUTPUTS		
CM	Induced Draft Motor	CM
IFO	Indoor Fan	IFO
R	24 Volt Power Output (Not Used)	R
SPARK	Sparker	—
LED	Display LED	

CURRENT SENSOR BOARD (CSB) — This board monitors the status of the compressor by sensing the current flow to the compressors and then provides digital status signal to the MBB and CXB.

TIMER RELAY CONTROL BOARD (TR1) — The TR1 is used on modulating gas heat equipped units only. It is located in the Gas Heat section and is used in combination with the SC30 to provide control of the Modulating Gas Heat section. The TR1 receives an input from the IGC, initiates a start-up sequence, powers the SC30, sets the induced-draft motor speed, and provides the main gas valve high fire input. When the start-up sequence is complete, the TR1 checks the input from the SC30 to determine which state to command the induced-draft motor and main gas valve. See Table 112.

SIGNAL CONDITIONER CONTROL BOARD (SC30) — The SC30 is used on modulating gas heat equipped units only. It is located in the Gas Heat section and is used in combination with the TR1 to provide control of the Modulating Gas Heat section. The SC30 is powered by an output from the TR1. It receives a capacity input from the SCB, provides a capacity output to the modulating gas valve, and provides an output to the TR1 to determine which state to command the induced-draft motor and main gas valve. See Table 113.

SCROLLING MARQUEE — This device is the keypad interface used to access the control information, read sensor values, and test the unit. The scrolling marquee display is a 4-key, 4-character, 16-segment LED display as well as an Alarm Status LED. See Fig. 34. The display is easy to operate using 4 buttons and a group of 11 LEDs that indicate the following menu structures:

- Run Status
- Service Test
- Temperatures
- Pressures
- Set points
- Inputs
- Outputs
- Configuration
- Timeclock
- Operating Modes
- Alarms

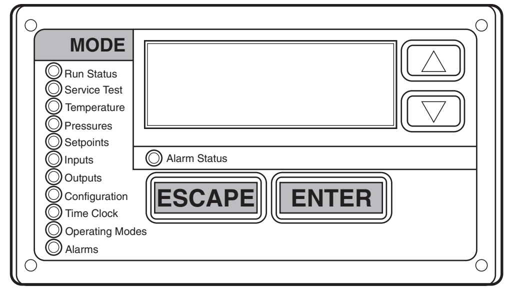


Fig. 34 — Scrolling Marquee

Table 112 — TR1 Board Inputs and Outputs

TERMINAL	TYPE OF I/O	RESULT/ACTION
INPUTS		
1, 2	24 Vac Input	Powers TR1
3, 4		
5	Not Used	Not Used
6	24 Vac Input from SC30	Starts Timer no. 2 IDM2 Runs at High Speed MGV2 Operates in High Fire
7	24 Vac Input from IGC2	Starts Timer no. 1 IDM2 Runs at High Speed MGV2 Operates in Low Fire Terminal 6 Input ignored during duration of Timer no. 1
OUTPUTS		
8, 9	Relay Output	MGV2 Operates in High Fire
10, 11	Relay Output	Powers SC30
12, 14	Relay Output	IDM2 Runs at High Speed
13, 14	Relay Output	IDM2 Runs at Low Speed

Table 113 — SC30 Board Inputs and Outputs

TERMINAL	TYPE OF I/O	RESULT/ACTION
INPUTS		
1	24 Vac Input from TR1	Powers SC30
2		
7	4-20 mA Input from SCB	Sets Output to Modulating Gas Valve
8		
OUTPUTS		
3	0-20 Vdc Output	Output to Modulating Gas Valve
4		
5, 6	Relay Output	Starts TR1 Timer no. 2

Through the scrolling marquee, the user can access all the inputs and outputs to check on their values and status. Because the unit is equipped with suction pressure transducers and discharge saturation temperature sensors, the scrolling marquee can also display pressures typically obtained from gages. The control includes a full alarm history, which can be accessed from the display. In addition, through the scrolling marquee the user can access a built-in test routine that can be used at start-up commission and to diagnose operational problems with the unit. The scrolling marquee is located in the main control box and is standard on all units.

SUPPLY FAN — The 48/50P030-050 units are equipped with a single 25 x 25-in. forward-curved fan. The 48/50P055-070 units are equipped with a single 30 x 27-in. forward-curved fan. The 48/50P075-100 units are equipped with either a single 36 x 30-in. forward-curved fan or a 36-in. airfoil fan. The fan sleds are spring isolated and driven by a single, 3-phase motor. The fan is controlled directly by the *Comfort*Link controls.

VARIABLE FREQUENCY DRIVE (VFD) — On units equipped with optional supply fan and/or exhaust fan VFDs, the fan speed is controlled by a 3-phase VFD. The supply fan VFD is located in the supply fan section (030-050 size units) or mixing box section (055-100 size units) behind an access door. For 055-100 size units with optional VFD power exhaust, the exhaust VFD is located in the mixing box section behind an access door. For 030-050 units, it is located in the supply fan section. For 075-100 size units with optional high-capacity power exhaust or return fan, the exhaust fan VFD is located in the mixing box section behind an access door.

The P Series units use ABB VFDs. The VFDs communicate to the *Comfort*Link MBB over the local equipment network (LEN). The VFD speed is controlled directly by the *Comfort*Link controls over the LEN. The interface wiring for the VFDs is shown in Fig. 35 and the terminal designations are shown in Table 114. The VFD has a keypad display panel that can be used for service diagnostics and setting the initial VFD parameters required to allow the VFD to communicate on the LEN. Additional VFD parameters are set by the *Comfort*Link controls, and sent to the VFD over the LEN at power up of the VFD. The VFD faults can be reset with the VFD keypad or through the *Comfort*Link controls (***Alarms→R.CUR*** =Yes).

POWER EXHAUST — The units can be equipped with an optional power exhaust system. The power exhaust fans are two belt-drive forward-curved fans. On non-modulating systems, the fans are staged by the *Comfort*Link controls based on the economizer damper position. For modulating (CV or VAV) applications, the fans are turned on by the *Comfort*Link controls based on building pressure sensed by the building pressure transducer. The fan output is modulated via discharge dampers communicating actuators to maintain the building pressure set point.

Table 114 — VFD Terminal Designations

TERMINAL	FUNCTION
U1 V1 W1	Three-phase main circuit input power supply
U2 V2 W2	Three-Phase AC Output to Motor, 0 V to Maximum Input Voltage Level
X1-11 (GND) X1-12 (D-COM)	Factory-supplied jumper
X1-10 (+24 V) X1-13 (DI-1)	Factory-supplied jumper
X1-10 (+24 V) X1-16 (DI-4)	Start Enable 1 (Factory-supplied jumper). When opened the drive goes to emergency stop.
X1-28 (SCR) X1-29 (B+) X1-30 (B-) X1-31 (AGND) X1-32 (SCR)	Factory wired for local equipment network LEN communication

VFD POWER EXHAUST — On units equipped with VFD power exhaust, both power exhaust fan motors are controlled by a single VFD. Fans are turned on by the *Comfort*Link controls based on building pressure sensed by the building pressure transducer. The VFD fan speed is controlled by the *Comfort*Link controls. The power exhaust fan motors are each protected by a motor starter protector located in an enclosure below the power exhaust VFD. The required motor starter protector settings are shown on a label on the cover of the enclosure.

HIGH CAPACITY POWER EXHAUST (Sizes 075-100 Only) — The power exhaust fans are two belt-driven forward-curved fans. Operation of the power exhaust is a combination modulating/staged control. The lead fan is controlled by a VFD and provides 0 to 50% of total exhaust capability. The second fan is staged On/Off (for a step of 50% of total exhaust capability) according to the VFD output level on fan no. 1.

RETURN FAN (Sizes 075-100 Only) — The return fan power exhaust assembly consists of one belt-drive plenum fan. The plenum fan pressurizes the plenum fan section so that the air can either be discharged horizontally out the back of the unit or discharged through the return air section of the economizer.

ECONOMIZER MOTOR(S) — The economizer outside air and return air dampers are gear-driven dampers without linkages. A communicating economizer motor(s) controls their position. The motor position is controlled by the MBB through the communication bus. This allows for accurate control of the motors as well as feedback information and diagnostics information. The control has a self-calibration routine that allows the motor position to be configured at initial unit start-up. The motor(s) is located on the economizer and can be reached through the filter access door.

THERMISTORS AND PRESSURE TRANSDUCERS — The unit is equipped with several thermistors for measurement of temperatures. The thermistors are summarized in Table 115.

The units have two pressure transducers that are connected to the low side of the system. These two pressure transducers measure the low side pressure and are used for low pressure protection and coil freeze protection.

The units also have two pressure transducers that are connected to the high side of the system. These two pressure transducers measure the discharge pressure and are used to cycle the condenser fans to maintain head pressure.

By using the high and low side pressure transducers, the *Comfort*Link controls display the high and low side pressures and saturation temperatures and a normal gage set is not required.

SMOKE DETECTOR — The units can be equipped with an optional smoke detector located in either the return air or supply air, or in both. The detector is wired to the *Comfort*Link controls and, if activated, will stop the unit by means of a special fire mode. The smoke detector can also be wired to an external alarm system through TB201 terminals 1 and 2. The sensor is located in the air section.

FILTER STATUS SWITCH — The units can be equipped with an optional filter status switch. The switch measures the pressure drop across the filters and closes when an adjustable pressure set point is exceeded. The sensor is located in the return air section behind the filter access door.

FAN STATUS SWITCH — The units can be equipped with an optional fan status switch that will monitor the pressure rise across the indoor fans.

RETURN AIR CO_2 SENSOR — The unit can be equipped with a return air IAQ CO_2 sensor that is used for the demand control ventilation. The sensor is located in the return air section and can be accessed from the filter access door.

BOARD ADDRESSES — Each board in the system has an address. The MBB has a default address of 1 but it does have an instance jumper that should be set to 1 as shown in Fig. 30. For the other boards in the system there is a 4-dip switch header on each board that should be set as shown below.

BOARD	SW1	SW2	SW3	SW4
RXB	0	0	0	0
EXB	1	0	0	0
SCB	0	0	0	0
CEM	0	0	0	0

0 = On; 1 = Off

PHASE LOSS PROTECTION MONITOR OPTION (PMO) — If all 3 phases of electrical supply are relatively equal and in proper sequence, the normally open contacts (Y/Y-OUT) will close when 24 volts are applied between C and Y terminals. If the phases are out of sequence, or if one is missing, the contacts will never close. If a phase is lost while the phase monitor is energized, the contacts will open immediately and will remain open until the error is corrected.

Accessory Control Components — In addition to the factory-installed options, the units can also be equipped with several field-installed accessories that expand the control features of the unit. The following hardware components can be used as accessories.

ROOM THERMOSTATS — The *Comfort*Link controls support a conventional electro-mechanical or electronic thermostat that uses the Y1, Y2, W1, W2, and G signals. The control also supports an additional input for an occupied/unoccupied command that is available on some new thermostats. The *Comfort*Link controls can be configured to run with up to 6 stages of capacity. The room thermostat is connected to TB201.

The *Comfort*Link controls also support the use of space temperature sensors and can be used with the T55 and T56 sensors. The controls can also be used with CCN communicating T58 room sensor. The T55 and T56 sensors are connected to TB201 terminals 1, 2, and 3. The T58 sensor is connected to the CCN connections on COMM board. Whenever a unit equipped with heat is operated without a thermostat, the user must install the red jumpers from R to W1, and W2 on TB201 for the heat function to work correctly.

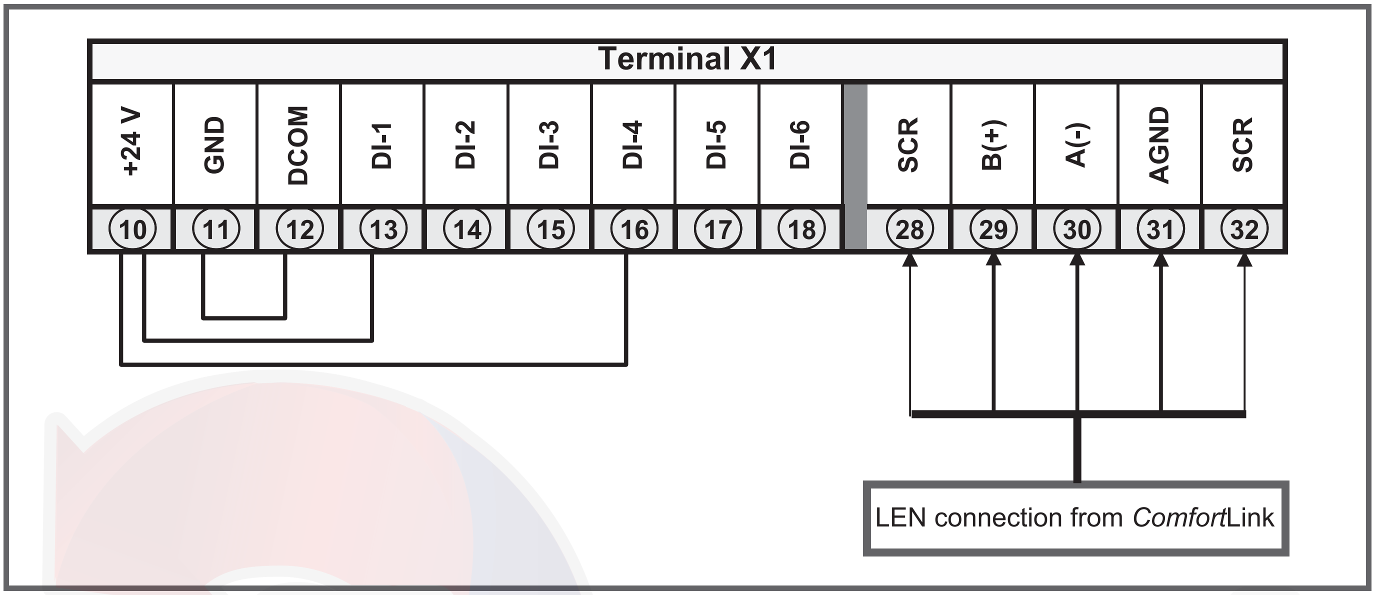


Fig. 35 — VFD Wiring

Table 115 — Thermistors and Unit Operation Control Pressure Transducers

SENSOR	DESCRIPTION AND LOCATION	PART NO.
Thermistors		
CCT	Cooling Coil Thermistor input. Provided with factory-option hydronic heat. Located on face of the hydronic heating coil. Consists of 4 thermistors wired into a 2x2 array.	HH79NZ039 (4)
LST	Limit Switch Thermistor. Provided with Staged Gas Control option. Located in the heating compartment.	HH79NZ034
OAT	Outside Air Thermistor. Located in top of the return plenum, attached to roof pole.	HH79NZ039
RAT	Return Air Thermistor. Without Economizer: Located on left side base rail in the return plenum. With Economizer: Located on left side face of return damper section in the return plenum.	HH79NZ039
SAT	Supply Air Thermistor. Located in the Supply Fan section, on left side of the fan housing. (May be relocated or replaced when unit is used with CCN Linkage systems; see page 66.)	HH79NZ039
LAT 1,2,3	Leaving Air Thermistors, provided with Staged Heat Control option. Shipped in the control box. Installer must pull out and mount in the supply duct.	HH79NZ034 (3)
Control Pressure Transducers		
BP	Building Pressure. Provided with Modulating Power Exhaust, High-Capacity Power Exhaust and Return Fan options. Located in the auxiliary control box (left-hand side of unit near return plenum).	HK05ZG018
DPT-A	Discharge Pressure (refrigerant), Circuit A.	HK05ZZ001
DPT-B	Discharge Pressure (refrigerant), Circuit B.	HK05ZZ001
SPT-A	Suction Pressure (refrigerant), Circuit A.	HK05SZ003
SPT-B	Suction Pressure (refrigerant), Circuit B.	HK05SZ003
DSP	Duct Static Pressure. Provided with VAV models equipped with VFD or Inlet Guide Vane options. Located in the auxiliary control box (right-hand side of unit near return plenum).	HK05ZG010
FT_SF	Supply Air Cfm (velocity pressure). Provided with factory-option return fan system (sizes 075-100 only). Located in the supply fan compartment, on right side, on vertical post.	HK05ZG015
FT_RF	Return Air Cfm (velocity pressure). Provided with factory-option return fan system (sizes 075-100 only). Located in auxiliary control box (right-hand side, filter access panel).	HK05ZG07
Outside Air CFM Control	Outside Air Cfm Monitor (velocity pressure). Provided with the Outside Air Cfm Control option. Located in auxiliary control box (right-hand side, filter access panel).	50ZZ400290 (030-070) 50ZZ400289 (075-100)
DTT	Digital Scroll Discharge Temperature Thermistor. Provided with digital scroll compressor option. Located on discharge line.	HH79EZ003
RGTA	Circuit A Return Gas Thermistor. Provided with MLV option. Located in suction line well.	HH79NZ016 (030-060) HH79NZ020 (070, 075) HH79NZ014 (090, 100)

LEGEND

MLV — Minimum Load Valve
VAV — Variable Air Volume
VFD — Variable Frequency Drive

SPACE CO_2 SENSORS — The *Comfort*Link controls also support a CO_2 IAQ sensor that can be located in the space for use in demand ventilation. The sensor must be a 4 to 20 mA sensor and should be connected to TB201 terminals 7 and 8.

ECONOMIZER HUMIDITY CHANGEOVER SENSORS — The *Comfort*Link controls support 5 different changeover systems for the economizer. These are:

- Outdoor enthalpy switch
- Outdoor air dry bulb
- Differential dry bulb
- Outdoor air enthalpy curves
- Differential enthalpy
- Custom curves (a combination of an enthalpy/dewpoint curve and a dry bulb curve).

The units are equipped as standard with an outdoor air enthalpy control. Outside air and return air dry bulb sensors which support the dry bulb changeover method are also supplied as standard. If the other methods are to be used, then a field-installed humidity sensor must be installed for outdoor air enthalpy and customer curve control and two humidity sensors must be installed for differential enthalpy. Installation holes are pre-drilled and wire harnesses are installed in every unit for connection of the humidity sensors. The *Comfort*Link controls have the capability to convert the measured humidity and dry bulb temperature into enthalpy.

ACCESSORY NAVIGATOR™ DISPLAY — The accessory handheld Navigator display can be used with the 48/50P Series units. See Fig. 36. The Navigator display operates the same way as the scrolling marquee device. The RXB and EXB boards contain a second LEN port than can be used with the handheld Navigator display.

CONTROL MODULE COMMUNICATIONS

Red LED — Proper operation of the control boards can be visually checked by looking at the red status LEDs as shown on Fig. 30-33. When operating correctly, the red status LEDs should blink 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. Also, be sure that the main base board is supplied with the current software and that all boards are configured on. If necessary, reload current software. If the problem still persists, a board may need to be replaced. A board LED that is lit continuously or blinking at a rate of once per second or faster indicates that the board should be replaced.

Green LED — The boards also have a green LED, which is the indicator of the operation of the LEN communications, which is used for communications between the boards. On the MBB board the local equipment network (LEN) LED should always be blinking whenever power is on. All other boards have a LEN LED that will blink whenever power is on and there is communication occurring. If LEN LED is not blinking, check LEN connections for potential communication errors (J3 and J4 connectors). A 3-wire sensor bus accomplishes communication between modules. These 3 wires run in parallel from module to module.

Yellow LED — The MBB has one yellow LED. The Carrier Comfort Network® (CCN) LED will blink during times of network communication. The other boards do not have a CCN communications port.

CARRIER COMFORT NETWORK® INTERFACE — The 48/50P Series units can be connected to the CCN if desired. See Fig. 37. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is field supplied and installed. See the Installation Instructions for wiring information.

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 the COMM board. See Fig. 20. Consult the CCN Contractor's Manual for further information.

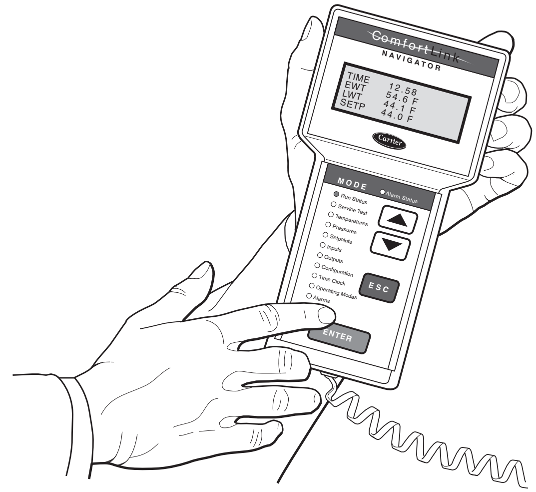


Fig. 36 — Accessory Navigator Display

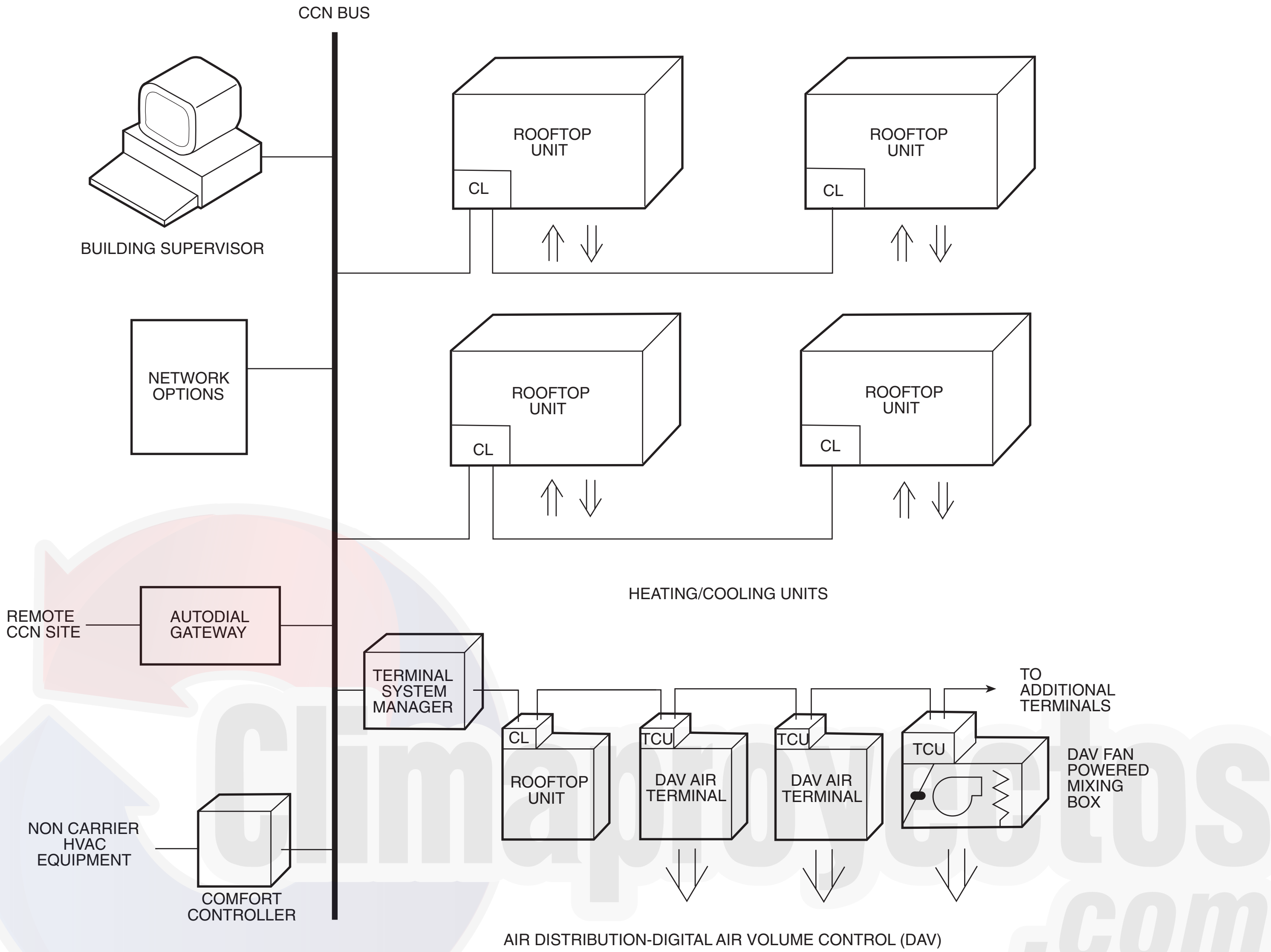
NOTE: Conductors and drain wire must be 20-AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20°C to 60°C is required.

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 the COMM board, the white wire to COM terminal on the COMM board, and the black wire to the (–) terminal on the COMM board.
4. The RJ14 CCN connector on the COMM board can also be used, but is only intended for temporary connection (for example, a laptop computer running Service Tool).
5. Restore power to unit.

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.



LEGEND

CCN — Carrier Comfort Network®
CL — *Comfort*Link™ Controls
DAV — Digital Air Volume
HVAC — Heating, Ventilation, and Air Conditioning
TCU — Terminal Control Unit

Fig. 37 — CCN System Architecture

SERVICE

Service Access — All unit components can be reached through clearly labeled hinged access doors. These doors are not equipped with tiebacks, so if heavy duty servicing is needed, either remove them or prop them open to prevent accidental closure.

Each door is held closed with 3 latches. The latches are secured to the unit with a single $^1/_4$-in. –20 x $^1/_2$-in. long bolt. See Fig. 38.

To open, loosen the latch bolt using a $^7/_{16}$-in. wrench. Pivot the latch so it is not in contact with the door. Open the door. To shut, reverse the above procedure.

NOTE: Disassembly of the top cover may be required under special service circumstances. It is very important that the orientation and position of the top cover be marked on the unit prior to disassembly. This will allow proper replacement of the top cover onto the unit and prevent rainwater from leaking into the unit.

> IMPORTANT: After servicing is completed, make sure door is closed and relatched properly, and that the latches are tight. Failure to do this can result in water leakage into the indoor-air section of the unit.

COMPRESSORS

Sizes 030,035 — Access to the compressors is below the unit-control box.

Sizes 040-060 — Access to the compressors is through the doors on the condenser end of the unit. This door also provides access to the discharge service valves, filter driers, the crankcase heaters, and the high-pressure and low-pressure switches. Circuit A is always the compressor on the left when facing main control box.

Sizes 070-100 — Each compressor is readily accessible from sides of unit.

LIQUID SERVICE VALVES, SUCTION SERVICE VALVES, AND SIGHT GLASSES

Sizes 030-060 — Access to these components is through the access panel on the right side of the unit. See Fig. 39. There is also a Schrader port in each suction line that is accessible through this same panel.

Sizes 070-100 — Access to these components is from the side of the unit.

SUPPLY-FAN MOTORS, PULLEYS, AND BELTS — Access to these components is through the 2 doors labeled FAN SECTION on each side of the unit.

POWER EXHAUST MOTORS, PULLEYS, AND BELTS — Access to these components is through the door below the side economizer hoods on both sides of the unit. See Fig. 40.

RETURN AIR FILTERS — Access to these filters is through the door marked FILTER SECTION.

UNIT CONTROL BOX — Access to this component is through the doors marked ELECTRICAL SECTION on the condenser end of the unit.

GAS HEAT SECTION (48P Only) — Access to the gas heat section is through the door labeled HEAT SECTION on the right side of the unit (when facing return air end). Figures 41-43 show the gas system components for 2-stage heat and staged gas heat. Figure 44 shows the components of a typical modulating gas heat section. For modulating heat units, Fig. 44 replaces section 2 in Fig. 41-43.

MAIN BURNERS (48P Only) — At the beginning of each heating season, inspect for deterioration due to corrosion or other causes. The main burner assembly is shown in Fig. 45 for 2-stage heat and staged gas heat. For modulating gas heat, see Fig. 46. Refer to Main Burners Removal and Replacement section on page 174 for burner removal sequence. Observe the main burner flames and adjust if necessary. See Gas System Adjustment section on page 174.

FLUE GAS PASSAGEWAYS (48P Only) — The flue collector box and heat exchanger cells may be inspected by removing heat exchanger access panel, flue box cover, and main burner assembly (Fig. 45 and 46). If cleaning is required, remove heat exchanger baffles and clean tubes with a wire brush.

Use caution with ceramic heat exchanger baffles. When installing retaining clip, be sure the center leg of the clip extends inward toward baffle. See Fig. 47.

PRESSURE SWITCH (48P Modulating Gas Only) — Inspect the riveted surface of the pressure fitting (see Fig. 44) by removing the flue box cover. Clean as necessary to ensure the proper function of the combustion air proving switch. When assemble back the flue box, ensure that both ends of pressure switch tubing are tight pressed into fitting and pressure switch, respectively.

COMBUSTION-AIR BLOWERS (48P Only) — Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bi-monthly to determine proper cleaning frequency.

To inspect blower wheel, remove heat exchanger access panel. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel assembly by removing screws holding motor mounting plate to top of combustion fan housing (Fig. 48). The motor and wheel assembly will slide up and out of the fan housing. Remove the blower wheel from the motor shaft and clean with a detergent or solvent. Replace motor and wheel assembly.

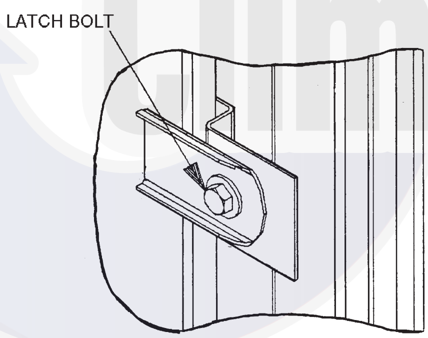


Fig. 38 — Door Latch

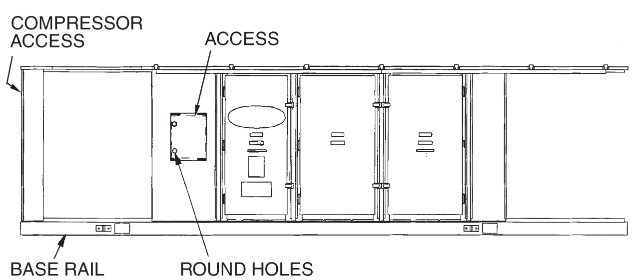


Fig. 39 — Typical Filter Drier and Liquid Service Valve Access

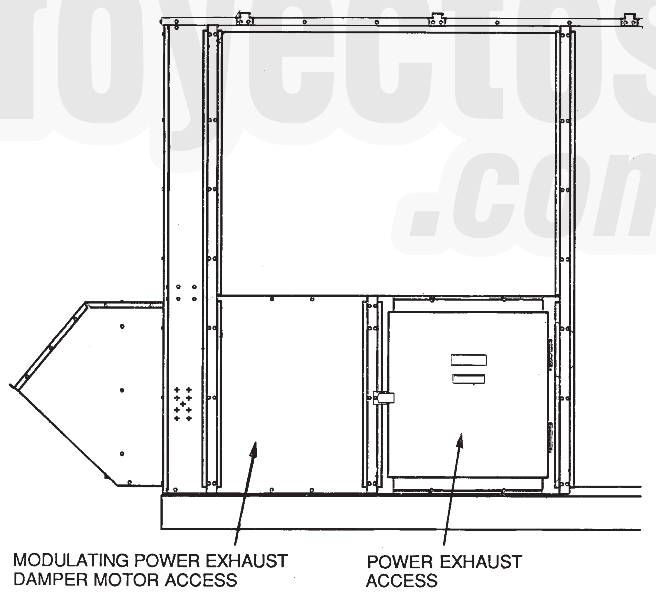
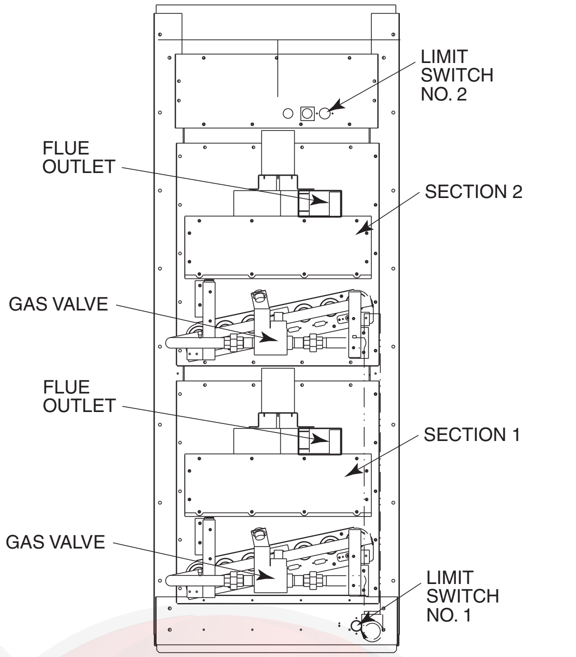


Fig. 40 — Modulating Power Exhaust Motor Access (Both Sides)



NOTE: High heat consists of sections 1 and 2. Low heat consists of section 1 only.

Fig. 41 — Gas Section Detail, Sizes 030-050

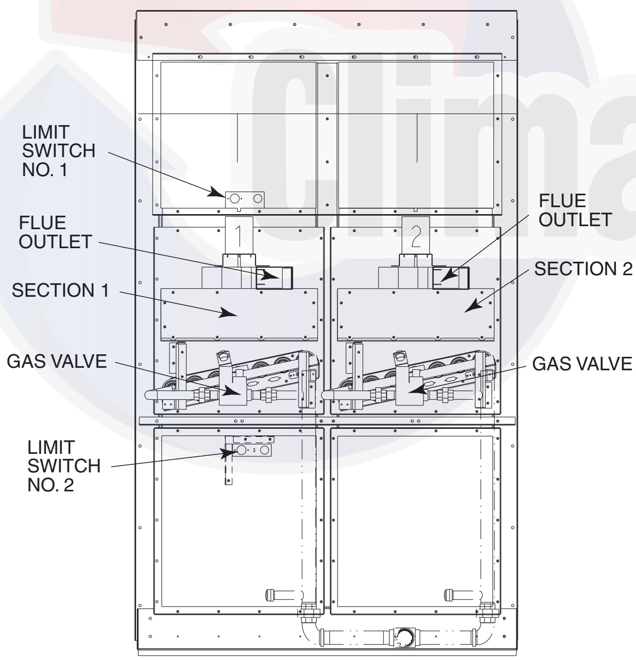


Fig. 42 — Gas Section Detail, Sizes 055-100 — Low Heat

ECONOMIZER DAMPER MOTOR(S) — On units so equipped, the economizer motor(s) is located in the mixing box section. Access to it is through the door labeled FILTER SECTION.

CONDENSER FANS AND FAN MOTORS — Remove the wire fan guard on top of the unit to gain access to the condenser fans and motors.

25% OUTDOOR-AIR DAMPER — Access to adjust the damper is through the hoods. Remove filters to gain access into unit to adjust linkage arms.

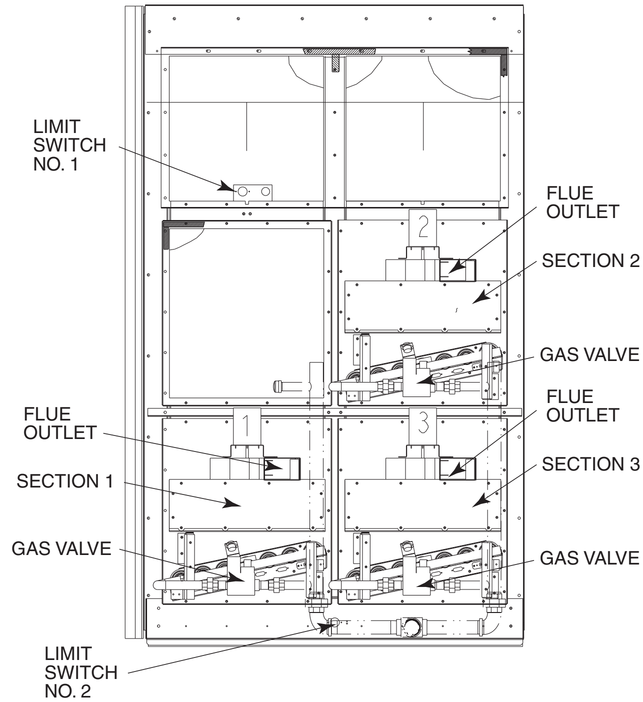


Fig. 43 — Gas Section Detail, Sizes 055-100 — High Heat

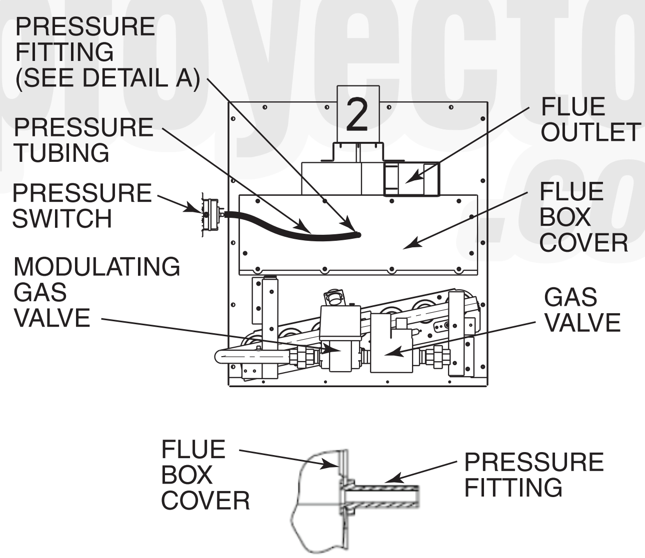


Fig. 44 — Gas Section Detail, Modulating Gas Heat

MODULATING POWER EXHAUST DAMPER MOTOR — The modulating power exhaust damper motor is located in the return-air end of the unit.

> IMPORTANT: When replacing panel, be sure to properly secure it in order to prevent water from being drawn into the unit.

The motor is accessed through the small door below the side economizer hoods on the left side of the unit. See Fig. 40.

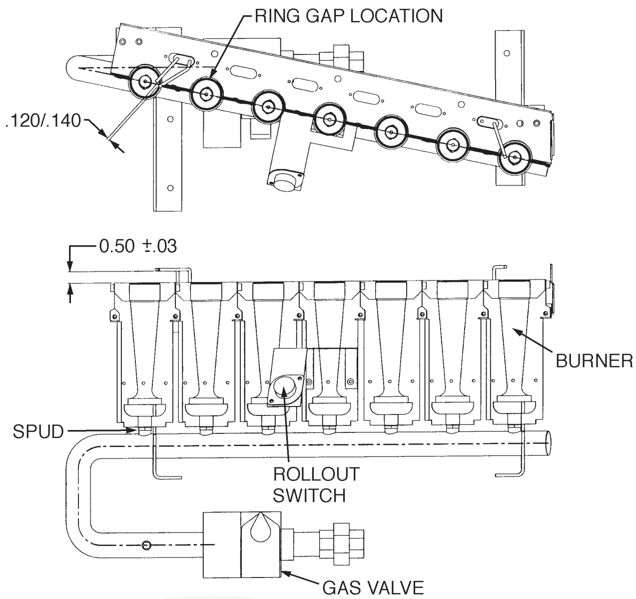


Fig. 45 — Burner Section Detail — 2-Stage and Staged Gas Units

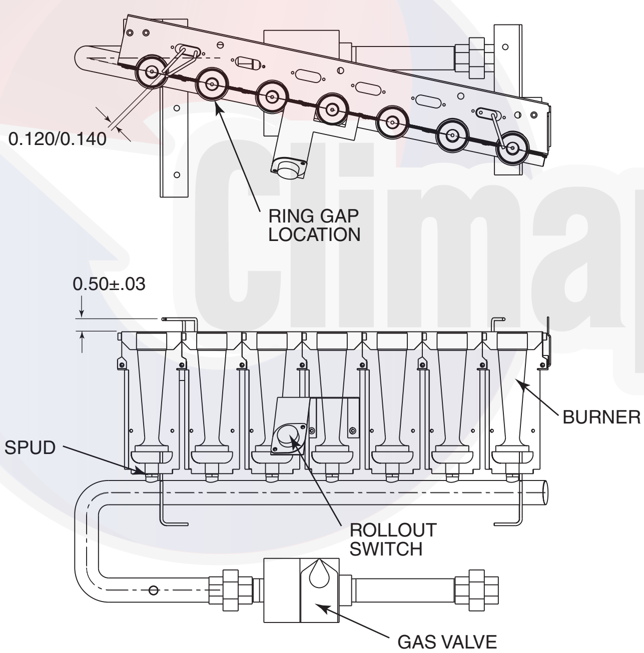


Fig. 46 — Burner Section Detail — Modulating Gas Units

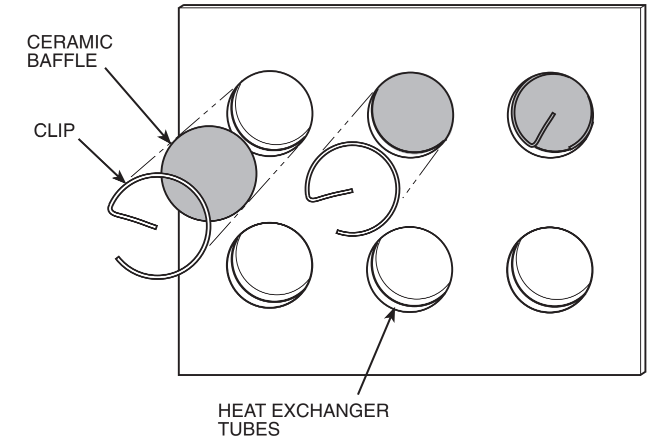
RETURN-AIR FILTERS — Access to these filters is through the door marked FILTER SECTION. Filters in upper and lower bag filter tracks can only be removed from the right side of the unit.

Adjustments

RETURN FAN MOTOR PLATE

Adjust using a $^{3}/_{4}$-in. wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 49).
2. Turn the adjusting bolts to move the motor mounting plate toward or away from the fan to loosen or tighten the belts. Make the same number of turns to each bolt.
3. Retighten holddown bolts.



NOTE: One baffle and clip will be in each upper tube of the heat exchanger.

Fig. 47 — Removing Heat Exchanger Ceramic Baffles and Clips

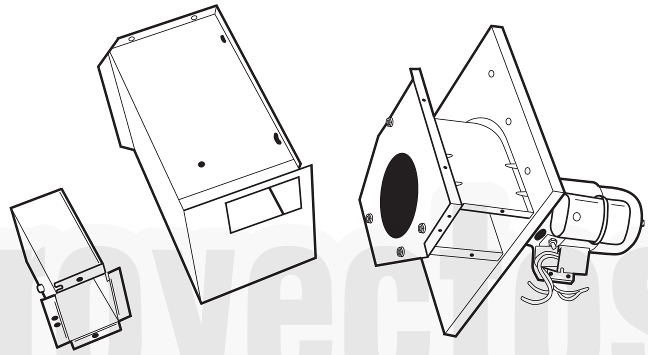


Fig. 48 — Combustion Blower Removal

SUPPLY FAN AND POWER EXHAUST MOTOR PLATE — Adjust using a $^{15}/_{16}$-in. wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 50.)
2. Turn the adjusting bolts to move the motor mounting plate toward or away from the fan to loosen or tighten the belts. Make the same number of turns to each bolt.
3. Retighten holddown bolts.

BELT INSTALLATION AND TENSIONING

IMPORTANT: When installing or replacing belts, always use a complete set of new, matched belts to prevent potential vibration problems. Mixing belts often results in premature breakage of the new belts.

1. Turn off unit power.
2. Adjust motor plate so belts can be installed without stretching over the grooves of the pulley. (Forcing the belts can result in uneven belt stretching and a mismatched set of belts.)
3. Before tensioning the belts, equalize belt slack so that it is on the same side of the belt for all belts. Failure to do so may result in uneven belt stretching.
4. Tighten belts using the motor plate adjusting bolts.

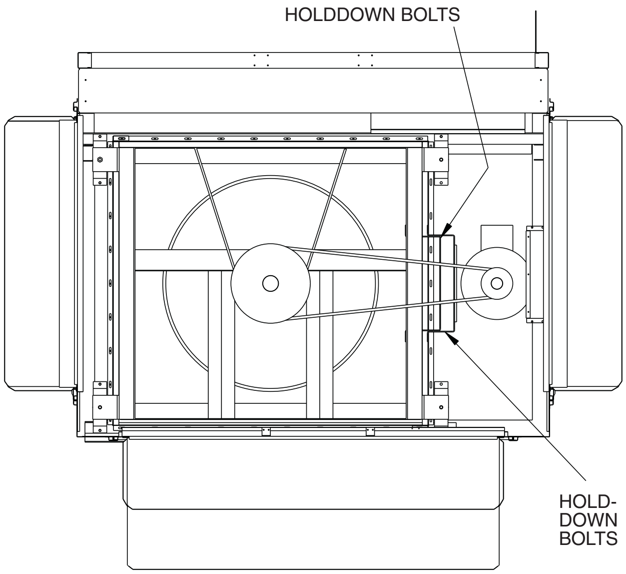


Fig. 49 — Return Fan Motor Plate Adjustment

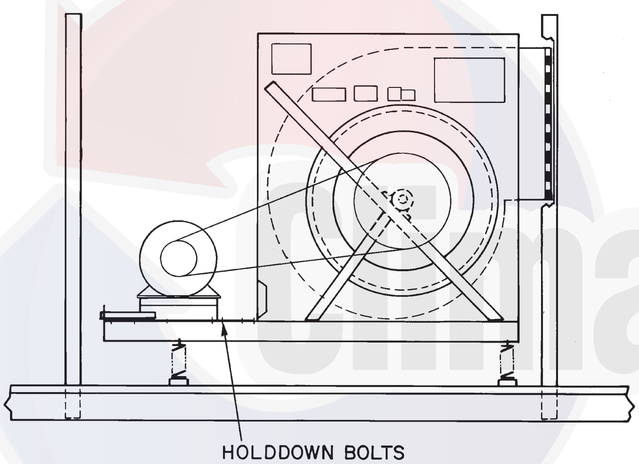


Fig. 50 — Motor Plate Adjustment

5. Adjust until proper belt tension ($^1/_2$-in. [13 mm] deflection with one finger centered between pulleys) is obtained. Be sure to adjust both adjusting bolts the same number of turns.

   NOTE: Check the tension at least twice during the first day of operation, as there is normally a rapid decrease in tension until the belts have run in. Check tension periodically thereafter and keep it at the recommended tension.

With the correct belt tension, belts may slip and squeal momentarily on start-up. This slippage is normal and disappears after wheel reaches operating speed. Excessive belt tension shortens belt life and may cause bearing and shaft damage.

PULLEY ALIGNMENT — For proper belt life, the motor and fan pulleys must be properly aligned. To check, first turn off unit power. Place a straightedge against the motor and fan pulleys. See Fig. 51. If the pulleys are properly aligned, the straightedge should be parallel to the belts.

If they are not parallel, check that the motor shaft and fan shaft are parallel. If they are not, adjust the motor plate adjusting bolts until they are.

After verifying that the shafts are parallel, loosen the setscrews on the motor pulley. Move pulley on the shaft until the pulleys are parallel. To move the sheave on the shaft, loosen the belts. If necessary, blower sheave can also be moved on the shaft.

INSTALLING REPLACEMENT MOTOR PULLEY (Supply Fan Only) — To install a field-supplied replacement pulley:

1. Turn off unit power.
2. Loosen belts using motor adjusting bolts until belts can be removed without stretching them over the grooves of the pulley.
3. Remove belts.
4. Loosen setscrews on motor pulley.
5. Slide pulley off motor shaft. Make sure setscrews on new pulley are loose.
6. Slide new pulley onto fan shaft and align it with the fan pulley as described in Pulley Alignment section above.
7. Tighten setscrews.
8. Install belts and tension properly as described in Pulley Alignment section above.

CONDENSER FAN ADJUSTMENT (All Units Except Size 035)

1. Turn off unit power.
2. Remove fan guard and loosen fan hub setscrew.
3. See Fig. 52 and adjust fan height using a straight edge laid across the fan deck.
4. Tighten setscrew to 12.5 to 13.75 ft-lb and replace rubber hubcap to prevent hub from rusting to the motor shaft. Fill hub recess with Permagum if hub has no rubber hubcap.
5. Replace fan guard.

CONDENSER FAN ADJUSTMENT (Size 035) — Each fan is supported by a formed wire mount bolted to a fan deck and covered with a wire guard. The exposed end of the fan motor shaft is protected from weather by grease. If the fan motor must be removed for service or replacement, be sure to regrease fan shaft and reinstall fan cover, retaining clips, and fan guard. For proper performance, the fans should be positioned as shown in Fig. 53. Tighten setscrews to 14 ± 1 ft-lb (18 ± 1.3 N-m).

Check for proper rotation of the fan(s) once reinstalled (counterclockwise viewed from above). If necessary to reverse, switch leads at contactor(s) in control box.

AIR PRESSURE TRANSDUCER FIELD ADJUSTMENT — All transducers have been factory calibrated and should not require field adjustment. If field adjustment is necessary, follow the instructions below. To re-calibrate a transducer:

1. Shut the unit power off.
2. Take the wiring and pressure tubing off the transducer. Take the transducer out of the unit.
3. Connect a 24-vdc power supply to transducer terminals EXC(+) and COM(–). See Fig. 54.
4. Using a digital multimeter measure the current between terminals EXC(+) and OUT.
5. With both pressure ports open to atmosphere adjust the Zero (Z) screw potentiometer on the transducer and read the multimeter until the desired current output at 0 in. wg pressure is obtained (see Fig. 54).
6. Reinstall the transducer in the unit.
7. Restore power to the unit.

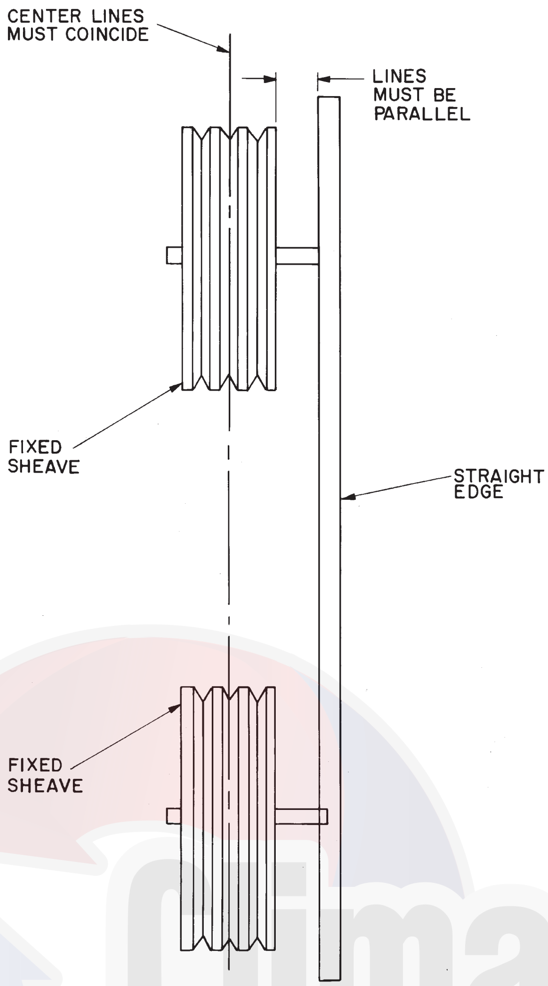


Fig. 51 — Pulley Alignment

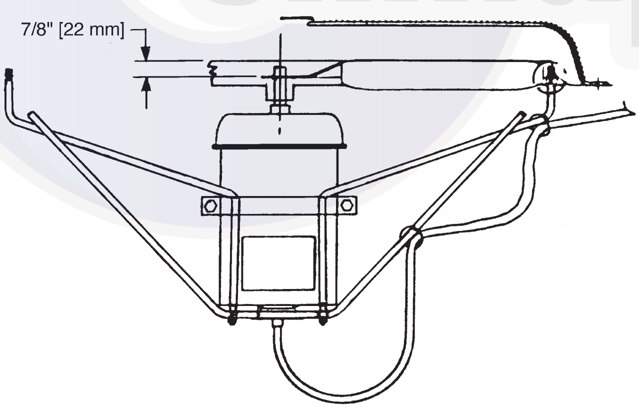


Fig. 52 — Condenser-Fan Adjustment
(All Units Except Size 035)

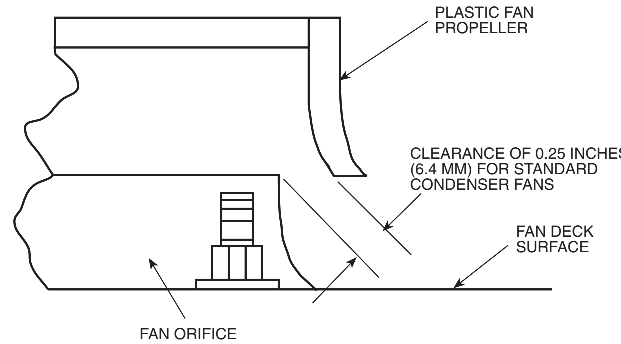


Fig. 53 — Condenser Fan Position (Size 035 Units)

TRANSDUCER PART NUMBER	INPUT RANGE (in. wg)	OUTPUT RANGE	OUTPUT AT 0 IN. WG	USAGE
HK05ZG019	0-5	4-20 mA	4 mA	Supply Duct/ Air Foil Fan Cfm
HK05ZG020	0-1	4-20 mA	4 mA	Forward Curved Fan Cfm
HK05ZG021	0-15	4-20 mA	4 mA	Return/ Exhaust Fan Cfm
HK05ZG022	–0.25-0.25	4-20 mA	12 mA	Building Pressure

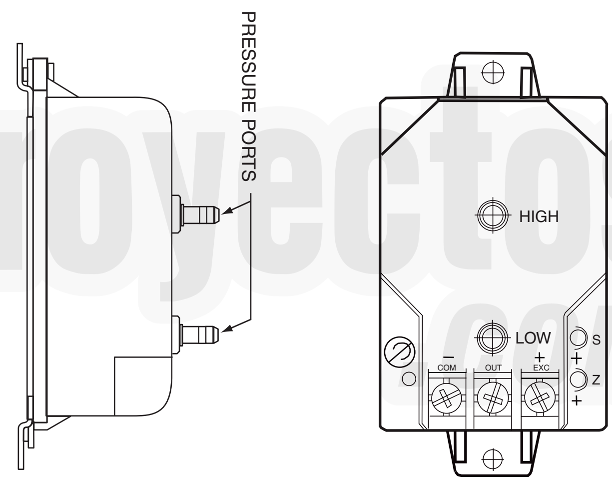


Fig. 54 — Transducer Details

Cleaning — Inspect unit at the beginning of each heating and cooling season and during each season as operating conditions may require.

MICROCHANNEL HEAT EXCHANGER (MCHX) CONDENSER COIL MAINTENANCE AND CLEANING RECOMMENDATIONS

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

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

1. Remove any foreign objects or debris attached to the coil 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.
4. Clean condenser face by spraying the coil steady 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.

CONDENSATE DRAIN — Check and clean each year at start of cooling season. In winter, keep drains and traps dry.

FILTERS — Clean or replace at start of each heating and cooling season, or more often if operating conditions require. Refer to Installation Instructions for type and size.

1. Remove economizer outdoor-air filters from the hoods by removing the filter retainers.
2. Clean filters with steam or hot water and mild detergent.
3. Reinstall filters in hoods after cleaning. Never replace cleanable filters with throwaway filters.

OUTDOOR-AIR INLET SCREENS — Clean screens with steam or hot water and a mild detergent. Do not use disposable filters in place of screens.

Lubrication

FAN SHAFT BEARINGS — Lubricate fan shaft bearings at least once a year with suitable bearing grease. Extended grease lines are provided on pulley side of blower. Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No. 1
Sunoco	Prestige 42
Texaco	Multifak 2

*Preferred lubricant because it contains rust and oxidation inhibitors.

FAN MOTOR BEARINGS — The condenser-fan and evaporator-fan motors have sealed bearings so no field lubrication is required.

DOOR HINGES — All door hinges should be lubricated at least once a year.

Refrigerant Feed Components — Each refrigerant circuit (2 per unit) has all the necessary refrigerant controls.

Thermostatic Expansion Valve (TXV) — On sizes 030 and 035, each circuit has one TXV. On sizes 040-100, each circuit has 2 TXVs on which superheat may be adjusted if necessary. Adjustment is not normally required or recommended.

The TXV is set to maintain 10 to 13°F superheat leaving the evaporator coil. It controls the flow of refrigerant to the evaporator coils.

Refrigeration Circuits

LEAK TESTING — Units are shipped with a full operating charge of R-410A (see unit nameplate). 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.

REFRIGERANT CHARGE — Amount of refrigerant charge is listed on unit nameplate. Refer to Carrier GTAC II; Module 5; Charging, Recovery, Recycling, and Reclamation section for charging methods and procedures.

Unit panels must be in place when unit is operating during charging procedure.

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

NO CHARGE — Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant from the unit nameplate.

LOW CHARGE COOLING — Due to the compact, all aluminum design, microchannel heat exchangers will reduce refrigerant charge and overall operating weight. As a result, charging procedures for MCHX units require more accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided (Fig. 55-92), add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in $^1/_4$ lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

To Use the Cooling Charging Chart — Use the outdoor air temperature, saturated suction temperature and saturated condensing temperature (available on the *Comfort*Link display), and find the intersection point on the cooling charging chart. If intersection point is above the line, carefully recover some of the refrigerant. If intersection point is below the line, carefully add refrigerant.

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

In order to determine which charging chart to use, the technician can verify the evaporator configuration of the unit (High Cap or Std Cap) by counting the number of rows on the installed evaporator. Use Table 116 to identify the correct unit configuration for refrigerant charging.

Units With Humidi-MiZer® Adaptive Dehumidification System

NOTE: All circuits must be running in normal cooling mode. Indoor airflow must be within specified air quantity limits for cooling. All outdoor fans must be on and running at normal speed.

Table 116 — Unit Capacity Type

UNIT SIZE 48/50P	NUMBER OF ROWS ON EVAPORATOR	
	High Capacity	Std Capacity
030	4	3
035	N/A	4
040	6	3
050	6	4
055	6	4
060	6	4
070	6	4
075	6	4
090	6	4
100	6	4

Use the following procedure to adjust charge on Circuit B of Humidi-MiZer equipped units:

1. Start all compressors and outdoor fans. Allow unit to run for 5 minutes.
2. Switch system to run in a Dehumidification mode for 5 minutes by switching ***RHV*** to ON through the Service Test function ***(Service Test→COOL→RHV)***.

3. At the end of the 5-minute period, switch back into Cooling mode through the Service Test function ***(Service Test→COOL→RHV***) by switching ***RHV*** to OFF.
4. Using the cooling charging charts provided (Fig. 55-92), add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in $^{1}/_{4}$ lb increments until complete. See paragraph "To Use the Cooling Charging Chart" for additional instructions.
5. If a charge adjustment was necessary in Step 4, then repeat the steps in this paragraph (starting with Step 2) until no charge adjustment is necessary. When no more charge adjustment is necessary after switching from a Dehumidification Mode to a Cooling Mode (Steps 2 and 3), then the charge adjustment procedure is complete.

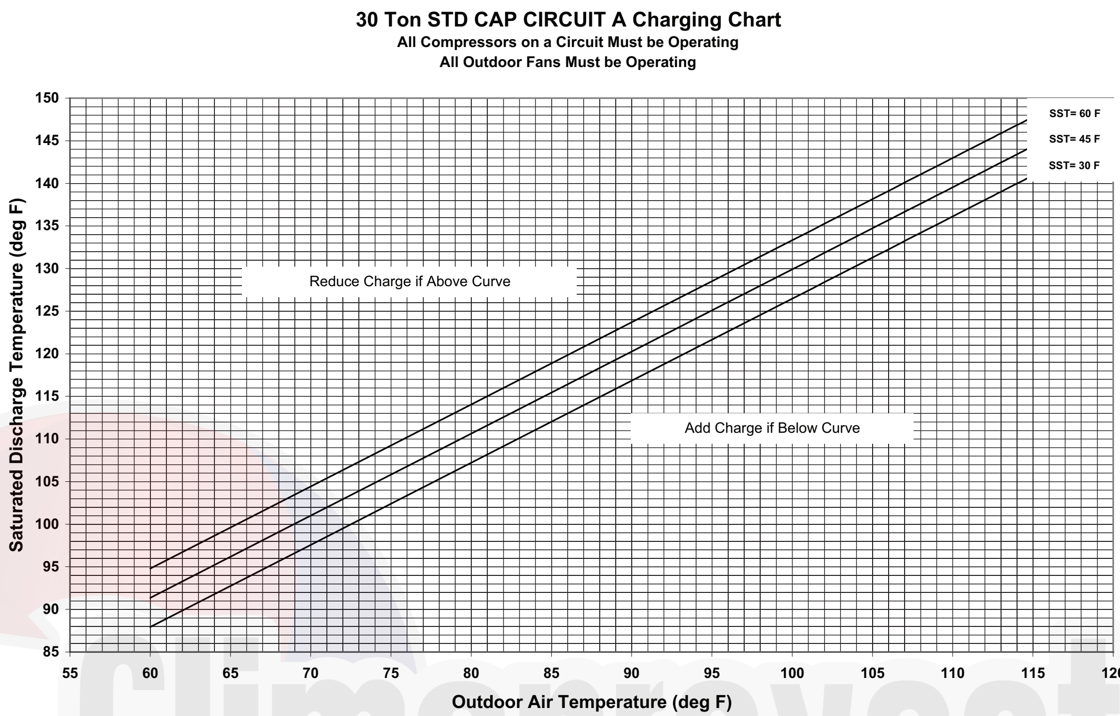


Fig. 55 — Charging Chart — 48/50P030 Standard Units — Circuit A

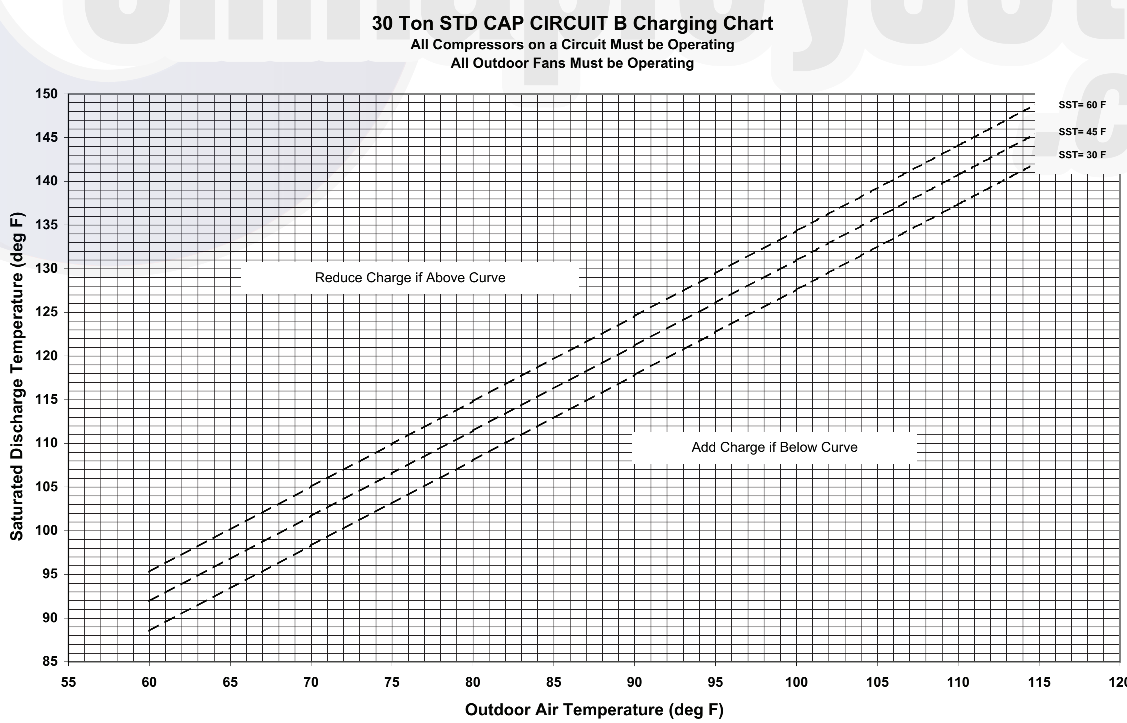


Fig. 56 — Charging Chart — 48/50P030 Standard Units — Circuit B

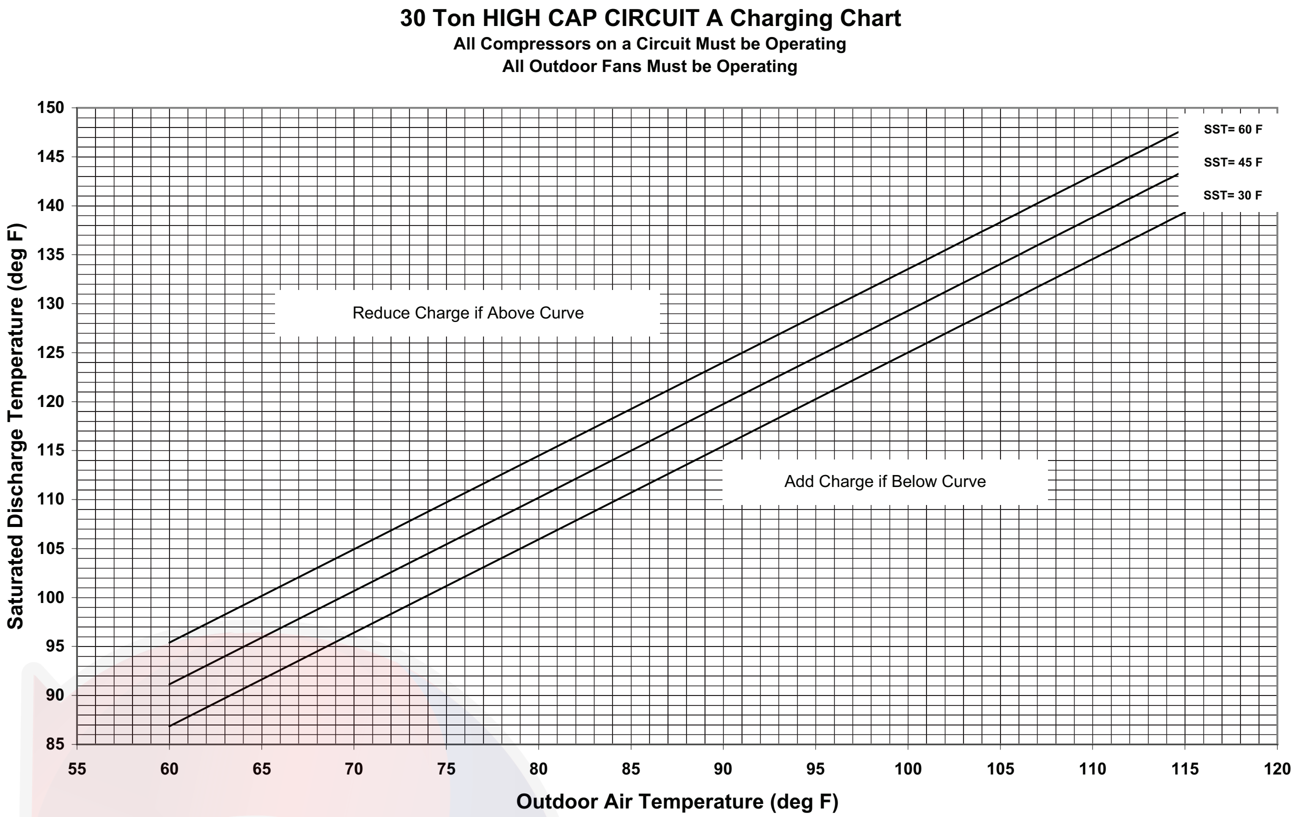


Fig. 57 — Charging Chart — 48/50P030 High-Capacity Units — Circuit A

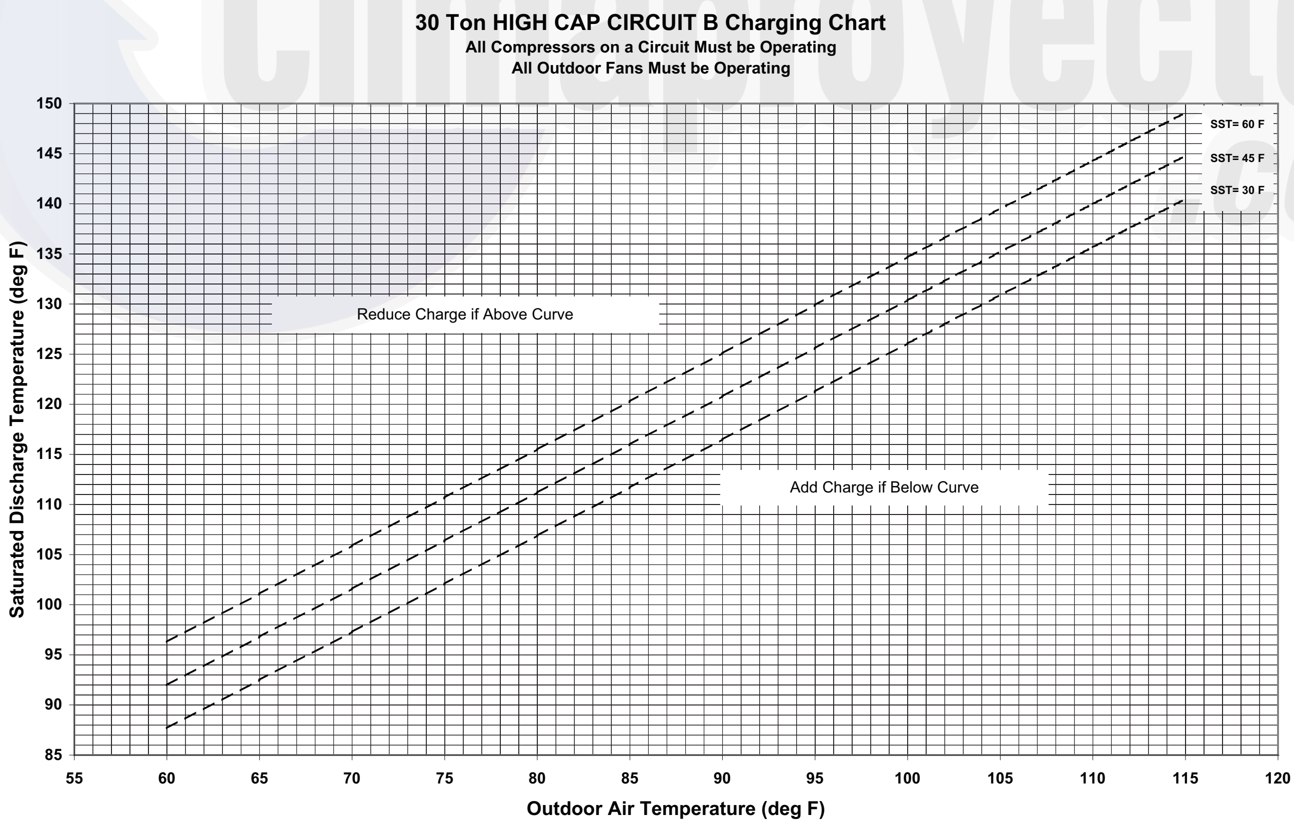


Fig. 58 — Charging Chart — 48/50P030 High-Capacity Units — Circuit B

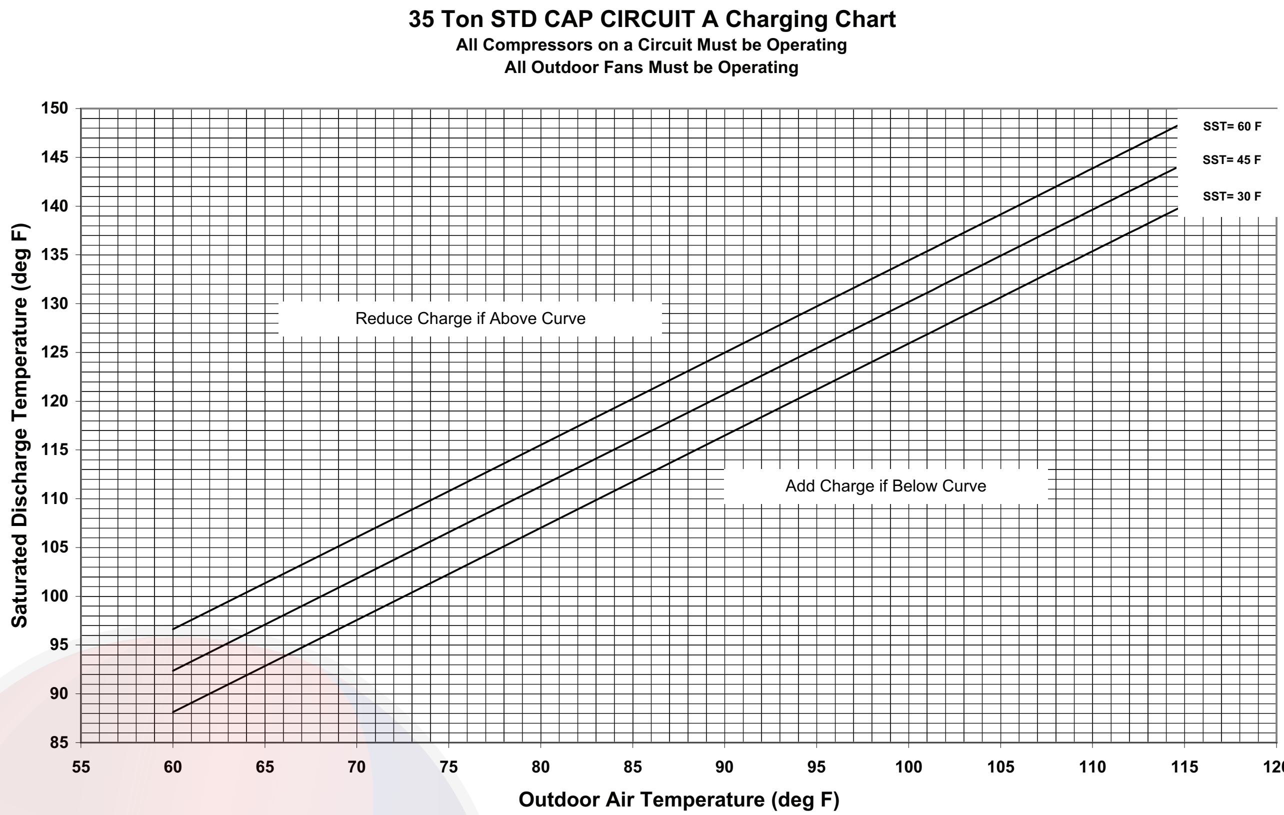


Fig. 59 — Charging Chart — 48/50P035 Standard Units — Circuit A

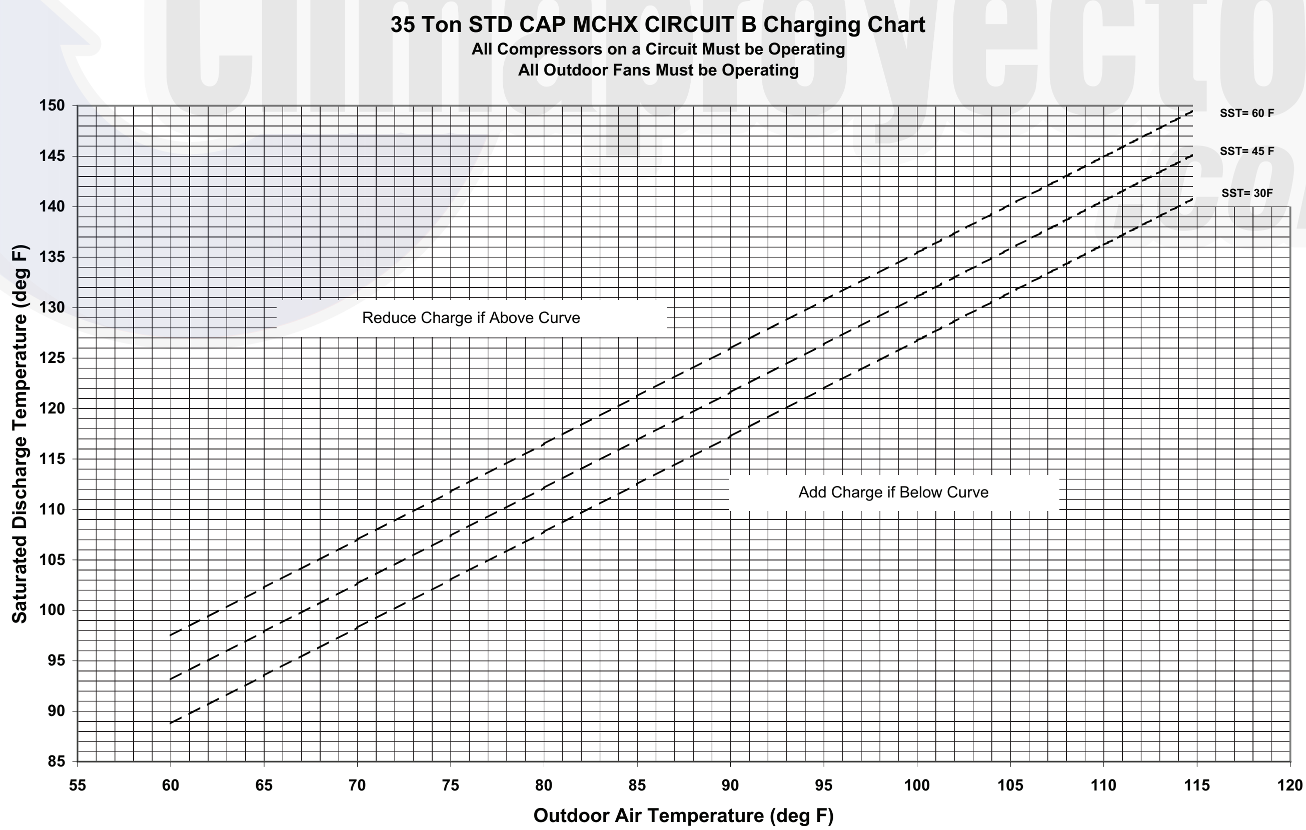


Fig. 60 — Charging Chart — 48/50P035 Standard Units — Circuit B

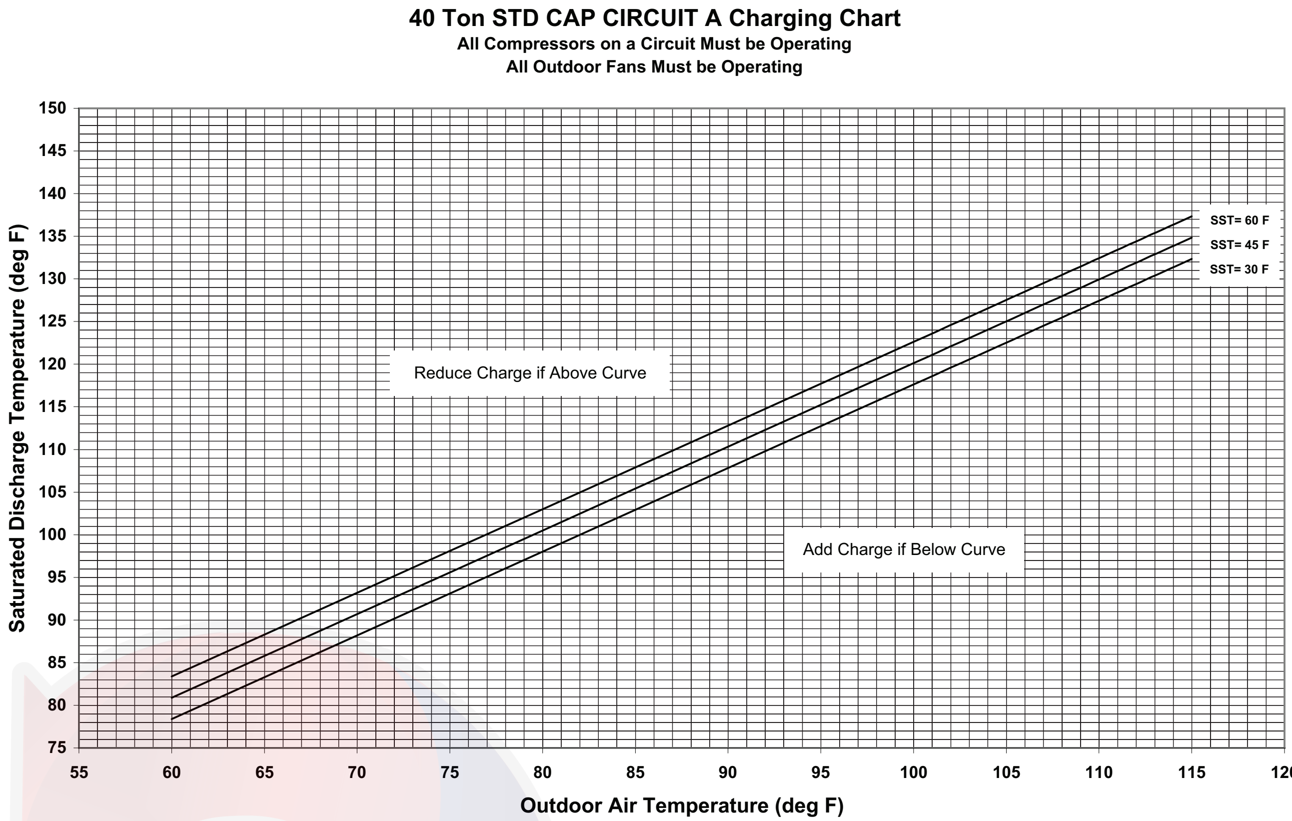


Fig. 61 — Charging Chart — 48/50P040 Standard Units — Circuit A

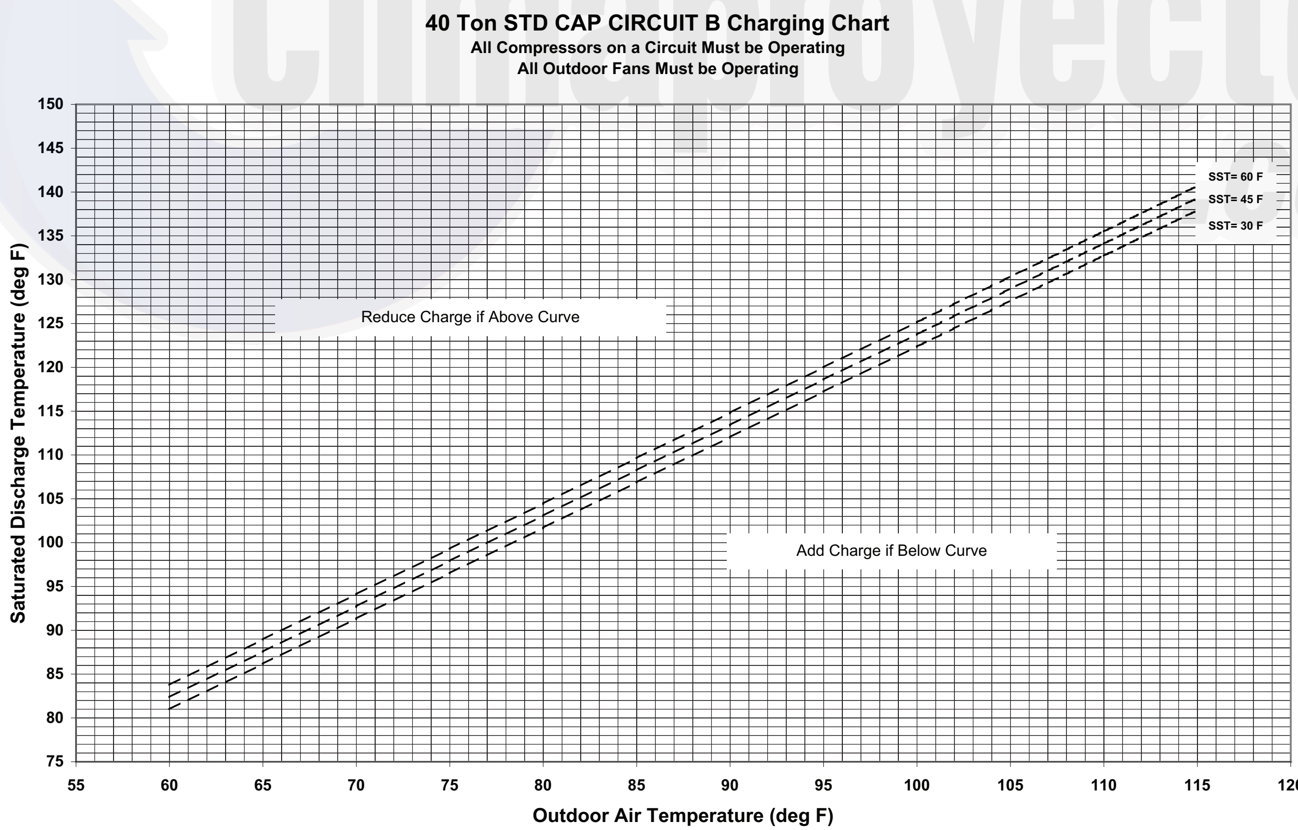


Fig. 62 — Charging Chart — 48/50P040 Standard Units — Circuit B

40 Ton HIGH CAP CIRCUIT A Charging Chart

All Compressors on a Circuit Must be Operating
All Outdoor Fans Must be Operating

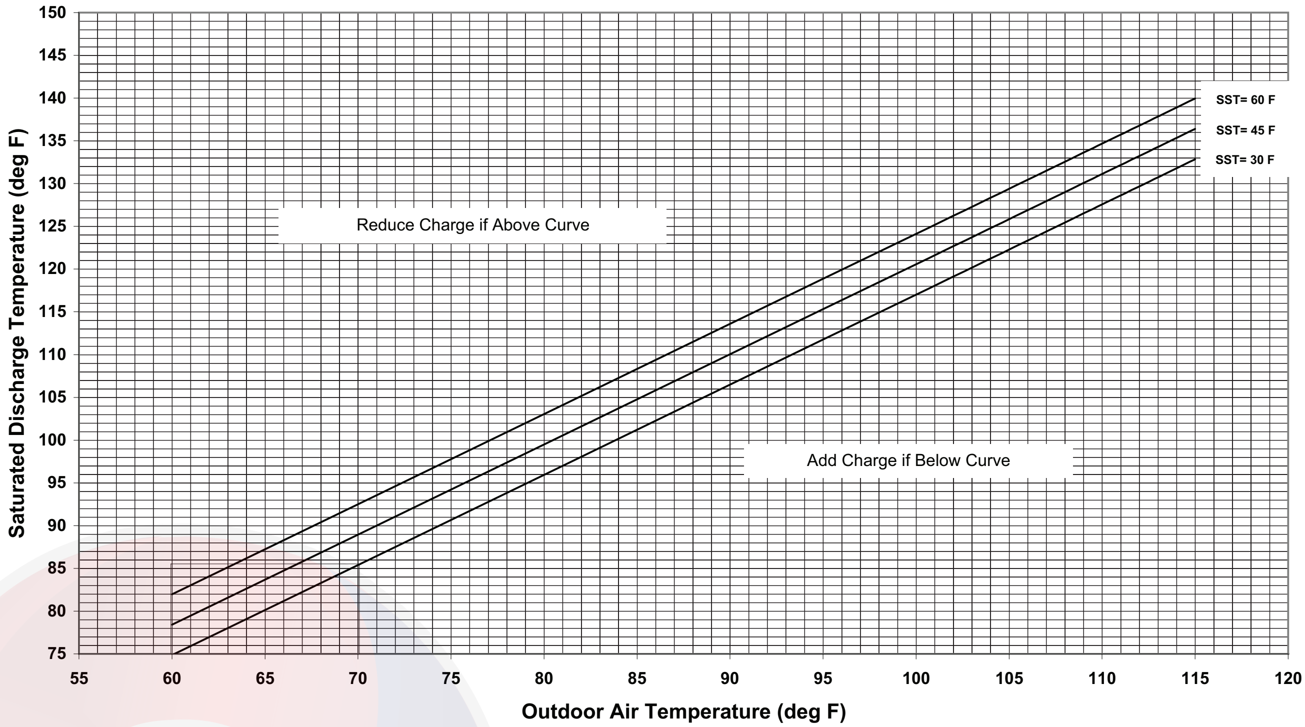


Fig. 63 — Charging Chart — 48/50P040 High-Capacity Units — Circuit A

40 Ton HIGH CAP CIRCUIT B Charging Chart

All Compressors on a Circuit Must be Operating
All Outdoor Fans Must be Operating

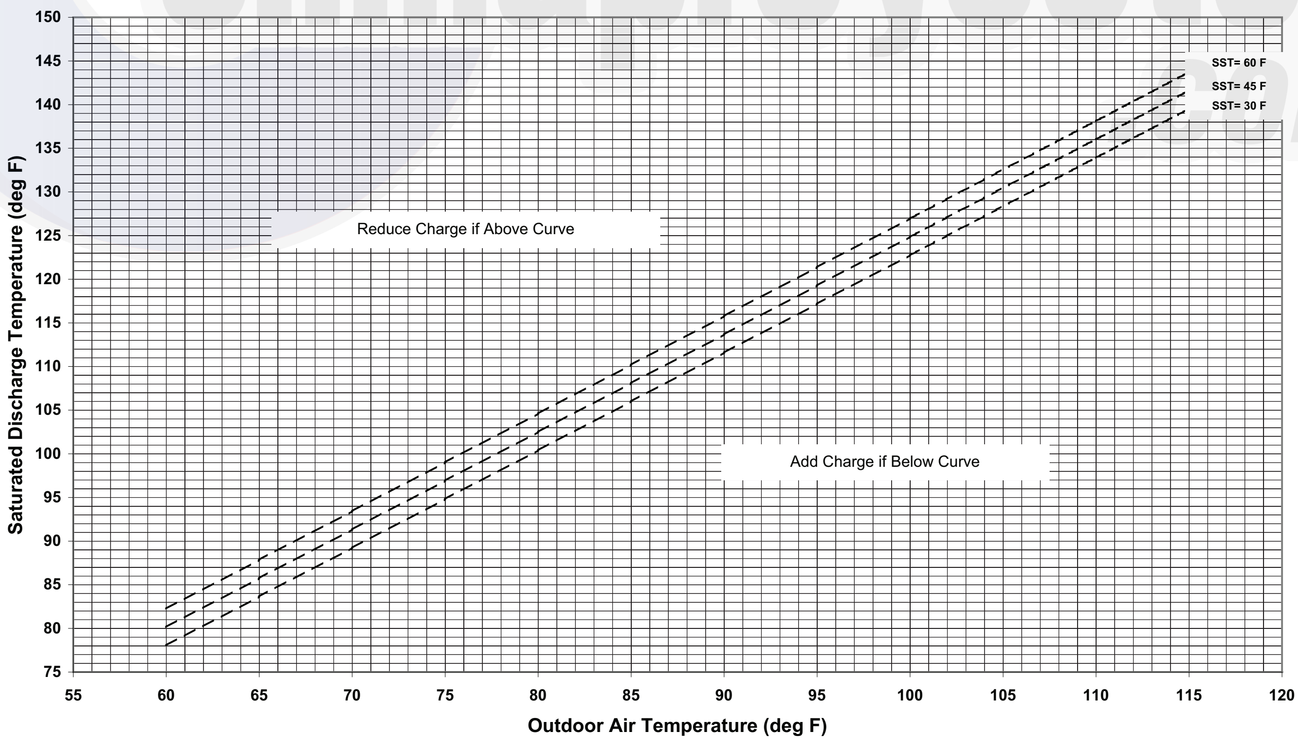


Fig. 64 — Charging Chart — 48/50P040 High-Capacity Units — Circuit B

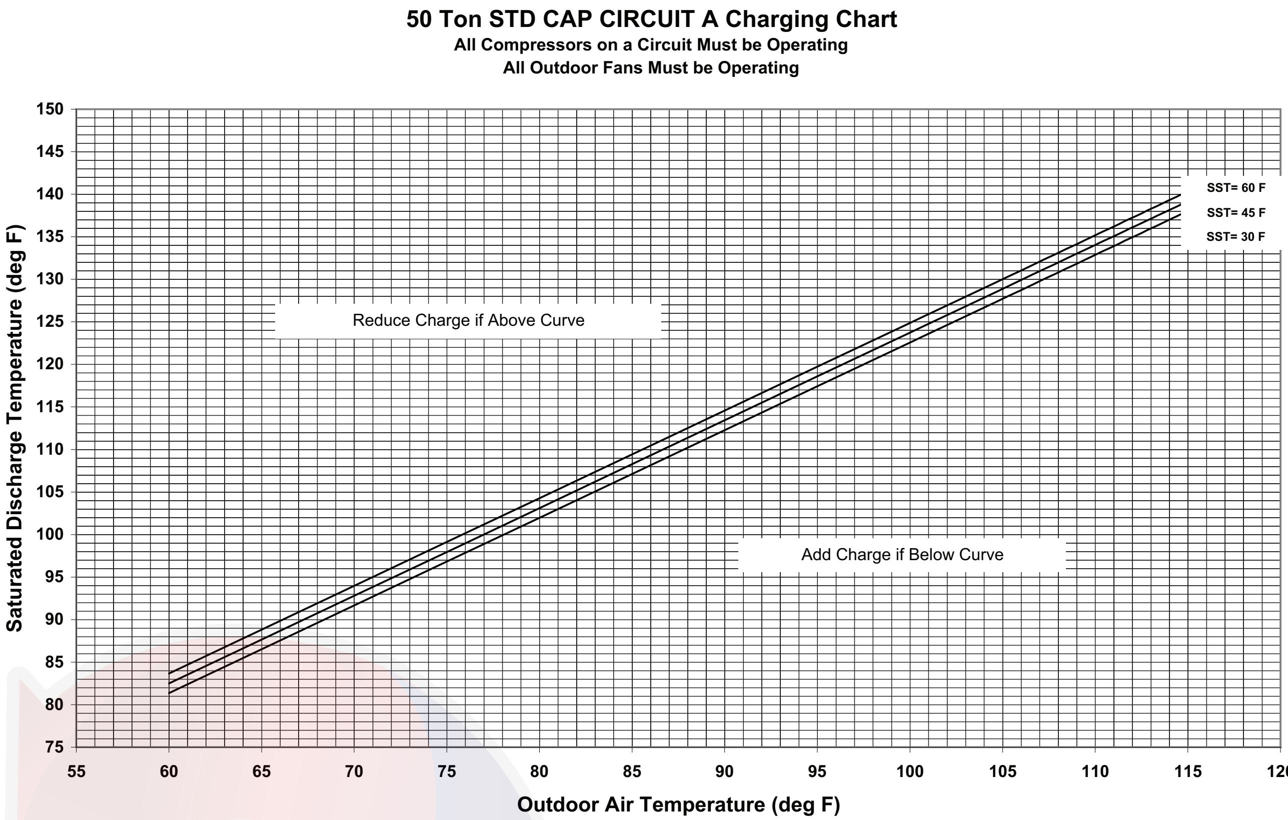


Fig. 65 — Charging Chart — 48/50P050 Standard Units — Circuit A

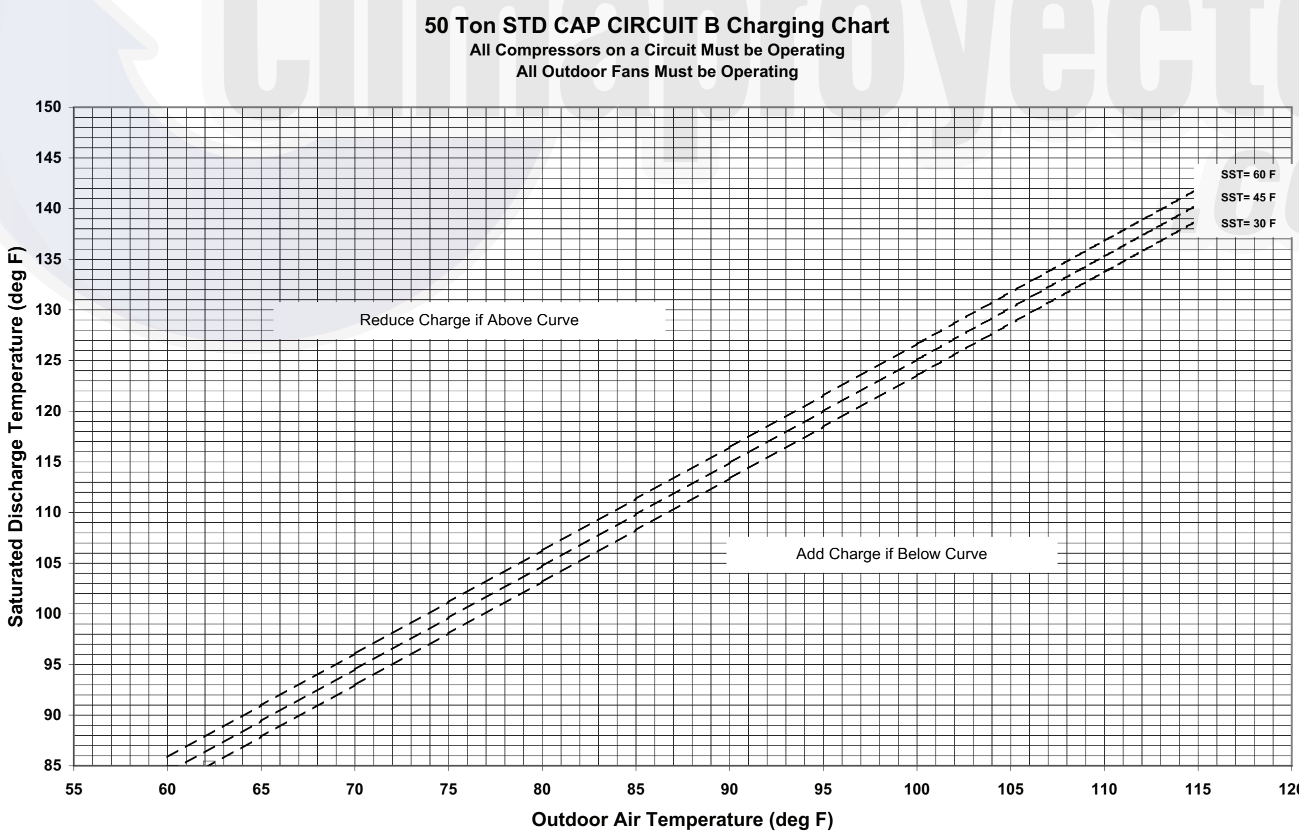


Fig. 66 — Charging Chart — 48/50P050 Standard Units — Circuit B

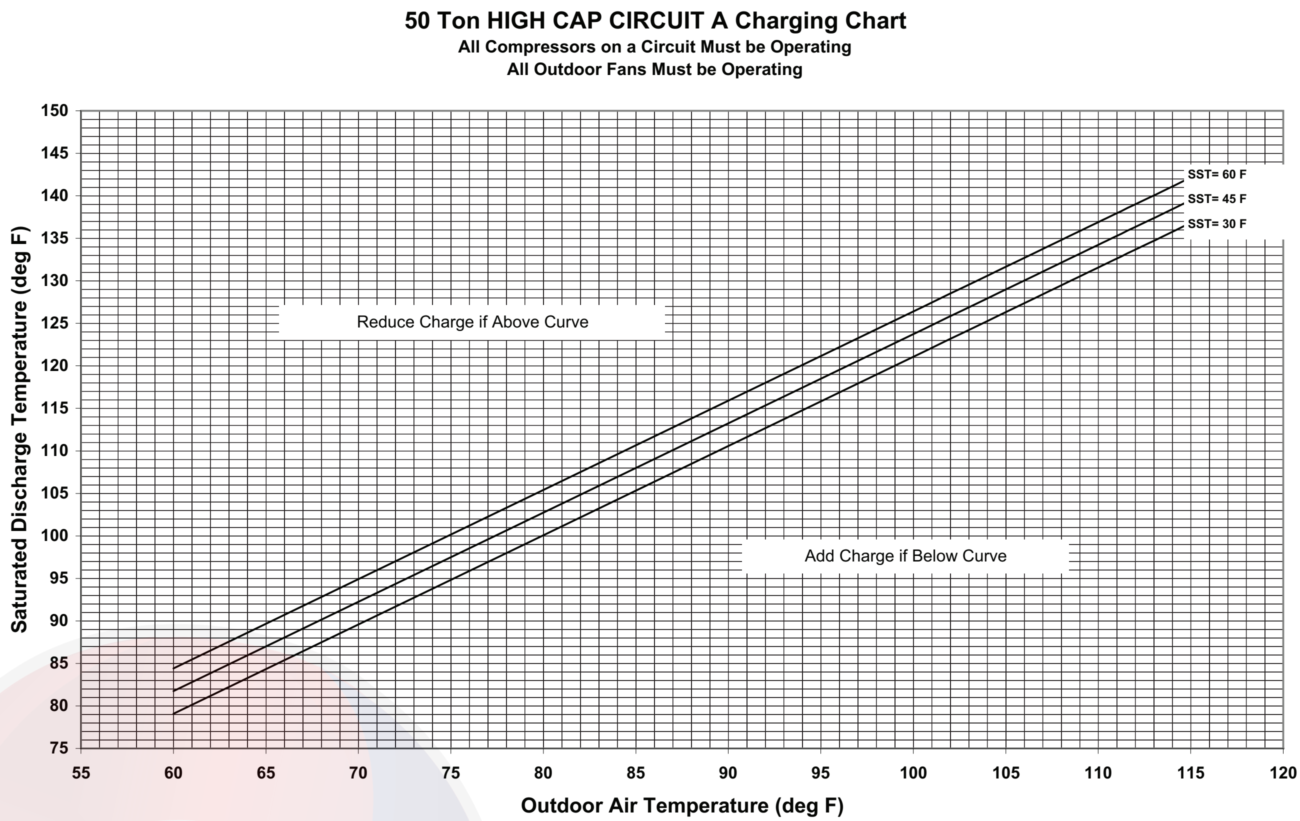


Fig. 67 — Charging Chart — 48/50P050 High-Capacity Units — Circuit A

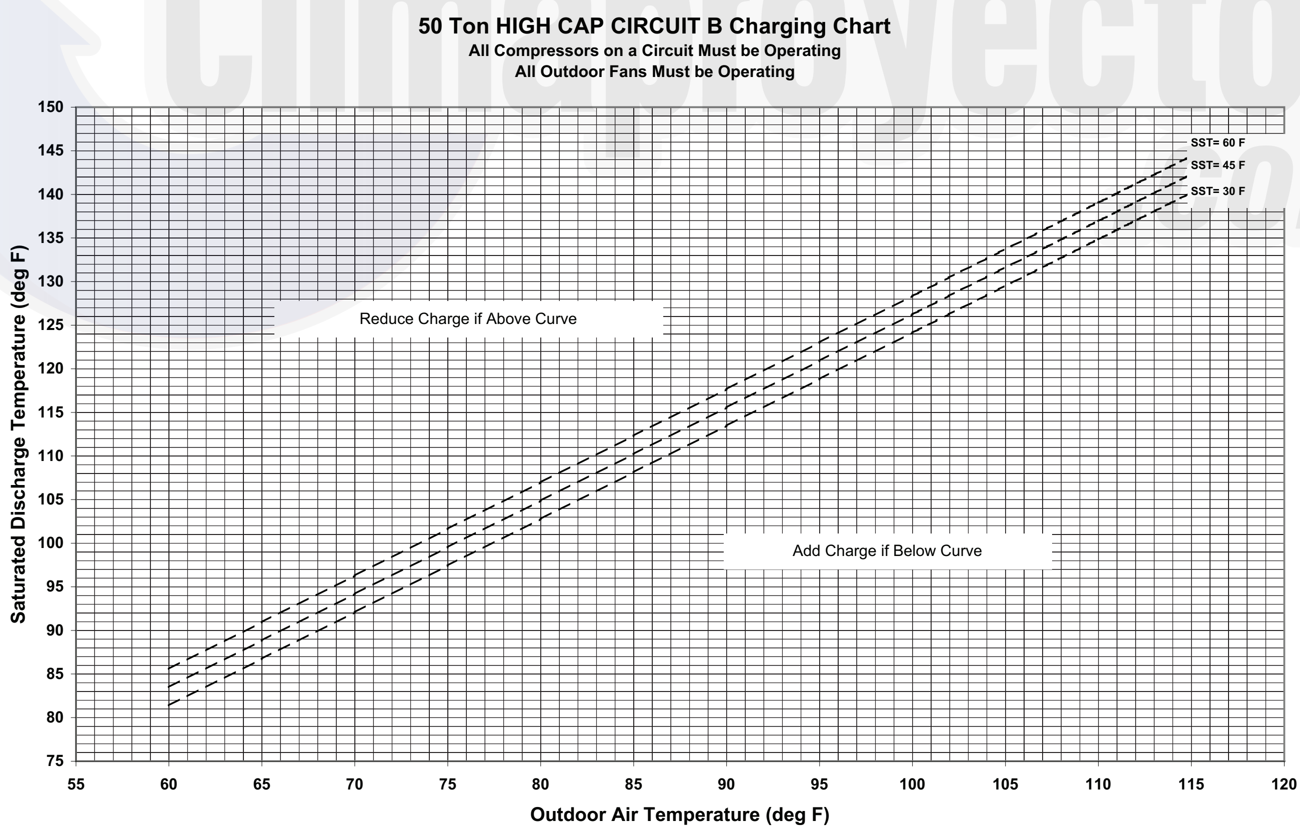


Fig. 68 — Charging Chart — 48/50P050 High-Capacity Units — Circuit B

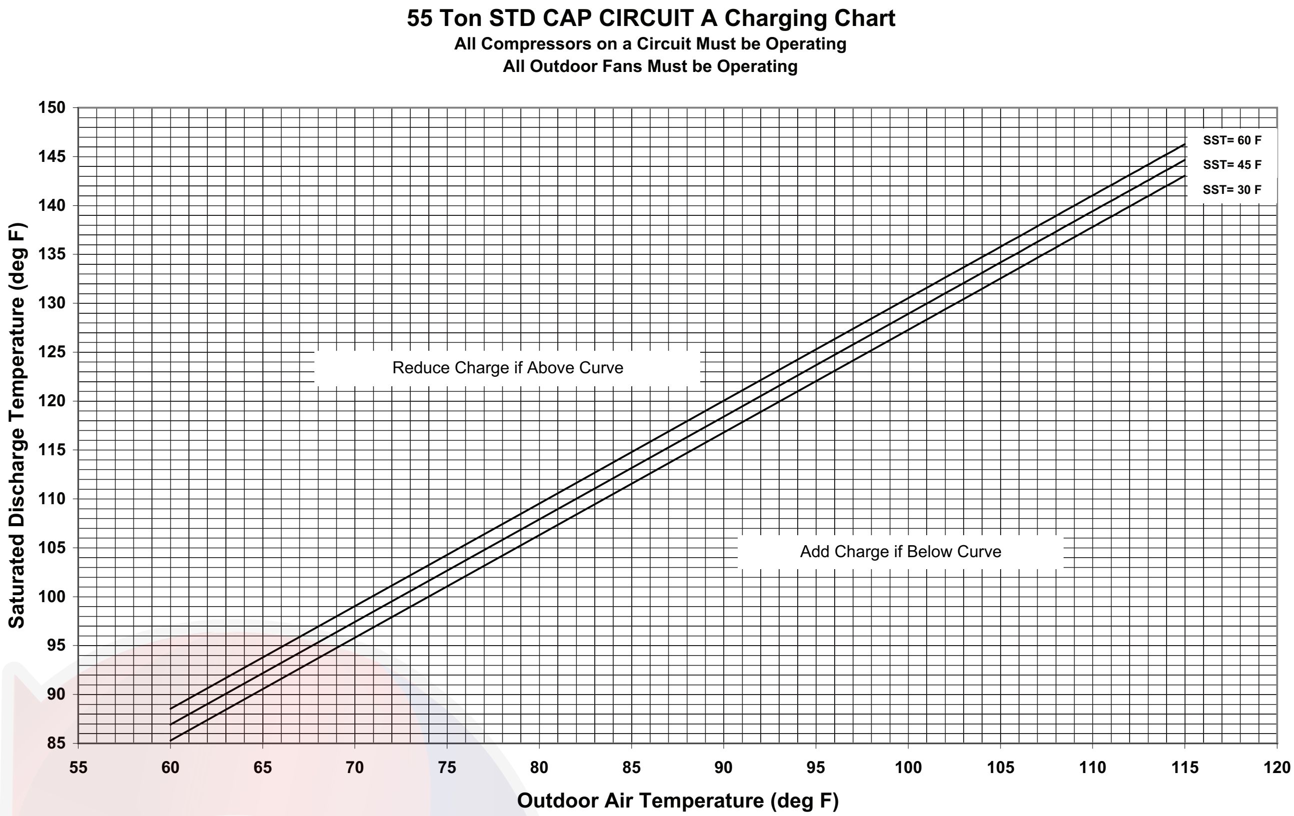


Fig. 69 — Charging Chart — 48/50P055 Standard Units — Circuit A

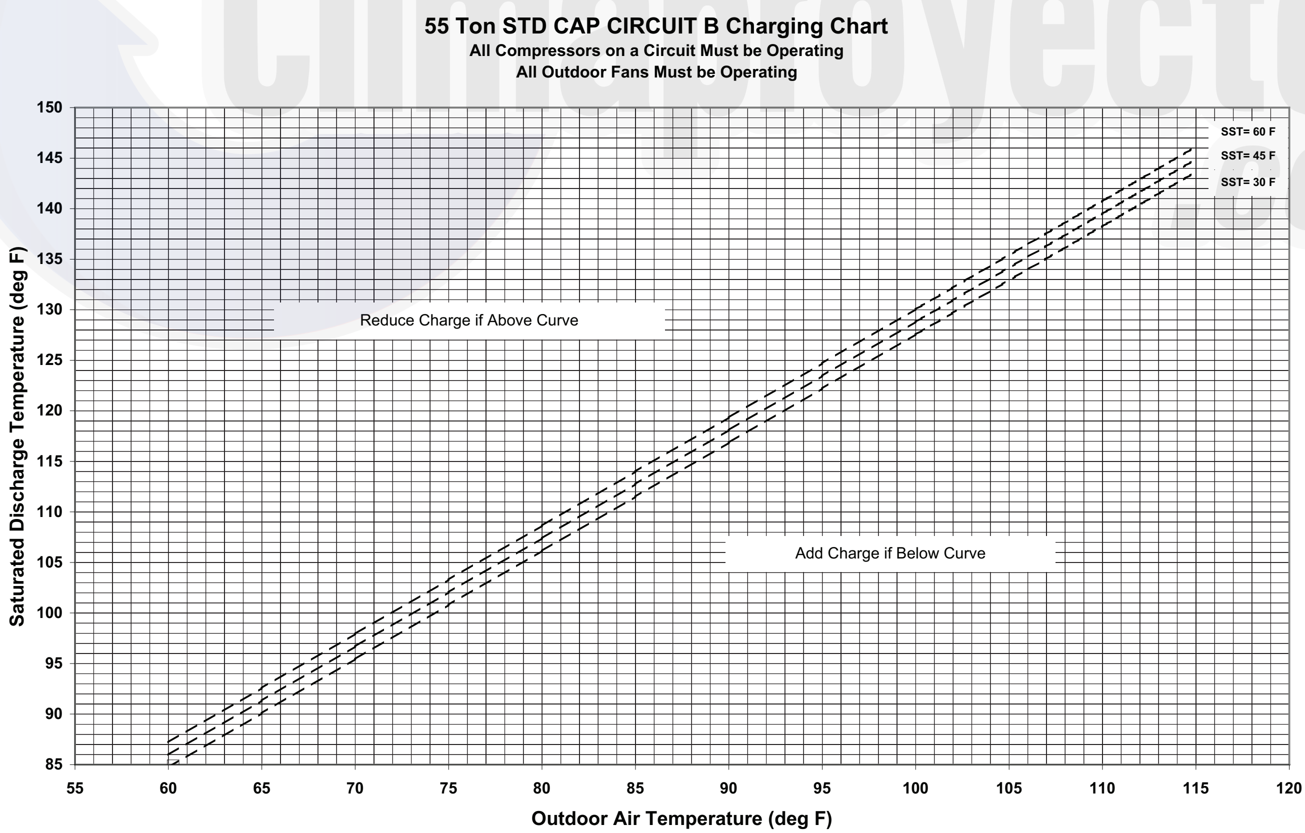


Fig. 70 — Charging Chart — 48/50P055 Standard Units — Circuit B

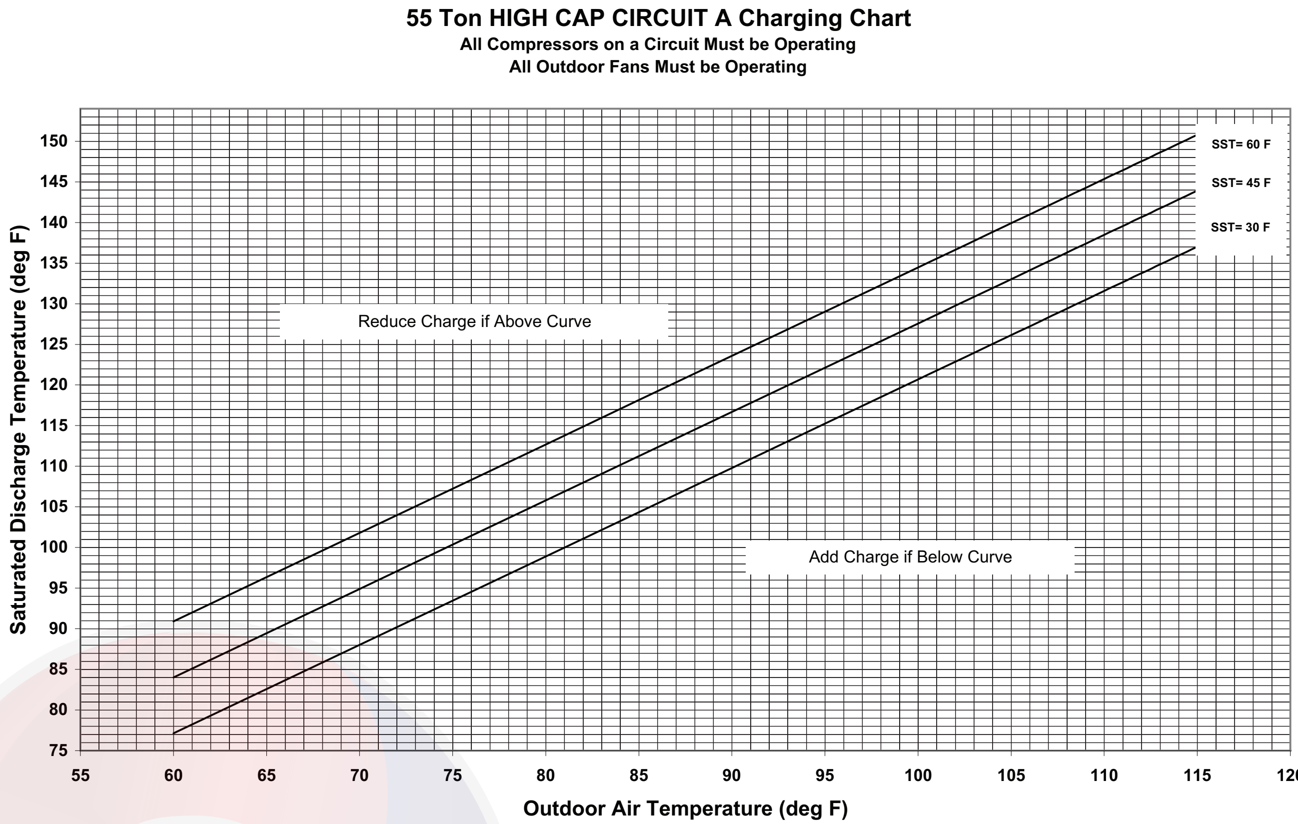


Fig. 71 — Charging Chart — 48/50P055 High-Capacity Units — Circuit A

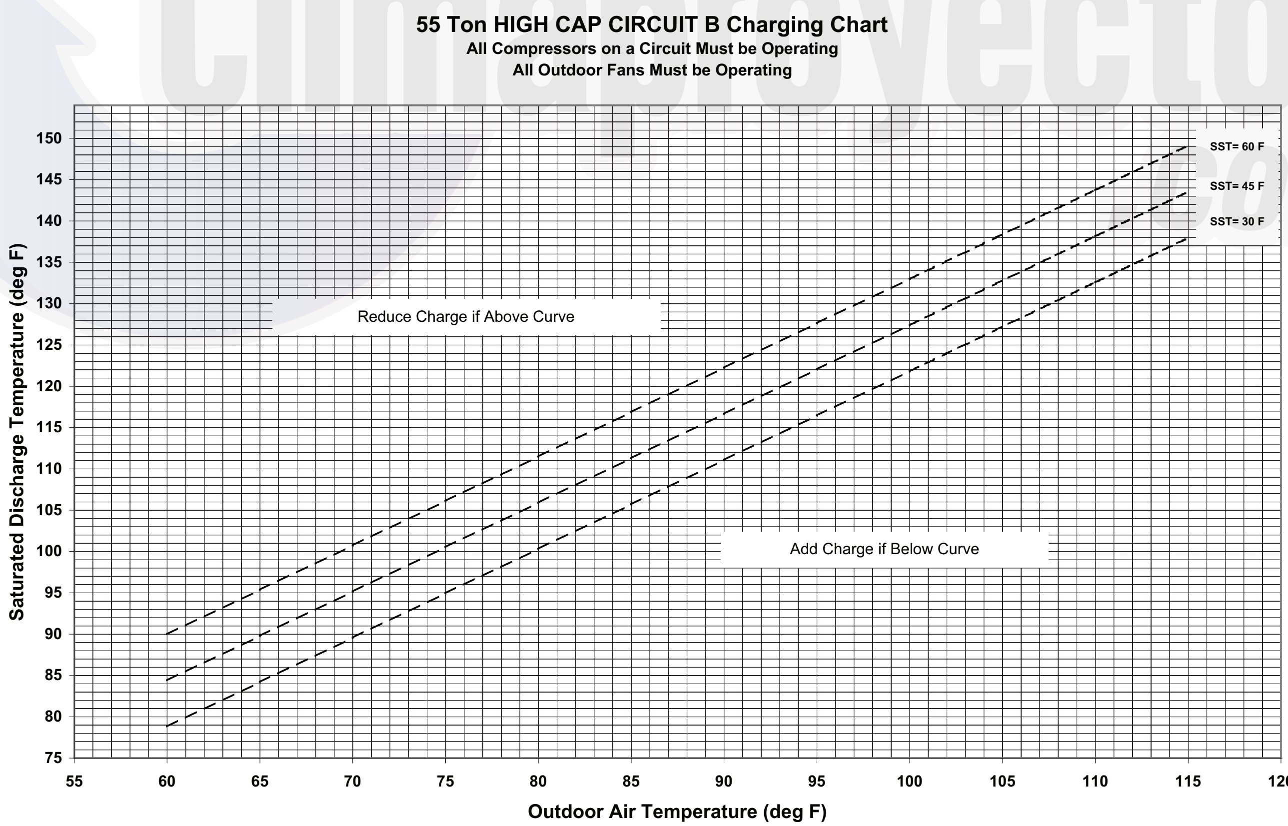


Fig. 72 — Charging Chart — 48/50P055 High-Capacity Units — Circuit B

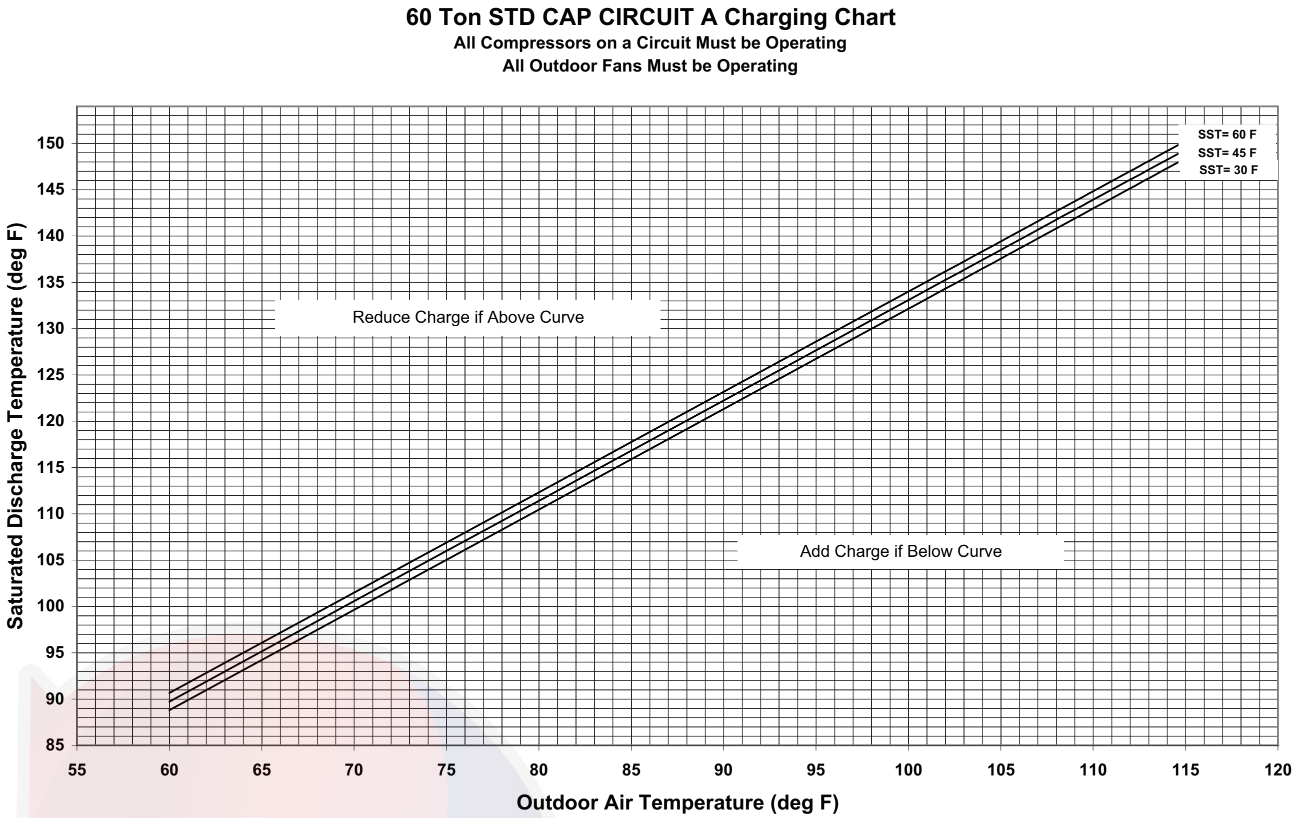


Fig. 73 — Charging Chart — 48/50P060 Standard Units — Circuit A

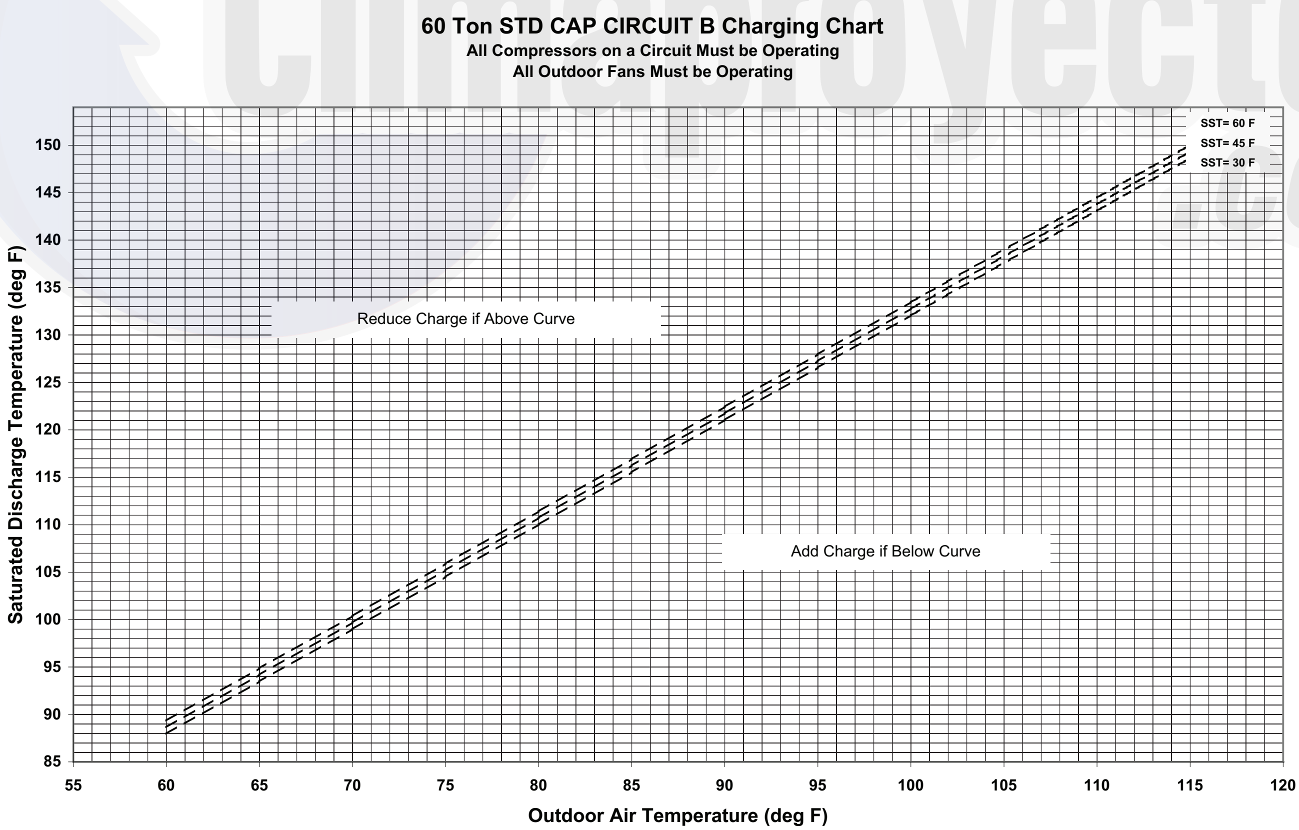


Fig. 74 — Charging Chart — 48/50P060 Standard Units — Circuit B

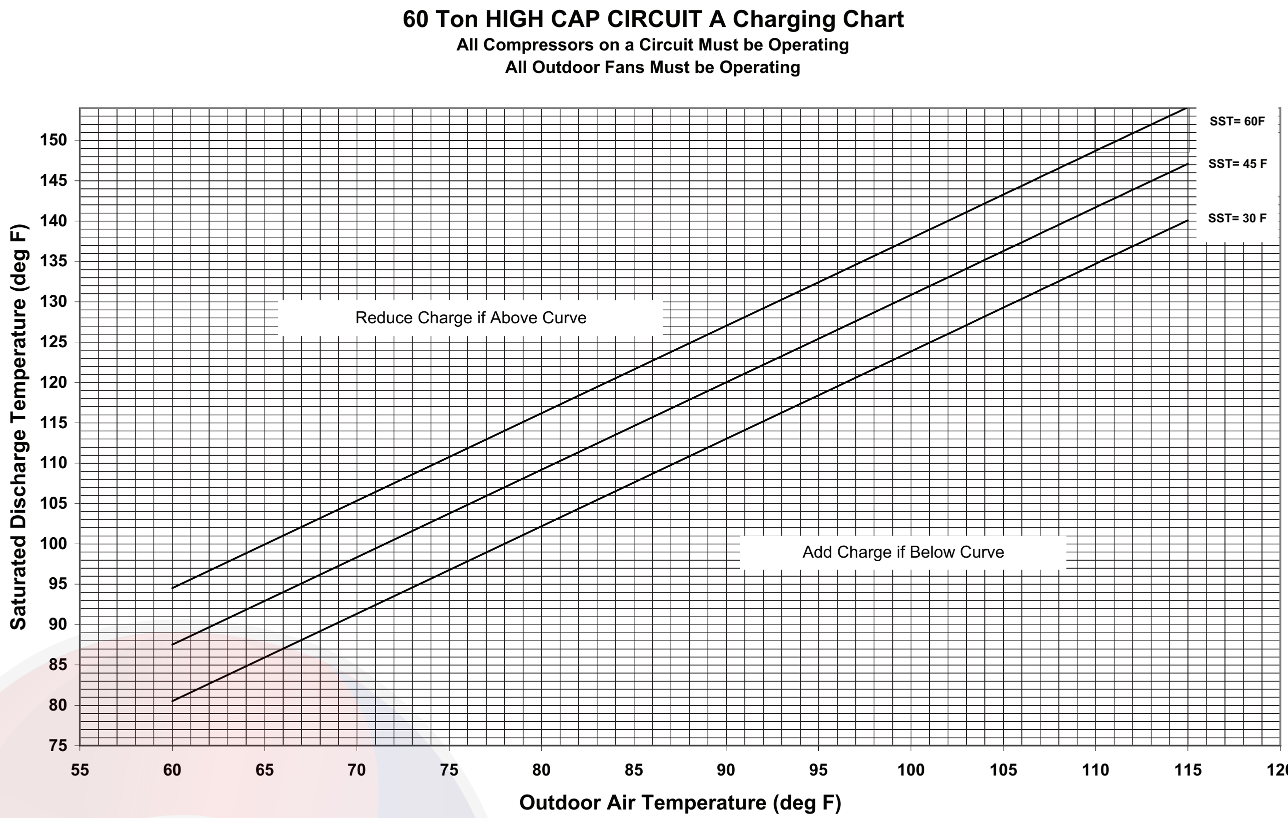


Fig. 75 — Charging Chart — 48/50P060 High-Capacity Units — Circuit A

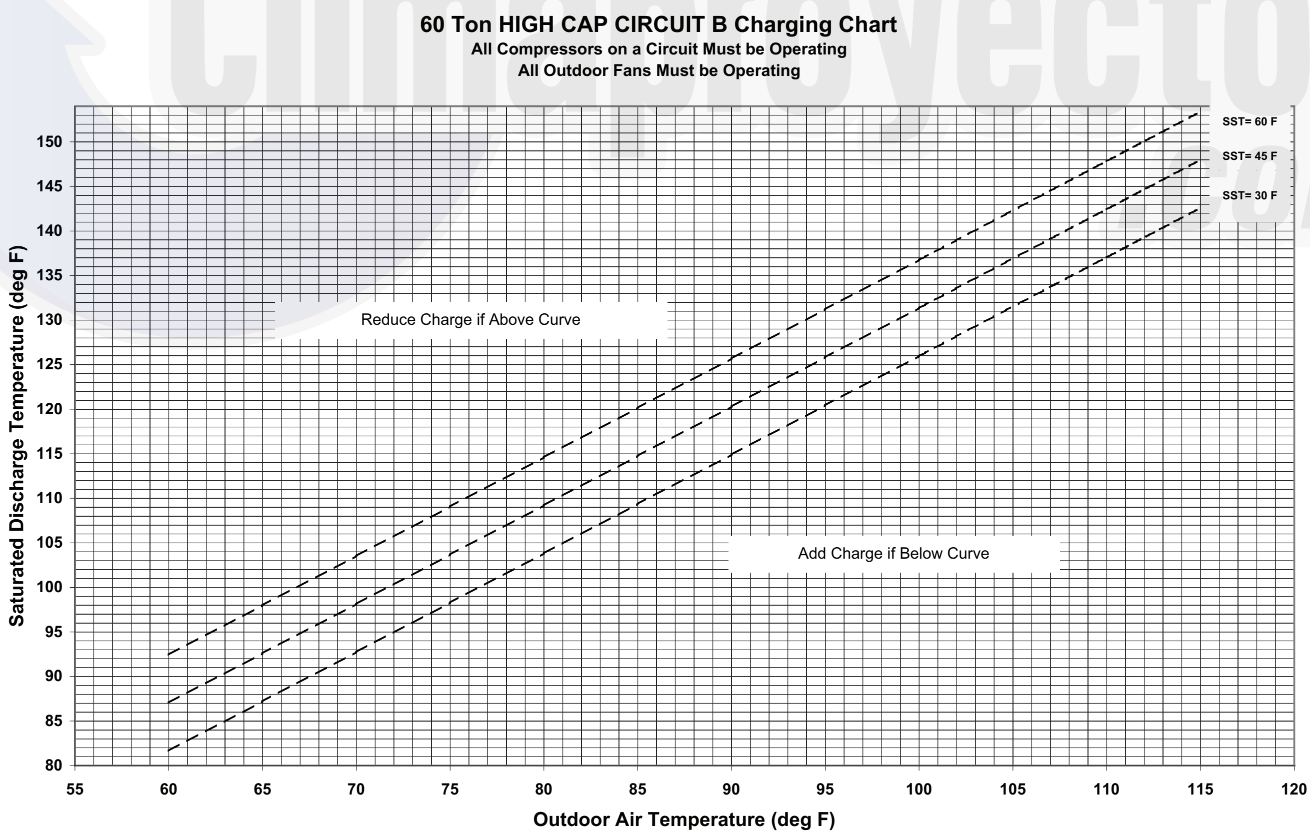


Fig. 76 — Charging Chart — 48/50P060 High-Capacity Units — Circuit B

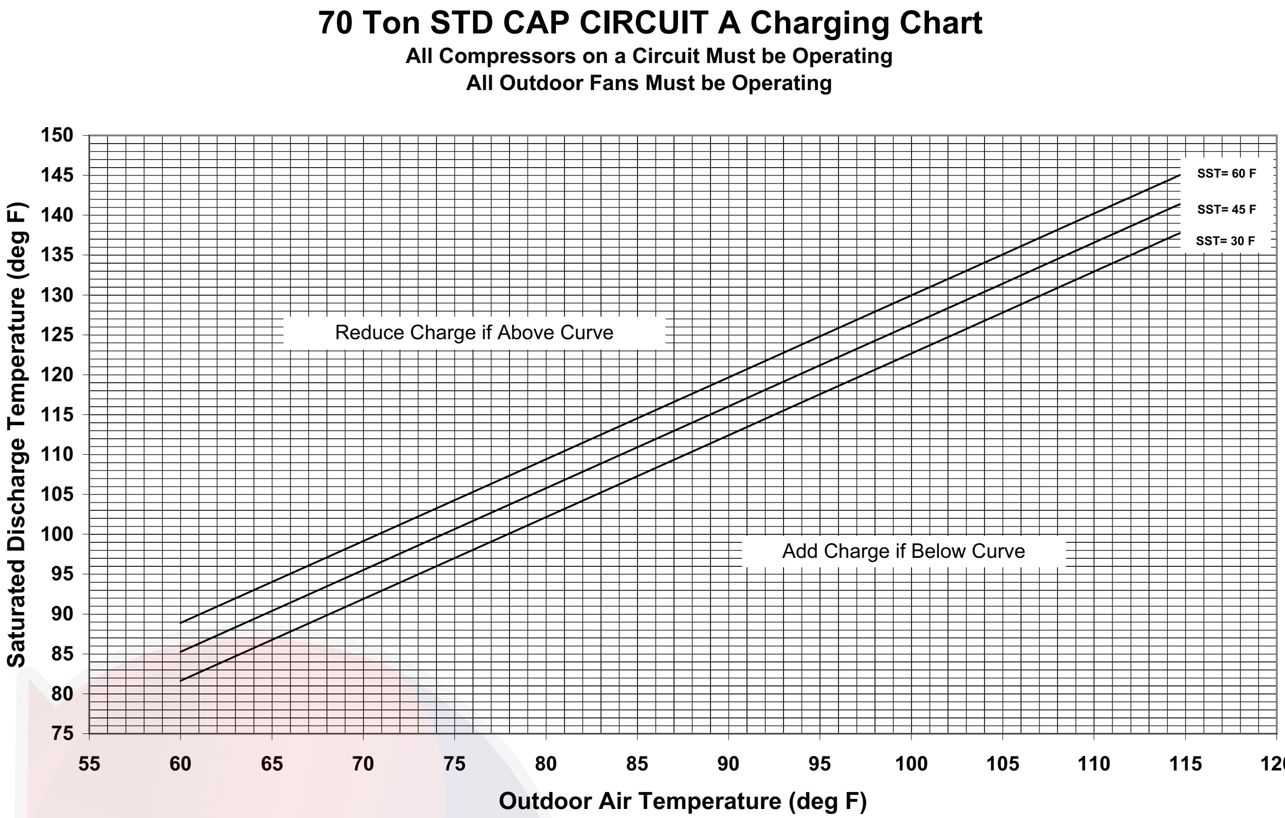


Fig. 77 — Charging Chart — 48/50P070 Standard Units — Circuit A

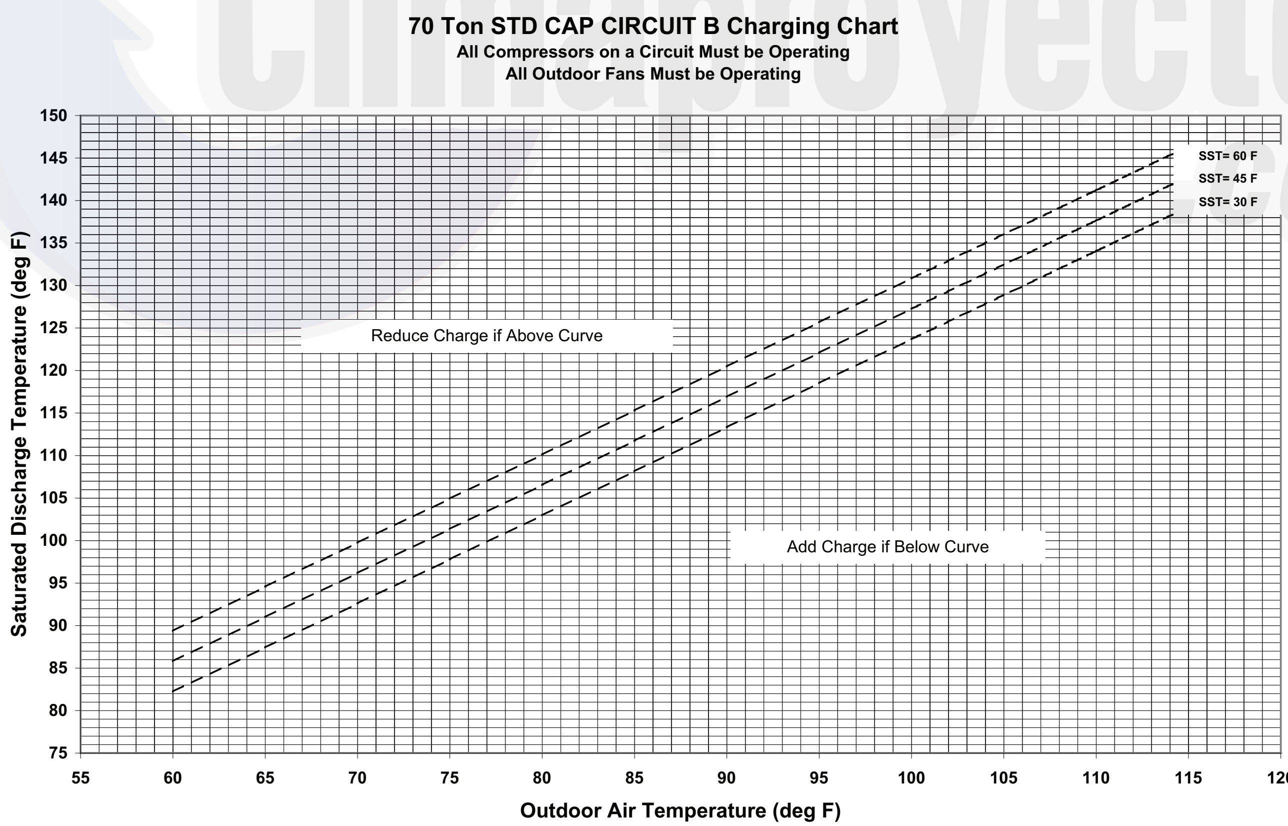


Fig. 78 — Charging Chart — 48/50P070 Standard Units — Circuit B

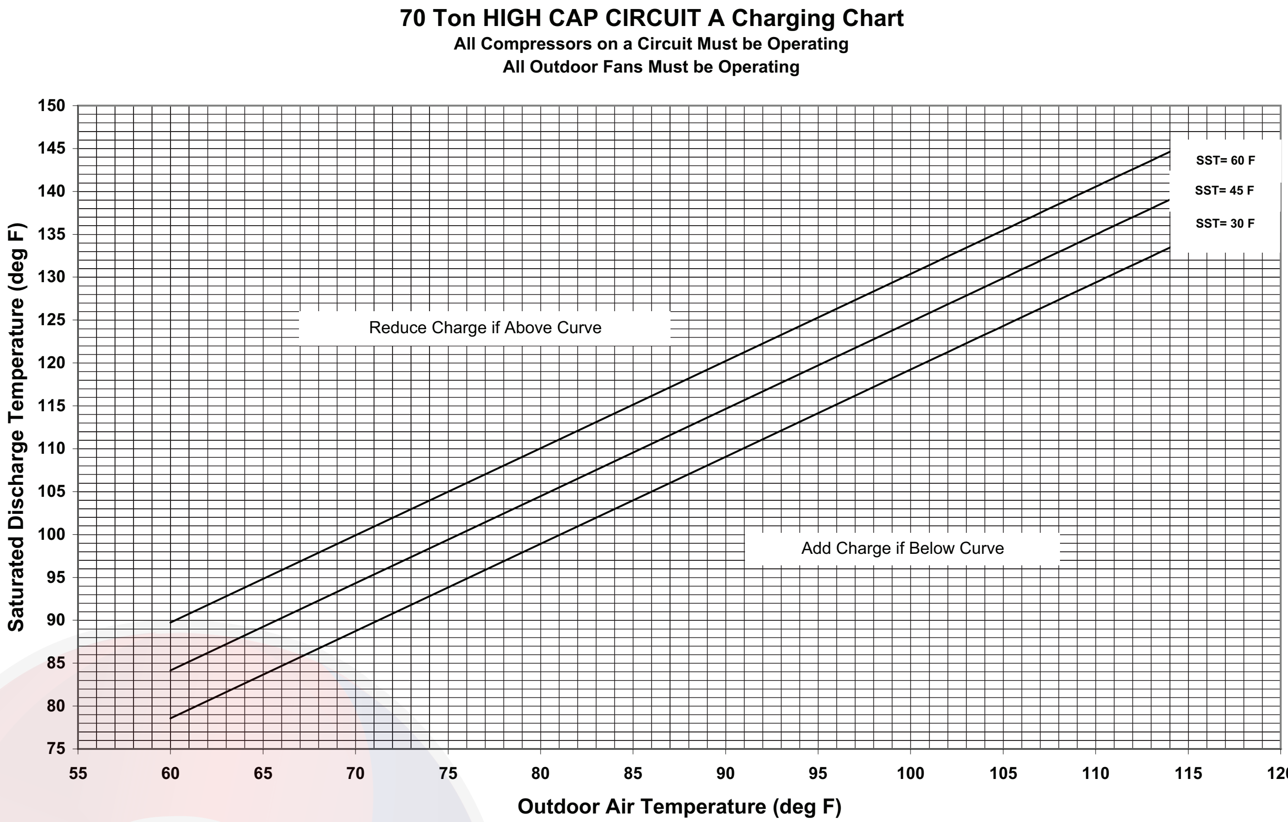


Fig. 79 — Charging Chart — 48/50P070 High-Capacity Units — Circuit A

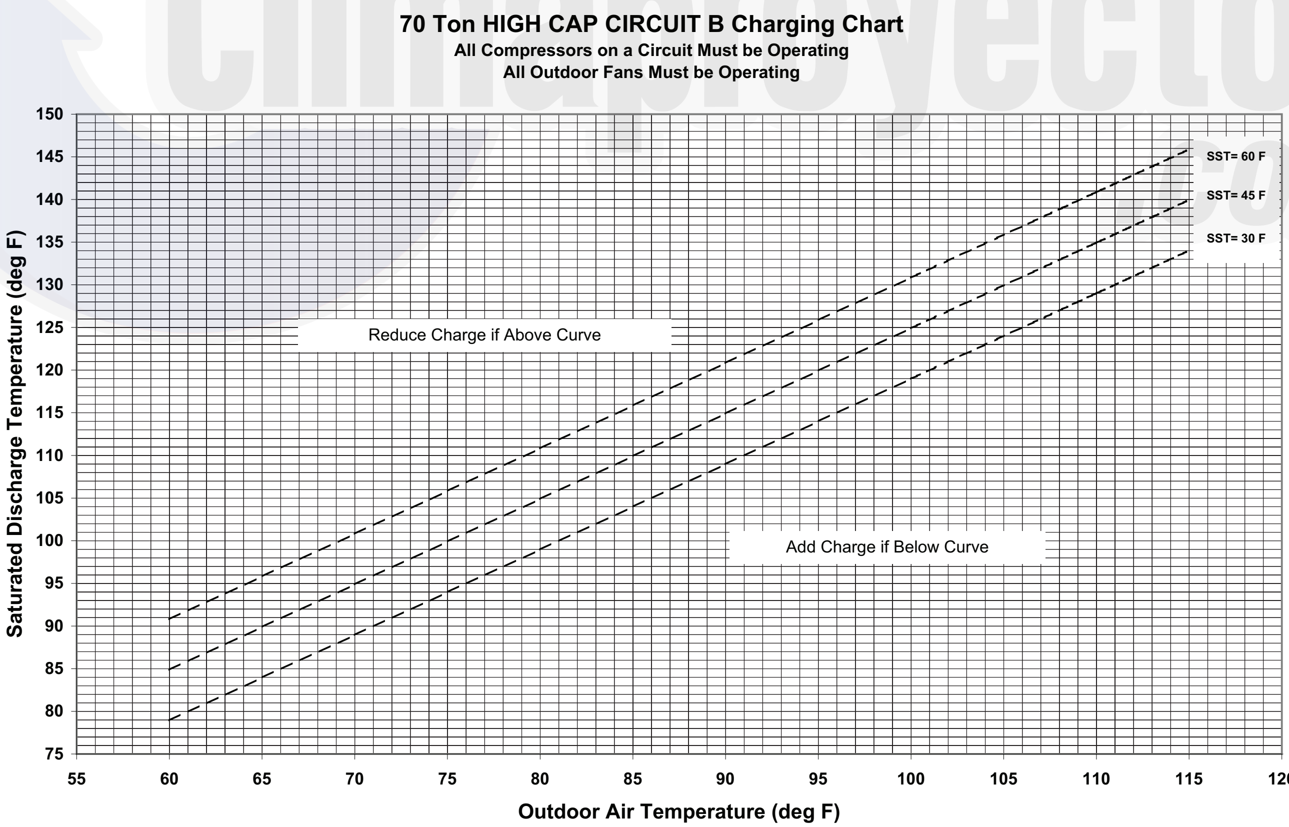


Fig. 80 — Charging Chart — 48/50P070 High-Capacity Units — Circuit B

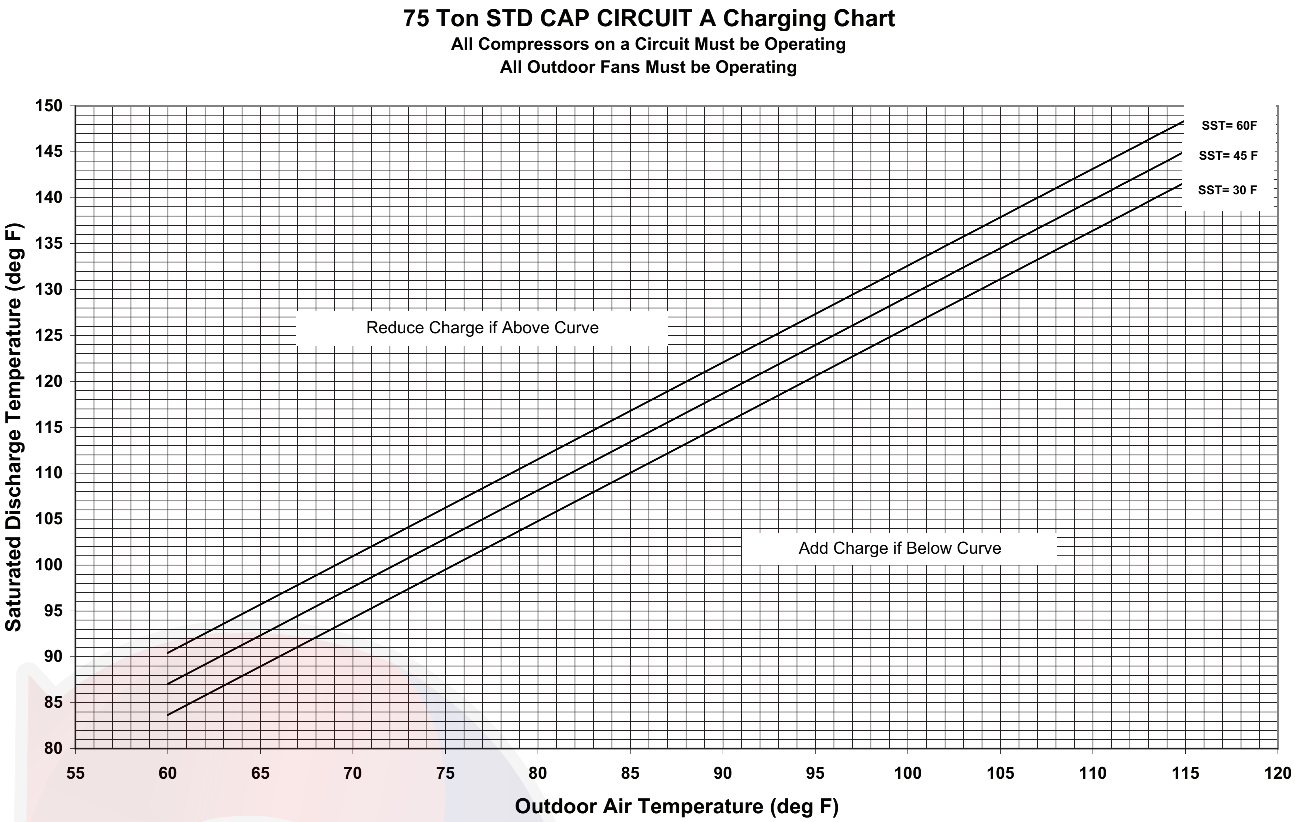


Fig. 81 — Charging Chart — 48/50P075 Standard Units — Circuit A

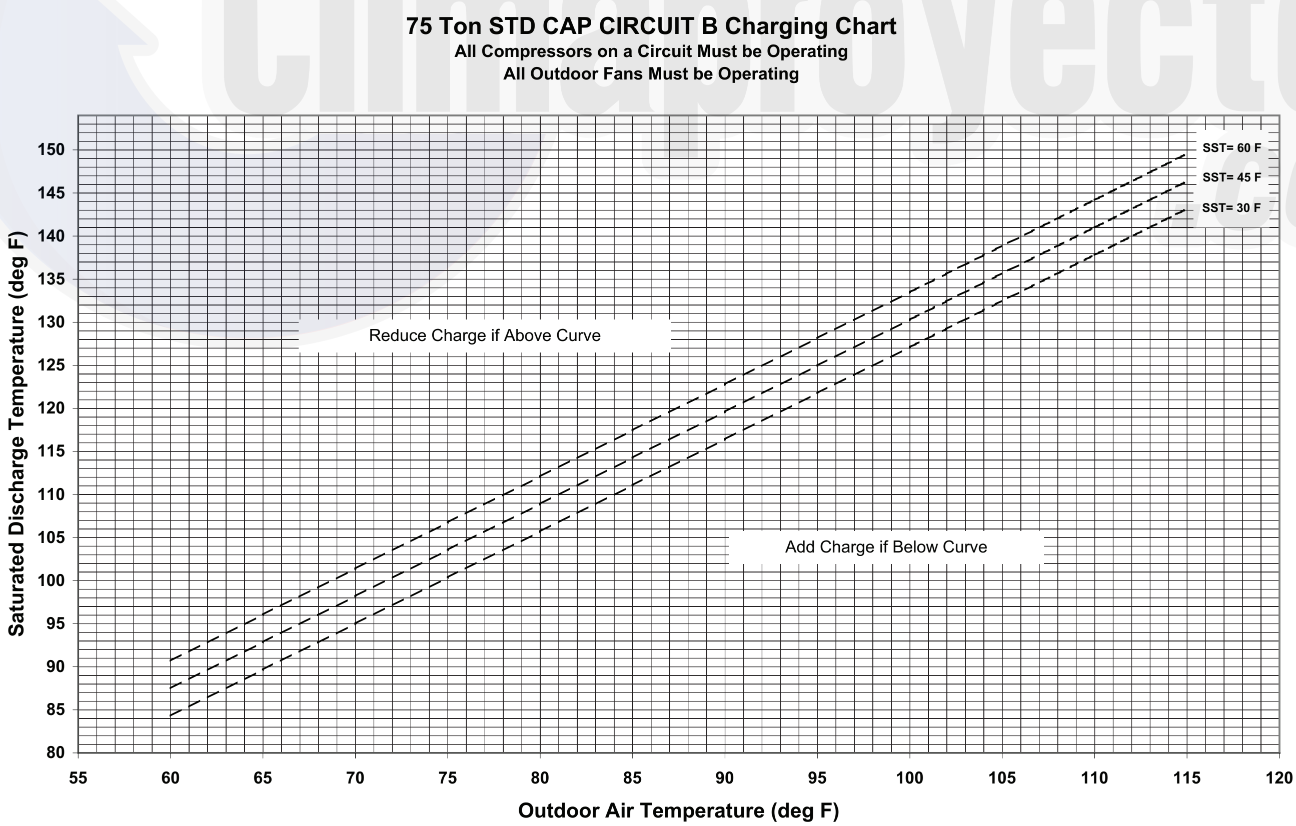


Fig. 82 — Charging Chart — 48/50P075 Standard Units — Circuit B

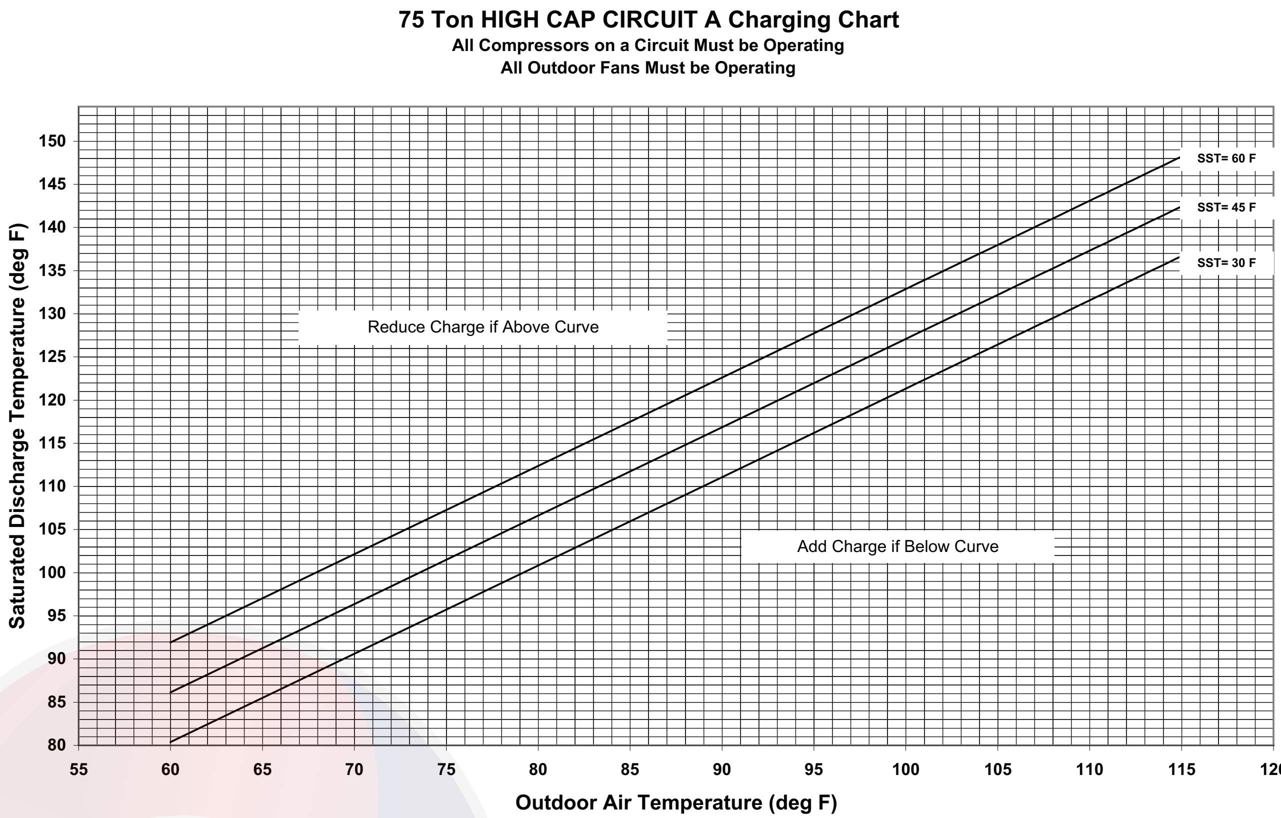


Fig. 83 — Charging Chart — 48/50P075 High-Capacity Units — Circuit A

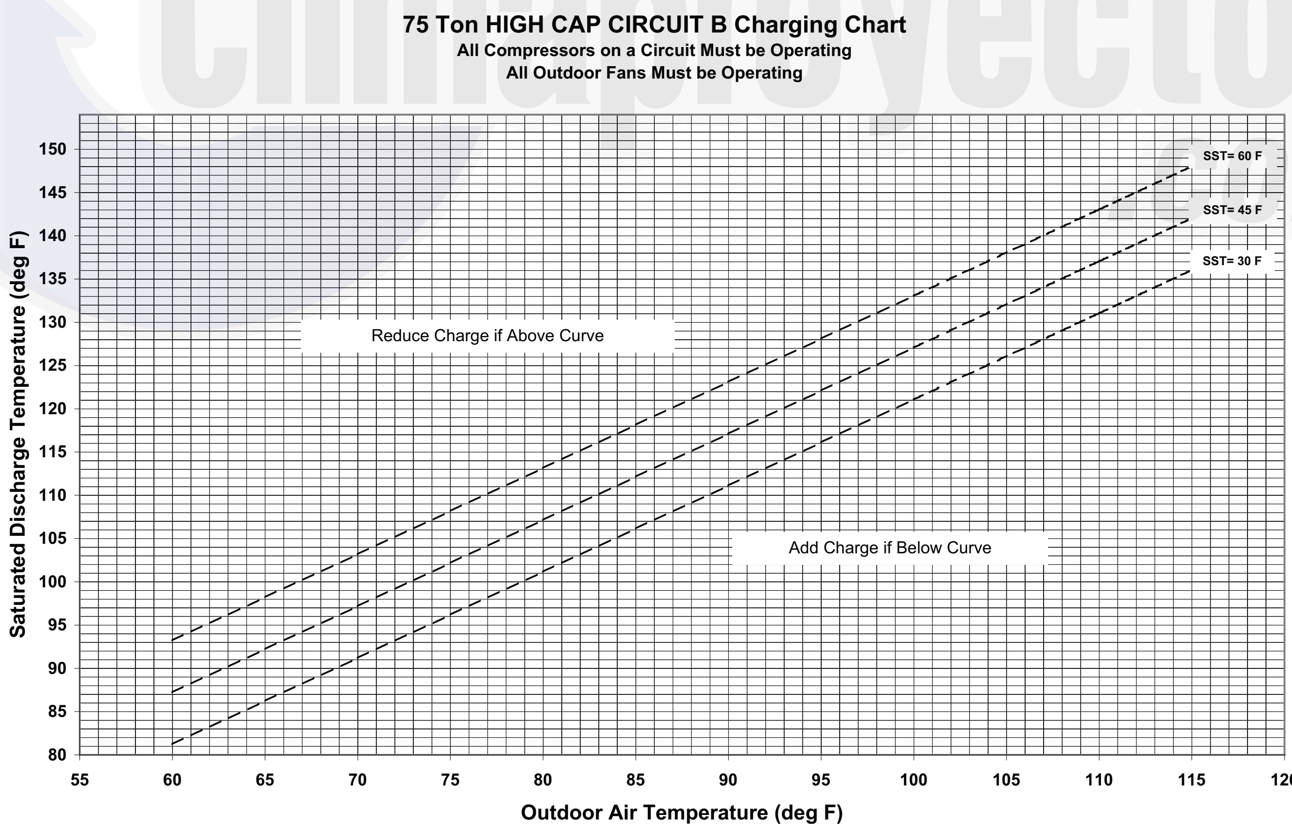


Fig. 84 — Charging Chart — 48/50P075 High-Capacity Units — Circuit B

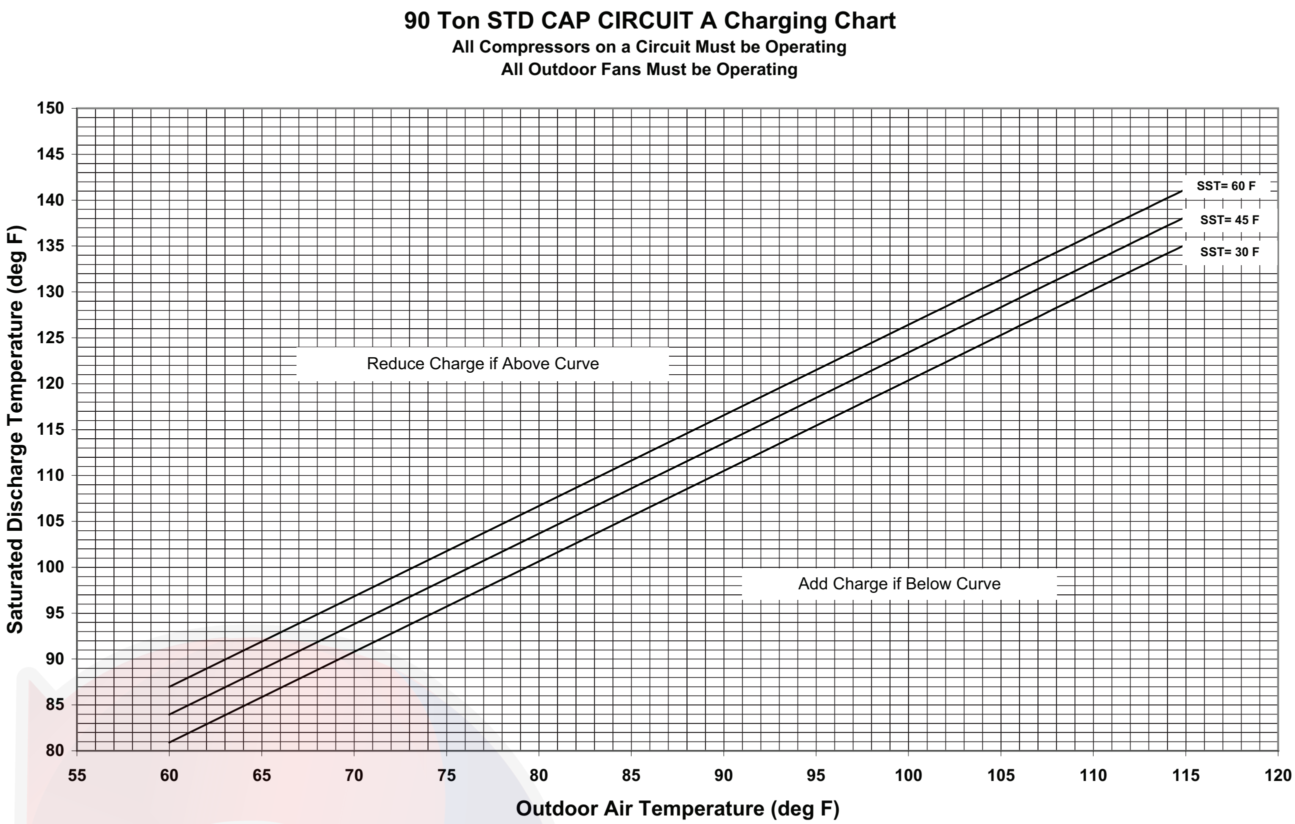


Fig. 85 — Charging Chart — 48/50P090 Standard Units — Circuit A

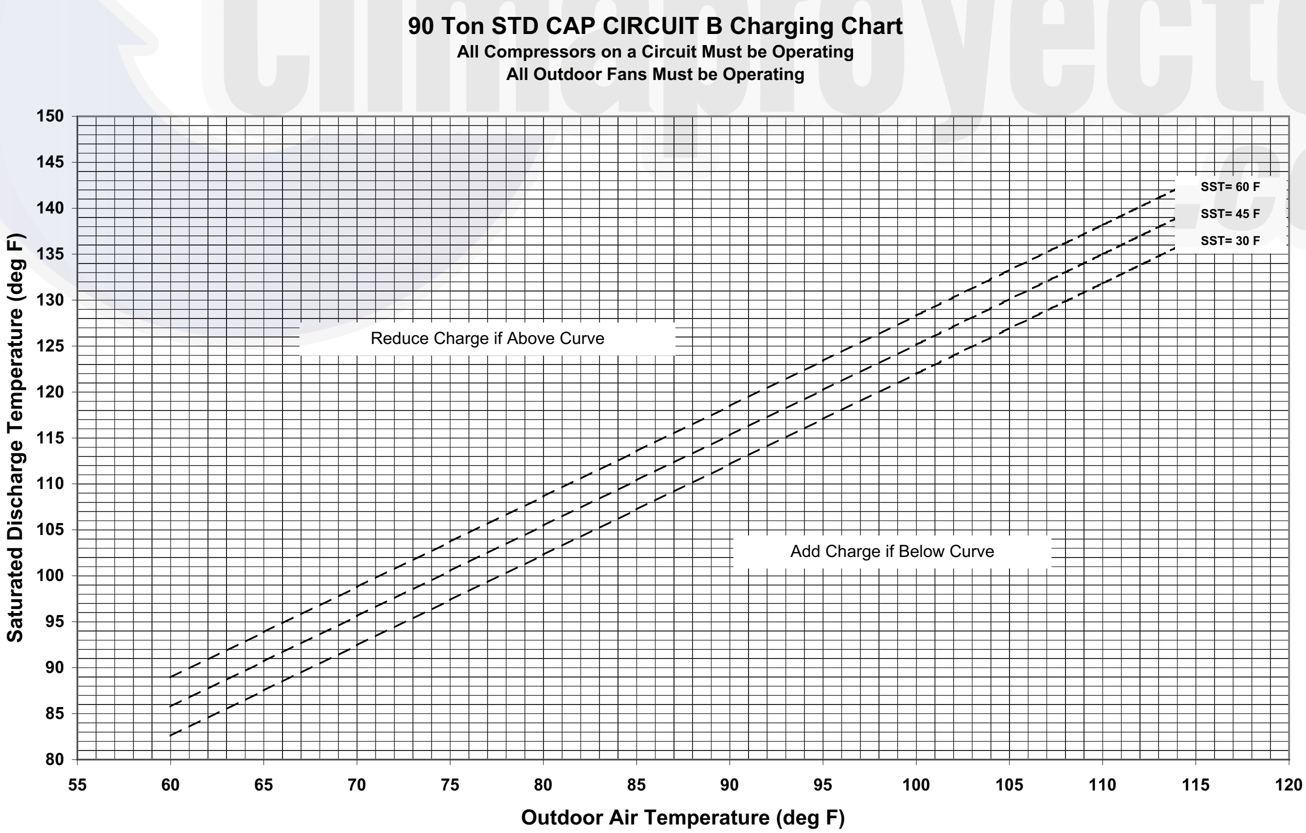


Fig. 86 — Charging Chart — 48/50P090 Standard Units — Circuit B

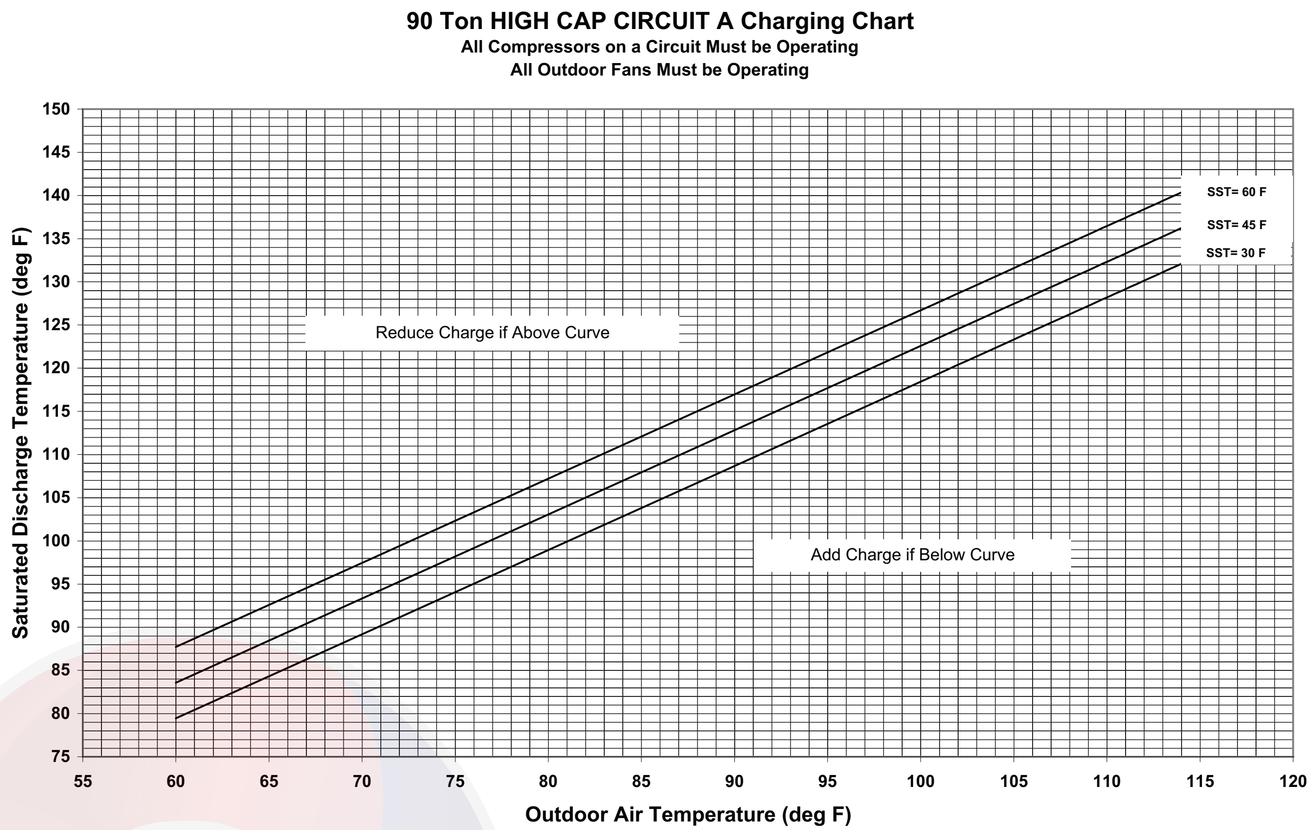


Fig. 87 — Charging Chart — 48/50P090 High-Capacity Units — Circuit A

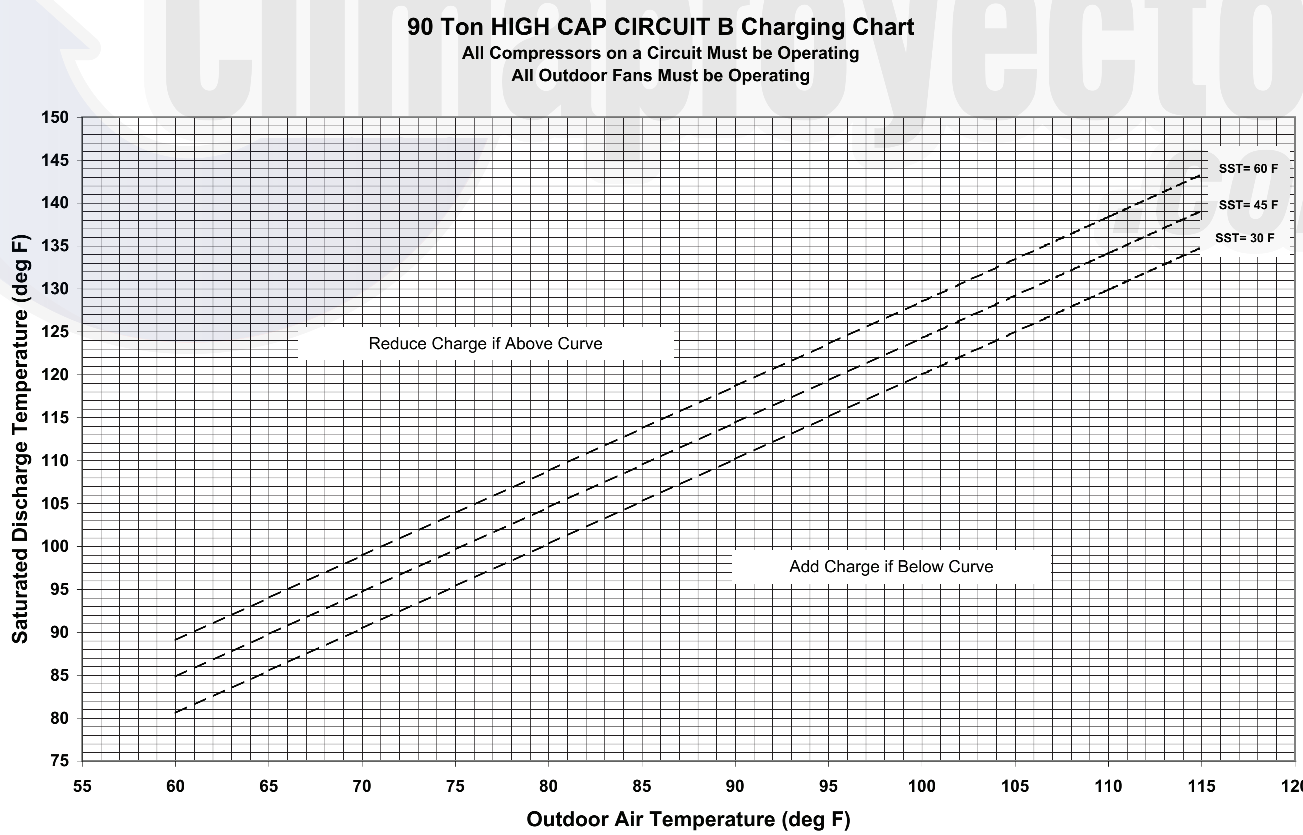


Fig. 88 — Charging Chart — 48/50P090 High-Capacity Units — Circuit B

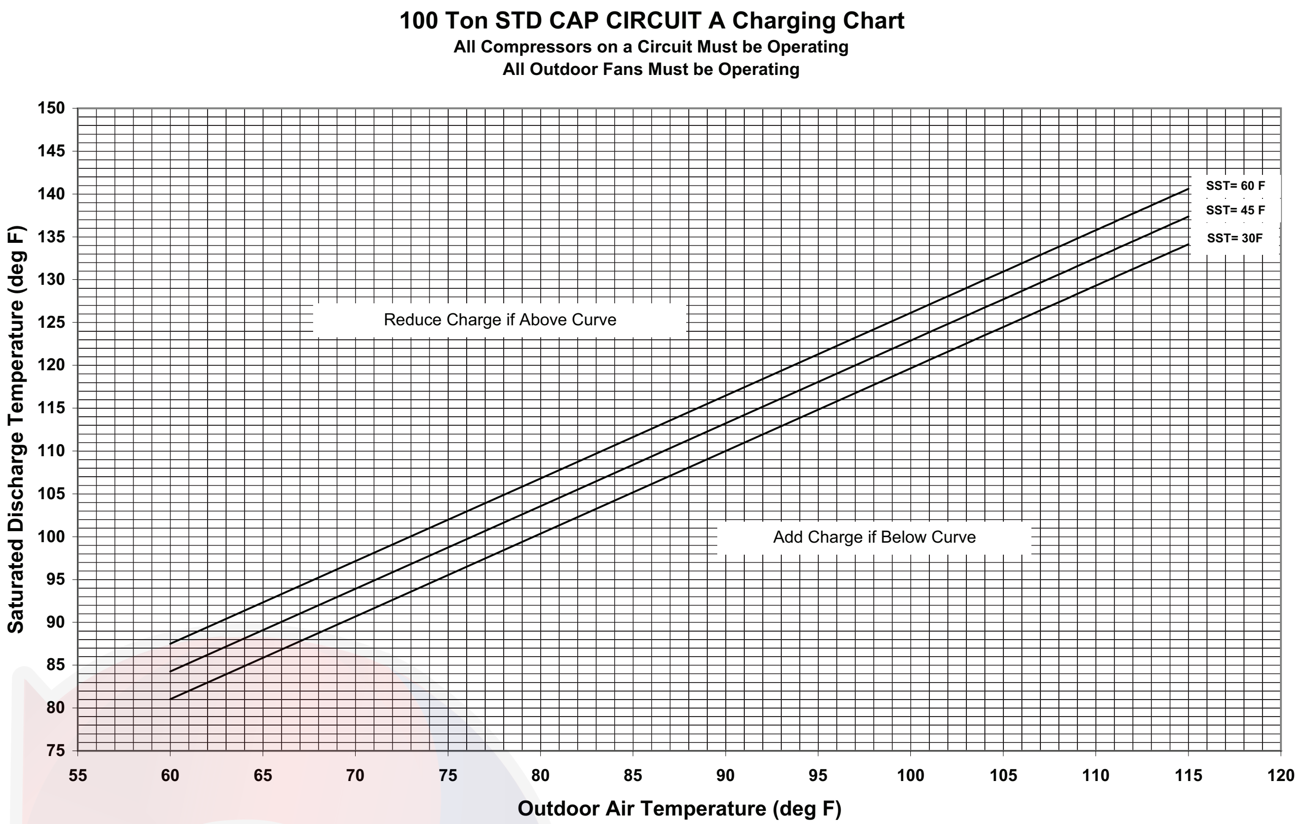


Fig. 89 — Charging Chart — 48/50P100 Standard Units — Circuit A

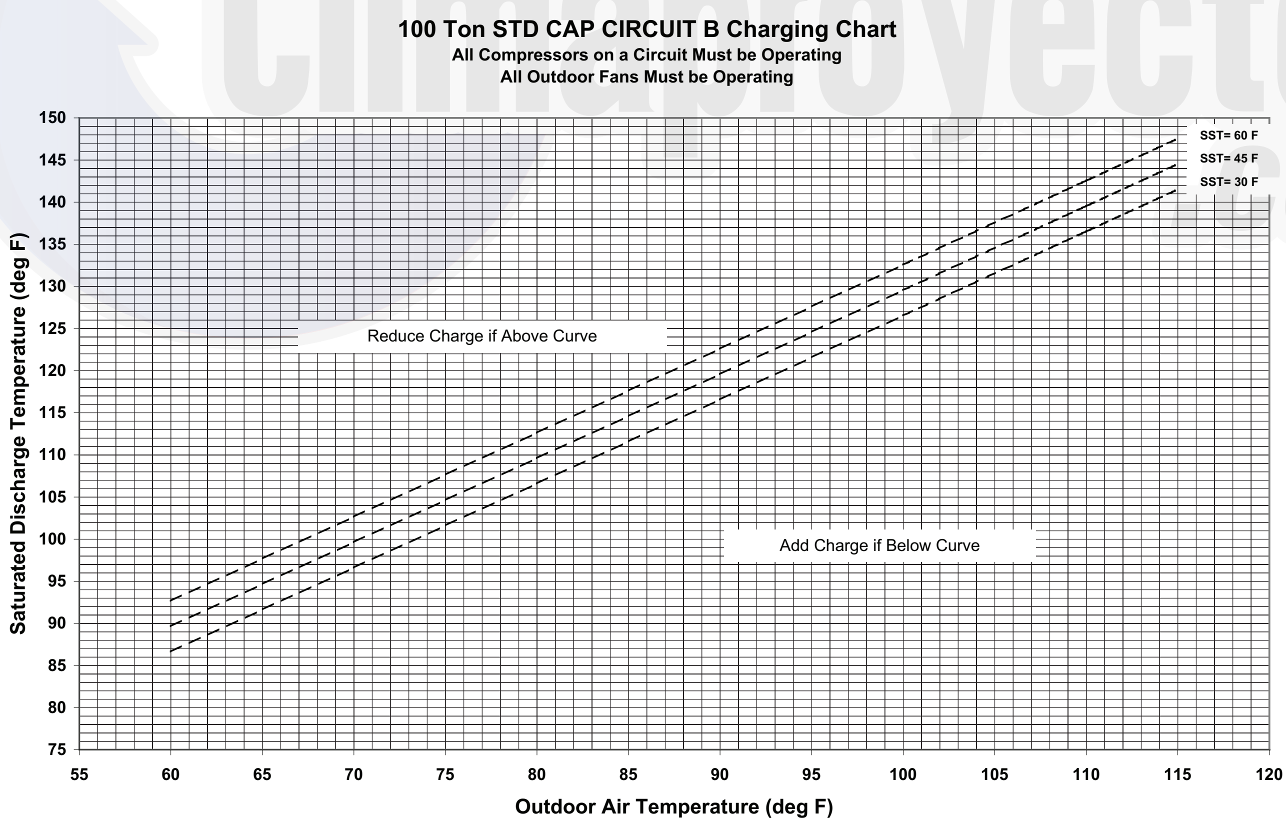


Fig. 90 — Charging Chart — 48/50P100 Standard Units — Circuit B

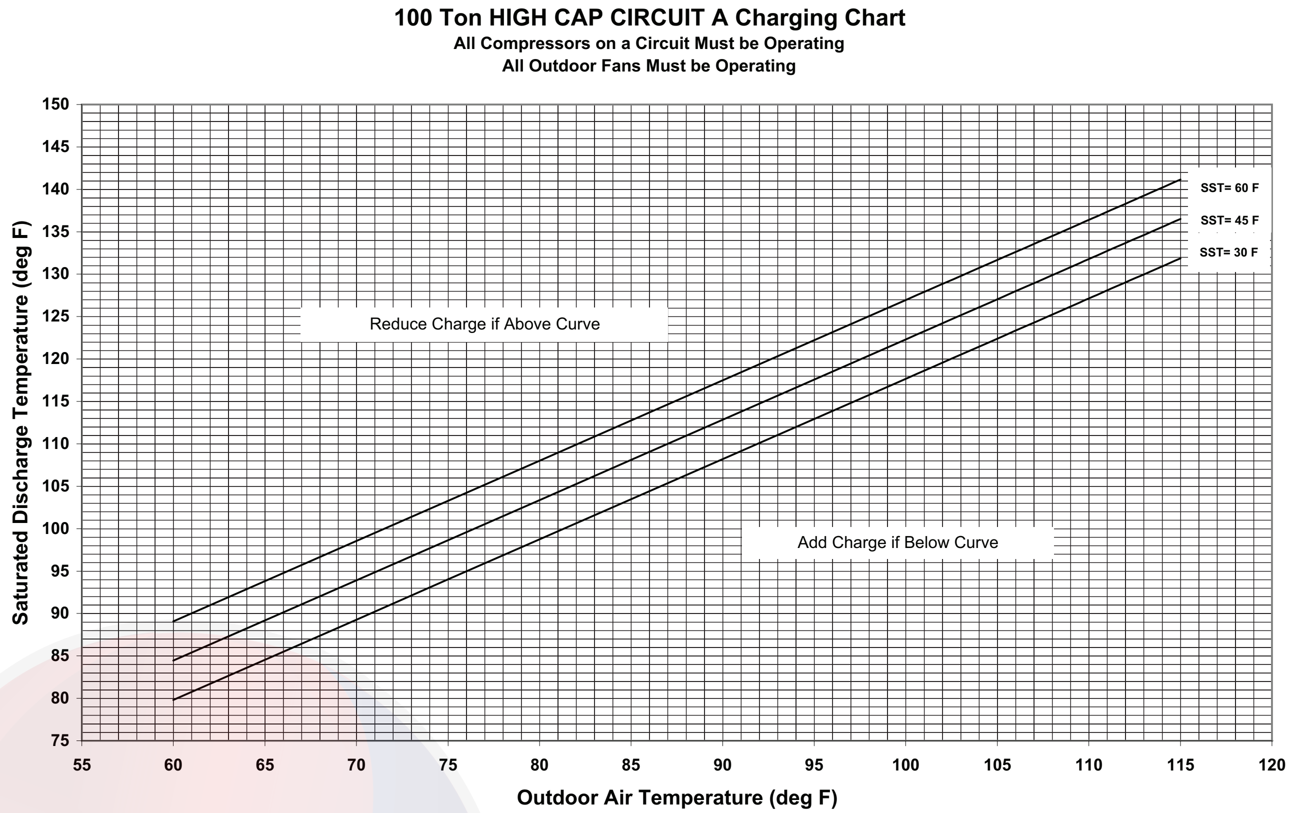


Fig. 91 — Charging Chart — 48/50P100 High-Capacity Units — Circuit A

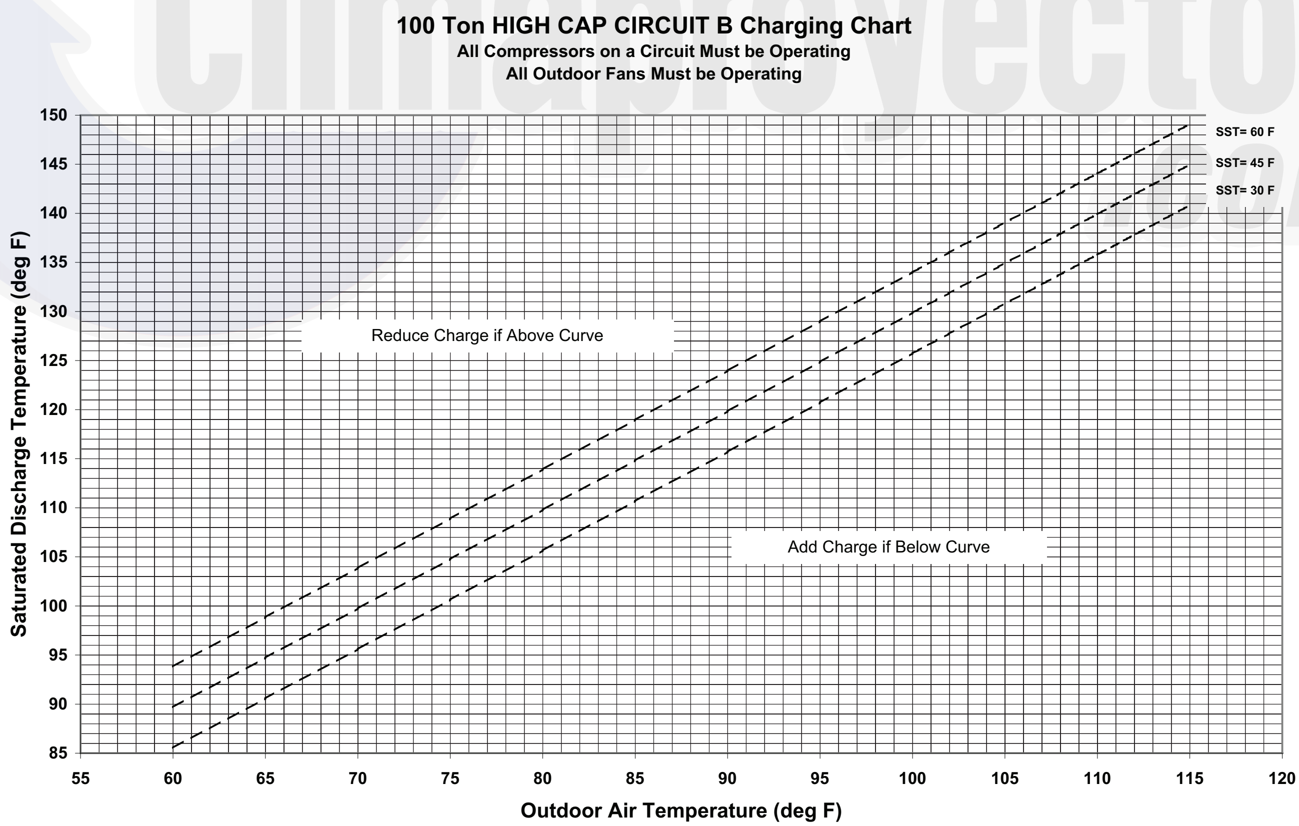


Fig. 92 — Charging Chart — 48/50P100 High-Capacity Units — Circuit B

Gas System Adjustment (48P Only)

TWO-STAGE GAS VALVE ADJUSTMENT — The gas valve opens and closes in response to the unit control.

When power is supplied to valve terminals D1 and C2, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body (3.3 in. wg).

To adjust regulator:

1. Set thermostat at setting for no call for heat.
2. Switch main gas valve to OFF position.
3. Remove $^1/_8$-in. pipe plug from manifold or gas valve pressure tap connection. Install a suitable pressure-measuring device.
4. Switch main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment screw (see Fig. 93).
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, set thermostat setting for no call for heat, turn off main gas valve, remove pressure-measuring device, and replace $^1/_8$-in. pipe plug and screw cap.

MODULATING GAS VALVE ADJUSTMENT — The modulating gas valve is an electrically operated valve controlled by a 0-20 VDC input directly to valve terminals or from an external controller. The modulating gas valve is installed downstream a separate pressure regulator, such as a 2-stage gas valve. See Fig 94.

The modulating gas valve has both sides fitted for low fire adjustment. When 0 VDC is applied at the connect terminals, the bypass provides a minimum outlet pressure of 0.3 in. wg for 2.0 in. wg at the gas regulator upstream the modulating valve (factory setting).

For low fire adjustment (see Fig. 95):

1. Disconnect a wire from modulating valve connect terminals.

   NOTE: Do not allow wire to come into contact with any other part.
2. Remove the left bypass cap.
3. Turn adjustment screw using a small screwdriver to the desire low fire adjustment.

   NOTE: Clockwise screw rotation reduces flow rate. Do not over tighten.

MAIN BURNERS — For all applications, main burners are factory set and should require no adjustment.

MAIN BURNER REMOVAL AND REPLACEMENT

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Remove gas section access door, door frame, and corner post.
4. Disconnect gas piping from gas valve inlet.
5. Remove wires from gas valve.
6. Remove wires from rollout switch.
7. Remove sensor wire and igniter cable form IGC board.
8. Remove 2 screws securing manifold bracket to basepan.
9. Remove 2 screws that hold the burner support plate flange to the vestibule plate.
10. Lift burner assembly out of unit.
11. Replace burner assembly. Reinstall by reversing Steps 1 to 10.

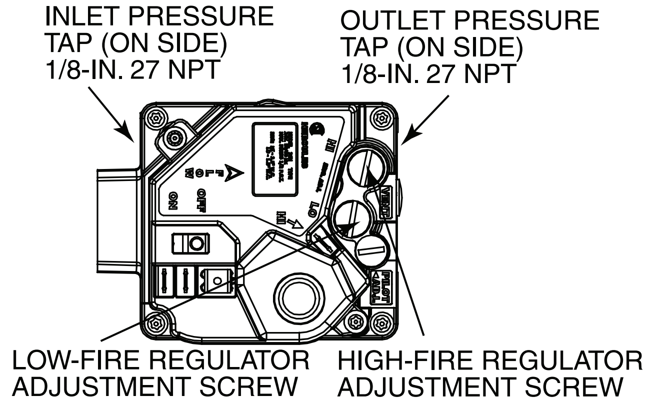


Fig. 93 — Two-Stage Gas Valve

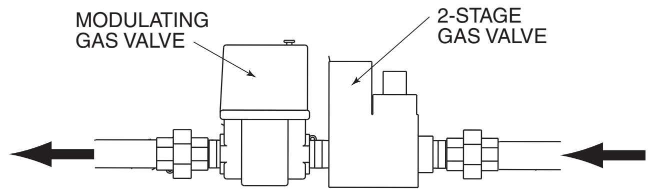


Fig. 94 — Modulating Gas Valve Location

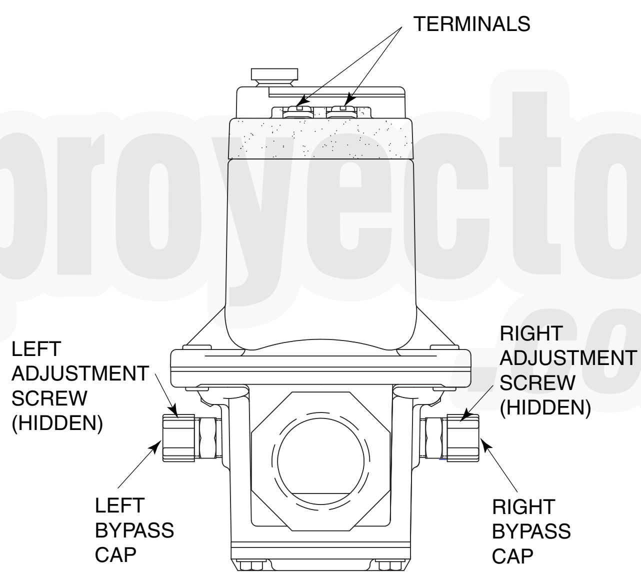


Fig. 95 — Modulating Gas Valve Bypass Adjustment

Moisture/Liquid Indicator — A clear flow of liquid refrigerant indicates sufficient charge in the system. Bubbles indicate undercharged system or the presence of noncondensables. Moisture in the system measured in parts per million (ppm) changes the color of the indicator:

Green — moisture below 45 ppm (dry)
Chartreuse — 45 to 130 ppm (caution!)
Yellow — moisture above 130 ppm (wet)

Change filter driers at the first sign of moisture in the system. See Carrier Charging Handbook for more information.

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.

Filter Drier — Replace whenever the moisture/liquid indicator shows moisture in the system.

Liquid Line Service Valves — Use caution when closing liquid line service valves. The expansion of a trapped liquid can create dangerously high pressures. Remove refrigerant immediately from trapped sections or attach a hose from the high side to the low side of the system to provide relief. If equipped with a liquid line solenoid valve in the evaporator section, it will be closed during the off-cycle. This creates the potential for a liquid trap between the solenoid valve and a closed service valve. Remove refrigerant immediately from the section or attach a hose for relief.

Protective Devices

COMPRESSOR PROTECTION

Overcurrent — Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. 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.

Overtemperature — Each compressor has a protector to protect it against excessively high discharge gas temperatures.

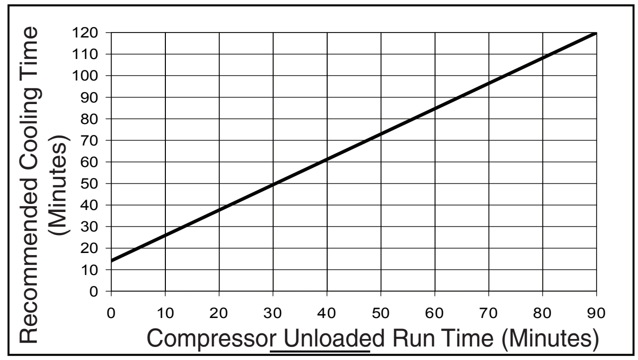
Additionally, some units contain Copeland compressors equipped with advanced scroll temperature protection (ASTP). A label located above the terminal box identifies Copeland Scroll compressor models that contain this technology. See Fig. 96. Advanced scroll temperature protection is a form of internal discharge temperature protection that unloads the scroll compressor when the internal temperature reaches approximately 300°F. At this temperature, an internal bi-metal disk valve opens and causes the scroll elements to separate, which stops compression. Suction and discharge pressures balance while the motor continues to run. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. See Fig. 97.

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.

Fig. 96 — Advanced Scroll Temperature Protection Label

Crankcase Heater — Each compressor has a crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since 115-v power for the crankcase heaters is drawn from the unit control circuit, main unit power must be on for the heaters to be energized.

> IMPORTANT: After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressor.



*Times are approximate.

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

Fig. 97 — Recommended Minimum Cool-Down Time After Compressor is Stopped*

EVAPORATOR-FAN MOTOR PROTECTION — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

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 on a common circuit. As with the circuit breakers, do not bypass connections or increase breaker size to correct trouble. Determine the cause and correct it before resetting the breaker.

HIGH-PRESSURE SWITCHES — Settings for these switches are shown in Tables 117 and 118. If either switch trips, that refrigerant circuit will be automatically locked out by the controls. To reset, set ***ALARMS→R.CUR*** = YES.

Table 117 — Pressure Switch Settings (psig)

SWITCH	CUTOUT	CUT-IN
High	650 ± 10	500 ± 15

Table 118 — Pressure Switch Settings (kPa)

SWITCH	CUTOUT	CUT-IN
High	4482 ± 69	3447 ± 103

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.

Control Circuit, 115 V — This control circuit is protected against overcurrent by a 10-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Control Circuit, 24 V — This control circuit is protected against overcurrent by two 10-amp and four 3.2-amp circuit breakers. Breakers can be reset. If a breaker trips, determine cause of trouble before resetting.

Gas Heat (48P Only)

LIMIT SWITCHES — The maximum supply-air temperature is controlled by a limit switch located in the gas section. The limit is designed to trip at 100°F above the maximum temperature rise.

When the limit trips, 2 flashes occur on the IGC board. The gas valve is deenergized. After cooling, the system will reset and fires gas again. If four trips occur, the system shuts down into Lockout and 4 flashes occur on the IGC board. The system must then be manually reset by power down and power up of the unit.

LIMIT SWITCH THERMISTOR (Staged Gas Unit Only) — The limit switch thermistor is a factory-installed component. It is located next to the lower limit switch. The limit switch thermistor senses temperature at limit switch location and prevents the limit from tripping while the unit is operating at low airflow.

PRESSURE SWITCH (Modulating Gas Units Only) — This switch senses vacuum to ensure the proper function of combustion induced-draft blower. It is a normally open switch set to close on negative pressure rise. The pressure switch is located next to ignition and modulating gas controllers in the gas section.

ROLLOUT SWITCH — This switch senses any flame or excessive heat in the main burner compartment and deenergizes the gas valve. If this occurs, the gas heating system is locked out (7 flashes on IGC board) until the rollout switch is reset manually. Reset rollout switch manually by powering down and powering up of the unit.

When the rollout switch trips, it usually indicates a flue blockage. Inspect the unit for any obstruction in the flue system, for holes in the flue box, a defective hall effect sensor or pressure switch, a defective inducer motor, or a loose combustion blower.

Compressor Removal — All compressors can be removed from the compressor side of the unit.

IMPORTANT: All compressor mounting hardware and support brackets removed during servicing must be reinstalled prior to start-up.

1. Disconnect power to unit; lockout power to compressor.
2. Close suction and discharge service valves.
3. Relieve refrigerant pressure into a refrigerant recovery system.
4. Disconnect power wires at terminal box and disconnect conduit.
5. Disconnect wires from crankcase heater.
6. Lift compressor off mounting bolts and remove.

Compressor Replacement — Perform the following:

1. Reverse procedure in Compressor Removal section.
2. Leak-check and evacuate system, recover refrigerant.
3. Recharge system per pre-start-up and start-up sequences. Recheck oil levels.
4. Energize crankcase heater for 24 hours prior to restart of system.

APPENDIX A — LOCAL DISPLAY TABLES

MODE — RUN STATUS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
VIEW	AUTO VIEW OF RUN STATUS					
→HVAC	ascii string spelling out the hvac modes			string		101,111
→OCC	Occupied ?	YES/NO		OCCUPIED	forcible	101,111
→MAT	Mixed Air Temperature		dF	MAT		101,111
→EDT	Evaporator Discharge Tmp		dF	EDT		51,111
→LAT	Leaving Air Temperature		dF	LAT		51,111
→EC.C.P	Economizer Control Point		dF	ECONCPNT		77,87,111
→ECN.P	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS		111
→EC2.P	Economzr Act.Curr.Pos.	0-100	%	ECON2POS		111
→CL.C.P	Cooling Control Point		dF	COOLCPNT		48,77,111
→C.CAP	Current Running Capacity			CAPTOTAL		111
→CL.ST	Requested Cool Stage			CL_STAGE		111
→HT.C.P	Heating Control Point		dF	HEATCPNT		60-62,111
→HT.ST	Requested Heat Stage			HT_STAGE		62-64,111
→H.MAX	Maximum Heat Stages			HTMAXSTG		63,64,111
ECON	ECONOMIZER RUN STATUS					
→ECN.P	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS		54,78,111,112
→EC2.P	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS		78,111,112
→ECN.C	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible	78,112
→ACTV	Economizer Active ?	YES/NO		ECACTIVE		54,77,78,112
→DISA	ECON DISABLING CONDITIONS					
→DISA→UNV.1	Econ Act. Unavailable?	YES/NO		ECONUNAV		78,112
→DISA→UNV.2	Econ2 Act. Unavailable?	YES/NO		ECN2UNAV		78,112
→DISA→ENTH	Enth. Switch Read High ?	YES/NO		ENTH		78,112
→DISA→DBC	DBC - OAT Lockout?	YES/NO		DBC_STAT		78,112
→DISA→DEW	DEW - OA Dewpt.Lockout?	YES/NO		DEW_STAT		78,112
→DISA→DDBC	DDBD- OAT > RAT Lockout?	YES/NO		DDBCSTAT		72,78,112
→DISA→OAEC	OAEC- OA Enth Lockout?	YES/NO		OAECSTAT		78,112
→DISA→DEC	DEC - Diff.Enth.Lockout?	YES/NO		DEC_STAT		78,112
→DISA→EDT	EDT Sensor Bad?	YES/NO		EDT_STAT		78,112
→DISA→OAT	OAT Sensor Bad ?	YES/NO		OAT_STAT		78,112
→DISA→FORC	Economizer Forced ?	YES/NO		ECONFORC		78,112
→DISA→SFON	Supply Fan Not On 30s ?	YES/NO		SFONSTAT		78,112
→DISA→CLOF	Cool Mode Not In Effect?	YES/NO		COOL_OFF		78,112
→DISA→OAQL	OAQ Lockout in Effect ?	YES/NO		OAQLOCKD		78,112
→DISA→HELD	Econ Recovery Hold Off?	YES/NO		ECONHELD		78,112
→DISA→DH.DS	Dehumid. Disabled Econ.?	YES/NO		DHDISABL		78,112
→O.AIR	OUTSIDE AIR INFORMATION					78,112
→O.AIR→OAT	Outside Air Temperature		dF	OAT	forcible	78,112
→O.AIR→OA.RH	Outside Air Rel. Humidity		%	OARH	forcible	78,112
→O.AIR→OA.E	Outside Air Enthalpy			OAE		78,112
→O.AIR→OA.D.T	OutsideAir Dewpoint Temp		dF	OADEWTMP		78,112
COOL	COOLING INFORMATION					
→C.CAP	Current Running Capacity		%	CAPTOTAL		50,51,53,111,112
→CUR.S	Current Cool Stage			COOL_STG		50,51,77,111,112
→REQ.S	Requested Cool Stage			CL_STAGE		50,51,111,112
→MAX.S	Maximum Cool Stages			CLMAXSTG		50,51,111,112
→DEM.L	Active Demand Limit		%	DEM_LIM	forcible	50,51,53,111,112
→SUMZ	COOL CAP. STAGE CONTROL					
→SUMZ→SMZ	Capacity Load Factor	-100 → +100		SMZ		50,51,111,112
→SUMZ→ADD.R	Next Stage EDT Decrease		^F	ADDRISE		50,51,111,112
→SUMZ→SUB.R	Next Stage EDT Increase		^F	SUBRISE		50,51,111,112
→SUMZ→R.PCT	Rise Per Percent Capacity			RISE_PCT		50,51,111,112
→SUMZ→Y.MIN	Cap Deadband Subtracting			Y_MINUS		50,51,111,112
→SUMZ→Y.PLU	Cap Deadband Adding			Y_PLUS		50,51,111,112
→SUMZ→Z.MIN	Cap Threshold Subtracting			Z_MINUS		50,51,111,112
→SUMZ→Z.PLU	Cap Threshold Adding			Z_PLUS		51,112
→SUMZ→H.TMP	High Temp Cap Override			HI_TEMP		51,112,113
→SUMZ→L.TMP	Low Temp Cap Override			LOW_TEMP		51,112,113
→SUMZ→PULL	Pull Down Cap Override			PULLDOWN		51,112,113
→SUMZ→SLOW	Slow Change Cap Override			SLO_CHNG		51,112,113
→HMZR	HUMIDIMIZER					
→HMZR→CAPC	HumidiMiZer Capacity			HMZRCAPC		51,112
→HMZR→C.EXV	Condenser EXV Position			COND_EXV		51,112
→HMZR→B.EXV	Bypass EXV Position			BYP_EXV		51,112
→HMZR→RHV	HumidiMiZer 3-way Valve			HUM3WVAL		51,112
→HMZR→C.CPT	Cooling Control Point			COOLCPNT		51,112
→HMZR→EDT	Evaporator Discharge Tmp			EDT		51,112
→HMZR→H.CPT	Heating Control Point			HEATCPNT		51,112
→HMZR→LAT	Leaving Air Temperature			LAT		51,112

MODE — RUN STATUS (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
VFDS	VFD INFORMATION					
→S.VFD	SUPPLY FAN VFD (VFD 1)					
→S.VFD→SPD	VFD1 Actual Speed %			VFD1_SPD		113
→S.VFD→RPM	VFD1 Actual Motor RPM			VFD1RPM		113
→S.VFD→FREQ	VFD1 Actual Motor Freq			VFD1FREQ		113
→S.VFD→AMPS	VFD1 Actual Motor Amps			VFD1AMPS		113
→S.VFD→TORQ	VFD1 Actual Motor Torque			VFD1TORQ		113
→S.VFD→PWR	VFD1 Actual Motor Power			VFD1PWR		113
→S.VFD→VDC	VFD1 DC Bus Voltage			VFD1VDC		113
→S.VFD→V.OUT	VFD1 Output Voltage			VFD1VOUT		113
→S.VFD→TEMP	VFD1 Transistor Temp (C)			VFD1TEMP		113
→S.VFD→RUN.T	VFD1 Cumulative Run Time			VFD1RUNT		113
→S.VFD→KWH	VFD1 Cumulative kWh			VFD1KWH		113
→S.VFD→LFC	VFD1 Last Fault Code			VFD1LFC		113
→E.VFD	EXHAUST FAN VFD (VFD 2)					
→E.VFD→SPD	VFD2 Actual Speed %			VFD2_SPD		113
→E.VFD→RPM	VFD2 Actual Motor RPM			VFD2RPM		113
→E.VFD→FREQ	VFD2 Actual Motor Freq			VFD2FREQ		113
→E.VFD→AMPS	VFD2 Actual Motor Amps			VFD2AMPS		113
→E.VFD→TORQ	VFD2 Actual Motor Torque			VFD2TORQ		113
→E.VFD→PWR	VFD2 Actual Motor Power			VFD2PWR		113
→E.VFD→VDC	VFD2 DC Bus Voltage			VFD2VDC		113
→E.VFD→V.OUT	VFD2 Output Voltage			VFD2VOUT		113
→E.VFD→TEMP	VFD2 Transistor Temp (C)			VFD2TEMP		113
→E.VFD→RUN.T	VFD2 Cumulative Run Time			VFD2RUNT		113
→E.VFD→KWH	VFD2 Cumulative kWh			VFD2KWH		113
→E.VFD→LFC	VFD2 Last Fault Code			VFD2LFC		113
TRIP	MODE TRIP HELPER					
→UN.C.S	Unoccup. Cool Mode Start			UCCLSTRT		50,60,114
→UN.C.E	Unoccup. Cool Mode End			UCCL_END		50,60,114
→OC.C.S	Occupied Cool Mode Start			OCCLSTRT		50,60,114
→OC.C.E	Occupied Cool Mode End			OCCL_END		50,60,114
→TEMP	Ctl.Temp RAT,SPT or Zone			CTRLTEMP		50,60,114
→OC.H.E	Occupied Heat Mode End			OCHT_END		50,60,114
→OC.H.S	Occupied Heat Mode Start			OCHTSTRT		50,60,114
→UN.H.E	Unoccup. Heat Mode End			UCHT_END		50,60,114
→UN.H.S	Unoccup. Heat Mode Start			UCHTSTRT		50,60,114
→HVAC	ascii string spelling out the hvac modes			string		50,60,114
LINK	CCN - LINKAGE					
→MODE	Linkage Active - CCN	ON/OFF		MODELINK		114
→L.Z.T	Linkage Zone Control Tmp		dF	LZT		114
→L.C.SP	Linkage Curr. Cool Setpt		dF	LCSP		114
→L.H.SP	Linkage Curr. Heat Setpt		dF	LHSP		114
HRS	COMPRESSOR RUN HOURS					
→HR.A1	Compressor A1 Run Hours	0-999999	HRS	HOURS_A1	config	114
→HR.A2	Compressor A2 Run Hours	0-999999	HRS	HOURS_A2	config	114
→HR.A3	Compressor A3 Run Hours	0-999999	HRS	HOURS_A3	config	114
→HR.B1	Compressor B1 Run Hours	0-999999	HRS	HOURS_B1	config	114
→HR.B2	Compressor B2Run Hours	0-999999	HRS	HOURS_B2	config	114
→HR.B3	Compressor B3Run Hours	0-999999	HRS	HOURS_B3	config	114
STRT	COMPRESSOR STARTS					
→ST.A1	Compressor A1 Starts	0-999999		CY_A1	config	114
→ST.A2	Compressor A2 Starts	0-999999		CY_A2	config	114
→ST.A3	Compressor A3 Starts	0-999999		CY_A3	config	114
→ST.B1	Compressor B1 Starts	0-999999		CY_B1	config	114
→ST.B2	Compressor B2 Starts	0-999999		CY_B2	config	114
→ST.B3	Compressor B3 Starts	0-999999		CY_B3	config	114
VERS	SOFTWARE VERSION NUMBERS					
→MBB	CESR131461-xx-xx			string		114
→RXB	CESR131465-xx-xx			string		114
→EXB	CESR131465-xx-xx			string		114
→CEM	CESR131174-xx-xx			string		114
→CXB	CESR131173-xx-xx			string		114
→SCB	CESR131226-xx-xx			string		114
→EXV	CESR131172-xx-xx			string		114
→VFD1	VERSION-313D			string		114
→VFD2	VERSION-313D			string		114
→MARQ	CESR131171-xx-xx			string		114
→NAVI	CESR130227-xx-xx			string		114

APPENDIX A — LOCAL DISPLAY TABLES (cont)

MODE — SERVICE TEST

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
TEST	Service Test Mode	ON/OFF		MAN_CTRL		35
STOP	Local Machine Disable	YES/NO		UNITSTOP	config	35
S.STP	Soft Stop Request	YES/NO		SOFTSTOP	forcible	35
FAN.F	Supply Fan Request	YES/NO		SFANFORC	forcible	35
INDP	TEST INDEPENDENT OUTPUTS					
→***HUM.R***	Humidifier Relay	ON/OFF		HUMR_TST		35
→***ALRM***	Remote Alarm / Aux Relay	ON/OFF		ALRM_TST		35
FANS	TEST FANS					
→***F.MOD***	Fan Test Automatic?	YES/NO		FANAUTO		35,36
→***E.POS***	Econo Damper Command Pos		%	ECONFANS		36
→***S.FAN***	Supply Fan Relay	ON/OFF		SFAN_TST		36
→***S.VFD***	Supply Fan VFD Speed	0-100	%	SFVFDTST		36
→***P.E.1***	Power Exhaust Relay 1	ON/OFF		PE1_TST		36
→***E.VFD***	Exhaust Fan VFD Speed	0-100	%	EFVFDTST		36
→***P.E.2***	Power Exhaust Relay 2	ON/OFF		PE2_TST		36
→***BP1.C***	BP 1 Command Position	0-100	%	BLDPTST1		36
→***BP2.C***	BP 2 Command Position	0-100	%	BLDPTST2		36
→***CDF.1***	Condenser Fan Output 1	ON/OFF		CDF1_TST		36
→***CDF.2***	Condenser Fan Output 2	ON/OFF		CDF2_TST		36
→***CDF.3***	Condenser Fan Output 3	ON/OFF		CDF3_TST		36
→***CDF.4***	Condenser Fan Output 4	ON/OFF		CDF4_TST		36
ACT.C	CALIBRATE TEST-ACTUATORS					
→***ECN.C***	Economizer Act.Cmd.Pos.	0-100	%	ECON1TST		35,36
→***EC.CL***	Economizer Calibrate Cmd	YES/NO		ECONOCAL		36
→***ECN.A***	Econ Act. Control Angle	read only		ECONCANG		36
→***EC2.C***	Economzr 2 Act.Cmd.Pos.	0-100	%	ECON2TST		36
→***E2.CL***	Economzr 2 Calibrate Cmd	YES/NO		ECON2CAL		36
→***EC2.A***	Econ2 Act. Control Angle	read only		ECN2CANG		36
→***BP1.C***	BP 1 Command Position	0-100	%	BLDG1TST		36
→***B1.CL***	BP 1 Actuator Cal Cmd	YES/NO		BLDG1CAL		36
→***BP1.A***	BP Act.1 Control Angle	read only		BP1_CANG		36
→***BP1.M***	BP 1 Actuator Max Pos.	0-100	%	BP1SETMX		36
→***BP2.C***	BP 2 Command Position	0-100	%	BLDG2TST		36
→***B2.CL***	BP 2 Actuator Cal Cmd	YES/NO		BLDG2CAL		36
→***BP2.A***	BP Act.2 Control Angle	read only		BP2_CANG		36
→***BP2.M***	BP 2 Actuator Max Pos.	0-100	%	BP2SETMX		36
→***HTC.C***	Ht.Coil Command Position	0-100	%	HTCLACTC		36
→***HT.CL***	Heating Coil Act. Cal.Cmd	YES/NO		HCOILCAL		36
→***HTC.A***	Heat Coil Act.Ctl.Angle	read only		HTCLCANG		36
→***HMD.C***	Humidifier Command Pos.	0-100	%	HUMD_TST		36
→***HM.CL***	Humidifier Act. Cal.Cmd	YES/NO		HUMIDCAL		36
→***HMD.A***	Humidifier Act.Ctrl.Ang.	read only		HUMDCANG		36
HMZR	TEST HUMIDIMIZER					
→***RHV***	HumidiMiZer 3-way Valve	Off/On		RHVH_TST		36,37
→***C.EXV***	Condenser EXV Position	0 to 100	%	CEXVHTST		36,37
→***B.EXV***	Bypass EXV Position	0 to 100	%	BEXVHTST		36,37
→***C.CAL***	Condenser EXV Calibrate	Off/On		CEXV_CAL		36,37
→***B.CAL***	Bypass EXV Calibrate	Off/On		BEXV_CAL		36,37
COOL	TEST COOLING					
→**E.POS**	Econo Damper Command Pos	0-100	%	ECONCOOL		36,37
→**SP.SP**	Static Pressure Setpoint	0-5	" H2O	SPSP_TST		36,37
→**CL.ST**	Requested Cool Stage	0-n		CLST_TST		36,37
→**MLV**	Minimum Load Valve Relay	ON/OFF		MLV_TST		36
→**A1**	Compressor A1 Relay	ON/OFF		CMPA1TST		36
→**A1.CP**	Compressor A1 Capacity	20-100		A1CAPTST		36
→**A1.B1**	Two Circuit Start A1,B1	ON/OFF		CMPABTST		36
→**A2**	Compressor A2 Relay	ON/OFF		CMPA2TST		36
→**A3**	Compressor A3 Relay	ON/OFF		CMPA3TST		36
→**B1**	Compressor B1 Relay	ON/OFF		CMPB1TST		36
→**B2**	Compressor B2 Relay	ON/OFF		CMPB2TST		36
→**B3**	Compressor B3 Relay	ON/OFF		CMPB3TST		36
→***RHV***	HumidiMiZer 3-way Valve	Off/On		RHVH_TST		36-38
→***C.EXV***	Condenser EXV Position	0 to 100	%	CEXVHTST		36-38
→***B.EXV***	Bypass EXV Position	0 to 100	%	BEXVHTST		36-38
HEAT	TEST HEATING					
→***HT.ST***	Requested Heat Stage	0-n		HTST_TST		36,38
→***HT.1***	Heat Relay 1	ON/OFF		HS1_TST		36,38
→***H1.CP***	Modulating Heat Capacity	0-100	%	MGAS_TST		36,38
→***HT.2***	Heat Relay 2	ON/OFF		HS2_TST		36,38
→***HT.3***	Relay 3 W1 Gas Valve 2	ON/OFF		HS3_TST		36,38
→***HT.4***	Relay 4 W2 Gas Valve 2	ON/OFF		HS4_TST		36,38
→***HT.5***	Relay 5 W1 Gas Valve 3	ON/OFF		HS5_TST		36,38
→***HT.6***	Relay 6 W2 Gas Valve 3	ON/OFF		HS6_TST		36,38
→***H.I.R***	Heat Interlock Relay	ON/OFF		HIR_TST		36,38
→***HTC.C***	Ht.Coil Command Position	0-100	%	HTCLHEAT		36,38

APPENDIX A — LOCAL DISPLAY TABLES (cont)

MODE — TEMPERATURES

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
AIR.T	AIR TEMPERATURES				
→CTRL	CONTROL TEMPS				
→CTRL→EDT	Evaporator Discharge Tmp		dF	EDT	
→CTRL→LAT	Leaving Air Temperature		dF	LAT	
→CTRL→MAT	Mixed Air Temperature		dF	MAT	
→CTRL→R.TMP	Controlling Return Temp		dF	RETURN_T	forcible
→CTRL→S.TMP	Controlling Space Temp		dF	SPACE_T	forcible
→SAT	Air Tmp Lvg Supply Fan		dF	SAT	
→OAT	Outside Air Temperature	-40 - 240	dF	OAT	forcible
→RAT	Return Air Temperature		dF	RAT	forcible
→SPT	Space Temperature	-40 - 240	dF	SPT	forcible
→SPTO	Space Temperature Offset		^F	SPTO	forcible
→CCT	Air Temp Lvg Evap Coil		dF	CCT	
→S.G.LS	Staged Heat LAT Sum		dF	LAT_SGAS	
→S.G.L1	Staged Heat LAT 1		dF	LAT1SGAS	
→S.G.L2	Staged Heat LAT 2		dF	LAT2SGAS	
→S.G.L3	Staged Heat LAT 3		dF	LAT3SGAS	
→S.G.LM	Staged Gas Limit Sw.Temp		dF	LIMSWTMP	
REF.T	REFRIGERANT TEMPERATURES				
→SCT.A	Cir A Sat.Condensing Tmp		dF	SCTA	
→SST.A	Cir A Sat.Suction Temp.		dF	SSTA	
→SCT.B	Cir B Sat.Condensing Tmp		dF	SCTB	
→SST.B	Cir B Sat.Suction Temp.		dF	SSTB	
→RGT.A	Suction Gas Temp Circ A		dF	RGTA	
→DT.A1	A1 Discharge Temperature		dF	DTA1	

MODE — PRESSURES

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
AIR.P	AIR PRESSURES				
→SP	Static Pressure		" H2O	SP	
→BP	Building Pressure		" H2O	BP	
REF.P	REFRIGERANT PRESSURES				
→DP.A	Cir A Discharge Pressure		PSIG	DP_A	
→SP.A	Cir A Suction Pressure		PSIG	SP_A	
→DP.B	Cir B Discharge Pressure		PSIG	DP_B	
→SP.B	Cit B Suction Pressure		PSIG	SP_B	

MODE — SETPOINTS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
OHSP	Occupied Heat Setpoint	40-99	dF	OHSP	68
OCSP	Occupied Cool Setpoint	40-99	dF	OCSP	75
UHSP	Unoccupied Heat Setpoint	40-99	dF	UHSP	55
UCSP	Unoccupied Cool Setpoint	40-110	dF	UCSP	90
GAP	Heat-Cool Setpoint Gap	2-10	deltaF	HCSP_GAP	5
V.C.ON	VAV Occ. Cool On Delta	0-25	deltaF	VAVOCON	3.5
V.C.OF	VAV Occ. Cool Off Delta	1-25	deltaF	VAVOCOFF	2
SASP	Supply Air Setpoint	45-75	dF	SASP	55
SA.HI	Supply Air Setpoint Hi	45-75	dF	SASP_HI	55
SA.LO	Supply Air Setpoint Lo	45-75	dF	SASP_LO	60
SA.HT	Heating Supply Air Setpt	80-120	dF	SASPHEAT	85
T.PRG	Tempering Purge SASP	-20-80	dF	TEMPPURG	50
T.CL	Tempering in Cool SASP	5-75	dF	TEMPCOOL	5
T.V.OC	Tempering Vent Occ SASP	-20-80	dF	TEMPVOCC	65
T.V.UN	Tempering Vent Unocc. SASP	-20-80	dF	TEMPVUNC	50

MODE — INPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
GEN.I	GENERAL INPUTS				
→***FLT.S***	Filter Status Input	DRTY/CLN		FLTS	forcible
→***G.FAN***	Fan Request From IGC	ON/OFF		IGCFAN	
→***REMT***	Remote Input State	*		RMTIN	forcible
→***ENTH***	Enth. Switch Read High ?	YES/NO		ENTH	forcible
→***S.FN.S***	Supply Fan Status Switch	ON/OFF		SFS	forcible
→***FRZ.S***	Freeze Status Switch	ALRM/NORM		FRZ	forcible
→***PP.SW***	Plenum Press.Safety Sw.	HIGH/LOW		PPS	forcible
→***DL.S1***	Demand Limit Switch 1	ON/OFF		DMD_SW1	forcible
→***DL.S2***	Demand Limit Switch 2	ON/OFF		DMD_SW2	forcible
→***DH.IN***	Dehumidify Switch Input	ON/OFF		DHDISCIN	forcible
FD.BK	COMPRESSOR FEEDBACK				
→***HPS.A***	Circ A High Press. Switch	HIGH/LOW		CIRCAHPS	
→***HPS.B***	Circ B High Press. Switch	HIGH/LOW		CIRCBHPS	
→***CS.A1***	Compressor A1 Feedback	ON/OFF		CSB_A1	
→***CS.A2***	Compressor A2 Feedback	ON/OFF		CSB_A2	
→***CS.A3***	Compressor A3 Feedback	ON/OFF		CSB_A3	
→***CS.B1***	Compressor B1 Feedback	ON/OFF		CSB_B1	
→***CS.B2***	Compressor B2 Feedback	ON/OFF		CSB_B2	
→***CS.B3***	Compressor B3 Feedback	ON/OFF		CSB_B3	
STAT	THERMOSTAT INPUTS				
→***G***	Thermostat G Input	ON/OFF		G	forcible
→***W1***	Thermostat W1 Input	ON/OFF		W1	forcible
→***W2***	Thermostat W2 Input	ON/OFF		W2	forcible
→***Y1***	Thermostat Y1 Input	ON/OFF		Y1	forcible
→***Y2***	Thermostat Y2 Input	ON/OFF		Y2	forcible
FIRE	FIRE-SMOKE INPUTS				
→***FSD***	Fire Shutdown Input	ALRM/NORM		FSD	forcible
→***PRES***	Pressurization Input	ALRM/NORM		PRES	forcible
→***EVAC***	Evacuation Input	ALRM/NORM		EVAC	forcible
→***PURG***	Smoke Purge Input	ALRM/NORM		PURG	forcible
REL.H	RELATIVE HUMIDITY				
→***OA.RH***	Outside Air Rel. Humidity		%	OARH	forcible
→***OA.EN***	Outdoor Air Enthalpy			OAE	
→***OA.DP***	OutsideAir Dewpoint Temp		dF	OADEWTMP	
→***RA.RH***	Return Air Rel. Humidity		%	RARH	forcible
→***RA.EN***	Return Air Enthalpy			RAE	
→***SP.RH***	Space Relative Humidity		%	SPRH	forcible
→***SP.EN***	Space Enthalpy			SPE	
AIR.Q	AIR QUALITY SENSORS				
→***IAQ.I***	IAQ - Discrete Input	HIGH/LOW		IAQIN	forcible
→***IAQ***	IAQ - PPM Return CO2			IAQ	forcible
→***OAQ***	OAQ - PPM Return CO2			OAQ	forcible
→***DAQ***	Diff.Air Quality in PPM			DAQ	
→***IQ.P.O***	IAQ Min.Pos. Override		%	IAQMINOV	forcible
CFM	CFM SENSORS				
→***O.CFM***	Outside Air CFM		CFM	OACFM	
→***R.CFM***	Return Air CFM		CFM	RACFM	
→***S.CFM***	Supply Air CFM		CFM	SACFM	
→***D.CFM***	Fan Track Control D.CFM		CFM	DELTACFM	
RSET	RESET INPUTS				
→***SA.S.R***	Supply Air Setpnt. Reset		^F	SASPRSET	forcible
→***SP.RS***	Static Pressure Reset			SPRESET	forcible
4-20	4-20 MILLIAMP INPUTS				
→***IAQ.M***	IAQ Milliamps		ma	IAQ_MA	
→***OAQ.M***	OAQ Milliamps		ma	OAQ_MA	
→***SP.R.M***	SP Reset milliamps		ma	SPRST_MA	
→***DML.M***	4-20 ma Demand Signal		ma	DMDLMTMA	forcible
→***EDR.M***	EDT Reset Milliamps		ma	EDTRESMA	
→***ORH.M***	OARH Milliamps		ma	OARH_MA	
→***SRH.M***	SPRH Milliamps		ma	SPRH_MA	
→***RRH.M***	RARH Milliamps		ma	RARH_MA	
→***SAC.M***	SACFM Milliamps		ma	SACFM_MA	
→***SA.M.T***	Supply Air CFM Trim (ma)	-2.0 → 2.0		SAMATRIM	
→***RAC.M***	RACFM Milliamps		ma	RACFM_MA	
→***RA.M.T***	Return Air CFM Trim (ma)	-2.0 → 2.0		RAMATRIM	config
→***OAC.M***	OACFM Milliamps		ma	OACFM_MA	
→***OA.M.T***	Outside Air CFM Trim(ma)	-2.0 → 2.0		OAMATRIM	config
→***BP.M***	BP Milliamps		ma	BP_MA	
→***BP.M.T***	Bldg. Pressure Trim (ma)	-2.0 → 2.0		BPMATRIM	config
→***SP.M***	SP Milliamps		ma	SP_MA	
→***SP.M.T***	Static Press. Trim (ma)	-2.0 → 2.0		SPMATRIM	config

*The display text changes depending on the remote switch configuration (***Configuration***→***UNIT***→***RM.CF***). If ***RM.CF*** is set to 0 (No Remote Switch), then the display text will be “On” or “Off.” If ***RM.CF*** is set to 1 (Occupied/Unoccupied Switch), then the display text will be “Occupied” or “Unoccupied.” If ***RM.CF*** is set to 2 (Start/Stop), then the display text will be “Stop” or “Start.” If ***RM.CF*** is set to 3 (Override Switch), then the display text will be “No Override” or “Override.”

MODE — OUTPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
FANS	FANS				
→***S.FAN***	Supply Fan Relay	ON/OFF		SFAN	
→***S.VFD***	Supply Fan VFD Speed	0-100	%	SFAN_VFD	
→***E.VFD***	Exhaust Fan VFD Speed	0-100	%	EFAN_VFD	
→***P.E.1***	Power Exhaust Relay 1	ON/OFF		PE1	
→***P.E.2***	Power Exhaust Relay 2	ON/OFF		PE2	
→***CDF.1***	Condenser Fan Output 1	ON/OFF		CONDFAN1	
→***CDF.2***	Condenser Fan Output 2	ON/OFF		CONDFAN2	
→***CDF.3***	Condenser Fan Output 3	ON/OFF		CONDFAN3	
→***CDF.4***	Condenser Fan Output 4	ON/OFF		CONDFAN4	
COOL	COOLING				
→***A1***	Compressor A1 Relay	ON/OFF		CMPA1	
→***A2***	Compressor A2 Relay	ON/OFF		CMPA2	
→***A3***	Compressor A3 Relay	ON/OFF		CMPA3	
→***B1***	Compressor B1 Relay	ON/OFF		CMPB1	
→***B2***	Compressor B2Relay	ON/OFF		CMPB2	
→***B3***	Compressor B3 Relay	ON/OFF		CMPB3	
→***A1.CP***	Compressor A1 Capacity	0-100	%	CMPA1CAP	
→***MLV***	Minimum Load Valve Relay	ON/OFF		MLV	
→***RHV***	Humidimizer 3-Way Valve	ON/OFF		HUM3WVAL	
→***C.EXV***	Condenser EXV Position	0-100	%	COND_EXV	
→***B.EXV***	Bypass EXV Position	0-100	%	BYP_EXV	
HEAT	HEATING				
→***HT.1***	Heat Relay 1	ON/OFF		HS1	
→***H1.CP***	Modulating Heat Capacity	0-100	%	HTMG_CAP	
→***HT.2***	Heat Relay 2	ON/OFF		HS2	
→***HT.3***	Relay 3 W1 Gas Valve 2	ON/OFF		HS3	
→***HT.4***	Relay 4 W2 Gas Valve 2	ON/OFF		HS4	
→***HT.5***	Relay 5 W1 Gas Valve 3	ON/OFF		HS5	
→***HT.6***	Relay 6 W2 Gas Valve 3	ON/OFF		HS6	
→***H.I.R***	Heat Interlock Relay	ON/OFF		HIR	forcible
→***HTC.P***	Ht.Coil Act.Current Pos.	0-100	%	HTCLRPOS	
ACTU	ACTUATORS				
→***ECN.P***	Economizer Act.Curr.Pos.	0-100	%	ECONRPOS	
→***EC2.P***	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS	
→***ECN.C***	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
→***BP1.P***	BP 1 Actuator Curr.Pos.	0-100	%	BP1_RPOS	
→***BP1.C***	BP 1 Command Position	0-100	%	BP1_CPOS	
→***BP2.P***	BP 2 Actuator Curr.Pos.	0-100	%	BP2_RPOS	
→***BP2.C***	BP 2 Command Position	0-100	%	BP2_CPOS	
→***HTC.P***	Ht.Coil Act.Current Pos.	0-100	%	HTCLRPOS	
→***HTC.C***	Ht.Coil Command Position	0-100	%	HTCLCPOS	
→***HMD.P***	Humidifier Act.Curr.Pos.	0-100	%	HUMDRPOS	
→***HMD.C***	Humidifier Command Pos.	0-100	%	HUMDCPOS	
GEN.O	GENERAL OUTPUTS				
→***HUM.R***	Humidifier Relay	ON/OFF		HUMIDRLY	
→***ALRM***	Remote Alarm / Aux Relay	ON/OFF		ALRM	forcible

APPENDIX A — LOCAL DISPLAY TABLES (cont)

MODE — CONFIGURATION

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
UNIT	UNIT CONFIGURATION					
→C.TYP	Machine Control Type	1 - 4 (multi-text strings)		CTRLTYPE	4	32,33,40, 43-45,48-50, 54,58, 77,96
→SIZE	Unit Size (30-100)	30 - 100		UNITSIZE	30	43-45,50
→FN.MD	Fan Mode (0=Auto, 1=Cont)	0 - 1 (multi-text strings)		FAN_MODE	1	33,43,44
→RM.CF	Remote Switch Config	0 - 3 (multi-text strings)		RMTINCFG	0	38,43,44
→CEM	CEM Module Installed	Yes/No		CEM_BRD	No	43,44
→TCS.C	Temp.Cmp.Strt.Cool Factr	0 - 60	min	TCSTCOOL	0	43,44,89
→TCS.H	Temp.Cmp.Strt.Heat Factr	0 - 60	min	TCSTHEAT	0	43,44,89
→SFS.S	Fan Fail Shuts Down Unit	Yes/No		SFS_SHUT	No	43,44,70,123
→SFS.M	Fan Stat Monitoring Type	0 - 2 (multi-text strings)		SFS_MON	0	43,44,70,123
→VAV.S	VAV Unocc.Fan Retry Time	0 - 720	min	SAMPMINS	50	44
→50.HZ	50 Hertz Unit ?	Yes/No		UNIT_HZ	No	44,45,50
→MAT.S	MAT Calc Config	0 - 2 (multi-text strings)		MAT_SEL	1	44,52
→MAT.R	Reset MAT Table Entries?	Yes/No		MATRESET	No	44,52
→MAT.D	MAT Outside Air Default	0 -100	%	MATOAPOS	20	44
→ALTI	Altitude……..in feet:	0 - 60000		ALTITUDE	0	44
→DLAY	Startup Delay Time	0 -900	secs	DELAY	0	44
→AUX.R	Auxiliary Relay Config	0 - 3 (multi-text strings)		AUXRELAY	0	44
→SENS	INPUT SENSOR CONFIG					
→SENS→SPT.S	Space Temp Sensor	Enable/Disable		SPTSENS	Disable	32,33,44
→SENS→SP.O.S	Space Temp Offset Sensor	Enable/Disable		SPTOSENS	Disable	44,96
→SENS→SP.O.R	Space Temp Offset Range	1 - 10		SPTO_RNG	5	44,96
→SENS→SRH.S	Space Air RH Sensor	Enable/Disable		SPRHSENS	Disable	43-45,86
→SENS→RRH.S	Return Air RH Sensor	Enable/Disable		RARHSENS	Disable	43-45,76, 86,92,122
→SENS→FLT.S	Filter Stat.Sw.Enabled ?	Enable/Disable		FLTS_ENA	Disable	44,45,70
COOL	COOLING CONFIGURATION					
→A1.EN	Enable Compressor A1	Enable/Disable		CMPA1ENA	Enable	46
→A2.EN	Enable Compressor A2	Enable/Disable		CMPA2ENA	Enable	46
→A3.EN	Enable Compressor A3	Enable/Disable		CMPA3ENA	Enable	46,47
→B1.EN	Enable Compressor B1	Enable/Disable		CMPB1ENA	Enable	46,47
→B2.EN	Enable Compressor B2	Enable/Disable		CMPB2ENA	Enable	46,47
→B3.EN	Enable Compressor B3	Enable/Disable		CMPB3ENA	Enable	46,47
→CS.A1	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	Enable	46
→CS.A2	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	Enable	46
→CS.A3	CSB A3 Feedback Alarm	Enable/Disable		CSB_A3EN	Enable	46,47
→CS.B1	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	Enable	46,47
→CS.B2	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	Enable	46,47
→CS.B3	CSB B3 Feedback Alarm	Enable/Disable		CSB_B3EN	Enable	46,47
→Z.GN	Capacity Threshold Adjst	0.1 - 10.0		Z_GAIN	1	46,47,50,52, 111, 113
→MC.LO	Compressor Lockout Temp	-25 - 55	dF	OATLCOMP	40	46,47,53
→LLAG	Lead/Lag Configuration	0, 1, 2		LEAD_LAG	0	46,47
→M.M.	Motor Master Control ?	Yes/No		MOTRMAST	No	46,47,53
→ SCT.H	Maximum Condenser Temp	100 - 150	dF	SCT_MAX	115	46,47,53
→ SCT.L	Minimum Condenser Temp	40 - 90	dF	SCT_MIN	72	46,47,53
→ DG.A1	A1 is Digital Scroll	Yes/No		DIGCMPA1	No	46,47
→ MC.A1	A1 Min Digital Capacity	10 - 100	%	MINCAPA1	50	46,47
→ DS.AP	Dig Scroll Adjust Delta	0 -100	%	DSADJPCT	100	46,47
→ DS.AD	Dig Scroll Adjust Delay	15 - 60	sec	DSADJDLY	20	46,47
→ DS.RP	Dig Scroll Reduce Delta	0 -100	%	DSREDPCT	6	46,47
→ DS.RD	Dig Scroll Reduce Delay	15 - 60	sec	DSREDDLY	30	46,47
→ DS.RO	Dig Scroll Reduction OAT	70-120	dF	DSREDOAT	95	46,47
→ DS.MO	Dig Scroll Max Only OAT	70-120	dF	DSMAXOAT	105	46,47
→ MLV	Min Load Valve Enable	Enable/Disable		MLV_ENAB	Disable	46,47,96
→ H.SST	Hi SST Alert Delay Time	5 - 30	min	HSSTTIME	10	46-48,120
→ RR.VF	Rev Rotation Verified?	Yes/No		REVR_VER	No	46-48,120
→ CS.HP	Use CSBs for HPS Detect?	Yes/No		CSBHPDET	Yes	46-48
EDT.R	EVAP.DISCHRGE TEMP RESET					
→RS.CF	EDT Reset Configuration	0 - 3 (multi-text strings)		EDRSTCFG	2	32,38,45,46, 116
→RTIO	Reset Ratio	0 - 10		RTIO	3	32,45,46
→LIMT	Reset Limit	0 - 20	deltaF	LIMT	10	32,45,46
→RES.S	EDT 4-20 ma Reset Input	Enable/Disable		EDTRSENS	Disable	32,43,45,46

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
HEAT	HEATING CONFIGURATION					
→*HT.CF*	Heating Control Type	0 - 5		HEATTYPE	0	58-61,66,87
→*HT.SP*	Heating Supply Air Setpt	80 - 120	dF	SASPHEAT	85	58
→*OC.EN*	Occupied Heating Enabled	Yes/No		HTOCCENA	No	58
→*LAT.M*	MBB Sensor Heat Relocate	Yes/No		HTLATMON	No	58,66
→*SG.CF*	STAGED HEAT CONFIGS					
→*SG.CF*→*HT.ST*	Staged Heat Type	0 - 8		HTSTGTYP	0	58,61-65
→*SG.CF*→*CAP.M*	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45	58,61,62
→*SG.CF*→*M.R.DB*	St.Ht DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5	58,61,62
→*SG.CF*→*S.G.DB*	St.Heat Temp. Dead Band	0 - 5	^F	HT_SG_DB	2	58,61,62
→*SG.CF*→*RISE*	Heat Rise dF/sec Clamp	0.05 - 0.2		HTSGRISE	0.06	58,61,62
→*SG.CF*→*LAT.L*	LAT Limit Config	0 - 20	^F	HTLATLIM	10	58,61,62
→*SG.CF*→*LIM.M*	Limit Switch Monitoring?	Yes/No		HTLIMMON	Yes	58,61,62,64, 65
→*SG.CF*→*SW.H.T*	Limit Switch High Temp	80 - 210	dF	HT_LIMHI	170	58,61,62
→*SG.CF*→*SW.L.T*	Limit Switch Low Temp	80 - 210	dF	HT_LIMLO	160	58,61,62
→*SG.CF*→*HT.P*	Heat Control Prop. Gain	0 - 1.5		HT_PGAIN	1	58,61,62
→*SG.CF*→*HT.D*	Heat Control Derv. Gain	0 - 1.5		HT_DGAIN	1	58,61,62
→*SG.CF*→*HT.TM*	Heat PID Rate Config	30 - 300	sec	HTSGPIDR	90	58,61,62
→*HH.CF*	HYDRONIC HEAT CONFIGS					
→*HH.CF*→*HW.P*	Hydronic Ctl.Prop. Gain	0 - 1.5		HW_PGAIN	1	58,60,61
→*HH.CF*→*HW.I*	Hydronic Ctl.Integ. Gain	0 - 1.5		HW_IGAIN	1	58,60,61
→*HH.CF*→*HW.D*	Hydronic Ctl.Derv. Gain	0 - 1.5		HW_DGAIN	1	58,60,61
→*HH.CF*→*HW.TM*	Hydronic PID Rate Config	15 - 300	sec	HOTWPIDR	90	58,60,61
→*HH.CF*→*ACT.C*	HYDR.HEAT ACTUATOR CFGS.					
→*HH.CF*→*ACTC*→*SN.1*	Hydronic Ht.Serial Num.1	0 - 9999		HTCL_SN1	0	58,61
→*HH.CF*→*ACTC*→*SN.2*	Hydronic Ht.Serial Num.2	0 - 6		HTCL_SN2	0	58,61
→*HH.CF*→*ACTC*→*SN.3*	Hydronic Ht.Serial Num.3	0 - 9999		HTCL_SN3	0	58,61
→*HH.CF*→*ACTC*→*SN.4*	Hydronic Ht.Serial Num.4	0 - 254		HTCL_SN4	0	58,61
→*HH.CF*→*ACTC*→*C.A.LM*	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85	58,61
SP	SUPPLY STATIC PRESS.CFG.					
→*SP.CF*	Static Pressure Config	Enable/Disable		STATICFG	Disable	38,67,68,70
→*SP.SV*	Staged Air Volume Control	Enable/Disable		STGAVCFG	Disable	67,68
→*SP.S*	Static Pressure Sensor	Enable/Disable		SPSENS	Disable	67,68
→*SP.LO*	Static Press. Low Range	-10 - 0	in. W.C.	SP_LOW	0	68
→*SP.HI*	Static Press. High Range	0 - 10	in. W.C.	SP_HIGH	5	68
→*SP.SP*	Static Pressure Setpoint	0 - 5	in. W.C.	SPSP	1.5	32,67-69
→*SP.MN*	VFD Minimum Speed	0 - 100	%	STATPMIN	20	38,67,68
→*SP.MX*	VFD Maximum Speed	0 - 100	%	STATPMAX	100	38,67,68
→*SP.FS*	VFD Fire Speed Over.	0 - 100	%	STATPFSO	100	68,82
→*SP.RS*	Stat. Pres. Reset Config	0 - 4 (multi-text strings)		SPRSTCFG	0	38,68-70
→*SP.RT*	SP Reset Ratio	0.00 - 2.00		SPRRATIO	0.20	68
→*SP.LM*	SP Reset Limit	0.00 - 2.00		SPRLIMIT	0.75	68
→*SP.EC*	SP Reset Econo. Position	0 - 100	%	ECONOSPR	5	68
→*S.PID*	STAT.PRESS.PID CONFIGS					
→*S.PID*→*SP.TM*	Stat.Pres.PID Run Rate	5 - 120	sec	SPIDRATE	15	68,69
→*S.PID*→*SP.P*	Static Press. Prop. Gain	0 - 5		STATP_PG	0.5	68,69
→*S.PID*→*SP.I*	Static Pressure Intg. Gain	0 - 2		STATP_IG	0.5	68,69
→*S.PID*→*SP.D*	Static Pressure Derv. Gain	0 - 5		STATP_DG	0.3	68,69

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
ECON	ECONOMIZER CONFIGURATION					
→EC.EN	Economizer Installed?	Yes/No		ECON_ENA	Yes	33,73,75
→EC2.E	Econ.Act.2 Installed?	Yes/No		ECON_TWO	No	33,73,75
→EC.MN	Economizer Min.Position	0 - 100	%	ECONOMIN	5	33,73,75,76
→EC.MX	Economizer Max.Position	0 - 100	%	ECONOMAX	98	33,54,75
→E.TRM	Economzr Trim For SumZ ?	Yes/No		ECONTRIM	Yes	33,52,75
→E.SEL	Econ ChangeOver Select	0 - 3 (multi-text strings)		ECON_SEL	0	33,40,73,75
→DDB.C	Diff Dry Bulb RAT Offset	0 - 3	dF	EC_DDBCO	0	75
→OA.E.C	OA Enthalpy ChgOvr Selct	1 - 5 (multi-text strings)		OAEC_SEL	4	33,74,75
→OA.EN	Outdr.Enth Compare Value	18 - 28		OAEN_CFG	24	33,74,75
→OAT.L	High OAT Lockout Temp	-40 - 120	dF	OAT_LOCK	60	33,75
→O.DEW	OA Dewpoint Temp Limit	50 - 62	dF	OADEWCFG	55	33,75,76
→ORH.S	Outside Air RH Sensor	Enable/Disable		OARHSENS	Disable	33,43,74,75
→CFM.C	OUTDOOR AIR CFM CONTROL					
→CFM.C→OCF.S	Outdoor Air CFM Sensor	Enable/Disable		OCFMSENS	Disable	33,43,70,75,85
→CFM.C→O.C.MX	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000	33,75,76,85
→CFM.C→O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0	33,75,76,85
→CFM.C→O.C.DB	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400	33,75,76,85
→E.CFG	ECON.OPERATION CONFIGS					
→E.CFG→E.P.GN	Economizer Prop.Gain	0.7 - 3.0		EC_PGAIN	1	75
→E.CFG→E.RNG	Economizer Range Adjust	0.5 - 5	^F	EC_RANGE	2.5	75
→E.CFG→E.SPD	Economizer Speed Adjust	0.1 - 10		EC_SPEED	0.75	75
→E.CFG→E.DBD	Economizer Deadband	0.1 - 2	^F	EC_DBAND	0.5	75
→UEFC	UNOCC.ECON.FREE COOLING					
→UEFC→FC.CF	Unoc Econ Free Cool Cfg	0-2 (multi-text strings)		UEFC_CFG	0	75,76
→UEFC→FC.TM	Unoc Econ Free Cool Time	0 - 720	min	UEFCTIME	120	75,76
→UEFC→FC.L.O	Un.Ec.Free Cool OAT Lock	40 - 71	dF	UEFCNTLO	50	75,76
→ACT.C	ECON.ACTUATOR CONFIGS					
→ACTC→SN.1.1	Econ Serial Number 1	0 - 9999		ECON_SN1	0	75
→ACTC→SN.1.2	Econ Serial Number 2	0 - 6		ECON_SN2	0	75
→ACTC→SN.1.3	Econ Serial Number 3	0 - 9999		ECON_SN3	0	75
→ACTC→SN.1.4	Econ Serial Number 4	0 - 254		ECON_SN4	0	75
→ACTC→C.A.L1	Econ Ctrl Angle Lo Limit	0 - 90		ECONCALM	85	75,76
→ACTC→SN.2.1	Econ 2 Serial Number 1	0 - 9999		ECN2_SN1	0	75
→ACTC→SN.2.2	Econ 2 Serial Number 2	0 - 6		ECN2_SN2	0	75
→ACTC→SN.2.3	Econ 2 Serial Number 3	0 - 9999		ECN2_SN3	0	75
→ACTC→SN.2.4	Econ 2 Serial Number 4	0 - 254		ECN2_SN4	0	75
→ACTC→C.A.L2	Ecn2 Ctrl Angle Lo Limit	0 - 90		ECN2CALM	85	74-76
→T.24.C	TITLE 24 CONFIGS					
→T.24.C→LOG.F	Log Title 24 Faults	Yes/No		T24LOGFL	No	72,75
→T.24.C→EC.MD	T24 Econ Move Detect	1 - 10		T24ECMDB	1	72,75
→T.24.C→EC.ST	T24 Econ Move SAT Test	10 - 20		T24ECSTS	10	72,75
→T.24.C→S.CHG	T24 Econ Move SAT Change	0 - 5		T24SATMD	0.2	72,75
→T.24.C→E.SOD	T24 Econ RAT-OAT Diff	5 - 20		T24RATDF	15	72,75
→T.24.C→E.CHD	T24 Heat/Cool End Delay	0 - 60		T24CHDLY	25	72,75
→T.24.C→SAT.T	SAT Settling Time	10 - 900		SAT_SET	240	72,75
→T.24.C→ET.MN	T24 Test Minimum Pos.	0 - 50		T24TSTMN	15	73,75
→T.24.C→ET.MX	T24 Test Maximum Pos.	50 - 100		T24TSTMX	85	73,75
→T.24.C→AC.EC	Economizer Deadband Temp	0 - 10		AC_EC_DB	4	73,75
→T.24.C→E.GAP	Econ Fault Detect Gap	2 - 100		EC_FLGAP	5	73,75
→T.24.C→E.TMR	Econ Fault Detect Timer	10 - 240		EC_FLTMR	20	73,75
→T.24.C→X.CFM	Excess Air CFM	400 - 4000		EX_ARCFM	800	73,75
→T.24.C→X.TMR	Excess Air Detect Timer	30 - 240		EX_ARTMR	150	73,75
→T.24.C→AC.MR	T24 AutoTest SF Run Time	1 - 10		T24ACMRT	2	73,75
→T.24.C→AC.SP	T24 Auto-Test VFD Speed	10 - 50		T24ACSPD	20	73,75
→T.24.C→AC.OP	T24 Auto-Test Econ % Opn	1 - 100		T24ACOPN	50	73,75
→T.24.C→VF.PC	T24 Auto-Test VFD % Chng	1 - 20		T24VFDPC	10	73,75
→T.24.C→EC.DY	T24 Econ Auto-Test Day	0=Never, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday		T24_ECDY	6=Saturday	73,75
→T.24.C→EC.TM	T24 Econ Auto-Test Time	0 - 23		T24_ECTM	2	73,75

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
BP	BUILDING PRESS. CONFIGS					
→BP.CF	Building Press. Config	0 - 5 (multi-text strings)		BLDG_CFG	0	33,34,78-81,94
→BP.S	Building Pressure Sensor	Enable/Disable		BPSENS	Disable	78,79
→BP.R	Bldg. Press. (+/-) Range	0.10 - 0.25	" H2O	BP_RANGE	0.25	78,79
→BP.SP	Building Pressure Setp.	-0.25 - 0.25	" H2O	BPSP	0.05	33,34,78-81
→BP.SO	BP Setpoint Offset	0 - 0.5	" H2O	BPSO	0.05	33,34,78-80
→BP.P1	Power Exhaust On Setp.1	0 - 100	%	PES1	25	33,78-80
→BP.P2	Power Exhaust On Setp.2	0 - 100	%	PES2	75	33,78-80
→B.V.A	VFD/ACTUATOR CONFIG					
→B.V.A→BP.FS	VFD/Act. Fire Speed/Pos.	0 - 100	%	BLDGPFSO	100	33,34,78,79,81
→B.V.A→BP.MN	VFD/Act. Min.Speed/Pos.	0 - 50	%	BLDGPMIN	0	33,34,78-80
→B.V.A→BP.MX	VFD Maximum Speed	50 - 100	%	BLDGPMAX	100	34,78-80
→B.V.A→BP.1M	BP 1 Actuator Max Pos.	85 - 100	%	BP1SETMX	100	33,78-80
→B.V.A→BP.2M	BP 2 Actuator Max Pos.	85 - 100	%	BP2SETMX	100	33,78
→B.V.A→BP.CL	BP Hi Cap VFD Clamp Val.	5 - 25	%	BLDGCLMP	10	34,78
→FAN.T	FAN TRACKING CONFIG					
→FAN.T→FT.CF	Fan Track Learn Enable	Yes/No		DCFM_CFG	No	34,78,79
→FAN.T→FT.TM	Fan Track Learn Rate	5-60	min	DCFMRATE	15	34,79,81
→FAN.T→FT.ST	Fan Track Initial DCFM	-20000 - 20000	CFM	DCFMSTRT	2000	34,78,79,81
→FAN.T→FT.MX	Fan Track Max Clamp	0 - 20000	CFM	DCFM_MAX	4000	34,79,81
→FAN.T→FT.AD	Fan Track Max Correction	0 -20000	CFM	DCFM_ADJ	1000	34,79,81
→FAN.T→FT.OF	Fan Track Internl EEPROM	-20000 - 20000	CFM	DCFM_OFF	0	34,79
→FAN.T→FT.RM	Fan Track Internal RAM	-20000 - 20000	CFM	DCFM_RAM	0	34,79
→FAN.T→FT.RS	Fan Track Reset Internal	Yes/No		DCFMRSET	No	34,79
→FAN.T→SCF.C	Supply Air CFM Config	1 - 2 (multi-text strings)		SCFM_CFG	1	34,79
→B.PID	BLDG.PRESS.PID CONFIGS					
→B.PID→BP.TM	Bldg.Pres.PID Run Rate	5 - 120	sec	BPIDRATE	10	79,80
→B.PID→BP.P	Bldg.Press. Prop. Gain	0 - 5		BLDGP_PG	0.5	79,80
→B.PID→BP.I	Bldg.Press. Integ. Gain	0 - 2		BLDGP_IG	0.5	79,80
→B.PID→BP.D	Bldg.Press. Deriv. Gain	0 - 5		BLDGP_DG	0.3	79,80
→ACT.C	BLDG.PRES. ACTUATOR CFGS					
→ACT.C→BP.1	BLDG.PRES. ACT.1 CONFIGS					
→ACT.C→BP.1→SN.1	BP 1 Serial Number 1	0 - 9999		BP_1_SN1	0	79,81
→ACT.C→BP.1→SN.2	BP 1 Serial Number 2	0 - 6		BP_1_SN2	0	79,81
→ACT.C→BP.1→SN.3	BP 1 Serial Number 3	0 - 9999		BP_1_SN3	0	79,81
→ACT.C→BP.1→SN.4	BP 1 Serial Number 4	0 - 254		BP_1_SN4	0	79,81
→ACT.C→BP.1→C.A.LM	BP1 Cntrl Angle Lo Limit	0-90		BP1_CALM	35	79,81
→ACT.C→BP.2	BLDG.PRES. ACT.2 CONFIGS					
→ACT.C→BP.2→SN.1	BP 2 Serial Number 1	0 - 9999		BP_2_SN1	0	79,81
→ACT.C→BP.2→SN.2	BP 2 Serial Number 2	0 - 6		BP_2_SN2	0	79,81
→ACT.C→BP.2→SN.3	BP 2 Serial Number 3	0 - 9999		BP_2_SN3	0	79,81
→ACT.C→BP.2→SN.4	BP 2 Serial Number 4	0 - 254		BP_2_SN4	0	79,81
→ACT.C→BP.2→C.A.LM	BP2 Cntrl Angle Lo Limit	0-90		BP2_CALM	35	79,81
D.LV.T	COOL/HEAT SETPT. OFFSETS					
→L.H.ON	Dmd Level Lo Heat On	-1 - 2	^F	DMDLHON	1.5	32,49,59,60
→H.H.ON	Dmd Level(+) Hi Heat On	0.5 - 20.0	^F	DMDHHON	0.5	49,59,60
→L.H.OF	Dmd Level(-) Lo Heat Off	0.5 - 2.0	^F	DMDLHOFF	1	32,49,59,60
→L.C.ON	Dmd Level Lo Cool On	-1 - 2	^F	DMDLCON	1.5	48,49,59,60
→H.C.ON	Dmd Level(+) Hi Cool On	0.5 - 20.0	^F	DMDHCON	0.5	49,59
→L.C.OF	Dmd Level(-) Lo Cool Off	0.5 - 2.0	^F	DMDLCOFF	1	49,59
→C.T.LV	Cool Trend Demand Level	0.1 - 5.0	^F	CTRENDLV	0.1	49,59
→H.T.LV	Heat Trend Demand Level	0.1 - 5.0	^F	HTRENDLV	0.1	49,59,60
→C.T.TM	Cool Trend Time	30 - 600	sec	CTRENDTM	120	49,59
→H.T.TM	Heat Trend Time	30 - 600	sec	HTRENDTM	120	49,59,60
DMD.L	DEMAND LIMIT CONFIG.					
→DM.L.S	Demand Limit Select	0 - 3 (multi-text strings)		DMD_CTRL	0	39,43,53,54
→D.L.20	Demand Limit at 20 ma	0 - 100	%	DMT20MA	100	39,53,54
→SH.NM	Loadshed Group Number	0 - 99		SHED_NUM	0	53,54
→SH.DL	Loadshed Demand Delta	0 - 60	%	SHED_DEL	0	53,54
→SH.TM	Maximum Loadshed Time	0 - 120	min	SHED_TIM	60	53,54
→D.L.S1	Demand Limit Sw.1 Setpt.	0 - 100	%	DLSWSP1	80	39,53,54
→D.L.S2	Demand Limit Sw.2 Setpt.	0 - 100	%	DLSWSP2	50	39,53,54

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
IAQ	INDOOR AIR QUALITY CFG.					
→DCV.C	DCV ECONOMIZER SETPOINTS					
→DCV.C→EC.MN	Economizer Min.Position	0 - 100	%	ECONOMIN	5	33,39,40,82-85
→DCV.C→IAQ.M	IAQ Demand Vent Min.Pos.	0 - 100	%	IAQMINP	0	33,39,77,82-85,121
→DCV.C→O.C.MX	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000	33,39,76,84,85
→DCV.C→O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0	33,39,77,84,85
→DCV.C→O.C.DB	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400	33,77,84,85
→AQ.CF	AIR QUALITY CONFIGS					
→AQ.CF→IQ.A.C	IAQ Analog Sensor Config	0 - 4 (multi-text strings)		IAQANCFG	0	39,40,83,84
→AQ.CF→IQ.A.F	IAQ 4-20 ma Fan Config	0 - 2 (multi-text strings)		IAQANFAN	0	39,40,83,84
→AQ.CF→IQ.I.C	IAQ Discrete Input Config	0 - 2 (multi-text strings)		IAQINCFG	0	39,43,83,84
→AQ.CF→IQ.I.F	IAQ Disc.In. Fan Config	0 - 2 (multi-text strings)		IAQINFAN	0	39,83,84
→AQ.CF→OQ.A.C	OAQ 4-20ma Sensor Config	0 - 2 (multi-text strings)		OAQANCFG	0	43,69,84
→AQ.SP	AIR QUALITY SETPOINTS					
→AQ.SP→IQ.O.P	IAQ Econo Override Pos.	0 - 100	%	IAQOVPOS	100	39,40,83,84
→AQ.SP→IQ.O.C	IAQ Override Flow	0 - 31000	CFM	IAQOVCFM	10000	83,84
→AQ.SP→DAQ.L	Diff.Air Quality LoLimit	0 - 1000		DAQ_LOW	100	83,84
→AQ.SP→DAQ.H	Diff. Air Quality HiLimit	100 - 2000		DAQ_HIGH	700	40,83,84
→AQ.SP→D.F.OF	DAQ PPM Fan Off Setpoint	0 - 2000		DAQFNOFF	200	40,83,84
→AQ.SP→D.F.ON	DAQ PPM Fan On Setpoint	0 - 2000		DAQFNON	400	40,83,84
→AQ.SP→IAQ.R	Diff. AQ Responsiveness	-5 - 5		IAQREACT	0	82,84
→AQ.SP→OAQ.L	OAQ Lockout Value	0 - 2000		OAQLOCK	0	82,84
→AQ.SP→OAQ.U	User Determined OAQ	0 - 5000		OAQ_USER	400	40,82,84
→AQ.S.R	AIR QUALITY SENSOR RANGE					
→AQ.S.R→IQ.R.L	IAQ Low Reference	0 - 5000		IAQREFL	0	40,84
→AQ.S.R→IQ.R.H	IAQ High Reference	0 - 5000		IAQREFH	2000	40,84
→AQ.S.R→OQ.R.L	OAQ Low Reference	0 - 5000		OAQREFL	0	84
→AQ.S.R→OQ.R.H	OAQ High Reference	0 - 5000		OAQREFH	2000	84
→IAQ.P	IAQ PRE-OCCUPIED PURGE					
→IAQ.P→IQ.PG	IAQ Purge	Yes/No		IAQPURGE	No	84
→IAQ.P→IQ.P.T	IAQ Purge Duration	5 - 60	min	IAQPTIME	15	84,85
→IAQ.P→IQ.P.L	IAQ Purge LoTemp Min Pos	0 - 100	%	IAQPLTMP	10	84,85
→IAQ.P→IQ.P.H	IAQ Purge HiTemp Min Pos	0 - 100	%	IAQPHTMP	35	84,85
→IAQ.P→IQ.L.O	IAQ Purge OAT Lockout	35 - 70	dF	IAQPNTLO	50	84,85
HUMD	HUMIDITY CONFIGURATION					
→HM.CF	Humidifier Control Cfg.	0 - 4		HUMD_CFG	0	85,86
→HM.SP	Humidifier Setpoint	0 - 100	%	HUSP	40	85,86
→H.PID	HUMIDIFIER PID CONFIGS					
→H.PID→HM.TM	Humidifier PID Run Rate	10 - 120	sec	HUMDRATE	30	85,86
→H.PID→HM.P	Humidifier Prop. Gain	0 - 5		HUMID_PG	1	85,86
→H.PID→HM.I	Humidifier Integral Gain	0 - 5		HUMID_IG	0.3	85,86
→H.PID→HM.D	Humidifier Deriv. Gain	0 - 5		HUMID_DG	0.3	85,86
→ACT.C	HUMIDIFIER ACTUATOR CFGS					
→ACTC→SN.1	Humd Serial Number 1	0 - 9999		HUMD_SN1	0	85,86
→ACTC→SN.2	Humd Serial Number 2	0 - 6		HUMD_SN2	0	85,86
→ACTC→SN.3	Humd Serial Number 3	0 - 9999		HUMD_SN3	0	85,86
→ACTC→SN.4	Humd Serial Number 4	0 - 254		HUMD_SN4	0	85,86
→ACTC→C.A.LM	Humd Ctrl Angle Lo Limit	0-90		HUMDCALM	85	85,86
DEHU	DEHUMIDIFICATION CONFIG.					
→D.SEL	Dehumidification Config	0-3(multi-text strings)		DHSELECT	0	86-88,100
→D.SEN	Dehumidification Sensor	1-3(multi-text strings)		DHSENSOR	1	43,86,87,88,100
→D.EC.D	Econ disable in DH mode?	Yes/No		DHECDISA	Yes	86-88
→D.V.CF	Vent Reheat Setpt Select	0-1(multi-text strings)		DHVHTCFG	0	86-88
→D.V.RA	Vent Reheat RAT offset	0-8	^F	DHVRAOFF	0	86-88,100
→D.V.HT	Vent Reheat Setpoint	55-95	dF	DHVHT_SP	70	86-88,100
→D.C.SP	Dehumidify Cool Setpoint	40-55	dF	DHCOOLSP	45	86-88,100
→D.RH.S	Dehumidify RH Setpoint	10-90	%	DHRELHSP	55	86-88,100
→HZ.RT	Humidimizer Adjust Rate	5-120		HMZRRATE	30	87,88
→HZ.PG	Humidimizer Prop. Gain	0-10		HMZR_PG	0.8	87,88
CCN	CCN CONFIGURATION					
→CCNA	CCN Address	1 - 239		CCNADD	1	90,91
→CCNB	CCN Bus Number	0 - 239		CCNBUS	0	90,91
→BAUD	CCN Baud Rate	1 - 5 (multi-text strings)		CCNBAUDD	3	90,91
→BROD	CCN BROADCST DEFINITIONS					
→BROD→TM.DT	CCN Time/Date Broadcast	ON/OFF		CCNBC	On	90,91
→BROD→OAT.B	CCN OAT Broadcast	ON/OFF		OATBC	Off	90,91
→BROD→ORH.B	CCN OARH Broadcast	ON/OFF		OARHBC	Off	90,91
→BROD→OAQ.B	CCN OAQ Broadcast	ON/OFF		OAQBC	Off	90,91
→BROD→G.S.B	Global Schedule Broadcst	ON/OFF		GSBC	Off	90,91
→BROD→B.ACK	CCN Broadcast Ack'er	ON/OFF		CCNBCACK	Off	90,91
→SC.OV	CCN SCHEDULES-OVERRIDES					
→SC.OV→SCH.N	Schedule Number	0 - 99		SCHEDNUM	1	32-34,90,91
→SC.OV→HOL.T	Accept Global Holidays?	YES/NO		HOLIDAYT	No	90,91
→SC.OV→O.T.L.	Override Time Limit	0 - 4	HRS	OTL	1	90,91
→SC.OV→OV.EX	Timed Override Hours	0 - 4	HRS	OVR_EXT	0	90,91
→SC.OV→SPT.O	SPT Override Enabled ?	YES/NO		SPT_OVER	Yes	91
→SC.OV→T58.O	T58 Override Enabled ?	YES/NO		T58_OVER	Yes	91
→SC.OV→GL.OV	Global Sched. Override ?	YES/NO		GLBLOVER	No	91

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
ALLM	ALERT LIMIT CONFIG.					
→***SP.L.O***	SPT lo alert limit/occ	-10-245	dF	SPLO	60	91,92,122
→***SP.H.O***	SPT hi alert limit/occ	-10-245	dF	SPHO	85	91,92,122
→***SP.L.U***	SPT lo alert limit/unocc	-10-245	dF	SPLU	45	91,92,122
→***SP.H.U***	SPT hi alert limit/unocc	-10-245	dF	SPHU	100	91,92,122
→***SA.L.O***	EDT lo alert limit/occ	-40-245	dF	SALO	40	91,92,122
→***SA.H.O***	EDT hi alert limit/occ	-40-245	dF	SAHO	100	91,92,122
→***SA.L.U***	EDT lo alert limit/unocc	-40-245	dF	SALU	40	91,92,122
→***SA.H.U***	EDT hi alert limit/unocc	-40-245	dF	SAHU	100	91,92,122
→***RA.L.O***	RAT lo alert limit/occ	-40-245	dF	RALO	60	91,92,122
→***RA.H.O***	RAT hi alert limit/occ	-40-245	dF	RAHO	90	91,92,122
→***RA.L.U***	RAT lo alert limit/unocc	-40-245	dF	RALU	40	91,92,122
→***RA.H.U***	RAT hi alert limit/unocc	-40-245	dF	RAHU	100	91,92,122
→***OAT.L***	OAT lo alert limit	-40-245	dF	OATL	-40	91,92,122
→***OAT.H***	OAT hi alert limit	-40-245	dF	OATH	150	91,92,122
→***R.RH.L***	RARH low alert limit	0-100	%	RRHL	0	92,122
→***R.RH.H***	RARH high alert limit	0-100	%	RRHH	100	92,122
→***O.RH.L***	OARH low alert limit	0-100	%	ORHL	0	92
→***O.RH.H***	OARH high alert limit	0-100	%	ORHH	100	92
→***SP.L***	SP low alert limit	0-5	" H2O	SPL	0	92,122
→***SP.H***	SP high alert limit	0-5	" H2O	SPH	2	92,122
→***BP.L***	BP lo alert limit	-0.25-0.25	" H2O	BPL	-0.25	92,122
→***BP.H***	BP high alert limit	-0.25-0.25	" H2O	BPH	0.25	92,122
→***IAQ.H***	IAQ high alert limit	0-5000		IAQH	1200	92,122
TRIM	SENSOR TRIM CONFIG.					
→***SAT.T***	Air Temp Lvg SF Trim	-10 - 10	^F	SAT_TRIM	0	92,93
→***RAT.T***	RAT Trim	-10 - 10	^F	RAT_TRIM	0	92,93
→***OAT.T***	OAT Trim	-10 - 10	^F	OAT_TRIM	0	92,93
→***SPT.T***	SPT Trim	-10 - 10	^F	SPT_TRIM	0	92,93
→***L.SW.T***	Limit Switch Trim	-10 - 10	^F	LSW_TRIM	0	92,93
→***CCT.T***	Air Temp Lvg Evap Trim	-10 - 10	^F	CCT_TRIM	0	92,93
→***DTA.1***	A1 Discharge Temp Trim	-10 - 10	^F	DTA1TRIM	0	93
→***SP.A.T***	Suct.Press.Circ.A Trim	-50 - 50	PSIG	SPA_TRIM	0	93
→***SP.B.T***	Suct.Press.Circ.B Trim	-50 - 50	PSIG	SPB_TRIM	0	93
→***DP.A.T***	Dis.Press.Circ.A Trim	-50 - 50	PSIG	DPA_TRIM	0	93
→***DP.B.T***	Dis.Press.Circ.B Trim	-50 - 50	PSIG	DPB_TRIM	0	93
SW.LG	SWITCH LOGIC: NO / NC					
→***FTS.L***	Filter Status Inpt-Clean	Open/Close		FLTSLOGC	Open	93
→***IGC.L***	IGC Feedback - Off	Open/Close		GASFANLG	Open	93
→***RMI.L***	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG	Open	38,93,96
→***ENT.L***	Enthalpy Input - Low	Open/Close		ENTHLOGC	Close	74,93
→***SFS.L***	Fan Status Sw. - Off	Open/Close		SFSLOGIC	Open	93,94
→***DL1.L***	Dmd.Lmt.Sw.1 - Off	Open/Close		DMD_SW1L	Open	39,93,94
→***DL2.L***	Dmd.Lmt.Sw.2 - Off	Open/Close		DMD_SW2L	Open	39,93,94
→***IAQ.L***	IAQ Disc.Input - Low	Open/Close		IAQINLOG	Open	39,93,94
→***FSD.L***	Fire Shutdown - Off	Open/Close		FSDLOGIC	Open	93,94
→***PRS.L***	Pressurization Sw. - Off	Open/Close		PRESLOGC	Open	93,94
→***EVC.L***	Evacuation Sw. - Off	Open/Close		EVACLOGC	Open	93,94
→***PRG.L***	Smoke Purge Sw. - Off	Open/Close		PURGLOGC	Open	93,94
→***DH.LG***	Dehumidify Sw. - Off	Open/Close		DHDISCLG	Open	93,94
DISP	DISPLAY CONFIGURATION					
→***TEST***	Test Display LEDs	ON/OFF		TEST	Off	94,95
→***METR***	Metric Display	ON/OFF		DISPUNIT	Off	94,95
→***LANG***	Language Selection	0 - 1 (multi-text strings)		LANGUAGE	0	94,95
→***PAS.E***	Password Enable	ENABLE/DISABLE		PASS_EBL	Enable	94,95
→***PASS***	Service Password	0000 - 9999		PASSWORD	1111	94,95
S.VFD	SUPPLY FAN VFD CONFIG					
→***N.VLT***	VFD1 Nominal Motor Volts	0 to 999	Volts	VFD1NVLT	460*	94,95
→***N.AMP***	VFD1 Nominal Motor Amps	0 to 999	Amps	VFD1NAMP	55.0*	94,95
→***N.FRQ***	VFD1 Nominal Motor Freq	10 to 500	Hz	VFD1NFRQ	60	94,95
→***N.RPM***	VFD1 Nominal Motor RPM	50 to 30000	RPM	VFD1NRPM	1750	94,95
→***N.PWR***	VFD1 Nominal Motor HPwr	0 to 500	HP	VFD1NPWR	40*	94,95
→***M.DIR***	VFD1 Motor Direction	0=FWD, 1=REV		VFD1MDIR	0	94,95
→***ACCL***	VFD1 Acceleration Time	0 to 1800	sec	VFD1ACCL	30	94,95
→***DECL***	VFD1 Deceleration Time	0 to 1800	sec	VFD1DECL	30	94,95
→***SW.FQ***	VFD1 Switching Frequency	0=1kHz, 1=4kHz, 2=8kHz, 3=12kHz		VFD1SWFQ	2	94,95
→***TYPE***	VFD1 Type	0=LEN, 1=ANALOG		VFD1TYPE	0	94,95

* Model number dependent.

APPENDIX A — LOCAL DISPLAY TABLES (cont)

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
E.VFD	EXHAUST FAN VFD CONFIG					
→N.VLT	VFD2 Nominal Motor Volts	0 to 999	Volts	VFD2NVLT	460*	94,95
→N.AMP	VFD2 Nominal Motor Amps	0 to 999	Amps	VFD2NAMP	28.7*	94,95
→N.FRQ	VFD2 Nominal Motor Freq	10 to 500	Hz	VFD2NFRQ	60	95
→N.RPM	VFD2 Nominal Motor RPM	50 to 30000	RPM	VFD2NRPM	1750	95
→N.PWR	VFD2 Nominal Motor HPwr	0 to 500	H.P.	VFD2NPWR	20*	95
→M.DIR	VFD2 Motor Direction	0=FWD, 1=REV		VFD2MDIR	0	95
→ACCL	VFD2 Acceleration Time	0 to 1800	sec	VFD2ACCL	30	95
→DECL	VFD2 Deceleration Time	0 to 1800	sec	VFD2DECL	30	95
→SW.FQ	VFD2 Switching Frequency	0=1kHz, 1=4kHz, 2=8kHz, 3=12kHz		VFD2SWFQ	2	95
→TYPE	VFD2 Type	0=LEN, 1=ANALOG		VFD2TYPE	0	95

MODE — TIMECLOCK

ACRONYM	NAME	RANGE	UNITS	CNN POINT	DEFAULTS	PAGE NO.
TIME	TIME OF DAY					
→HH.MM	Hour and Minute	00:00		TIME		97,98
DATE	MONTH,DATE,DAY AND YEAR					
→MNTH	Month of Year	multi-text strings		MOY		97,98
→DOM	Day of Month	0-31		DOM		97,98
→DAY	Day of Week	multi-text strings		DOWDISP		97,98
→YEAR	Year	e.g. 2003		YOCDISP		97,98
SCH.L	LOCAL TIME SCHEDULE					
→PER.1	PERIOD 1					97,98
→PER.1→DAYS	DAY FLAGS FOR PERIOD 1				Period 1 only	97,98
→PER.1→DAYS→MON	Monday in Period	YES/NO		PER1MON	Yes	97,98
→PER.1→DAYS→TUE	Tuesday in Period	YES/NO		PER1TUE	Yes	97,98
→PER.1→DAYS→WED	Wednesday in Period	YES/NO		PER1WED	Yes	97,98
→PER.1→DAYS→THU	Thursday in Period	YES/NO		PER1THU	Yes	97,98
→PER.1→DAYS→FRI	Friday in Period	YES/NO		PER1FRI	Yes	97,98
→PER.1→DAYS→SAT	Saturday in Period	YES/NO		PER1SAT	Yes	97,98
→PER.1→DAYS→SUN	Sunday in Period	YES/NO		PER1SUN	Yes	97,98
→PER.1→DAYS→HOL	Holiday in Period	YES/NO		PER1HOL	Yes	97,98
→PER.1→OCC	Occupied from	00:00		PER1_OCC	00:00	97,98
→PER.1→UNC	Occupied to	00:00		PER1_UNC	24:00	97,98
Repeated for periods 2 to 8						
HOL.L	LOCAL HOLIDAY SCHEDULES					
→HD.01	HOLIDAY SCHEDULE 01					97,98
→HD.01→MON	Holiday Start Month	0-12		HOL_MON1		97,98
→HD.01→DAY	Start Day	0-31		HOL_DAY1		97,98
→HD.01→LEN	Duration (Days)	0-99		HOL_LEN1		97,98
Repeated for holidays 2 to 30						97,98
DAY.S	DAYLIGHT SAVINGS TIME					
DS.ST	DAYLIGHT SAVINGS START					97,98
DS.ST→ST.MN	Month	1 - 12		STARTM	4	97,98
DS.ST→ST.WK	Week	1 - 5		STARTW	1	97,98
DS.ST→ST.DY	Day	1 - 7		STARTD	7	97,98
DS.ST→MIN.A	Minutes to Add	0 - 90		MINADD	60	97,98
DS.SP	DAYLIGHTS SAVINGS STOP					
DS.SP→SP.MN	Month	1 - 12		STOPM	10	97,98
DS.SP→SP.WK	Week	1 - 5		STOPW	5	98
DS.SP→SP.DY	Day	1 - 7		STOPD	7	98
DS.SP→MIN.S	Minutes to Subtract	0 - 91,92		MINSUB	60	98

MODE — OPERATING MODES

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
SYS.M	ascii string spelling out the system mode			string
HVAC	ascii string spelling out the hvac modes			string
CTRL	ascii string spelling out the "control type"			string
MODE	MODES CONTROLLING UNIT			
→OCC	Currently Occupied	ON/OFF		MODEOCCP
→T.OVR	Timed Override in Effect	ON/OFF		MODETOVR
→DCV	DCV Resetting Min Pos	ON/OFF		MODEADCV
→SA.R	Supply Air Reset	ON/OFF		MODESARS
→DMD.L	Demand Limit in Effect	ON/OFF		MODEDMLT
→T.C.ST	Temp.Compensated Start	ON/OFF		MODETCST
→IAQ.P	IAQ Pre-Occ Purge Active	ON/OFF		MODEIQPG
→LINK	Linkage Active - CCN	ON/OFF		MODELINK
→LOCK	Mech.Cooling Locked Out	ON/OFF		MODELOCK
→H.NUM	HVAC Mode Numerical Form	number		MODEHVAC

MODE — ALARMS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
CURR	CURRENTLY ACTIVE ALARMS				
	this is a dynamic list of active alarms			strings	
R.CUR	Reset All Current Alarms	YES/NO		ALRESET	ram config
HIST	ALARM HISTORY				
	this is a record of the last 20 alarms			strings	

APPENDIX B — CCN TABLES

All P Series units with *Comfort*Link controls have a port for interface with the Carrier Comfort Network® (CCN) system. On TB3 there is a J11 jack which can be used for temporary connection to the CCN network or to computers equipped with CCN software like the Service Tool. Also on TB3 there are screw connections that can be used for more permanent CCN connections.

In the following tables the structure of the tables which are used with the Service Tool as well as the names and data that are included in each table are shown. There are several CCN variables that are not displayed through the scrolling marquee and are used for more extensive diagnostics and system evaluations.

STATUS DISPLAY TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
COOLING					
	HVAC Mode…………..:	ascii text strings			
	Control Mode………..:	ascii text strings			
	Current Running Capacity		%	CAPTOTAL	
	Total Capacity Needed		%	COOLCALC	
	Current Cool Stage			COOL_STG	
	Requested Cool Stage			CL_STAGE	
	Maximum Cool Stage			CLMAXSTG	
	Cooling Control Point		dF	COOLCPNT	
	Evaporator Discharge Tmp		dF	EDT	
	Mixed Air Temperature		dF	MAT	
	Next capacity step down		%	CAPNXTDN	
	Next capacity step up		%	CAPNXTUP	
COOL_A					
	Current Cool Stage			COOL_STG	
	Cir A Discharge Pressure		PSIG	DP_A	
	Cir A Suction Pressure		PSIG	SP_A	
	Cir A Sat.Condensing Tmp		dF	SCTA	
	Cir A Sat.Suction Temp.		dF	SSTA	
	A1 Discharge Temperature		dF	DTA1	
	Suction Gas Temp Circ A		dF	RGTA	
	Compressor A1 Relay			CMPA1	
	Compressor A2 Relay			CMPA2	
	Compressor A3 Relay			CMPA3	
	Compressor A1 Feedback			CSB_A1	
	Compressor A2 Feedback			CSB_A2	
	Compressor A3 Feedback			CSB_A3	
	Circ A High Press.Switch			CIRCAHPS	
COOL_B					
	Current Cool Stage			COOL_STG	
	Cir B Discharge Pressure			DP_B	
	Cir B Suction Pressure		PSIG	SP_B	
	Cir B Sat.Condensing Tmp		PSIG	SCTB	
	Cir B Sat.Suction Temp.		dF	SSTB	
	Compressor B1 Relay			CMPB1	
	Compressor B2 Relay			CMPB2	
	Compressor B3 Relay			CMPB3	
	Compressor B1 Feedback			CSB_B1	
	Compressor B2 Feedback			CSB_B2	
	Compressor B3 Feedback			CSB_B3	
	Circ B High Press.Switch			CIRCBHPS	
ECONDIAG					
	Economizer Active ?	Yes/No		ECACTIVE	
	Conditions which prevent				
	Economizer being active:				
	Econ Act. Unavailable?	Yes/No		ECONUNAV	
	Econ2 Act. Unavailable	Yes/No		ECN2UNAV	
	Enth.Switch Read High ?	Yes/No		ENTH	
	DBC - OAT lockout?	Yes/No		DBC_STAT	
	DEW - OA Dewpt. lockout?	Yes/No		DEW_STAT	
	DDBC- OAT > RAT lockout?	Yes/No		DDBCSTAT	
	OAEC- OA Enth Lockout?	Yes/No		OAECSTAT	
	DEC - Diff.Enth.Lockout?	Yes/No		DEC_STAT	
	EDT Sensor Bad ?	Yes/No		EDT_STAT	
	OAT Sensor Bad ?	Yes/No		OAT_STAT	
	Economizer forced ?	Yes/No		ECONFORC	
	Supply Fan not on 30s ?	Yes/No		SFONSTAT	
	Cool Mode not in effect?	Yes/No		COOL_OFF	
	OAQ lockout in effect ?	Yes/No		OAQLOCKD	
	Econ recovery hold off?	Yes/No		ECONHELD	
	Dehumid. Disabled Econ.?	Yes/No		DHDISABL	

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
ECONOMZR					
	Economizer Act.Curr.Pos.		%	ECONOPOS	
	Economizer 2 Act.Curr.Pos.		%	ECON2POS	
	Economizer Act.Cmd.Pos.		%	ECONOCMD	forcible
	Economizer Active ?			ECACTIVE	
	Economizer Control Point		dF	ECONCPNT	
	Outside Air Temperature		dF	OAT	forcible
	Evaporator Discharge Tmp		dF	EDT	
	Controlling Return Temp		dF	RETURN_T	forcible
	Econo Current Min. Pos.		%	ECMINPOS	
	Econo Current Min. CFM		CFM	ECMINCFM	
	Outside Air CFM		CFM	OACFM	
GENERAL					
	Occupied ?	YES/NO		OCCUPIED	forcible
	Static Pressure		" H2O	SP	
	Building Pressure		" H2O	BP	
	Outside Air CFM		CFM	OACFM	
	Return Air CFM		CFM	RACFM	
	Supply Air CFM		CFM	SACFM	
	Outside Air Rel.Humidity		%	OARH	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Space Relative Humidity		%	SPRH	forcible
	Space Temperature Offset		^F	SPTO	forcible
	Supply Air Setpnt. Reset		^F	SASPRSET	forcible
	Static Pressure Reset			SPRESET	forcible
	IAQ - PPM Return CO2			IAQ	forcible
	OAQ - PPM Return CO2			OAQ	forcible
	IAQ Min.Pos.Override		%	IAQMINOV	forcible
GENERIC	20 points dependent upon the configuration of the “generics” table in the Service-Config section on page 190				
HEATING					
	HVAC Mode…………..:	ascii text strings			
	Control Mode………..:	ascii text strings			
	Heat Control Type……:	ascii text strings			
	Re-Heat Control Type...:	ascii text strings			
	Heating Mode………..:	ascii text strings			
	Requested Heat Stage			HT_STAGE	
	Ht.Coil Act.Current Pos.		%	HTCLRPOS	
	Heating Control Point		dF	HEATCPNT	
	Heat Relay 1			HS1	
	Modulating Heat Capacity		%	HTMG_CAP	
	Heat Relay 2			HS2	
	Relay 3 W1 Gas Valve 2			HS3	
	Relay 4 W2 Gas Valve 2			HS4	
	Relay 5 W1 Gas Valve 3			HS5	
	Relay 6 W2 Gas Valve 3			HS6	
	Heat Interlock Relay			HIR	forcible
HMZR					
	HVAC Mode…………..:	ascii text strings			
	Humidimizer Capacity		%	HMZRCAPC	
	Condenser EXV Position		%	COND_EXV	
	Bypass EXV Position		%	BYP_EXV	
	Humidimzer 3-Way Valve	On/Off		HUM3WVAL	
	Cooling Control Point		dF	COOLCPNT	
	Evaporator Discharge Tmp		dF	EDT	
	Heating Control Point		dF	HEATCPNT	
	Leaving Air Temperature		dF	LAT	
MODEDISP					
	System Mode…………:	ascii text strings			
	HVAC Mode…………..:	ascii text strings			
	Control Mode………..:	ascii text strings			
	Currently Occupied	On/Off		MODEOCCP	
	Timed Override in effect	On/Off		MODETOVR	
	DCV resetting min pos	On/Off		MODEADCV	
	Supply Air Reset	On/Off		MODESARS	
	Demand Limit in Effect	On/Off		MODEDMLT	
	Temp.Compensated Start	On/Off		MODETCST	
	IAQ pre-occ purge active	On/Off		MODEIQPG	
	Linkage Active - DAV	On/Off		MODELINK	
	Mech.Cooling Locked Out	On/Off		MODELOCK	
	HVAC Mode Numerical Form	number		MODEHVAC	

APPENDIX B — CCN TABLES (cont)

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
MODETRIP					
	Unoccup. Cool Mode Start			UCCLSTRT	
	Unoccup. Cool Mode End			UCCL_END	
	Occupied Cool Mode Start			OCCLSTRT	
	Occupied Cool Mode End			OCCL_END	
	Ctl.Temp RAT,SPT or Zone			CTRLTEMP	
	Occupied Heat Mode End			OCHT_END	
	Occupied Heat Mode Start			OCHTSTRT	
	Unoccup. Heat Mode End			UCHT_END	
	Unoccup. Heat Mode Start			UCHTSTRT	
	HVAC Mode…………..:	ascii text strings		string	
TEMPCTRL					
	Evaporator Discharge Tmp		dF	EDT	
	Leaving Air Temperature		dF	LAT	
	Mixed Air Temperature		dF	MAT	
	Controlling Return Temp		dF	RETURN_T	forcible
	Controlling Space Temp		dF	SPACE_T	forcible
TEMPS					
	Air Temp Lvg Supply Fan		dF	SAT	
	Return Air Temperature		dF	RAT	forcible
	Outside Air Temperature		dF	OAT	forcible
	Space Temperature		dF	SPT	forcible
	Space Temperature Offset		^F	SPTO	forcible
	Staged Heat LAT Sum		dF	LAT_SGAS	
	Staged Heat LAT 1		dF	LAT1SGAS	
	Staged Heat LAT 2		dF	LAT2SGAS	
	Staged Heat LAT 3		dF	LAT23SGAS	
	Staged Gas Limit Sw.Temp		dF	LIMSWTMP	
	Air Temp Lvg Evap Coil		dF	CCT	
	Cir A Sat.Condensing Tmp		dF	SCTA	
	Cir B Sat.Condensing Tmp		dF	SCTB	
	Cir A Sat.Suction Temp.		dF	SSTA	
	Cir B Sat.Suction Temp.		dF	SSTB	
TSTAT					
	Control Mode………..:	ascii text strings			
	Thermostat Y1 Input	On/Off		Y1	forcible
	Thermostat Y2 Input	On/Off		Y2	forcible
	Thermostat W1 Input	On/Off		W1	forcible
	Thermostat W2 Input	On/Off		W2	forcible
	Thermostat G Input	On/Off		G	forcible
UINPUTS					
	Filter Status Input	Dirty/Clean		FLTS	forcible
	Fan request from IGC	On/Off		IGCFAN	
	Fire Shutdown Input	Alarm/Normal		FSD	forcible
	Thermostat G Input	On/Off		G	forcible
	Thermostat W2 Input	On/Off		W2	forcible
	Thermostat W1 Input	On/Off		W1	forcible
	Thermostat Y2 Input	On/Off		Y2	forcible
	Thermostat Y1 Input	On/Off		Y1	forcible
	Remote Input State	On/Off		RMTIN	forcible
	Enth. Switch Read High ?	Yes/No		ENTH	forcible
	Supply Fan Status Switch	On/Off		SFS	forcible
	Circ A High Press.Switch	On/Off		CIRCAHPS	
	Circ B High Press.Switch	On/Off		CIRCBHPS	
	Freeze Status Switch	Alarm/Normal		FRZ	forcible
	Plenum Press.Safety Sw.	High/Low		PPS	forcible
	Demand Limit Switch 1	On/Off		DMD_SW1	forcible
	Demand Limit Switch 2	On/Off		DMD_SW2	forcible
	Pressurization Input	Alarm/Normal		PRES	forcible
	Evacuation Input	Alarm/Normal		EVAC	forcible
	Smoke Purge Input	Alarm/Normal		PURG	forcible
	IAQ - Discrete Input	High/Low		IAQIN	forcible
	Dehumidify Switch Input	On/Off		DHDISCIN	forcible

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
UOUTPUTS					
	FANS				
	Supply Fan Relay	On/Off		SFAN	
	Supply Fan Commanded %	0-100	%	SFAN_VFD	
	Supply Fan Request	Yes/No		SFANFORC	forcible
	Exhaust Fan Commanded %	0-100	%	EFAN_VFD	
	Power Exhaust Relay 1	On/Off		PE1	
	Power Exhaust Relay 2	On/Off		PE2	
	Condenser Fan Output 1	On/Off		CONDFAN1	
	Condenser Fan Output 2	On/Off		CONDFAN2	
	Condenser Fan Output 3	On/Off		CONDFAN3	
	Condenser Fan Output 4	On/Off		CONDFAN4	
	COOLING				
	Compressor A1 Relay	On/Off		CMPA1	
	Compressor A2 Relay	On/Off		CMPA2	
	Compressor A3 Relay	On/Off		CMPA3	
	Compressor B1 Relay	On/Off		CMPB1	
	Compressor B2 Relay	On/Off		CMPB2	
	Compressor B3 Relay	On/Off		CMPB3	
	Compressor A1 Capacity		%	CMPA1CAP	
	Minimum Load Valve Relay	On/Off		MLV	
	Humidimizer 3-Way Valve	On/Off		HUM3WVAL	
	Condenser EXV Position		%	COND_EXV	
	Bypass EXV Position		%	BYP_EXV	
	HEATING				
	Heat Relay 1	On/Off		HS1	
	Modulating Heat Capacity	0-100	%	HTMG_CAP	
	Heat Relay 2	On/Off		HS2	
	Relay 3 W1 Gas Valve 2	On/Off		HS3	
	Relay 4 W2 Gas Valve 2	On/Off		HS4	
	Relay 5 W1 Gas Valve 3	On/Off		HS5	
	Relay 6 W2 Gas Valve 3	On/Off		HS6	
	Heat Interlock Relay	On/Off		HIR	forcible
	ACTUATORS				
	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS	
	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
	Economzr 2 Act.Curr.Pos.	0-100	%	ECN2RPOS	
	Econ Command Position	0-100	%	ECN2CPOS	
	Humidifer Act.Curr.Pos.	0-100	%	HUMDRPOS	
	Humidifier Command Pos.	0-100	%	HUMDCPOS	
	Ht.Coil Act.Current Pos.	0-100	%	HTCLRPOS	
	Ht.Coil Command Position	0-100	%	HTCLCPOS	
	BP 1 Actuator Curr.Pos.	0-100	%	BP1_RPOS	
	BP 1 Command Position	0-100	%	BP1_CPOS	
	BP 2 Actuator Curr.Pos.	0-100	%	BP2_RPOS	
	BP 2 Command Position	0-100	%	BP2_CPOS	
	GENERAL OUTPUTS				
	Humidifier Relay	On/Off		HUMIDRLY	
	Remote Alarm / Aux Relay	On/Off		ALRM	forcible

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
VFD_DATA					
	VFD1 Status Word 1			VFD1STAT	
	VFD1 Actual Speed %		%	VFD1_SPD	
	VFD1 Actual Motor RPM			VFD1RPM	
	VFD1 Actual Motor Freq			VFD1FREQ	
	VFD1 Actual Motor Amps		amps	VFD1AMPS	
	VFD1 Actual Motor Torque		%	VFD1TORQ	
	VFD1 Actual Motor Power			VFD1PWR	
	VFD1 DC Bus Voltage		volts	VFD1VDC	
	VFD1 Output Voltage		volts	VFD1VOUT	
	VFD1 Transistor Temp (C)			VFD1TEMP	
	VFD1 Cumulative Run Time		hours	VFD1RUNT	
	VFD1 Cumulative kWh			VFD1KWH	
	VFD1 Last Fault Code			VFD1LFC	
	VFD1 DI1 State	Open/Close		VFD1_DI1	
	VFD1 DI2 State	Open/Close		VFD1_DI2	
	VFD1 DI3 State	Open/Close		VFD1_DI3	
	VFD1 DI4 State	Open/Close		VFD1_DI4	
	VFD1 DI5 State	Open/Close		VFD1_DI5	
	VFD1 DI6 State	Open/Close		VFD1_DI6	
	VFD1 AI1 (% of range)		%	VFD1_AI1	
	VFD1 AI2 (% of range)		%	VFD1_AI2	
	VFD2 Status Word 1			VFD2STAT	
	VFD2 Actual Speed		%	VFD2_SPD	
	VFD2 Actual Motor RPM			VFD2RPM	
	VFD2 Actual Motor Freq			VFD2FREQ	
	VFD2 Actual Motor Amps		amps	VFD2AMPS	
	VFD2 Actual Motor Torque		%	VFD2TORQ	
	VFD2 Actual Motor Power			VFD2PWR	
	VFD2 DC Bus Voltage		volts	VFD2VDC	
	VFD2 Output Voltage		volts	VFD2VOUT	
	VFD2 Transistor Temp (C)			VFD2TEMP	
	VFD2 Cumulative Run Time		hours	VFD2RUNT	
	VFD2 Cumulative kWh			VFD2KWH	
	VFD2 Last Fault Code			VFD2LFC	
	VFD2 DI1 State	Open/Close		VFD2_DI1	
	VFD2 DI2 State	Open/Close		VFD2_DI2	
	VFD2 DI3 State	Open/Close		VFD2_DI3	
	VFD2 DI4 State	Open/Close		VFD2_DI4	
	VFD2 DI5 State	Open/Close		VFD2_DI5	
	VFD2 DI6 State	Open/Close		VFD2_DI6	
	VFD2 AI1 (% of range)		%	VFD2_AI1	
	VFD2 AI2 (% of range)		%	VFD2_AI2	

SET POINT TABLE

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
SET_PNT					
	Occupied Heat Setpoint	40-99	dF	OHSP	68
	Occupied Cool Setpoint	40-99	dF	OCSP	75
	Unoccupied Heat Setpoint	40-99	dF	UHSP	55
	Unoccupied Cool Setpoint	40-110	dF	UCSP	90
	Heat-Cool Setpoint Gap	2-10	deltaF	HCSP_GAP	5
	VAV Occ. Cool On Delta	0-25	deltaF	VAVOCON	3.5
	VAV Occ. Cool Off Delta	1-25	deltaF	VAVOCOFF	2
	Supply Air Setpoint	45-75	dF	SASP	55
	Supply Air Setpoint Hi	45-75	dF	SASP_HI	55
	Supply Air Setpoint Lo	45-75	dF	SASP_LO	60
	Heating Supply Air Setpt	90-145	dF	SASPHEAT	85
	Tempering Purge SASP	-20-80	dF	TEMPPURG	50
	Tempering in Cool SASP	5-75	dF	TEMPCOOL	5
	Tempering in Vent Occ SASP	-20-80	dF	TEMPVOCC	65
	Tempering Vent Unocc. SASP	-20-80	dF	TEMPVUNC	50

CONFIG TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
BRODEFS					
	CCN Time/Date Broadcast	Off/On		CCNBC	Off
	CCN OAT Broadcast	Off/On		OATBC	Off
	CCN OARH Broadcast	Off/On		OARHBC	Off
	CCN OAQ Broadcast	Off/On		OAQBC	Off
	Global Schedule Broadcst	Off/On		GSBC	Off
	Daylight Savings Start:				
	Month	1 - 12		STARTM	4
	Week	1 - 5		STARTW	1
	Day	1 - 7		STARTD	7
	Minutes to Add	0 - 90		MINADD	60
	Daylight Savings Stop:				
	Month	1 - 12		STOPM	10
	Week	1 - 5		STOPW	5
	Day	1 - 7		STOPD	7
	Minutes to Subtract	0 - 90		MINSUB	60
SCHEDOVR					
	Schedule Number	0-99		SCHEDNUM	0
	Accept Global Holidays?	Yes/No		HOLIDAYT	No
	Override Time Limit	0-4	hours	OTL	1
	Timed Override Hours	0-4	hours	OVR_EXT	0
	Accepting an Override:				
	SPT Override Enabled ?	Yes/No		SPT_OVER	Yes
	T58 Override Enabled ?	Yes/No		T58_OVER	Yes
	Allowed to Broadcast a Global Sched. Override ?	Yes/No		GLBLOVER	No

SERVICE-CONFIG TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
ACTUATOR					
	Econ Serial Number 1	0 - 9999		ECON_SN1	0
	Econ Serial Number 2	0 - 6		ECON_SN2	0
	Econ Serial Number 3	0 - 9999		ECON_SN3	0
	Econ Serial Number 4	0 - 254		ECON_SN4	0
	Econ Ctrl Angle Lo Limit			ECONCALM	
	Econ 2 Serial Number 1	0 - 9999		ECN2_SN1	0
	Econ 2 Serial Number 2	0 - 6		ECN2_SN2	0
	Econ 2 Serial Number 3	0 - 9999		ECN2_SN3	0
	Econ 2 Serial Number 4	0 - 254		ECN2_SN4	0
	Econ 2 Ctrl Angle Lo Limit			ECN2CALM	
	Humd Serial Number 1	0 - 9999		HUMD_SN1	0
	Humd Serial Number 2	0 - 6		HUMD_SN2	0
	Humd Serial Number 3	0 - 9999		HUMD_SN3	0
	Humd Serial Number 4	0 - 254		HUMD_SN4	0
	Humd Ctrl Angle Lo Limit			HUMDCALM	
	Hydronic Ht.Serial Number 1	0 - 9999		HTCL_SN1	0
	Hydronic Ht.Serial Number 2	0 - 6		HTCL_SN2	0
	Hydronic Ht.Serial Number 3	0 - 9999		HTCL_SN3	0
	Hydronic Ht.Serial Number 4	0 - 254		HTCL_SN4	0
	Hydr.Ht. Ctrl Angle Lo Limit			HTCLCALM	
	BP 1 Serial Number 1	0 - 9999		BP1_SN1	0
	BP 1 Serial Number 2	0 - 6		BP1_SN2	0
	BP 1 Serial Number 3	0 - 9999		BP1_SN3	0
	BP 1 Serial Number 4	0 - 254		BP1_SN4	0
	BP 1 Ctrl Angle Lo Limit			BP1CALM	
	BP 2 Serial Number 1	0 - 9999		BP2_SN1	0
	BP 2 Serial Number 2	0 - 6		BP2_SN2	0
	BP 2 Serial Number 3	0 - 9999		BP2_SN3	0
	BP 2 Serial Number 4	0 - 254		BP2_SN4	0
	BP 2 Ctrl Angle Lo Limit			BP2CALM	

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
ALLM					
	SPT lo alert limit/occ	-10-245	dF	SPLO	60
	SPT hi alert limit/occ	-10-245	dF	SPHO	85
	SPT lo alert limit/unocc	-10-245	dF	SPLU	45
	SPT hi alert limit/unocc	-10-245	dF	SPHU	100
	EDT lo alert limit/occ	-40-245	dF	SALO	40
	EDT hi alert limit/occ	-40-245	dF	SAHO	100
	EDT lo alert limit/unocc	-40-245	dF	SALU	40
	EDT hi alert limit/unocc	-40-245	dF	SAHU	100
	RAT lo alert limit/occ	-40-245	dF	RALO	60
	RAT hi alert limit/occ	-40-245	dF	RAHO	90
	RAT lo alert limit/unocc	-40-245	dF	RALU	40
	RAT hi alert limit/unocc	-40-245	dF	RAHU	100
	OAT lo alert limit	-40-245	dF	OATL	-40
	OAT hi alert limit	-40-245	dF	OATH	150
	RARH low alert limit	0-100	%	RRHL	0
	RARH high alert limit	0-100	%	RRHH	100
	OARH low alert limit	0-100	%	ORHL	0
	OARH high alert limit	0-100	%	ORHH	100
	SP low alert limit	0-5	" H2O	SPL	0
	SP high alert limit	0-5	" H2O	SPH	2
	BP lo alert limit	-0.25-0.25	" H2O	BPL	-0.25
	BP high alert limit	-0.25-0.25	" H2O	BPH	0.25
	IAQ high alert limit	0-5000		IAQH	1200
BP__					
	Building Press. Config	0-5		BLDG_CFG	0
	Building Pressure Sensor	Enable/Disable		BPSENS	Disable
	Bldg. Press. (+/-) Range	0.10 - 0.25	" H2O	BP_RANGE	0.25
	Building Pressure Setp.	-0.25 - 0.25	" H2O	BPSP	0.05
	BP Setpoint Offset	0 - 0.5	^" H2O	BPSO	0.05
	Power Exhaust On Setp.1	0 - 100	%	PES1	25
	Power Exhaust On Setp.2	0 - 100	%	PES2	75
	VFD/Act. Fire Speed/Pos.	0 - 100	%	BLDGPFSO	100
	VFD/Act. Min. Speed/Pos.	0 - 100	%	BLDGPMIN	10
	VFD Maximum Speed	0 - 100	%	BLDGPMAX	100
	BP 1 Actuator Max Pos.	85 - 100	%	BP1SETMX	100
	BP 2 Actuator Max Pos.	85 - 100	%	BP2SETMX	100
	BP Hi Cap VFD Clamp Val.	5 - 25	%	BLDGCLMP	10
	Fan Track Learn Enable	Yes/No		DCFM_CFG	NO
	Fan Track Learn Rate	5-60	min	DCFMRATE	15
	Fan Track Initial DCFM	-20000 - 20000	CFM	DCFMSTRT	2000
	Fan Track Max Clamp	0 - 20000	CFM	DCFM_MAX	4000
	Fan Track Max Correction	0 -20000	CFM	DCFM_ADJ	1000
	Fan Track Internl EEPROM	-20000 - 20000	CFM	DCFM_OFF	0
	Fan Track Internal RAM	-20000 - 20000	CFM	DCFM_RAM	0
	Fan Track Reset Internal	Yes/No		DCFMRSET	No
	Supply Air CFM Config	1 - 2 (multi-text strings)		SCFM_CFG	1
	Bldg.Pres.PID Run Rate	5 - 120	sec	BPIDRATE	10
	Bldg.Press. Prop. Gain	0 - 5		BLDGP_PG	1
	Bldg.Press. Integ. Gain	0 - 2		BLDGP_IG	1
	Bldg.Press. Deriv. Gain	0 - 5		BLDGP_DG	0.5
	BP 1 Serial Number 1	0 - 9999		BP_1_SN1	0
	BP 1 Serial Number 2	0 - 6		BP_1_SN2	0
	BP 1 Serial Number 3	0 - 9999		BP_1_SN3	0
	BP 1 Serial Number 4	0 - 254		BP_1_SN4	0
	BP1 Cntrl Angle Lo Limit	0-90		BP1_CALM	35
	BP 2 Serial Number 1	0 - 9999		BP_2_SN1	0
	BP 2 Serial Number 2	0 - 6		BP_2_SN2	0
	BP 2 Serial Number 3	0 - 9999		BP_2_SN3	0
	BP 2 Serial Number 4	0 - 254		BP_2_SN4	0
	BP2 Cntrl Angle Lo Limit	0-90		BP2_CALM	35

APPENDIX B — CCN TABLES (cont)

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
COOL					
	Enable Compressor A1	Enable/Disable		CMPA1ENA	Enable
	Enable Compressor A2	Enable/Disable		CMPA2ENA	Enable
	Enable Compressor A3	Enable/Disable		CMPA3ENA	Enable
	Enable Compressor B1	Enable/Disable		CMPB1ENA	Enable
	Enable Compressor B2	Enable/Disable		CMPB2ENA	Enable
	Enable Compressor B3	Enable/Disable		CMPB3ENA	Enable
	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	Enable
	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	Enable
	CSB A3 Feedback Alarm	Enable/Disable		CSB_A3EN	Enable
	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	Enable
	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	Enable
	CSB B3 Feedback Alarm	Enable/Disable		CSB_B3EN	Enable
	Capacity Threshold Adjst	-10 - 10		Z_GAIN	1
	Compressor Lockout Temp	-25 - 55	dF	OATLCOMP	40
	Lead/Lag Configuration			LEAD_LAG	
	Motor Master Control ?	Yes/No		MOTRMAST	No
	Maximum Condenser Temp		dF	SCT_MAX	
	Minimum Condenser Temp		dF	SCT_MIN	
	A1 is a Digital Scroll	Yes/No		DIGCMPA1	
	A1 Min Digital Capacity		%	MINCAPA1	
	Dig Scroll Adjust Delta		%	DSADJPCT	
	Dig Scroll Adjust Delay		sec	DSADJDLY	
	Dig Scroll Reduce Delta		%	DSREDPCT	
	Dig Scroll Reduce Delay		sec	DSREDDLY	
	Dig Scroll Reduction OAT		dF	DSREDOAT	
	Dig Scroll Max Only OAT		dF	DSMAXOAT	
	Min Load Valve Enable	Enable/Disable		MLV_ENAB	
	Hi SST Alert Delay Time	5 - 30	min	HSSTTIME	10
	Rev Rotation Verified ?	Yes/No		REVR_VER	
	Use CSBs for HPS Detect	Yes/No		CSBHPDET	
DEHU					
	Dehumidification Config	0-3		DHSELECT	0
	Dehumidification Sensor	1-3		DHSENSOR	1
	Econ disable in DH mode?	Yes/No		DHECONEN	No
	Vent Reheat Setpt Select	0-1		DHVHTCFG	0
	Vent Reheat RAT offset	0-8	^F	DHVRAOFF	0
	Vent Reheat Setpoint	55-95	dF	DHVHT_SP	70
	Dehumidify Cool Setpoint	40-55	dF	DHCOOLSP	45
	Dehumidify RH Setpoint	10-90	%	DHRELHSP	55
	Humidimizer Adjust Rate		secs	HMZRRATE	
	Humidimizer Prop. Gain			HMZR_PG	
	Bypass EXV Max Open		%	BYP_MAX	
	Condenser EXV Max Open		%	COND_MAX	
	LAT Sample Buffer Length			LAT_SAMP	
	LAT Sample Rate seconds		secs	LAT_RATE	
DISP					
	Metric Display	Off/On		DISPUNIT	Off
	Language Selection	0-1		LANGUAGE	0
	Password Enable	Enable/Disable		PASS_EBL	Enable
	Service Password	0000-9999		PASSWORD	1111
	Contrast Adjustment	0-255		CNTR_ADJ	0
	Brightness Adjustment	0-255		BRTS_ADJ	0
DLVT					
	Dmd Level Lo Heat On	-1 - 2	^F	DMDLHON	1.5
	Dmd Level(+) Hi Heat On	0.5 - 20.0	^F	DMDHHON	0.5
	Dmd Level(-) Lo Heat Off	0.5 - 2.0	^F	DMDLHOFF	1
	Dmd Level Lo Cool On	-1 - 2	^F	DMDLCON	1.5
	Dmd Level(+) Hi Cool On	0.5 - 20.0	^F	DMDHCON	0.5
	Dmd Level(-) Lo Cool Off	0.5 - 2.0	^F	DMDLCOFF	1
	Cool Trend Demand Level	0.1 - 5.0	^F	CTRENDLV	0.1
	Heat Trend Demand Level	0.1 - 5.0	^F	HTRENDLV	0.1
	Cool Trend Time	30 - 600	sec	CTRENDTM	120
	Heat Trend Time	30 - 600	sec	HTRENDTM	120
DMDL					
	Demand Limit Select	0 - 3		DMD_CTRL	0
	Demand Limit at 20 ma	0 - 100	%	DMT20MA	100
	Loadshed Group Number	0 - 99		SHED_NUM	0
	Loadshed Demand Delta	0 - 60	%	SHED_DEL	0
	Maximum Loadshed Time	0 - 120	min	SHED_TIM	60
	Demand Limit Sw.1 Setpt.	0 - 100	%	DLSWSP1	80
	Demand Limit Sw.2 Setpt.	0 - 100	%	DLSWSP2	50

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
ECON					
	Economizer Installed ?	Yes/No		ECON_ENA	Yes
	Econ. Act.2 Installed ?	Yes/No		ECON_TWO	No
	Economizer Min.Position	0 - 100	%	ECONOMIN	5
	Economizer Max.Position	0 - 100	%	ECONOMAX	98
	Economzr trim for sumZ ?	Yes/No		ECONTRIM	Yes
	Econ ChangeOver Select	0 - 3		ECON_SEL	0
	OA Enthalpy ChgOvr Selct	1 - 5		OAEC_SEL	4
	Outdr.Enth Compare Value	18 - 28	BTU/LBM	OAEN_CFG	24
	High OAT Lockout Temp	55 - 120	dF	OAT_LOCK	60
	OA Dewpoint Temp Limit	50 - 62	dF	OADEWCFG	55
	Outside Air RH Sensor	Enable/Disable		OARHSENS	Disable
	Outdoor Air CFM Sensor	Enable/Dsable		OCFMSENS	Dsable
	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000
	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0
	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400
	Economizer Prop.Gain	0.7 - 3.0		EC_PGAIN	1
	Economizer Range Adjust	0.5 - 5	^F	EC_RANGE	2.5
	Economizer Speed Adjust	0.1 - 10		EC_SPEED	0.75
	Economizer Deadband	0.1 - 2	^F	EC_DBAND	0.5
	Unoc Econ Free Cool Cfg	0-2		UEFC_CFG	0
	Unoc Econ Free Cool Time	0-720	min	UEFCTIME	120
	Un.Ec.Free Cool OAT Lock	40-70	dF	UEFCNTLO	50
	Econ Serial Number 1	0-9999		ECON_SN1	
	Econ Serial Number 2	0-6		ECON_SN2	
	Econ Serial Number 3	0-9999		ECON_SN3	
	Econ Serial Number 4	0-254		ECON_SN4	
	Econ Ctrl Angle Lo Limit	0-90		ECONCALM	85
	Econ 2 Serial Number 1	0-9999		ECN2_SN1	
	Econ 2 Serial Number 2	0-6		ECN2_SN2	
	Econ 2 Serial Number 3	0-9999		ECN2_SN3	
	Econ 2 Serial Number 4	0-254		ECN2_SN4	
	Ecn2 Ctrl Angle Lo Limit	0-90		ECN2CALM	85
EDTR					
	EDT Reset Configuration	0 - 3		EDRSTCFG	2
	Reset Ratio	0 - 10		RTIO	3
	Reset Limit	0 - 20	^F	LIMT	10
	EDT 4-20 ma Reset Input	Enable/Disable		EDTRSENS	Disable
HEAT					
	Heating Control Type	0 - 5		HEATTYPE	0
	Heating Supply Air Setpt	80-120	dF	SASPHEAT	85
	Occupied Heating Enabled	Yes/No		HTOCCENA	No
	MBB Sensor Heat Relocate	Yes/No		HTLATMON	No
	Staged Heat Type	0 - 8		HTSTGTYP	0
	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45
	St.Ht DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5
	St.Heat Temp. Dead Band	0 - 5	^F	HT_SG_DB	2
	Heat Rise dF/sec Clamp	0.05 - 0.2		HTSGRISE	0.06
	LAT Limit Config	0 - 20	^F	HTLATLIM	10
	Limit Switch Switch Monitoring?	Yes/No		HTLIMMON	Yes
	Limit Switch High Temp	110 - 180	dF	HT_LIMHI	170
	Limit Switch Low Temp	100 - 170	dF	HT_LIMLO	160
	Heat Control Prop. Gain	0 - 1.5		HT_PGAIN	1
	Heat Control Derv. Gain	0 - 1.5		HT_DGAIN	1
	Heat PID Rate Config	30 - 300	sec	HTSGPIDR	90
	Hydronic Ctl.Prop. Gain	0 - 1.5		HW_PGAIN	1
	Hydronic Ctl.Integ. Gain	0 - 1.5		HW_IGAIN	1
	Hydronic Ctl.Derv. Gain	0 - 1.5		HW_DGAIN	1
	Hydronic PID Rate Config	15 - 300	sec	HOTWPIDR	90
	Hydronic Ht.Serial Num.1	0 - 9999		HTCL_SN1	0
	Hydronic Ht.Serial Num.2	0 - 6		HTCL_SN2	0
	Hydronic Ht.Serial Num.3	0 - 9999		HTCL_SN3	0
	Hydronic Ht.Serial Num.4	0 - 254		HTCL_SN4	0
	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85
HUMD					
	Humidifier Control Cfg.	0 - 4		HUMD_CFG	0
	Humidifier Setpoint	0 - 100	%	HUSP	40
	Humidifier PID Run Rate	10 - 120	sec	HUMDRATE	30
	Humidifier Prop. Gain	0 - 5		HUMID_PG	1
	Humidifier Integral Gain	0 - 5		HUMID_IG	0.3
	Humidifier Deriv. Gain	0 - 5		HUMID_DG	0.3
	Humd Serial Number 1	0 - 9999		HUMD_SN1	0
	Humd Serial Number 2	0 - 6		HUMD_SN2	0
	Humd Serial Number 3	0 - 9999		HUMD_SN3	0
	Humd Serial Number 4	0 - 254		HUMD_SN4	0
	Humd Ctrl Angle Lo Limit	0-90		HUMDCALM	85

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
IAQ_					
	Economizer Min.Position	0 - 100	%	ECONOMIN	5
	IAQ Demand Vent Min.Pos.	0 - 100	%	IAQMINP	0
	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000
	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0
	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400
	IAQ Analog Sensor Config	0 - 4		IAQANCFG	0
	IAQ 4-20 ma Fan Config	0 - 2		IAQANFAN	0
	IAQ Discrete Input Config	0 - 2		IAQINCFG	0
	IAQ Disc.In. Fan Config	0 - 2		IAQINFAN	0
	OAQ 4-20ma Sensor Config	0 - 2		OAQANCFG	0
	IAQ Econo Override Pos.	0 - 100	%	IAQOVPOS	100
	IAQ Override flow	0 - 31000	CFM	IAQOVCFM	10000
	Diff.Air Quality LoLimit	0 - 1000		DAQ_LOW	100
	Diff. Air Quality HiLimit	100 - 2000		DAQ_HIGH	700
	DAQ PPM Fan Off Setpoint	0 - 2000		DAQFNOFF	200
	DAQ PPM Fan On Setpoint	0 - 2000		DAQFNON	400
	Diff. AQ Responsiveness	-5 - 5		IAQREACT	0
	OAQ Lockout Value	0 - 2000		OAQLOCK	0
	User determined OAQ	0 - 5000		OAQ_USER	400
	IAQ Low Reference	0 - 5000		IAQREFL	0
	IAQ High Reference	0 - 5000		IAQREFH	2000
	OAQ Low Reference	0 - 5000		OAQREFL	0
	OAQ High Reference	0 - 5000		OAQREFH	2000
	IAQ Purge	Yes/No		IAQPURGE	No
	IAQ Purge Duration	5-60	min	IAQPTIME	15
	IAQ Purge LoTemp Min Pos	0-100	%	IAQPLTMP	10
	IAQ Purge HiTemp Min Pos	0-100	%	IAQPHTMP	35
	IAQ Purge OAT Lockout	35-70	dF	IAQPNTLO	50
SP__					
	Static Pressure Control	Enable/Disable		STATICFG	Disable
	Staged Air Volume Control	Enable/Disable		STGAVCFG	Disable
	Static Pressure Sensor	Enable/Disable		SPSENS	Disable
	Static Press. Low Range	-10 - 0		SP_LOW	0
	Static Press. High Range	0 - 10		SP_HIGH	5
	Static Pressure Setpoint	0 - 5	" H2O	SPSP	1.5
	VFD Minimum Speed	0 - 100	%	STATPMIN	10
	VFD Maximum Speed	0 - 100	%	STATPMAX	100
	VFD Fire Speed Over.	0 - 100	%	STATPFSO	100
	Stat. Pres. Reset Config	0 - 4 (multi-text strings)		SPRSTCFG	0
	SP Reset Ratio	0.00 - 2.00		SPRRATIO	0.20
	SP Reset Limit	0.00 - 2.00		SPRLIMIT	0.75
	SP Reset Econo. Position	0 - 100	%	ECONOSPR	5
	Stat.Pres.PID Run Rate	5 - 120	sec	SPIDRATE	15
	Static Press. Prop. Gain	0 - 5		STATP_PG	0.5
	Static Press. Intg. Gain	0 - 2		STATP_IG	0.5
	Static Press. Derv. Gain	0 - 5		STATP_DG	0.3
SWLG					
	Filter Status Inpt-Clean	Open/Close		FLTSLOGC	Open
	IGC Feedback - Off	Open/Close		GASFANLG	Open
	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG	Open
	Enthalpy Input - Low	Open/Close		ENTHLOGC	Close
	Fan Status Sw. - Off	Open/Close		SFSLOGIC	Open
	Dmd.Lmt.Sw.1 - Off	Open/Close		DMD_SW1L	Open
	Dmd.Lmt.Sw.2 - Off	Open/Close		DMD_SW2L	Open
	IAQ Disc.Input - Low	Open/Close		IAQINLOG	Open
	Fire Shutdown - Off	Open/Close		FSDLOGIC	Open
	Press. Switch - Off	Open/Close		PRESLOGC	Open
	Evacuation Sw. - Off	Open/Close		EVACLOGC	Open
	Smoke Purge Sw. - Off	Open/Close		PURGLOGC	Open
	Dehumidify Sw. - Off	Open/Close		DHDISCLG	Open

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
T24_CFG					
	Economizer Installed ?	Yes/No		ECON_ENA	Yes
	Econ.Act.2 Installed ?	Yes/No		ECON_TWO	No
	SAT Settling Time		secs	SAT_SET	240
	MBB Sensor Heat Relocate	Yes/No		HTLATMON	No
	Log Title 24 Faults	Yes/No		T24LOGFL	No
	T24 Econ Move Detect		%	T24ECMDB	1
	T24 Econ Move SAT Test		%	T24ECSTS	10
	T24 Econ Move SAT Change		deltaF	T24SATMD	0.2
	T24 Econ RAT-OAT Diff		deltaF	T24RATDF	15
	T24 Heat/Cool End Delay		mins	T24CHDLY	25
	T24 Test Mininmum Pos.		%	T24TSTMN	15
	T24 Test Maximum Pos.		%	T24TSTMX	85
	Economizer Deadband Temp		dF	AC_EC_DB	5
	Econ Fault Detect Gap		%	EC_FLGAP	5
	Econ Fault Detect Timer		secs	EC_FLTMR	20
	Excess Air CFM		CFM	EX_ARCFM	150
	Excess Air Detect Timer		secs	EX_ARTMR	800
	T24 Econ Auto-Test Day			T24_ECDY	0
	T24 Econ Auto-Test Time			T24_ECTM	2
	T24 AutoTest SF Run Time		mins	T24ACMRT	2
	T24 Auto-Test VFD Speed		%	T24ACSPD	20
	T24 Auto-Test Econ % Opn		%	T24ACOPN	50
	T24 Auto-Test VFD % Chng		%	T24VFDPC	10
TRIM					
	Air Temp Lvg SF Trim	-10 - 10	^F	SAT_TRIM	0
	RAT Trim	-10 - 10	^F	RAT_TRIM	0
	OAT Trim	-10 - 10	^F	OAT_TRIM	0
	SPT Trim	-10 - 10	^F	SPT_TRIM	0
	Limit Switch Trim	-10 - 10	^F	LSW_TRIM	0
	Air Temp Lvg Evap Trim	-10 - 10	^F	CCT_TRIM	0
	A1 Discharge Temp Trim	-10 - 10	^F	DTA1TRIM	
	Suction Gas Temp A Trim	-10 - 10	^F	RGTATRIM	
	Suct.Press.Circ.A Trim	-50 - 50		SPA_TRIM	0
	Suct.Press.Circ.B Trim	-50 - 50		SPB_TRIM	0
	Dis.Press.Circ.A Trim	-50 - 50		DPA_TRIM	0
	Dis.Press.Circ.B Trim	-50 - 50		DPB_TRIM	0
	Static Press. Trim (ma)	-2 - 2		SPMATRIM	0
	Bldg. Pressure Trim (ma)	-2 - 2		BPMATRIM	0
	Outside Air CFM Trim (ma)	-2 - 2		OAMATRIM	0
	Supply Air CFM Trim (ma)	-2 - 2		SAMATRIM	0
	Return Air CFM (ma)	-2 - 2		RAMATRIM	0
UNIT					
	Machine Control Type	1-6		CTRLTYPE	4
	Unit Size (30-100)	30-100		UNITSIZE	30
	Fan Mode (0=auto, 1=cont)	0-1		FAN_MODE	1
	Remote Switch Config	0 - 3		RMTINCFG	0
	CEM Module Installed	Yes/No		CEM_BRD	No
	Temp.Cmp.Strt.Cool Factr	0-60	min	TCSTCOOL	0
	Temp.Cmp.Strt.Heat Factr	0-60	min	TCSTHEAT	0
	Fan fail shuts down unit	Yes/No		SFS_SHUT	No
	Fan Stat Monitoring Type	0-2		SFS_MON	0
	VAV Unocc.Fan Retry time	0-720	min	SAMPMINS	50
	50 Hertz Unit ?	Yes/No		UNIT_HZ	No
	MAT Calc Config Type	0-2		MAT_SEL	1
	Reset MAT Table Entries?	Yes/No		MATRESET	No
	MAT Outside Air Default	0 - 100	%	MATOAPOS	20
	Altitude……..in feet:	0-60000		ALTITUDE	0
	MAT Outside Air Default		%	MATOAPOS	
	Startup Delay Time	0 - 900	secs	DELAY	0
	Auxiliary Relay Config	0 - 3 (multi-text strings)		AUXRELAY	0
	Space Temp Sensor	Enable/Disable		SPTSENS	Disable
	Space Temp Offset Sensor	Enable/Disable		SPTOSENS	Disable
	Space Temp Offset Range	1 - 10		SPTO_RNG	5
	Space Air RH Sensor	Enable/Disable		SPRHSENS	Disable
	Return Air RH Sensor	Enable/Disable		RARHSENS	Disable
	Filter Stat.Sw.Enabled ?	Enable/Disable		FLTS_ENA	Disable

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
VFD_CFG					
	VFD1 Nominal Motor Volts		volts	VFD1NVLT	
	VFD1 Nominal Motor Amps		amps	VFD1NAMP	
	VFD1 Nominal Motor Freq			VFD1NFRQ	
	VFD1 Nominal Motor RPM			VFD1NRPM	
	VFD1 Nominal Motor HPwr			VFD1NPWR	
	VFD1 Motor Direction			VFD1MDIR	
	VFD1 Acceleration Time		sec	VFD1ACCL	
	VFD1 Deceleration Time		sec	VFD1DECL	
	VFD1 Switching Frequency			VFD1SWFQ	
	VFD1 Type			VFD1TYPE	
	VFD2 Nominal Motor Volts		volts	VFD2NVLT	
	VFD2 Nominal Motor Amps		amps	VFD2NAMP	
	VFD2 Nominal Motor Freq			VFD2NFRQ	
	VFD2 Nominal Motor RPM			VFD2NRPM	
	VFD2 Nominal Motor HPwr			VFD2NPWR	
	VFD2 Motor Direction			VFD2MDIR	
	VFD2 Acceleration Time		sec	VFD2ACCL	
	VFD2 Deceleration Time		sec	VFD2DECL	
	VFD2 Switching Frequency			VFD2SWFQ	
	VFD2 Type			VFD2TYPE	
generics					
	Target Point Name	8 CHAR ASCII		POINT_01	
	Target Point Name	8 CHAR ASCII		POINT_02	
	Target Point Name	8 CHAR ASCII		POINT_03	
	Target Point Name	8 CHAR ASCII		POINT_04	
	Target Point Name	8 CHAR ASCII		POINT_05	
	Target Point Name	8 CHAR ASCII		POINT_06	
	Target Point Name	8 CHAR ASCII		POINT_07	
	Target Point Name	8 CHAR ASCII		POINT_08	
	Target Point Name	8 CHAR ASCII		POINT_09	
	Target Point Name	8 CHAR ASCII		POINT_10	
	Target Point Name	8 CHAR ASCII		POINT_11	
	Target Point Name	8 CHAR ASCII		POINT_12	
	Target Point Name	8 CHAR ASCII		POINT_13	
	Target Point Name	8 CHAR ASCII		POINT_14	
	Target Point Name	8 CHAR ASCII		POINT_15	
	Target Point Name	8 CHAR ASCII		POINT_16	
	Target Point Name	8 CHAR ASCII		POINT_17	
	Target Point Name	8 CHAR ASCII		POINT_18	
	Target Point Name	8 CHAR ASCII		POINT_19	
	Target Point Name	8 CHAR ASCII		POINT_20	

APPENDIX B — CCN TABLES (cont)

MAINTENANCE DISPLAY TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
ALARMS01					
	Active Alarm	ascii		ALARM_01	
	-----------------------	ascii			
	Active Alarm	ascii		ALARM_02	
	-----------------------	ascii			
	Active Alarm	ascii		ALARM_03	
	-----------------------	ascii			
	Active Alarm	ascii		ALARM_04	
	-----------------------	ascii			
follow same format for… ALARMS02 to ALARMS05					
BEL_ACTU					
	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS	
	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
	Economzr 2 Act.Curr.Pos.	0-100	%	ECN2RPOS	
	Econ Command Position	0-100	%	ECN2CPOS	
	Humidifer Act.Curr.Pos.	0-100	%	HUMDRPOS	
	Humidifier Command Pos.	0-100	%	HUMDCPOS	
	Ht.Coil Act.Current Pos.	0-100	%	HTCLRPOS	
	Ht.Coil Command Position	0-100	%	HTCLCPOS	
	BP 1 Actuator Curr.Pos.	0-100	%	BP1_RPOS	
	BP 1 Command Position	0-100	%	BP1_CPOS	
	BP 2 Actuator Curr.Pos.	0-100	%	BP2_RPOS	
	BP 2 Command Position	0-100	%	BP2_CPOS	
COMPRESR					
	Compressor A1 Relay	On/Off		CMPA1	
	Compressor A1 Capacity		%	CMPA1CAP	
	Circ A High Press.Switch	On/Off		CIRCAHPS	
	Compressor A1 Feedback	On/Off		CSB_A1	
	Curr.Sens.Brd. A1 Status	ascii		CSBA1ASC	
	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	config
	Comp A1 Locked Out ?	Yes/No		CMPA1LOK	
	Compressor A1 Strikes			CMPA1STR	
	Enable Compressor A1	Enable/Disable		CMPA1ENA	config
	Compressor A2 Relay	On/Off		CMPA2	
	Compressor A2 Feedback	On/Off		CSB_A2	
	Curr.Sens.Brd. A2 Status	ascii		CSBA2ASC	
	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	config
	Comp A2 Locked Out ?	Yes/No		CMPA2LOK	
	Compressor A2 Strikes			CMPA2STR	
	Enable Compressor A2	Enable/Disable		CMPA2ENA	config
	Compressor A3 Relay	On/Off		CMPA3	
	Compressor A3Feedback	On/Off		CSB_A3	
	Curr.Sens.Brd. A3 Status	ascii		CSBA3ASC	
	CSB A3 Feedback Alarm	Enable/Disable		CSB_A3EN	config
	Comp A3 Locked Out ?	Yes/No		CMPA3LOK	
	Compressor A3 Strikes			CMPA3STR	
	Enable Compressor A3	Enable/Disable		CMPA3ENA	config
	Compressor B1 Relay	On/Off		CMPB1	
	Circ B High Press.Switch	On/Off		CIRCBHPS	
	Compressor B1 Feedback	On/Off		CSB_B1	
	Curr.Sens.Brd. B1 Status	ascii		CSBB1ASC	
	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	config
	Comp B1 Locked Out ?	Yes/No		CMPB1LOK	
	Compressor B1 Strikes			CMPB1STR	
	Enable Compressor B1	Enable/Disable		CMPB1ENA	config
	Compressor B2 Relay	On/Off		CMPB2	
	Compressor B2 Feedback	On/Off		CSB_B2	
	Curr.Sens.Brd. B2 Status	ascii		CSBB2ASC	
	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	config
	Comp B2 Locked Out ?	Yes/No		CMPB2LOK	
	Compressor B2 Strikes			CMPB2STR	
	Enable Compressor B2	Enable/Disable		CMPB2ENA	config
	Compressor B3 Relay	On/Off		CMPB3	
	Compressor B3 Feedback	On/Off		CSB_B3	
	Curr.Sens.Brd. B3 Status	ascii		CSBB3ASC	
	CSB B3 Feedback Alarm	Enable/Disable		CSB_B3EN	config
	Comp B3 Locked Out ?	Yes/No		CMPB3LOK	
	Compressor B3 Strikes			CMPB3STR	
	Enable Compressor B3	Enable/Disable		CMPB3ENA	config

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
COMPTRIP					
	Comp. Security Password	0-10000		COMPPASS	config
	Low Suction Trip Level 1		dF	SSTLEV1	
	Low Suction Trip Level 2		dF	SSTLEV2	
	Low Suction Trip Level 3		dF	SSTLEV3	
	Low Suction Trip Level 4		dF	SSTLEV4	
	Low Suction Clear Temp		dF	SSTOK	
	Circuit A HPS Trip Press		PSIG	HPSATRIP	
	Circuit B HPS Trip Press		PSIG	HPSBTRIP	
DMANDLIM					
	Active Demand Limit	0-100	%	DEM_LIM	forcible
	Current Running Capacity	0-100	%	CAPTOTAL	
	Demand Limit Select	0-3		DMD_CTRL	config
	Demand Limit Switch 1	On/Off		DMD_SW1	forcible
	Demand Limit Switch 2	On/Off		DMD_SW2	forcible
	Demand Limit Sw.1 Setpt.	0-100	%	DLSWSP1	config
	Demand Limit Sw.2 Setpt.	0-100	%	DLSWSP2	config
	4-20 ma Demand Signal	4-20	ma	DMDLMTMA	forcible
	Demand Limit at 20 ma	0-100	%	DMT20MA	config
	CCN Loadshed Signal	0-99		DL_STAT	
	Loadshed Group Number	0-99		SHED_NUM	config
	Loadshed Demand Delta	0-60	%	SHED_DEL	config
	Maximum Loadshed Time	0-120	min	SHED_TIM	config
ECON_MIN					
	Economizer Act.Cmd.Pos.		%	ECONOCMD	forcible
	Economizer Act.Curr.Pos.		%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.		%	ECON2POS	
	Econo Current Min. Pos.		%	ECMINPOS	
	Econo Current Min. CFM		CFM	ECMINCFM	
	Outside Air CFM		CFM	OACFM	
	Diff.Air Quality in PPM			DAQ	
	IAQ Min.Pos.Override		%	IAQMINOV	forcible
	Econ Remote 10K Pot Val.			ECON_POT	forcible
	IAQ - PPM Return CO2			IAQ	forcible
	OAQ - PPM Return CO2			OAQ	forcible
	IAQ - Discrete Input			IAQIN	forcible
	IAQ Demand Vent Min.Pos.		%	IAQMINP	config
	Economizer Min.Position		%	ECONOMIN	config
	IAQ Demand Vent Min.Flow		CFM	OACFMMIN	config
	Economizer Min.Flow		CFM	OACFMMAX	config
	Econ OACFM MinPos Deadbd		CFM	OACFM_DB	config
	IAQ Analog Sensor Config			IAQANCFG	config
	IAQ 4-20 ma Fan Config			IAQANFAN	config
	IAQ Discrete Input Confg			IAQINCFG	config
	IAQ Disc.In. Fan Config			IAQINFAN	config
	IAQ Econo Override Pos.		%	IAQOVPOS	config
	Diff.Air Quality LoLimit			DAQ_LOW	config
	Diff.Air Quality HiLimit			DAQ_HIGH	config
	DAQ PPM Fan Off Setpoint			DAQFNOFF	config
	DAQ PPM Fan On Setpoint			DAQFNON	config
	Diff. AQ Responsiveness			IAQREACT	config
	IAQ Low Reference			IAQREFL	config
	IAQ High Reference			IAQREFH	config
	OAQ Lockout Value			OAQLOCK	config
	OAQ 4-20ma Sensor Config		ma	OAQANCFG	config
	IAQ milliamps		ma	IAQ_MA	
	OAQ milliamps			OAQ_MA	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
EC_DIAG					
	Economizer Active ?	Yes/No		ECACTIVE	
	Conditions which prevent economizer being active:				
	Econ Act. Unavailable?	Yes/No		ECONUNAV	
	Econ 2 Act. Unavailable?	Yes/No		ECN2UNAV	
	Enth.Switch Read High ?	Yes/No		ENTH	
	DBC - OAT lockout?	Yes/No		DBC_STAT	
	DEW - OA Dewpt. lockout?	Yes/No		DEW_STAT	
	DDBC- OAT > RAT lockout?	Yes/No		DDBCSTAT	
	OAEC- OA Enth Lockout?	Yes/No		OAECSTAT	
	DEC - Diff.Enth.Lockout?	Yes/No		DEC_STAT	
	EDT Sensor Bad ?	Yes/No		EDT_STAT	
	OAT Sensor Bad ?	Yes/No		OAT_STAT	
	Economizer forced ?	Yes/No		ECONFORC	
	Supply Fan not on 30s ?	Yes/No		SFONSTAT	
	Cool Mode not in effect?	Yes/No		COOL_OFF	
	OAQ lockout in effect ?	Yes/No		OAQLOCKD	
	Econ recovery hold off?	Yes/No		ECONHELD	
	Dehumid. Disabled Econ.?	Yes/No		DHDISABL	
	Outside Air Temperature		dF	OAT	forcible
	OutsideAir DewPoint Temp		dF	OADEWTMP	
	Outside Air Rel.Humidity		%	OARH	forcible
	Outdoor Air Enthalpy			OAE	
	Return Air Temperature		dF	RAT	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Return Air Enthalpy			RAE	
	High OAT Lockout Temp		dF	OAT_LOCK	config
	Econ ChangeOver Select			ECON_SEL	config
	OA Enthalpy ChgOvr Selct			OAEC_SEL	config
	Outdr.Enth Compare Value			OAEN_CFG	config
	OA Dewpoint Temp Limit		dF	OADEWCFG	config
	Supply Fan Relay			SFAN	
	Economizer Act.Cmd.Pos.		%	ECONOCMD	forcible
	Economizer Act.Curr.Pos.		%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.		%	ECON2POS	
	Evaporator Discharge Tmp		dF	EDT	
	Economizer Control Point		dF	ECONCPNT	
	EDT Trend in degF/minute		^F	EDTTREND	
	Economizer Prop.Gain			EC_PGAIN	config
	Economizer Range Adjust		^F	EC_RANGE	config
	Economizer Speed Adjust			EC_SPEED	config
	Economizer Deadband		^F	EC_DBAND	config
	Economizer Timer		sec	ERATETMR	config
ENTHALPY					
	Outdoor Air Enthalpy			OAE	
	Outside Air Temperature		dF	OAT	forcible
	Outside Air Rel.Humidity		%	OARH	forcible
	Outside Air RH Sensor			OARHSENS	config
	OA Dewpoint Temp Limit		dF	OADEWCFG	forcible
	OutsideAir DewPoint Temp		dF	OADEWTMP	
	OutsideAir Humidty Ratio			OA_HUMR	
	OA H2O Vapor Sat.Pressur		" Hg	OA_PWS	
	OA H2O Partial.Press.Vap		" Hg	OA_PWS	
	Space Enthalpy			SPE	
	Space Temperature		dF	SPT	forcible
	Controlling Space Temp		dF	SPACE_T	forcible
	Space Relative Humidity		%	SPRH	forcible
	Space Temp Sensor			SPTSENS	config
	Space Air RH Sensor			SPRHSENS	config
	Return Air Enthalpy			RAE	
	Return Air Temperature		dF	RAT	forcible
	Controlling Return Temp		dF	RETURN_T	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Return Air RH Sensor			RARHSENS	config
	Altitude……..in feet:			ALTITUDE	config
	Atmospheric Pressure		" Hg	ATMOPRES	config

APPENDIX B — CCN TABLES (cont)

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
HUMIDITY					
	Space Relative Humidity		%	SPRH	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Humidifier Relay			HUMIDRLY	
	Humidifier Act.Curr.Pos.		%	HUMDRPOS	
	Humidifier Command Pos.		%	HUMDCPOS	
	Humidifier Setpoint		%	HUSP	config
	Humidifier Control Config			HUMD_CFG	config
	Humidifier Prop. Gain			HUMID_PG	config
	Humidifier Integral Gain			HUMID_IG	config
	Humidifier Deriv. Gain			HUMID_DG	config
	Humidifier PID Run Rate		sec	HUMDRATE	config
	Space Air RH Sensor	Enable/Disable		SPRHSENS	config
	Return RH Sensor	Enable/Disable		RARHSENS	config
LINKDATA					
	Supervisory Element #			SUPE-ADR	
	Supervisory Bus			SUPE-BUS	
	Supervisory Block Number			BLOCKNUM	
	Average Occup. Heat Stp.		dF	AOHS	
	Average Occup. Cool Stp.		dF	AOCS	
	Average Unocc. Heat Stp.		dF	AUHS	
	Average Unocc. Cool Stp.		dF	AUCS	
	Average Zone Temperature		dF	AZT	
	Average Occup. Zone Temp		dF	AOZT	
	Linkage System Occupied?			LOCC	
	Next Occupied Day			LNEXTOCD	
	Next Occupied Time			LNEXTOCC	
	Next Unoccupied Day			LNEXTUOD	
	Next Unoccupied Time			LNEXTUNC	
	Last Unoccupied Day			LLASTUOD	
	Last Unoccupied Time			LLASTUNC	
MILLIAMP					
	IAQ milliamps		ma	IAQ_MA	
	OAQ milliamps		ma	OAQ_MA	
	SP Reset milliamps		ma	SPRST_MA	
	4-20 ma Demand Signal		ma	DMDLMTMA	forcible
	EDT Reset milliamps		ma	EDTRESMA	
	OARH milliamps		ma	OARH_MA	
	SPRH milliamps		ma	SPRH_MA	
	RARH milliamps		ma	RARH_MA	
	SACFM milliamps		ma	SACFM_MA	
	RACFM milliamps		ma	RACFM_MA	
	OACFM milliamps		ma	OACFM_MA	
	BP milliamps		ma	BP_MA	
	SP milliamps		ma	SP_MA	
MODES					
	System Mode…………:	ascii text strings			
	HVAC Mode…………..:	ascii text strings			
	Control Mode………..:	ascii text strings			
	Currently Occupied	On/Off		MODEOCCP	
	Timed Override in effect	On/Off		MODETOVR	
	DCV resetting min pos	On/Off		MODEADCV	
	Supply Air Reset	On/Off		MODESARS	
	Demand Limit in Effect	On/Off		MODEDMLT	
	Temp.Compensated Start	On/Off		MODETCST	
	IAQ pre-occ purge active	On/Off		MODEIQPG	
	Linkage Active - DAV	On/Off		MODELINK	
	Mech.Cooling Locked Out	On/Off		MODELOCK	
	HVAC Mode Numerical Form	number		MODEHVAC	
OCCDEFME					
	Current Day, Time & Date:	ascii date & time		TIMEDATE	
	Occupancy Controlled By:	ascii text		OCDFTXT1	
		ascii text		OCDFTXT2	
		ascii text		OCDFTXT3	
	Currently Occupied	Yes/No		MODE_OCC	
	Current Occupied Time			STRTTIME	
	Current Unoccupied Time			ENDTIME	
	Next Occupied Day & Time			NXTOC_DT	
	Next Unocc. Day & Time			NXTUN_DT	
	Last Unocc. Day & Time			PRVUN_DT	
	Current Occup. Period #			PER_NO	
	Timed-Override in Effect	Yes/No		OVERLAST	
	Timed-Override Duration		hours	OVR_HRS	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
PRESBLDG					
	Building Pressure		" H2O	BP	
	Return Air CFM		CFM	RACFM	
	Supply Air CFM		CFM	SACFM	
	Power Exhaust Relay 1	On/Off		PE1	
	Power Exhaust Relay 2	On/Off		PE2	
	BP 1 Actuator Curr.Pos.		%	BP1_RPOS	
	BP 1 Command Position		%	BP1_CPOS	
	BP 2 Actuator Curr.Pos.		%	BP2_RPOS	
	BP 2 Command Position		%	BP2_CPOS	
	Exhaust Fan VFD Speed		%	EFAN_VFD	
	Building Pressure Setp.		" H2O	BPSP	config
	BP Setpoint Offset		^" H2O	BPSO	config
	Fan Track Learn Enable	Yes/No		DCFM_CFG	config
	Fan Track Learn Rate		min	DCFMRATE	config
	Fan Track Initial DCFM		CFM	DCFMSTRT	config
	Fan Track Max Clamp		CFM	DCFM_MAX	config
	Fan Track Max Correction		CFM	DCFM_ADJ	config
	Fan Track Internl EEPROM		CFM	DCFM_OFF	config
	Fan Track Reset Internal			DCFMRSET	config
	Fan Track Internal RAM		CFM	DCFM_RAM	
	Fan Track Control D.CFM		CFM	DELTACFM	
PRESDUCT					
	Static Pressure		" H2O	SP	
	Supply Fan Commanded %		%	SFAN_VFD	
	Economzr 2 Act.Curr.Pos.		%	ECN2RPOS	
	Econ Command Position		%	ECN2CPOS	
	Static Pressure Setpoint		" H2O	SPSP	config
	Static Pressure Reset			SPRESET	forcible
STAGEGAS					
	Heating Mode………..:	ascii text strings			
	Requested Heat Stage			HT_STAGE	
	Heating Control Point			HEATCPNT	
	Staged Heat LAT Sum		dF	LAT_SGAS	
	Staged Heat LAT 1		dF	LAT1SGAS	
	Staged Heat LAT 2		dF	LAT2SGAS	
	Staged Heat LAT 3		dF	LAT3SGAS	
	Staged Gas Limit Sw.Temp		dF	LIMSWTMP	
	Heat PID Timer		sec	HTSGTIMR	
	Staged Heat Capacity Calc		%	HTSGCALC	
	Current Running Capacity		%	HTSG_CAP	
	Proportional Cap. Change			HTSG_P	
	Derivative Cap. Change			HTSG_D	
	Maximum Heat Stages			HTMAXSTG	
	Hi Limit Switch Tmp Mode			LIMTMODE	
	LAT Cutoff Mode			LATCMODE	
	Capacity Clamp Mode			CAPMODE	
STRTHOUR					
	Compressor A1 Run Hours		hours	HR_A1	config
	Compressor A2 Run Hours		hours	HR_A2	config
	Compressor A3 Run Hours		hours	HR_A3	config
	Compressor B1 Run Hours		hours	HR_B1	config
	Compressor B2 Run Hours		hours	HR_B2	config
	Compressor B3 Run Hours		hours	HR_B3	config
	Compressor A1 Starts			CY_A1	config
	Compressor A2 Starts			CY_A2	config
	Compressor A3 Starts			CY_A3	config
	Compressor B1 Starts			CY_B1	config
	Compressor B2 Starts			CY_B2	config
	Compressor B3 Starts			CY_B3	config

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
SUMZ					
	Cooling Control Point		dF	COOLCPNT	
	Mixed Air Temperature		dF	MAT	
	Evaporator Discharge Tmp		dF	EDT	
	Return Air Temperature		dF	RAT	forcible
	Outside Air Temperature		dF	OAT	forcible
	Economizer Act.Curr.Pos.		%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.		%	ECON2POS	
	Capacity Threshold Adjst			Z_GAIN	config
	Capacity Load Factor			SMZ	
	Next Stage EDT Decrease			ADDRISE	
	Next Stage EDT Increase			SUBRISE	
	Rise Per Percent Capacity			RISE_PCT	
	Cap Deadband Subtracting			Y_MINUS	
	Cap Deadband Adding			Y_PLUS	
	Cap Threshold Subtracting			Z_MINUS	
	Cap Threshold Adding			Z_PLUS	
	High Temp Cap Override	On/Off		HI_TEMP	
	Low Temp Cap Override	On/Off		LOW_TEMP	
	Pull Down Cap Override	On/Off		PULLDOWN	
	Slow Change Cap Override	On/Off		SLO_CHNG	
SYSTEM					
	Reset All Current Alarms	Yes/No		ALRESET	config
	Reset Alarm History	Yes/No		ALHISCLR	config
	Reset the Device	Yes/No		RESETDEV	config
	Local Machine Disable	Yes/No		UNITSTOP	config
	Soft Stop Request	Yes/No		SOFTSTOP	forcible
	Emergency Stop	Enable/Disable		EMSTOP	forcible
	CEM AN4 10K temp J5, 7-8			CEM10K1	forcible
	CEM AN5 10K temp J5, 9-10			CEM10K2	forcible
	CEM AN6 10K temp J5, 11-12			CEM10K3	forcible
	CEM AN1 10K temp J5, 1-2			CEM10K4	forcible
	CEM AN4 4-20 ma J5, 7-8			CEM4201	forcible
	CEM AN5 4-20 ma J5, 9-10			CEM4202	forcible
	CEM AN6 4-20 ma J5, 11-12			CEM4203	forcible
	CEM AN1 4-20 ma J5, 1-2			CEM4204	forcible
T24_DIAG					
	Economizer Installed ?	Yes/No		ECON_ENA	config
	Econ.Act.2 Installed ?	Yes/No		ECON_TWO	config
	Return Air Temperature		dF	RAT	forcible
	Air Temp Lvg Supply Fan		dF	SAT	
	Outside Air Temperature		dF	OAT	forcible
	Occupied?	Yes/No		OCCUPIED	forcible
	Supply Fan Relay	On/Off		SFAN	
	Supply Fan Commanded %		%	SFAN_VFD	
	Economizer Act.Curr.Pos.		%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.		%	ECON2POS	
	Economizer Act.Cmd.Pos.		%	ECONOCMD	forcible
	OK To Use Econ for T24?	Yes/No		T24ECOOL	
	OK Test Mech. D/C Act.	Yes/No		OKTSTMDA	
	Title 24 Previous SAT		dF	T24PRSAT	forcible
	Title 24 Econ Samp Pos		%	T24ECSMP	
	Title 24 SAT Check Time			T24SATCT	
	Elapsed Seconds			ELAPSECS	
	Title 24 Test Mark			T24TSMRK	
	RAT-OAT OK for Title 24	Yes/No		T24RO_OK	
T24_ECAC					
	Title 24 Test Mark			T24TSMRK	
	SAT Moving Average		dF	SAT_MAVG	
	SAT Trend d/dt (F/min)		dF	T24SATND	
	VFD1 Actual Motor Torque		%	VFD1TORQ	
	T24 Auto-Test VFD Samp.		dF	T24VFDSM	
	VFD1 Torque Moving Avg.		%	VFD1TMAV	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
TESTACTC					
	Economizer Act.Cmd.Pos.	0-100	%	ECON1TST	
	Economizer Calibrate Cmd	YES/NO		ECONOCAL	
	Econ Act. Control Angle	read only		ECONCANG	
	Economzr 2 Act.Cmd.Pos.	0-100	%	ECON2TST	
	Economzr 2 Calibrate Cmd	YES/NO		ECON2CAL	
	Econ2 Act. Control Angle	read only		ECN2CANG	
	BP 1 Command Position	0-100	%	BLDG1TST	
	BP 1 Actuator Cal Cmd	YES/NO		BLDG1CAL	
	BP Act.1 Control Angle	read only		BP1_CANG	
	BP 1 Actuator Max Pos.	0-100	%	BP1SETMX	
	BP 2 Command Position	0-100	%	BLDG2TST	
	BP 2 Actuator Cal Cmd	YES/NO		BLDG2CAL	
	BP Act.2 Control Angle	read only		BP2_CANG	
	BP 2 Actuator Max Pos.	0-100	%	BP2SETMX	
	Ht.Coil Command Position	0-100	%	HTCLACTC	
	Heating Coil Act. Cal.Cmd	YES/NO		HCOILCAL	
	Heat Coil Act.Ctl.Angle	read only		HTCLCANG	
	Humidifier Command Pos.	0-100	%	HUMD_TST	
	Humidifier Act. Cal.Cmd	YES/NO		HUMIDCAL	
	Humidifier Act.Ctrl.Ang.	read only		HUMDCANG	
TESTCOOL					
	Econo Damper Command Pos	0-100	%	ECONCOOL	
	Static Pressure Setpoint	0-5	" H2O	SPSP_TST	
	Requested Cool Stage	0-n		CLST_TST	
	Compressor A1 Relay	ON/OFF		CMPA1TST	
	Minimum Load Valve Relay	ON/OFF		MLV_TST	
	Compressor A1 Capacity		%	A1CAPTST	
	Two Circuit Start A1,B1	ON/OFF		CMPABTST	
	Compressor A2 Relay	ON/OFF		CMPA2TST	
	Compressor A3 Relay	ON/OFF		CMPA3TST	
	Compressor B1 Relay	ON/OFF		CMPB1TST	
	Compressor B2 Relay	ON/OFF		CMPB2TST	
	Compressor B3 Relay	ON/OFF		CMPB3TST	
	Humidimizer 3-Way Valve	ON/OFF		RHVC_TST	
	Condenser EXV Position		%	CEXVCTST	
	Bypass EXV Position		%	BEXVCTST	
TESTFANS					
	Fan Test Automatic?	YES/NO		FANAUTO	
	Economizer Act.Cmd.Pos.		%	ECONFANS	
	Supply Fan Relay	ON/OFF		SFAN_TST	
	Supply Fan Commanded %	0-100	%	SFVFDTST	
	Power Exhaust Relay 1	ON/OFF		PE1_TST	
	Power Exhaust Relay 2	ON/OFF		PE2_TST	
	BP 1 Command Position	0-100	%	BLDPTST1	
	BP 2 Command Position	0-100	%	BLDPTST2	
	Exhaust Fan Commanded %	0-100	%	EFVFDTST	
	Condenser Fan Output 1	ON/OFF		CNF1_TST	
	Condenser Fan Output 2	ON/OFF		CNF2_TST	
	Condenser Fan Output 3	ON/OFF		CNF3_TST	
	Condenser Fan Output 4	ON/OFF		CNF4_TST	
TESTHEAT					
	Requested Heat Stage	0-n		HTST_TST	
	Heat Relay 1	ON/OFF		HS1_TST	
	Modulating Heat Capacity	0-100	%	MGAS_TST	
	Heat Relay 2	ON/OFF		HS2_TST	
	Relay 3 W1 Gas Valve 2	ON/OFF		HS3_TST	
	Relay 4 W2 Gas Valve 2	ON/OFF		HS4_TST	
	Relay 5 W1 Gas Valve 3	ON/OFF		HS5_TST	
	Relay 6 W2 Gas Valve 3	ON/OFF		HS6_TST	
	Heat Interlock Relay	ON/OFF		HIR_TST	
	Ht.Coil Command Position	0-100	%	HTCLHEAT	
TESTHMZR					
	Humidimizer 3-Way Valve	ON/OFF		RHVC_TST	
	Condenser EXV Position		%	CEXVCTST	
	Bypass EXV Position		%	BEXVCTST	
	Condenser EXV Calibrate	ON/OFF		CEXV_CAL	
	Bypass EXV Calibrate	ON/OFF		BEXV_CAL	
TESTINDP					
	Humidifier Relay	ON/OFF		HUMR_TST	
	Remote Alarm / Aux Relay	ON/OFF		ALRM_TST	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
VERSIONS					
	MBB CESR131461-	ascii version#		MBB_SW	
	RXB CESR131465-	ascii version#		RXB_SW	
	EXB CESR131465-	ascii version#		EXB_SW	
	CXB CESR131173-	ascii version#		CXB_SW	
	SCB CESR131226-	ascii version#		SXB_SW	
	CEM CESR131174-	ascii version#		CEM_SW	
	EXV CESR131172-	ascii version#		EXV_SW	
	VFD1 Firmware Version-	ascii serial num		VFD1_SW	
	VFD2 Firmware Version-	ascii serial num		VFD2_SW	
	Economizr Serial Number-	ascii serial num		ECONSNUM	
	Econo 2 Serial Number-	ascii serial num		ECN2SNUM	
	Humidfier Serial Number-	ascii serial num		HUMDSNUM	
	Heat Coil Serial Number-	ascii serial num		HTCLSNUM	
	BP #1 Serial Number-	ascii serial num		BP1_SNUM	
	BP #2 Serial Number-	ascii serial num		BP2_SNUM	
	MARQUEE CESR131171-	ascii version#		MARQ_SW	
	NAVIGATOR CESR130227-	ascii version#		NAVI_SW	

TIME SCHEDULE CONFIG TABLE

Allowable Entries: Day not selected = 0 Day selected = 1

	DAY FLAGS MTWTFSSH	OCCUPIED TIME	UNOCCUPIED TIME
Period 1:	00000000	00:00	00:00
Period 2:	00000000	00:00	00:00
Period 3:	00000000	00:00	00:00
Period 4:	00000000	00:00	00:00
Period 5:	00000000	00:00	00:00
Period 6:	00000000	00:00	00:00
Period 7:	00000000	00:00	00:00
Period 8:	00000000	00:00	00:00

APPENDIX C — UNIT STAGING TABLES

ADAPTIVE CV STAGING SEQUENCE (Sizes 030,035)

STAGE	SEQUENCE			
	0	1*	1	2
COMP	Compressor Status			
A1	OFF	ON	ON	ON
B1	OFF	OFF	OFF	ON
UNIT	Capacity 48/50P			
030	0%	36%	50%	100%
035	0%	38%	50%	100%

*Minimum load valve.

VAV (WITH DIGITAL COMPRESSOR) STAGING SEQUENCE (Sizes 030,035)

STAGE	SEQUENCE		
	0	1	2
COMP	Compressor Status		
A1*	OFF	ON	ON
B1	OFF	OFF	ON
UNIT	Capacity 48/50P		
030	0%	25% to 50%	75% to 100%
035	0%	25% to 50%	75% to 100%

*On units with optional digital scroll compressor, compressor A1 modulates from minimum to maximum capacity to provide increased stages.

VAV AND ADAPTIVE CV STAGING SEQUENCE WITH MINIMUM LOAD VALVE (Size 040)

STAGE	SEQUENCE				
	0	1*	1	2	3
COMP	Compressor Status				
A1	OFF	ON	ON	ON	ON
B1	OFF	OFF	OFF	ON	ON
B2	OFF	OFF	OFF	OFF	ON
UNIT	Capacity 48/50P				
040	0%	36%	47%	73%	100%

*Minimum load valve.

VAV DIGITAL COMPRESSOR STAGING SEQUENCE (Size 040)

STAGE	SEQUENCE			
	0	1	2	3
COMP	Compressor Status			
A1*	OFF	ON	ON	ON
B1	OFF	OFF	ON	ON
B2	OFF	OFF	OFF	ON
UNIT	Capacity 48/50P			
040	0%	23% to 47%	50% to 73%	77% to 100%

*On units with optional digital scroll compressor, compressor A1 modulates from minimum to maximum capacity to provide increased stages.

VAV AND ADAPTIVE CV STAGING SEQUENCE WITHOUT MINIMUM LOAD VALVE (Size 040)

STAGE	SEQUENCE				
	0	1	2	3	4
COMP	Compressor Status				
A1	OFF	OFF	ON	ON	ON
B1	OFF	ON	OFF	ON	ON
B2	OFF	OFF	OFF	OFF	ON
UNIT	Capacity 48/50P				
040	0%	27%	47%	73%	100%

VAV AND ADAPTIVE CV STAGING SEQUENCE (Sizes 050-075)

STAGE	SEQUENCE					
	0	1*	1	2	3	4
COMP	Compressor Status					
A1	OFF	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	OFF	ON	ON	ON
B2	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Capacity 48/50P					
050	0%	15%	23%	50%	73%	100%
055	0%	17%	25%	50%	75%	100%
060	0%	18%	25%	50%	75%	100%
070	0%	16%	23%	46%	73%	100%
075	0%	19%	25%	50%	75%	100%

*Minimum load valve.

APPENDIX C — UNIT STAGING TABLES (cont)

VAV (WITH DIGITAL COMPRESSOR) STAGING SEQUENCE (Sizes 050-075)

STAGE	SEQUENCE				
	0	1	2	3	4
COMP	**Compressor Status**				
A1*	OFF	ON	ON	ON	ON
A2	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON
UNIT	**Capacity 48/50P**				
050	0%	12% to 23%	38% to 50%	62% to 73%	88% to 100%
055	0%	13% to 25%	38% to 50%	63% to 75%	88% to 100%
060	0%	13% to 25%	38% to 50%	63% to 75%	88% to 100%
070	0%	11% to 23%	34% to 46%	61% to 73%	89% to 100%
075	0%	13% to 25%	38% to 50%	63% to 75%	88% to 100%

*On units with optional digital scroll compressor, compressor A1 modulates from minimum to maximum capacity to provide increased stages.

VAV AND ADAPTIVE CV STAGING SEQUENCE (Sizes 090-100)

STAGE	SEQUENCE							
	0	1*	1	2	3	4	5	6
COMP	**Compressor Status**							
A1	OFF	ON	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	OFF	ON	ON	ON	ON
A3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	OFF	ON	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	**Capacity 48/50P**							
090	0%	12%	17%	33%	50%	67%	83%	100%
100	0%	11%	15%	33%	49%	67%	82%	100%

*Minimum load valve.

VAV (WITH DIGITAL COMPRESSOR) STAGING SEQUENCE (Sizes 090-100)

STAGE	SEQUENCE						
	0	1	2	3	4	5	6
COMP	**Compressor Status**						
A1*	OFF	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	ON	ON	ON	ON
A3	OFF	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	ON	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	**Capacity 48/50P**						
090	0%	8% to 17%	25% to 33%	42% to 50%	58% to 67%	75% to 83%	92% to 100%
100	0%	8% to 15%	26% to 33%	41% to 49%	59% to 67%	74% to 82%	92% to 100%

*On units with optional digital scroll compressor, compressor A1 modulates from minimum to maximum capacity to provide increased stages.

APPENDIX D — VFD INFORMATION

On units equipped with optional supply fan and/or exhaust fan VFDs, the fan speed is controlled by a 3-phase VFD. The supply fan VFD is located in the supply fan section (030-050 size units) or mixing box section (055-100 size units) behind an access door. For 075-100 size units with optional high-capacity power exhaust or return fan, the exhaust fan VFD is located in the mixing box section behind an access door.

The P Series units use ABB VFDs. The VFDs communicate to the *Comfort*Link MBB over the local equipment network (LEN). The VFD speed is controlled directly by the *Comfort*Link controls over the LEN. The interface wiring for the VFDs is shown in Fig. A and the terminal designations are shown in Table A. The VFD has a keypad display panel that can be used for Service Diagnostics and setting the initial VFD parameters required to allow the VFD to communicate on the LEN. Additional VFD parameters are set by the *Comfort*Link controls and sent to the VFD over the LEN at power up of the VFD. The VFD faults can be reset with the VFD keypad or through the *Comfort*Link controls (***Alarms→R.CUR*** =Yes).

Table B outlines the VFD parameters required to initialize communication over the *Comfort*Link LEN. These parameters must be set correctly for any communications to occur. These parameters come preset from the factory. If the VFD is replaced, these parameters must be set at the initial power up of the drive. This can be accomplished by running the Carrier Assistant through the VFD keypad (see START UP WITH THE CARRIER ASSISSTANT section), or setting each of the parameters individually.

After the parameters in Table B have been set, the *Comfort*Link controls configure the additional parameters listed in Tables C and D automatically. These parameter configurations are sent to the VFD at every power up. The parameters listed in Table C have corresponding *Comfort*Link configurations (***Configuration→S.VFD*** and ***Configuration→E.VFD***). The parameters in Table D are hard-coded to be set as listed.

After configuration Tables C and D have been sent to the VFD, the drive continues to send and receive information from the *Comfort*Link controls. This information is outlined in Tables E and F. Table E lists the information the VFD sends to the *Comfort*Link controls, and Table F lists the information the *Comfort*Link controls send to the VFD. These tables are updated at every scan the *Comfort*Link controls perform of the LEN. This occurs approximately once every second.

Table A — VFD Terminal Designations

TERMINAL	FUNCTION
U1 V1 W1	Three-Phase Main Circuit Input Power Supply
U2 V2 W2	Three-Phase AC Output to Motor, 0 V to Maximum Input Voltage Level
X1-11 (GND) X1-12 (D-COM)	Factory-supplied jumper
X1-10 (+24 V) X1-13 (DI-1)	Factory-supplied jumper
X1-10 (+24 V) X1-16 (DI-4)	Start Enable 1 (Factory-supplied jumper). When opened the drive goes to emergency stop.
X1-28 (SCR) X1-29 (B+) X1-30 (B-) X1-31 (AGND) X1-32 (SCR)	Factory wired for local equipment network LEN communication

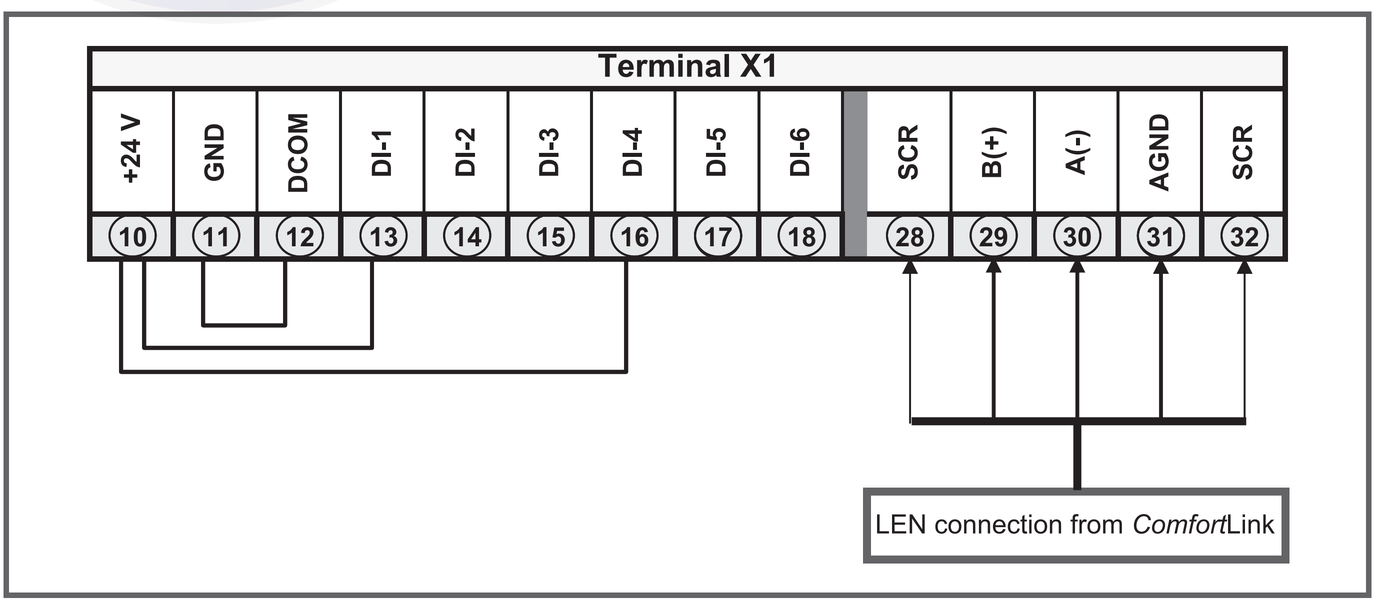


Fig. A — VFD Wiring

Table B — VFD Parameters Configured by Carrier Assistant

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	HVAC DEFAULT	CARRIER DEFAULT
Options	COMM PROT SEL	9802	NOT SEL (0)	LEN (6)
EFB Protocol	EFB PROTOCOL ID	5301	0000 hex	0601 hex
	EFB STATION ID	5302	0	41/42*
	EFB BAUD RATE	5303	9.6 kb/s	38.4 kb/s
	EFB PARITY	5304	8 NONE 1	8 NONE 1
	EFB CTRL PROFILE	5305	ABB DRV LIM	DCU PROFILE

* 41 for Supply Fan Motor VFD, 42 for Exhaust Fan Motor VFD.

Table C — VFD Parameters with CCN Points Configured with *Comfort*Link Controls

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	HVAC DEFAULT	CARRIER DEFAULT	CCN POINT SUPPLY FAN VFD	CCN POINT EXHAUST FAN VFD
Start-Up Data	MOTOR NOM VOLT	9905	230V,460V,575V	*TBD*	VFD1NVLT	VFD2NVLT
	MOTOR NOM CURR	9906	1.0*In	*TBD*	VFD1NAMP	VFD2NAMP
	MOTOR NOM FREQ	9907	60 Hz	60 Hz	VFD1NFRQ	VFD2NFRQ
	MOTOR NOM SPEED	9908	1750 rpm	1750 rpm	VFD1NRPM	VFD2NRPM
	MOTOR NOM POWER	9909	1.0*Pn	*TBD*	VFD1NPWR	VFD2NPWR
Start/Stop/Dir	DIRECTION	1003	FORWARD	REQUEST	VFD1MDIR	VFD2MDIR
Accel/Decel	ACCELER TIME 1	2202	30.0s	30.0s	VFD1ACCL	VFD2ACCL
	DECELER TIME 1	2203	30.0s	30.0s	VFD1DECL	VFD2DECL
Motor Control	SWITCHING FREQ	2606	4 kHz	8 kHz	VFD1SWFQ	VFD2SWFQ

Table D — VFD Parameters Configured with *Comfort*Link Controls

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	HVAC DEFAULT	CARRIER DEFAULT
Start/Stop/Dir	EXT1 COMMANDS	1001	DI1	COMM (10)
Reference Select	REF1 SELECT	1103	AI1	COMM (8)
Constant Speeds	CONST SPEED SEL	1201	DI3	NOT SEL (0)
	CONST SPEED 7	1208	60 Hz	0 Hz
System Controls	RUN ENABLE	1601	NOT SEL	NOT SEL (0)
	FAULT RESET SEL	1604	KEYPAD	COMM (8)
	START ENABLE 1	1608	DI4	DI4 (4)
Start/Stop	START FUNCTION	2101	SCALAR FLYSTART	AUTO (1)
	STOP FUNCTION	2102	COAST	RAMP (2)
Fault Functions	COMM FAULT FUNC	3018	NOT SEL	CONST SP 7 (2)
	COMM FAULT TIME	3019	10.0 s	10.0 s
Automatic Reset	AR OVERCURRENT	3104	Disable (0)	Disable (0)
	AR OVERVOLTAGE	3105	Enable (1)	Disable (0)
	AR UNDERVOLTAGE	3106	Enable (1)	Disable (0)
	AR AI<MIN	3107	Enable (1)	Disable (0)
	AR EXTERNAL FAULT	3108	Enable (1)	Disable (0)

Table E — VFD *Comfort*Link Control Variables

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	CCN POINT SUPPLY FAN VFD	CCN POINT EXHAUST FAN VFD
Actual Signals	FB STS WORD 1	303	VFD1STAT	VFD2STAT
Not Available	SPEED (%)	Not Available	VFD1_SPD	VFD2_SPD
Operating Data	SPEED	102	VFD1RPM	VFD2RPM
	OUTPUT FREQ	103	VFD1FREQ	VFD2FREQ
	CURRENT	104	VFD1AMPS	VFD2AMPS
	TORQUE	105	VFD1TORQ	VFD2TORQ
	POWER	106	VFD1PWR	VFD2PWR
	DC BUS VOLTAGE	107	VFD1VDC	VFD2VDC
	OUTPUT VOLTAGE	109	VFD1VOUT	VFD2VOUT
	DRIVE TEMP	110	VFD1TEMP	VFD2TEMP
	RUN TIME (R)	114	VFD1RUNT	VFD2RUNT
	KWH COUNTER (R)	115	VFD1KWH	VFD2KWH
	DI1 STATUS	118	VFD1_DI1	VFD2_DI1
	DI2 STATUS	118	VFD1_DI2	VFD2_DI2
	DI3 STATUS	118	VFD1_DI3	VFD2_DI3
	DI4 STATUS	119	VFD1_DI4	VFD2_DI4
	DI5 STATUS	119	VFD1_DI5	VFD2_DI5
	DI6 STATUS	119	VFD1_DI6	VFD2_DI6
	AI1	120	VFD1_AI1	VFD2_AI1
	AI2	121	VFD1_A12	VFD2_A12
Fault History	LAST FAULT	401	VFD1LFC	VFD2LFC

Table F — VFD *Comfort*Link Command Variables

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	CCN POINT SUPPLY FAN VFD	CCN POINT EXHAUST FAN VFD
Actual Signals	FB CMD WORD 1	301	Not Available	Not Available
Not Available	SPEED REF (%)	Not Available	SFAN_VFD	EFAN_VFD
Operating Data	COMM RO WORD - (RELAY OUTPUT 1)	134	VFD1REL1	VFD2REL1
	COMM RO WORD - (RELAY OUTPUT 2)	134	VFD1REL2	VFD2REL2
	COMM RO WORD - (RELAY OUTPUT 3)	134	VFD1REL3	VFD2REL3
	COMM VALUE 1 - (AO1)	135	VFD1_AO1	VFD2_AO1
	COMM VALUE 2 - (AO2)	136	VFD1_AO2	VFD2_AO2

VFD Operation — The VFD keypad is shown in Fig. B. The function of SOFT KEYS 1 and 2 change depending on what is displayed on the screen. The function of SOFT KEY 1 matches the word in the lower left-hand box on the display screen. The function of SOFT KEY 2 matches the word in the lower right-hand box on the display screen. If the box is empty, then the SOFT KEY does not have a function on that specific screen. The UP and DOWN keys are used to navigate through the menus. The OFF key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The HAND key is used to change control of the drive to local (hand held) control. The HELP button is used to access the help screens.

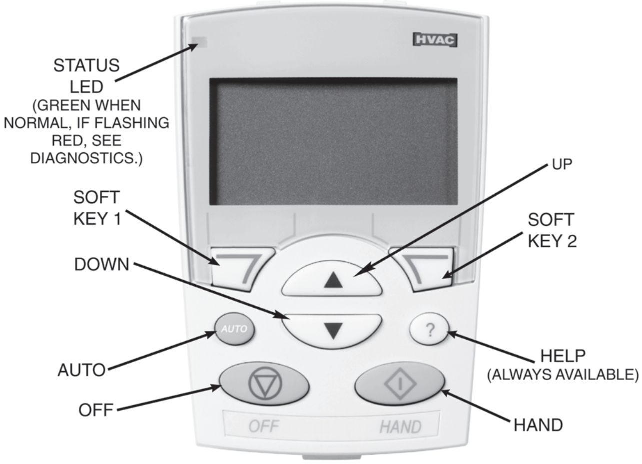


Fig. B — VFD Keypad

START UP WITH CARRIER ASSISTANT — Initial start-up has been performed at the factory. If a VFD has been replaced, start up the VFD with the Carrier Assistant using the following procedure:

NOTE: To change certain VFD parameters, the VFD must be in the OFF mode. To ensure the VFD is in the OFF mode prior to running the Carrier Assistant, it is recommended that you turn the drive OFF manually by pressing the OFF button on the VFD keypad. After completion of the Carrier Assistant, press the AUTO button on the VFD keypad to return to RUN mode.

1. Place the *Comfort*link controls in Service Test mode (***Service Test→TEST*** = ON).
2. With the VFD in the OFF mode, select MENU (SOFT KEY 2). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight ASSISTANTS on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight Carrier Assistant and press SEL (SOFT KEY 2).
5. The Carrier assistant will ask questions to determine the correct parameters for the VFD.
   a. The Carrier Assistant will ask "Select an App 1-3":
      1. Air Handler
      2. Roof Top
      3. Other Application
   b. Use the UP or DOWN keys to highlight Roof Top and press OK (SOFT KEY 2).
   c. The Carrier Assistant will ask "Is this a Hi E or Premium E motor?" :
      Hi E
      Premium E
   d. Use the UP or DOWN keys to highlight the correct motor efficiency and press OK (SOFT KEY 2).
   e. The Carrier Assistant will ask "Is this a Non-LEN VFD or LEN VFD?" :
      Non-LEN VFD
      LEN VFD
   f. Use the UP or DOWN keys to highlight LEN VFD and press OK (SOFT KEY 2).
   g. The Carrier Assistant will ask "Is this an IFM VFD or P.E. motor VFD?" :
      IFM VFD
      P.E. motor VFD
   h. Use the UP or DOWN keys to highlight the correct VFD and press OK (SOFT KEY 2).
6. The keypad will display "Carrier Assistant Complete". The parameters in Table B will now be set correctly. Press OK (SOFT KEY 2) then EXIT (SOFT KEY 1) to return to the Main Menu. Press EXIT (SOFT KEY 1) again to return to the Standard Display mode.
7. To allow the configuration parameters in Tables C and D to be sent to the VFD, power must be cycled to the drive. Cycle power using Service Test mode.
   a. For Supply Fan VFD, set ***Service Test→FANS→S.FAN*** = OFF. Allow VFD to power down completely (approximately 30 seconds) and then turn back ON.
   b. For Exhaust Fan VFD, set ***Service Test→FANS→P.E.1*** = OFF. Allow VFD to power down completely (approximately 30 seconds) and then turn back ON.
8. Press the AUTO button on VFD Keypad.
9. Take the *Comfort*link controls out of Service Test mode (***Service Test→TEST*** = OFF).

START UP BY CHANGING PARAMETERS INDIVIDUALLY — Initial start-up is performed at the factory. To start up the VFD with by changing individual parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFTKEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the application macro "HVAC Default."

VFD Modes — The VFD has several different modes for configuring, operating, and diagnosing the VFD. The modes are:

- Standard Display mode — shows drive status information and operates the drive
- Parameters mode — edits parameter values individually
- Start-up Assistant mode — guides the start up and configuration
- Changed Parameters mode — shows all changed parameters
- Drive Parameter Backup mode — stores or uploads the parameters
- Clock Set mode — sets the time and date for the drive
- I/O Settings mode — checks and edits the I/O settings

STANDARD DISPLAY MODE — Use the standard display mode to read information on the drive status and operate the drive. To reach the standard display mode, press EXIT until the LCD display shows status information as described below. See Fig. C.

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O (X1) or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For Carrier rooftop units, the correct rotation is counterclockwise.

The upper right corner shows the frequency set point that the drive will maintain.

Using parameter group 34, the middle of the LCD display can be configured to display 3 parameter values. The default display shows parameters 0103 (OUTPUT FREQ) in percentages, 0104 (CURRENT) in amperes, and 0120 (AI1) in milliamperes.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

To adjust the speed in HAND mode, press the UP or DOWN buttons (the reference changes immediately). The reference can be modified in the local control (HAND) mode, and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

PARAMETERS MODE — The Parameters mode is used to change the parameters on the drive. To change parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the Carrier application macro.

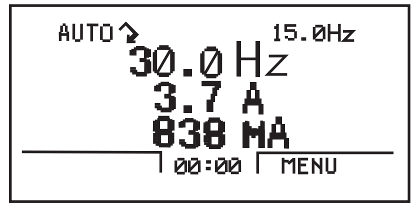


Fig. C — Standard Display Example

START-UP ASSISTANT MODE — To use the Start-Up Assistant, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight ASSISTANTS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight Commission Drive and press SEL (SOFT KEY 2).
4. The Start-Up Assistant will display the parameters that need to be configured. Select the desired values and press SAVE (SOFT KEY 2) after every change. The process will continue until all the parameters are set. The assistant checks to make sure that entered values are in range.

The assistant is divided into separate tasks. The user can activate the tasks one after the other or independently. The tasks are typically done in this order: Application, References 1 and 2, Start/Stop Control, Protections, Constant Speeds, PID Control, Low Noise Setup, Panel Display, Timed Functions, and Outputs.

CHANGED PARAMETERS MODE — The Changed Parameters mode is used to view and edit recently changed parameters on the drive. To view the changed parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight CHANGED PAR on the display screen and press ENTER (SOFT KEY 2). A list of the recently changed parameters will be displayed.
3. Use the UP or DOWN keys to highlight the desired parameter group and press EDIT (SOFT KEY 2) to change the parameter if desired.
4. Press EXIT (SOFT KEY 1) to exit the Changed Parameters mode.

DRIVE PARAMETER BACKUP MODE — The drive parameter back up mode is used to export the parameters from one drive to another. The parameters can be uploaded from a VFD to the removable control panel. The control panel can then be transferred to another drive and the parameters downloaded into memory.

Depending on the motor and application, there are two options available. The first option is to download all parameters. This copies both application and motor parameters to the drive from the control panel. This is recommended when using the same application for drives of the same size. This can also be used to create a backup of the parameters group for the drive.

The second option downloads only the application parameters to the drive. This is recommended when using the same application for drives of different sizes. Parameters 9905, 9906, 9907, 9908, 9909, 1605, 1607, 5201, and group 51 parameters and internal motor parameters are not copied.

Upload All Parameters — To upload and store parameters in the control panel from the VFD, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight UPLOAD TO PANEL and press SEL (SOFT KEY 2).
4. The text "Copying Parameters" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
5. When the upload is complete, the text "Parameter upload successful" will be displayed.
6. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
7. The control panel can now be disconnected from the drive.

Download All Parameters — To download all parameters from the control panel to the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (SOFT KEY 2). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight DOWNLOAD TO DRIVE ALL and press SEL (SOFT KEY 2).
5. The text "Restoring Parameters" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
8. The control panel can now be disconnected from the drive.

Download Application Parameters — To download application parameters only to the control panel from the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (SOFT KEY 2). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight DOWNLOAD APPLICATION and press SEL (SOFT KEY 2).
5. The text "Downloading Parameters (partial)" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
8. The control panel can now be disconnected from the drive.

CLOCK SET MODE — The clock set mode is used for setting the date and time for the internal clock of the VFD. In order to use the timer functions of the VFD control, the internal clock must be set. The date is used to determine weekdays and is visible in the fault logs.

To set the clock, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight CLOCK SET on the display screen and press ENTER (SOFT KEY 2). The clock set parameter list will be displayed.
3. Use the UP or DOWN keys to highlight CLOCK VISIBILITY and press SEL (SOFT KEY 2). This parameter is used to display or hide the clock on the screen. Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
4. Use the UP or DOWN keys to highlight SET TIME and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the hours and minutes. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
5. Use the UP or DOWN keys to highlight TIME FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
6. Use the UP or DOWN keys to highlight SET DATE and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the day, month, and year. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
7. Use the UP or DOWN keys to highlight DATE FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
8. Press EXIT (SOFT KEY 1) twice to return to the main menu.

I/O SETTINGS MODE — The I/O Settings mode is used for viewing and editing the I/O settings.

To configure the I/O settings, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight I/O SETTINGS on the display screen and press ENTER (SOFT KEY 2). The I/O Settings parameter list will be displayed.
3. Use the UP or DOWN keys to highlight the desired I/O setting and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to select the parameter to view. Press OK (SOFT KEY 2).
5. Use the UP or DOWN keys to change the parameter setting. Press SAVE (SOFT KEY 2) to save the configuration. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
6. Press EXIT (SOFT KEY 1) twice to return to the main menu.

Third Party Controls — For conversion to third party control of the VFD, perform the following procedure:

1. Remove the factory-installed jumper between X1-10 and X1-13 (control of VFD start/stop).
2. Remove the factory-installed jumper between X1-10 and X1-16 and replace with a normally closed safety contact for control of VFD start enable.

3. Install speed signal wires to AI-1 and AGND. This input is set at the factory for a 4 to 20 mA signal. If a 0 to 10 vdc signal is required, change DIP switch J1 (located above the VFD control terminal strip) to OFF (right position to left position) and change parameter 1301 to 0% from 20%.

VFD Diagnostics — The drive detects error situations and reports them using:

- the green and red LEDs on the body of the drive (located under the keypad)
- the status LED on the control panel
- the control panel display
- the Fault Word and Alarm Word parameter bits (parameters 0305 to 0309)

The form of the display depends on the severity of the error. The user can specify the severity for many errors by directing the drive to ignore the error situation, report the situation as an alarm, or report the situation as a fault.

FAULTS (RED LED LIT) — The VFD signals that it has detected a severe error, or fault, by:

- enabling the red LED on the drive (LED is either steady or flashing)
- setting an appropriate bit in a Fault Word parameter (0305 to 0307)
- overriding the control panel display with the display of a fault code
- stopping the motor (if it was on)
- sets an appropriate bit in Fault Word parameter 0305-0307.

The fault code on the control panel display is temporary. Pressing the MENU, ENTER, UP button or DOWN buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched and the fault is still active.

ALARMS (GREEN LED FLASHING) — For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

- flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
- sets an appropriate bit in an Alarm Word parameter (0308 or 0309)
- overrides the control panel display with the display of an alarm code and/or name

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists.

CORRECTING FAULTS — The recommended corrective action for faults is shown in the Fault Codes Table G. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter 1604 (FAULT RESET SELECT), digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

HISTORY — For reference, the last three fault codes are stored into parameters 0401, 0412, 0413. For the most recent fault (identified by parameter 0401), the drive stores additional data (in parameters 0402 through 0411) to aid in troubleshooting a problem. For example, a parameter 0404 stores the motor speed at the time of the fault. To clear the fault history (all of Group 04, Fault History parameters), perform the following procedure:

1. In the control panel, Parameters mode, select parameter 0401.
2. Press EDIT.
3. Press the UP and DOWN buttons simultaneously.
4. Press SAVE.

CORRECTING ALARMS — To correct alarms, first determine if the Alarm requires any corrective action (action is not always required). Use Table H to find and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact ABB Automation Inc., at 1-800-435-7365, option 4, option 3. A qualified technician will review the problem with the caller and make a determination regarding how to proceed. This may involve dispatching a designated service station (DSS) representative from an authorized station, dispatching a replacement unit, or advising return for repair.

VFD Maintenance — If installed in an appropriate environment, the VFD requires very little maintenance.

Table I lists the routine maintenance intervals recommended by Carrier.

HEAT SINK — The heat sink fins accumulate dust from the cooling air. Since a dusty sink is less efficient at cooling the drive, overtemperature faults become more likely. In a normal environment check the heat sink annually, in a dusty environment check more often.

Check the heat sink as follows (when necessary):

1. Remove power from drive.
2. Remove the cooling fan.
3. Blow clean compressed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. If there a risk of the dust entering adjoining equipment, perform the cleaning in another room.
4. Replace the cooling fan.
5. Restore power.

MAIN FAN REPLACEMENT — The main cooling fan of the VFD has a life span of about 60,000 operating hours at maximum rated operating temperature and drive load. The expected life span doubles for each 18°F drop in the fan temperature (fan temperature is a function of ambient temperatures and drive loads).

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heat sink temperature in spite of heat sink cleaning. If the drive is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from Carrier.

To replace the main fan for frame sizes R1 through R4, perform the following (see Fig. D):

1. Remove power from drive.
2. Remove drive cover.
3. For frame sizes R1 and R2, press together the retaining clips on the fan cover and lift. For frame sizes R3 and R4, press in on the lever located on the left side of the fan mount, and rotate the fan up and out.
4. Disconnect the fan cable.
5. Install the new fan by reversing Steps 2 to 4.
6. Restore power.

To replace the main fan for frame sizes R5 and R6, perform the following (see Fig. E):

1. Remove power from drive.
2. Remove the screws attaching the fan.
3. Disconnect the fan cable.
4. Install the fan in reverse order.
5. Restore power.

INTERNAL ENCLOSURE FAN REPLACEMENT — The VFD IP 54 / UL Type 12 enclosures have an additional internal fan to circulate air inside the enclosure.

To replace the internal enclosure fan for frame sizes R1 to R4, perform the following (see Fig. F):

1. Remove power from drive.
2. Remove the front cover.
3. The housing that holds the fan in place has barbed retaining clips at each corner. Press all four clips toward the center to release the barbs.
4. When the clips/barbs are free, pull the housing up to remove from the drive.
5. Disconnect the fan cable.
6. Install the fan in reverse order, noting the following: the fan airflow is up (refer to arrow on fan); the fan wire harness is toward the front; the notched housing barb is located in the right-rear corner; and the fan cable connects just forward of the fan at the top of the drive.

To replace the internal enclosure fan for frame sizes R5 or R6, perform the following:

1. Remove power from drive.
2. Remove the front cover.
3. Lift the fan out and disconnect the cable.
4. Install the fan in reverse order.
5. Restore power.

CONTROL PANEL CLEANING — Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

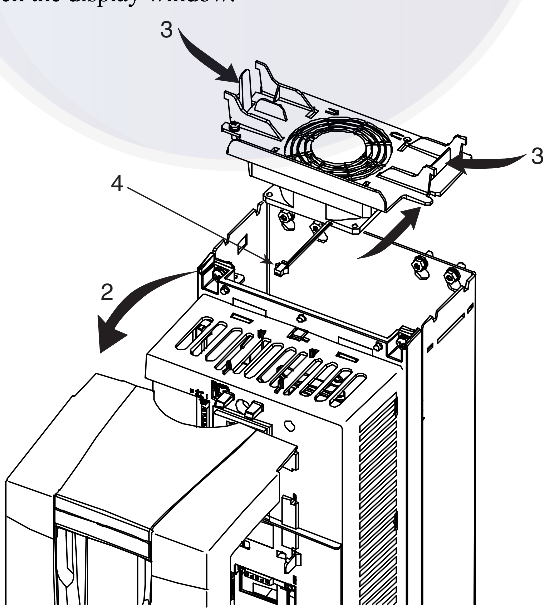


Fig. D — Main Fan Replacement (Frame Sizes R1-R4)

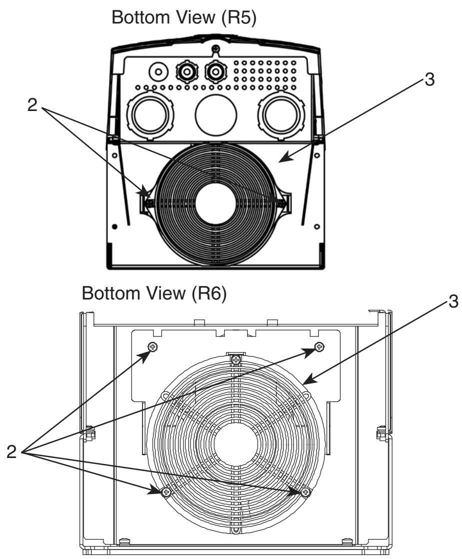


Fig. E — Main Fan Replacement (Frame Sizes R5 and R6)

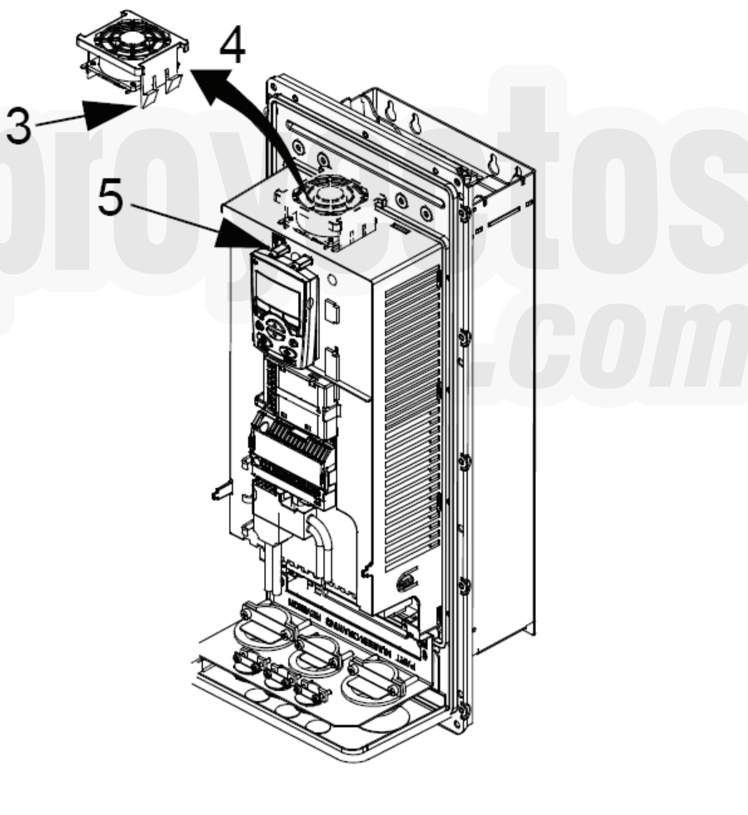


Fig. F — Internal Enclosure Fan Replacement

BATTERY REPLACEMENT — A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

Table G — Fault Codes

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1	OVERCURRENT	Output current is excessive. Check for excessive motor load, insufficient acceleration time (parameters 2202 ACCELER TIME 1, default 30 seconds), or faulty motor, motor cables or connections.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for static or transient over voltages in the input power supply, insufficient deceleration time (parameters 2203 DECELER TIME 1, default 30 seconds), or undersized brake chopper (if present).
3	DEV OVERTEMP	Drive heat sink is overheated. Temperature is at or above 115°C (239°F). Check for fan failure, obstructions in the air flow, dirt or dust coating on the heat sink, excessive ambient temperature, or excessive motor load.
4	SHORT CIRC	Fault current. Check for short-circuit in the motor cable(s) or motor or supply disturbances.
5	OVERLOAD	Inverter overload condition. The drive output current exceeds the ratings.
6	DC UNDERVOLT	Intermediate circuit DC voltage is not sufficient. Check for missing phase in the input power supply, blown fuse, or under voltage on main circuit.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1 FLT LIMIT (3021). Check source and connection for analog input and parameter settings for AI1 FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2 FLT LIMIT (3022). Check source and connection for analog input and parameter settings for AI2 FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT OVERTEMP	Motor is too hot, as estimated by the drive. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
10	PANEL LOSS	Panel communication is lost and either drive is in local control mode (the control panel displays LOC), or drive is in remote control mode (REM) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check the communication lines and connections. Check parameter 3002 PANEL COMM ERROR, parameters in Group 10: Command Inputs and Group 11:Reference Select (if drive operation is REM).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check motor connections.
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for excessive load or insufficient motor power. Check parameters 3010 through 3012.
13	RESERVED	Not used.
14	EXT FAULT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXT FAULT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 2.
16	EARTH FAULT	The load on the input power system is out of balance. Check for faults in the motor or motor cable. Verify that motor cable does not exceed maximum specified length.
17	UNDERLOAD	Motor load is lower than expected. Check for disconnected load. Check parameters 3013 UNDERLOAD FUNCTION through 3015 UNDERLOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact Carrier.
19	OPEX LINK	Internal fault. A communication-related problem has been detected between the OMIO and OINT boards. Contact Carrier.
20	OPEX PWR	Internal fault. Low voltage condition detected on the OINT board. Contact Carrier.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact Carrier.
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for missing main phase or blown fuse.
23	RESERVED	Not used.
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED parameters. Check parameter settings for 2001 and 2002. Check adequacy of motor braking torque. Check applicability of torque control. Check brake chopper and resistor.
25	RESERVED	Not used.
26	DRIVE ID	Internal fault. Configuration block drive ID is not valid.
27	CONFIG FILE	Internal configuration file has an error. Contact Carrier.
28	SERIAL 1 ERR	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
29	EFB CON FILE	Error in reading the configuration file for the field bus adapter.
30	FORCE TRIP	Fault trip forced by the field bus. See the field bus reference literature.
31	EFB 1	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
32	EFB 2	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
33	EFB 3	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
34	MOTOR PHASE	Fault in the motor circuit. One of the motor phases is lost. Check for motor fault, motor cable fault, thermal relay fault (if used), or internal fault.
35	OUTP WIRING	Error in power wiring suspected. Check that input power wired to drive output. Check for ground faults.
101-105	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.
201-206	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.
1000	PAR HZRPM	Parameter values are inconsistent. Check for any of the following: 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: -128/+128 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: -128/+128 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: -128/+128 2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: -128/+128
1001	PAR PFA REFNG	Parameter values are inconsistent. Check that 2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
1002	PAR PFA IOCNF	Parameter values are inconsistent. The number of programmed PFA relays does not match with Interlock configuration, when 8123 PFA ENABLE is active. Check consistency of RELAY OUTPUT parameters 1401 through 1403, and 1410 through 1412. Check 8117 NR OF AUX MOTORS, 8118 AUTOCHANGE INTERV, and 8120 INTERLOCKS.
1003	PAR AI SCALE	Parameter values are inconsistent. Check that parameter 1301 AI 1 MIN > 1302 AI 1 MAX and that parameter 1304 AI 2 MIN > 1305 AI 2 MAX.
1004	PAR AO SCALE	Parameter values are inconsistent. Check that parameter 1504 AO 1 MIN > 1505 AO 1 MAX and that parameter 1510 AO 2 MIN > 1511 AO 2 MAX.
1005	PAR PCU 2	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check the following parameters: 1.1 < (9906 MOTOR NOM CURR * 9905 MOTOR NOM VOLT * 1.73 / PN) < 2.6 Where: PN = 1000 * 9909 MOTOR NOM POWER (if units are kW) or PN = 746 * 9909 MOTOR NOM POWER (if units are HP, e.g., in US)
1006	PAR EXT RO	Parameter values are inconsistent. Check the extension relay module for connection and 1410 through 1412 RELAY OUTPUTS 4 through 6 have non-zero values.
1007	PAR FBUS	Parameter values are inconsistent. Check that a parameter is set for field bus control (e.g., 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
1008	PAR PFA MODE	Parameter values are inconsistent. The 9904 MOTOR CTRL MODE must be = 3 (SCALAR SPEED), when 8123 PFA ENABLE is activated.
1009	PAR PCU 1	Parameter values for power control are inconsistent or improper motor nominal frequency or speed. Check for both of the following: 1 < (60 * 9907 MOTOR NOM FREQ / 9908 MOTOR NOM SPEED < 16 0.8 < 9908 MOTOR NOM SPEED / (120 * 9907 MOTOR NOM FREQ / Motor poles) < 0.992
1010	OVERRIDE/PFA CONFLICT	Override mode is enabled and PFA is activated at the same time. This cannot be done because PFA interlocks cannot be observed in the override mode.

Table H — Alarm Codes

ALARM CODE	ALARM NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
2001	—	Reserved
2002	—	Reserved
2003	—	Reserved
2004	DIR LOCK	The change in direction being attempted is not allowed. Do not attempt to change the direction of motor rotation, or Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check input source and connections. Check the parameter that sets the minimum (3021) and the parameter that sets the Alarm/Fault operation (3001).
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check input source and connections. Check parameter that sets the minimum (3022) and the parameter that sets the Alarm/Fault operation (3001).
2008	PANEL LOSS	Panel communication is lost and either the VFD is in local control mode (the control panel displays HAND), or the VFD is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct, check the communication lines and connections, Parameter 3002 PANEL LOSS, and parameters in groups 10 COMMAND INPUTS and 11 REFERENCE SELECT (if drive operation is REM).
2009	—	Reserved
2010	MOT OVERTEMP	Motor is hot, based on either the VFD estimate or on temperature feedback. This alarm warns that a Motor Overload fault trip may be near. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check that the motor and drive ratings match (motor is NOT undersized for the drive). Check the settings on parameters 3013 to 3015.
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013*	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. To control automatic reset, use parameter group 31 (AUTOMATIC RESET).
2014*	AUTOCHANGE	This alarm warns that the PFA autochange function is active. To control PFA, use parameter group 81 (PFA) and the Pump Alternation macro.
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start any motor (when Autochange is used), or a speed regulated motor (when Autochange is not used).
2016	—	Reserved
2017*	OFF BUTTON	This alarm indicates that the OFF button has been pressed.
2018*	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. To control PID sleep, use parameters 4022 through 4026 or 4122 through 4126.
2019	ID RUN	The VFD is performing an ID run.
2020	OVERRIDE	Override mode is activated.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. To control Start Enable 1 function, use parameter 1608. To correct, check the digital input configuration and the communication settings.
2022	START ENABLE 2 MISSING	This alarm warns that the Start Enable 2 signal is missing. To control Start Enable 2 function, use parameter 1609. To correct, check the digital input configuration and the communication settings.
2023	EMERGENCY STOP	Emergency stop is activated.

*This alarm is not indicated by a relay output, even when the relay output is configured to indicate alarm conditions (parameter 1401 RELAY OUTPUT = 5 (ALARM) or 16 (FLT/ALARM).

Table I — Maintenance Intervals

MAINTENANCE	INTERVAL
Heat Sink Temperature Check and Cleaning	Every 6 to 12 months (depending on the dustiness of the environment)
Main Cooling Fan Replacement	Every five years
Internal Enclosure Cooling Fan Replacement	Every three years
Capacitor Change (Frame Size R5 and R6)	Every ten years
HVAC Control Panel Battery Change	Every ten years

APPENDIX E — MODE SELECTION PROCESS

The following section is to be used in conjunction with Fig. 4 on page 42. To help determine why the unit controls are in a certain mode, the programming logic is provided below. The software will proceed, step by step, until a mode is reached. If an "If" statement is true, then that mode will be entered. The "Else" statement refers to other possible choices.

If the System Mode is OFF:

{

If the fire shut down input (***Inputs→FIRE→FSD***) is in "alarm":

HVAC mode: ("Fire Shut Down") OFF

Else

HVAC mode: ("Disabled ") OFF

}

Else If: The rooftop is not in "factory test" and a fire smoke-control mode is "alarming":

{

If the pressurization input (***Inputs→FIRE→PRES***) is in "alarm":

HVAC mode: ("Pressurization ")

Else If:The evacuation input (***Inputs→FIRE→EVAC***) is in "alarm":

HVAC mode: ("Evacuation ")

Else If: The smoke purge input (***Inputs→FIRE→PURG***) is in "alarm":

HVAC mode: ("Smoke Purge ")

}

Else If: Someone changed the machine's control type (***Configuration→UNIT→C.TYP***) during run time, a 15 second delay is called out:

{

HVAC mode: ("Disabled ") OFF

}

Else If: The System Mode is TEST:

{

HVAC mode: ("Test ")

}

Else If: The "soft stop" command (***Service Test→S.STP)*** is forced to *YES*:

{

HVAC mode: ("SoftStop Request")

}

Else If: The remote switch config (***Configuration→ UNIT→RM.CF)***=2; "start/stop", and the remote input state (***Inputs→GEN.I→REMT***)=ON:

{

HVAC mode: ("Rem. Sw. Disable") OFF

}

Else If: Configured for hydronic heat (***Configuration→ HEAT→HT.CF***=4) or configured for dehumidification with modulating valve reheat (***Configuration→ DEHU→D.SEL***=1) and the freeze stat switch trips (***Inputs→GEN.I→FRZ.S*** = ALRM)

{

HVAC mode: ("Freeze Stat Trip")

}

Else If: Configured for static pressure control (***Configuration→SP→SP.CF*** = *1,2*) and the static pressure sensor (***Pressures→AIR.P→SP***) fails:

{

HVAC mode: ("Static Pres.Fail") OFF

}

Else If: Configured for supply fan status monitoring (***Configuration→UNIT→SFS.M*** = *1,2*) and configured to shut the unit down on fan status fail (***Configuration→UNIT→SFS.S*** = YES)

{

HVAC mode: ("Fan Status Fail ") OFF

Else If: Configured for return fan tracking (***Configuration→BP→BP.CF*** **=** 5) and there is a plenum pressure switch error

HVAC mode: ("Plen.Press.Fail ") OFF

}

Else If: The unit is just waking up from a power reset

{

HVAC mode: ("Starting Up ") OFF

}

Else If: A compressor is diagnosed as being "Stuck On"

{

HVAC mode: ("Comp. Stuck On ")

Else: The control is free to select the normal heating/cooling HVAC modes:

}

HVAC mode: ("Off ")

— The unit is off and no operating modes are active.

HVAC mode: ("Tempering Vent ")

— The economizer is at minimum vent position but the supply air temperature has dropped below the tempering vent set point. Gas or hydronic heat is used to temper the ventilation air.

HVAC mode: ("Tempering LoCool")

— The economizer is at minimum vent position but the combination of the outside-air temperature and the economizer position has dropped the supply-air temperature below the tempering cool set point. Gas or hydronic heat is used to temper the ventilation air.

HVAC mode: ("Tempering HiCool")

— The economizer is at minimum vent position but the combination of the outside air temperature and the economizer position has dropped the supply air temperature below the tempering cool set point. Gas or hydronic heat is used to temper the ventilation air.

HVAC mode: ("Re-Heat ")

— The unit is operating in dehumidification with a reheat device.

HVAC mode: ("Dehumidification")

— The unit is operating in the Dehumidification mode.

APPENDIX E — MODE SELECTION PROCESS (cont)

HVAC mode: ("Vent ")

— This is a normal operation mode where no heating or cooling is required and outside air is being delivered to the space to control IAQ levels.

HVAC mode: ("Low Cool ")

— This is a normal cooling mode when a low cooling demand exists.

HVAC mode: ("High Cool ")

— This is a normal cooling mode when a high cooling demand exists.

HVAC mode: ("Low Heat ")

— This is a normal heating mode when a low heating demand exists.

HVAC mode: ("High Heat ")

— This is a normal heating mode when a low heating demand exists.

HVAC mode: ("Unocc. Free Cool")

— In this mode the unit will operate in cooling but will be using the economizer for free cooling. Entering this mode will depend on the status of the outside air. The unit can be configured for outside air changeover, differential dry bulb changeover, outside air enthalpy changeover, differential enthalpy changeover, or a custom arrangement of enthalpy/dewpoint and dry bulb. See the Economizer section for further details.

NOTE: There is also a transitional mode whereby the machine may be waiting for relay timeguards to expire before shutting the machine completely down:

HVAC mode: ("Shutting Down ")

APPENDIX F — UPC OPEN CONTROLLER

The following section is used to configure the UPC Open controller. The UPC Open controller is mounted in a separate enclosure below the main control box.

To Address the UPC Open Controller — The user must give the UPC Open controller an address that is unique on the BACnet[1] 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. G and H), 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. G, 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.

1. BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).

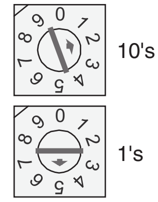


Fig. G — Address Rotary Switches

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.

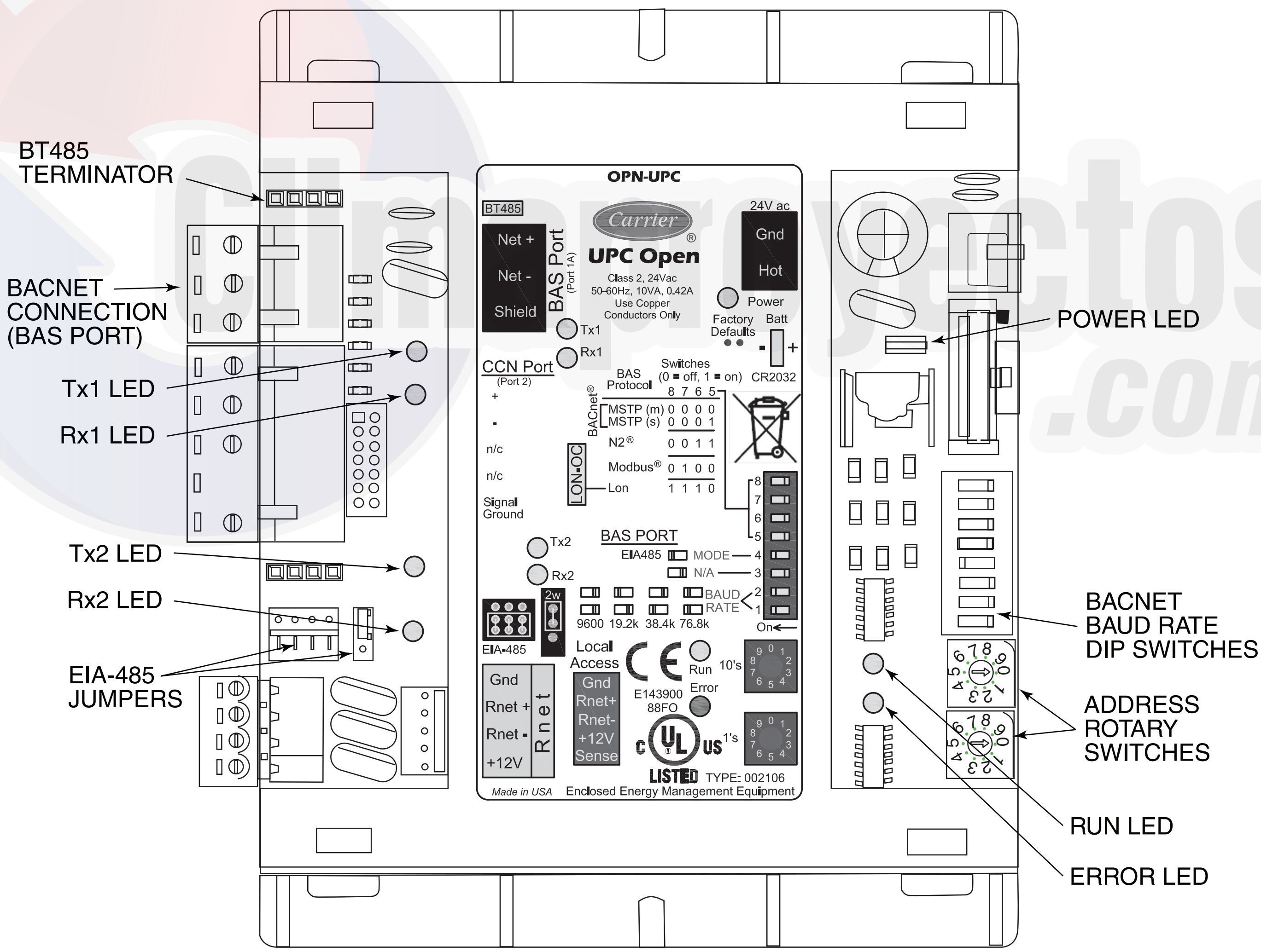


Fig. H — UPC Open Controller

Configure 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 J.

Table J — 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. I shows the BAS Port DIP Switches set for 76.8k (Carrier default) and MS/TP.

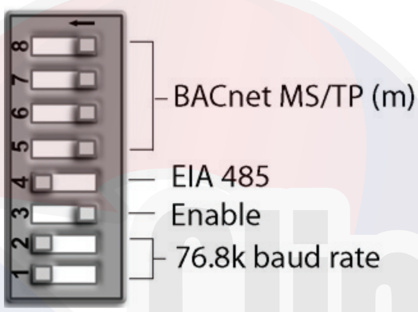


Fig. I — DIP Switches

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 Fig. I and Table K.

Table K — 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.

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.

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. H, J, and K.

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.

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, consult Commercial Products i-Vu® Open Control System Master Prices.

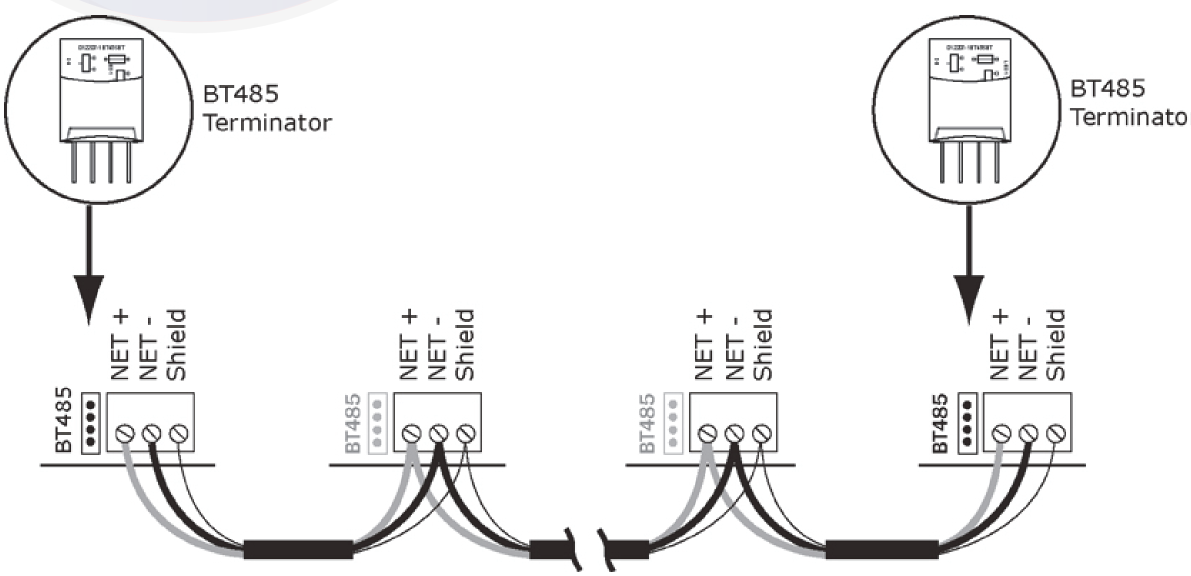


Fig. J — Network Wiring

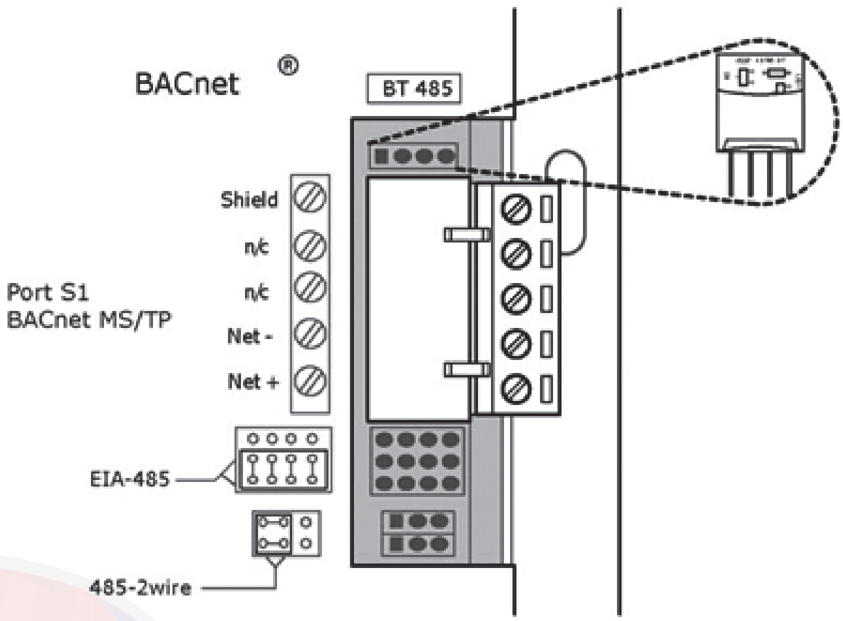


Fig. K — BT485 Terminator Installation

MS/TP Wiring Recommendations — Recommendations are shown in Tables L and M. The wire jacket and UL temperature rating specifications list two acceptable alternatives. The Halar[1] specification has a higher temperature rating and a tougher outer jacket than the SmokeGard[2] 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.

Local Access to the UPC Open Controller — The user can use a BACview[6] 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 BACview[6] unit connects to the local access port on the UPC Open controller. See Fig. L. 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 BACview[6] device.

To order a BACview[6] Handheld (BV6H), consult Commercial Products i-Vu Open Control System Master Prices.

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.

1. Halar is a registered trademark of Solvay Plastics.
2. SmokeGard is a trademark of AlphaGary-Mexichem Corp.

The following configurations are used to set the CCN Address and Bus number in the *Comfort*Link control. These configurations can be changed using the scrolling marquee display or accessory Navigator handheld device.

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 BACview[6] display.

Navigation: BACview→CCN

Home: Element Comm Stat

Element: 1

Bus: 0

Troubleshooting — If there are problems wiring or addressing the UPC Open controller, contact Carrier Technical Support.

COMMUNICATION LEDS — The LEDs indicate if the controller is communicating with the devices on the network. See Tables N and O. 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. H for location of LEDs on UPC Open module.

REPLACING THE UPC OPEN BATTERY — The UPC Open controller's 10-year lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages.

> IMPORTANT: Power must be **ON** to the UPC Open when replacing the battery, or the date, time, and trend data will be lost.

Remove the battery from the controller, making note of the battery's polarity. Insert the new battery, matching the battery's polarity with the polarity indicated on the UPC Open controller.

Table L — 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

Table M — 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
MS/TP Network (RS-485)	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

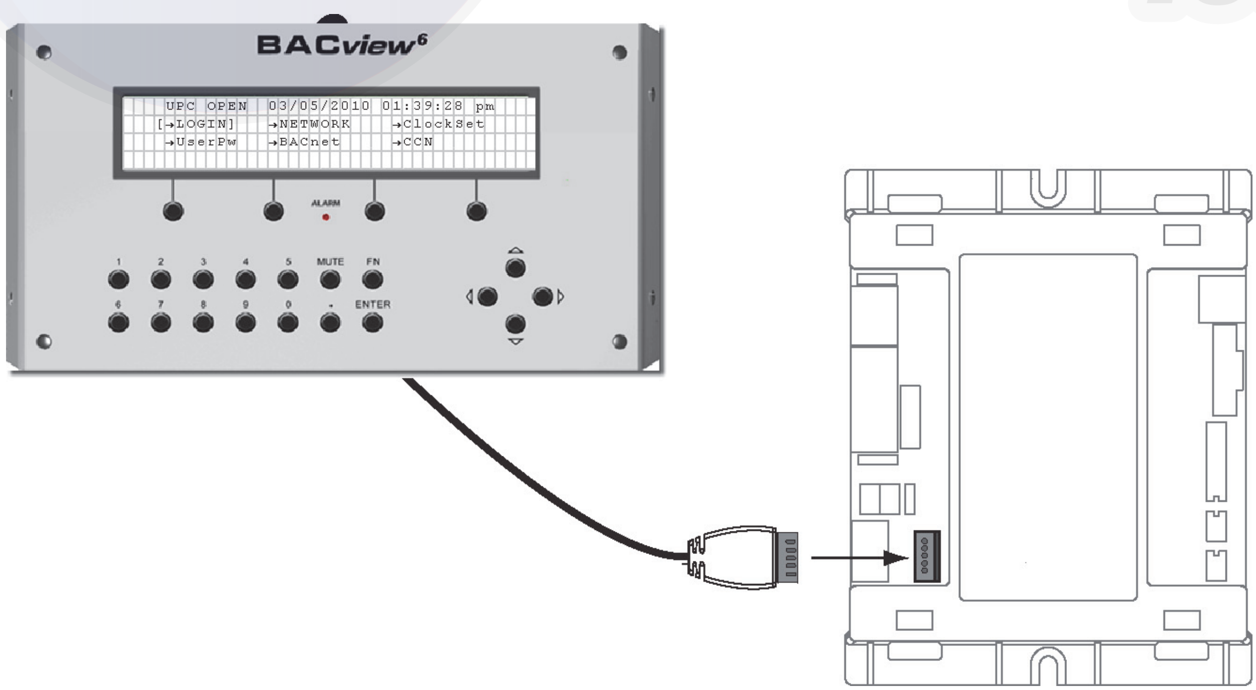


Fig. L — BACview⁶ Device Connection

Table N — 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 O.
Error	Lights based on controller status. See Table O.

Table O — 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

APPENDIX F — UPC OPEN CONTROLLER (cont)

NETWORK POINTS LIST

POINT DESCRIPTION	CNN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Active Demand Limit	DEM_LIM	W	%		0 - 100	AV:9	dem_lim_1
Air Temp Lvg Evap Coil	CCT	R	dF		-40 - 240	AV:11	cct_1
Air Temp Lvg Supply Fan	SAT	R	dF		-40 - 240	AV:10	sat_1
Airside Linkage Alarm		R				BV:7030	air_linkage_fail_1
Alarm State		R			n/a	BV:9	alm_1
BP 1 Command Position	BP1_CPOS	R	%		0 - 100	AV:12	b1_cpos_1
BP 2 Command Position	BP2_CPOS	R	%		0 - 100	AV:13	b2_cpos_1
BP Setpoint Offset	BPSO	W	H2O	0.05	0 - 0.5	AV:17	bpso_1
BP VFD Maximum Speed	BLDGPMAX	W	%	100	0 - 100	AV:14	bldgpmax_1
Building Pressure	BP	R	H2O		-20 - 20	AV:1070	bldg_statis_press_1
Building Pressure Setp.	BPSP	W	H2O	0.05	-0.25 - 0.25	AV:3070	bldg_press_stpt_1
Bypass EXV Position	BYP_EXV	R	%		0 - 100	AV:16	byp_exv_1
Capacity Clamp Mode	CAPMODE	R			0 - 1	BV:10	capmode_1
Capacity Load Factor	SMZ	R			-400 - 400	AV:22	smz_1
Capacity Threshold Adj	Z_GAIN	W		1	0.1 - 10	AV:23	z_gain_1
Cir A Discharge Pressure	DP_A	R	PSIG		-14 - 750	AV:1601	discharge_press_a_1
Cir A Sat. Condensing Temperature	SCTA	R	dF		-40 - 240	AV:1602	sat_cond_temp_a_1
Cir A Sat. Suction Temperature	SSTA	R	dF		-40 - 240	AV:1603	sat_suction_temp_a_1
Cir A Suction Pressure	SP_A	R	PSIG		-14 - 750	AV:1600	suction_press_a_1
Cir B Discharge Pressure	DP_B	R	PSIG		-14 - 750	AV:1605	discharge_press_b_1
Cir B Sat. Condensing Temperature	SCTB	R	dF		-40 - 240	AV:1606	sat_cond_temp_b_1
Cir B Sat. Suction Temperature	SSTB	R	dF		-40 - 240	AV:1607	sat_suction_temp_b_1
Cir B Suction Pressure	SP_B	R	PSIG		-14 - 750	AV:1604	suction_press_b_1
Circ A High Press.Switch	CIRCAHPS	R			0 - 1	BV:3	circahps_1
Circ B High Press.Switch	CIRCBHPS	R			0 - 1	BV:12	circbhps_1
Compressor A1 Capacity	CMPA1CAP	R	%		0 - 100	AV:18	cmpa1cap_1
Compressor A1 Relay	CMPA1	R			0 - 1	BV:16	cmpa1_1
Compressor A1 Run Hours	HR_A1	R	hr		0 - 999999.9	AV:24	hr_a1_1
Compressor A1 Starts	CY_A1	R			0 - 999999	AV:25	cy_a1_1
Compressor A1 Strikes	CMPA1STR	R			0 - 3	AV:26	cmpa1str_1
Compressor A2 Relay	CMPA2	R			0 - 1	BV:17	cmpa2_1
Compressor A2 Run Hours	HR_A2	R	hr		0 - 999999.9	AV:28	hr_a2_1
Compressor A2 Starts	CY_A2	R			0 - 999999	AV:29	cy_a2_1
Compressor A2 Strikes	CMPA2STR	R			0 - 3	AV:30	cmpa2str_1
Compressor A3 Relay	CMPA3	R			0 - 1	BV:13	cmpa3_1
Compressor A3 Run Hours	HR_A3	R	hr		0 - 999999.9	AV:19	hr_a3_1
Compressor A3 Starts	CY_A3	R			0 - 999999	AV:20	cy_a3_1
Compressor A3 Strikes	CMPA3STR	R			0 - 3	AV:21	cmpa3str_1
Compressor B1 Relay	CMPB1	R			0 - 1	BV:18	cmpb1_1
Compressor B1 Run Hours	HR_B1	R	hr		0 - 999999.9	AV:32	hr_b1_1
Compressor B1 Starts	CY_B1	R			0 - 999999	AV:33	cy_b1_1
Compressor B1 Strikes	CMPB1STR	R			0 - 3	AV:34	cmpb1str_1
Compressor B2 Relay	CMPB2	R			0 - 1	BV:19	cmpb2_1
Compressor B2 Run Hours	HR_B2	R	hr		0 - 999999.9	AV:36	hr_b2_1
Compressor B2 Starts	CY_B2	R			0 - 999999	AV:37	cy_b2_1
Compressor B2 Strikes	CMPB2STR	R			0 - 3	AV:38	cmpb2str_1
Compressor B3 Relay	CMPB3	R			0 - 1	BV:14	cmpb3_1
Compressor B3 Run Hours	HR_B3	R	hr		0 - 999999.9	AV:27	hr_b3_1
Compressor B3 Starts	CY_B3	R			0 - 999999	AV:31	cy_b3_1
Compressor B3 Strikes	CMPB3STR	R			0 - 3	AV:35	cmpb3str_1

See legend on page 235.

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	CNN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Compressor Lockout Temp	OATLCOMP	W	dF	40	-20 - 55	AV:40	oatlcomp_1
Condenser EXV Position	COND_EXV	R	%		0 - 100	AV:39	cond_exv_1
Condenser Fan Output 1	CONDFAN1	R			0 - 1	BV:15	condfan1_1
Condenser Fan Output 2	CONDFAN2	R			0 - 1	BV:21	condfan2_1
Condenser Fan Output 3	CONDFAN3	R			0 - 1	BV:23	condfan3_1
Condenser Fan Output 4	CONDFAN4	R			0 - 1	BV:24	condfan4_1
Controlling Return Air Temp	RETURN_T	W	dF		-40 - 240	AV:1030	ra_temp_1
Controlling Space Temp	SPACE_T	W	dF		-40 - 240	AV:2007	space_temp_1
Cool Mode Not In Effect?	COOL_OFF	R			0 - 1	BV:20	cool_off_1
Cooling Control Point	COOLCPNT	R	dF		-20 - 140	AV:1024	cool_ctrl_point_1
Cooling Occupied Setpoint	OCSP	W	dF		40 - 99	AV:3001	occ_cl_stpt_1
Cooling Unoccupied Setpoint	UCSP	W	dF		40 - 110	AV:3003	unocc_cl_stpt_1
Ctl.Temp RAT,SPT or ZONE	CTRLTEMP	R			0 - 100	AV:43	ctrltemp_1
Current Running Capacity	CAPTOTAL	R	%		0 - 100	AV:1023	cool_capacity_1
Current Running Capacity (Heat)	HTSG_CAP	R	%		0 - 100	AV:44	htsg_cap_1
Currently Occupied	MODEOCCP	R			0 - 1	BV:37	modeoccp_1
Currently Occupied ?	MODE_OCC	R			0 - 1	BV:39	mode_occ_1
DBC - OAT Lockout?	DBC_STAT	R			0 - 1	BV:25	dbc_stat_1
DCV Resetting Min Pos	MODEADCV	R			0 - 1	BV:26	modeadcv_1
DDBC- OAT > RAT Lockout?	DDBCSTAT	R			0 - 1	BV:27	ddbcstat_1
DEC - Diff.Enth.Lockout?	DEC_STAT	R			0 - 1	BV:28	dec_stat_1
Dehumid. Disabled Econ.?	DHDISABL	R			0 - 1	BV:29	dhdisabl_1
Dehumidify Cool Setpoint	DHCOOLSP	W	dF	45	40 - 55	AV:49	dhcoolsp_1
Dehumidify Input	DHDISCIN	W			0 - 1	BV:30	dhdiscin_1
Dehumidify RH Setpoint	DHRELHSP	W	%	55	10 - 90	AV:50	dhrelhsp_1
Demand Limit In Effect	MODEDMLT	R			0 - 1	BV:31	modedmlt_1
Demand Limit Sw.1 Setpt.	DLSWSP1	W	%	80	0 - 100	AV:53	dlswsp1_1
Demand Limit Sw.2 Setpt.	DLSWSP2	W	%	50	0 - 100	AV:54	dlswsp2_1
Demand Limit Switch 1	DMD_SW1	W			0 - 1	BV:1006	dmd_sw1_1
Demand Limit Switch 2	DMD_SW2	W			0 - 1	BV:1007	dmd_sw2_1
DEW - OA Dewpt.Lockout?	DEW_STAT	R			0 - 1	BV:32	dew_stat_1
Diff.Air Quality in PPM	DAQ	R			0 - 5000	AV:56	daq_1
Dmd Level Low Cool ON	DMDLCON	W	^F	1.5	0 - 2	AV:63	dmdlcon_1
Dmd Level Low Heat ON	DMDLHON	W	^F	1.5	0 - 2	AV:64	dmdlhon_1
Dmd Level(-) Low Cool OFF	DMDLCOFF	W	^F	1	0.5 - 2	AV:59	dmdlcoff_1
Dmd Level(-) Low Heat OFF	DMDLHOFF	W	^F	1	0.5 - 2	AV:60	dmdlhoff_1
Dmd Level(+) Hi Cool ON	DMDHCON	W	^F	0.5	0.5 - 20	AV:61	dmdhcon_1
Dmd Level(+) Hi Heat ON	DMDHHON	W	^F	0.5	0.5 - 20	AV:62	dmdhhon_1
Econ Act. Unavailable?	ECONUNAV	R			0 - 1	BV:34	econunav_1
Econ Command Position	ECN2CPOS	W	%		0 - 100	AV:41	ecn2cpos_1
Econ disable in DH mode?	DHECDISA	W		Yes	0 - 1	BV:35	dhecdisa_1
Econ Recovery Hold Off?	ECONHELD	R			0 - 1	BV:42	econheld_1
Econo Current Min. CFM	ECMINCFM	R	CFM		0 - 20000	AV:42	ecmincfm_1
Econo Current Min. Pos.	ECMINPOS	R	%		0 - 100	AV:45	ecminpos_1
Economizer Act. Curr. Pos	ECONOPOS	R	%		0 - 100	AV:1028	econ_pos_1
Economizer Act.Cmd Pos	ECONOCMD	W	%		0 - 100	AV:67	econocmd_1
Economizer Active?	ECACTIVE	R			0 - 1	BV:36	ecactive_1
Economizer Control Point	ECONCPNT	R	dF		0 - 180	AV:68	econpnt_1
Economizer Forced ?	ECONFORC	R			0 - 1	BV:38	econforc_1
Economizer Max.Position	ECONOMAX	W	%	98	0 - 100	AV:70	economax_1

See legend on page 235.

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	CNN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Economizer Min.Flow	OACFMMAX	W	CFM	2000	0 - 20000	AV:46	oacfmmax_1
Economizer Min.Position	ECONOMIN	W	%	5	0 - 100	AV:4005	econ_min_1
EDT Sensor Bad ?	EDT_STAT	R			0 - 1	BV:44	edt_stat_1
Element Comm Status		R				BV:2999	element_stat_1
Element Communications Alarm		R				BV:105	comm_lost_alm_1
Emergency Stop	EMSTOP	W			0 - 1	BV:45	emstop_1
Enth. Switch Read High ?	ENTH	W			0 - 1	BV:40	enth_1
Equipment Alarm		R				BV:127	element_alarm_1
Evacuation Input	EVAC	W			0 - 1	BV:1060	smk_evac_1
Evaporator Discharge Tmp	EDT	R	dF		-40 - 240	AV:76	edt_1
Exhaust Fan VFD Speed	EFAN_VFD	R	%		0 - 100	AV:2075	ef_vfd_output_1
Fan Fail Shuts Down Unit	SFS_SHUT	W		No	0 - 1	BV:50	sfs_shut_1
Fan Mode	FAN_MODE	W		1	0 - 1	AV:77	fan_mode_1
Fan request from IGC	IGCFAN	R			0 - 1	BV:11	igcfan_1
Fan Track Control D.CFM	DELTACFM	R	CFM		-20000 - 20000	AV:47	deltacfm_1
Fan Track Internal RAM	DCFM_RAM	W	CFM	0	-20000 - 20000	AV:48	dcfm_ram_1
Fan Track Max Clamp	DCFM_MAX	W	CFM	4000	0 - 20000	AV:51	dcfm_max_1
Fan Track Max Correction	DCFM_ADJ	W	CFM	1000	0 - 20000	AV:52	dcfm_adj_1
Filter Status Input	FLTS	W			0 - 1	BV:1052	filter_status_1
Fire Shutdown Input	FSD	W			0 - 1	BV:1005	firedown_status_1
Freeze Status Switch	FRZ	W			0 - 1	BV:41	frz_1
Heat Interlock Relay	HIR	W			0 - 1	BV:1026	heat_interlock_relay_1
Heat Relay 1	HS1	R			0 - 1	BV:52	hs1_1
Heat Relay 2	HS2	R			0 - 1	BV:53	hs2_1
Heat-Cool Setpoint Gap	HCSP_GAP	W	deltaF		2 - 10	AV:83	hcsp_gap_1
Heating Control Point	HEATCPNT	R			-20 - 140	AV:1025	heat_ctrl_point_1
Heating Occupied Setpoint	OHSP	W	dF		40 - 99	AV:3002	occ_ht_stpt_1
Heating Supply Air Setpt	SASPHEAT	W	dF	85	80 - 120	AV:85	saspheat_1
Heating Unoccupied Setpoint	UHSP	W	dF		40 - 99	AV:3004	unocc_ht_stpt_1
Hi Limit Switch Tmp Mode	LIMTMODE	R			0 - 1	BV:55	limtmode_1
High OAT Lockout Temp	OAT_LOCK	W	dF	60	-40 - 120	AV:9008	econ_oat_lockout_1
Ht.Coil Command Position	HTCLCPOS	R	%		0 - 100	AV:55	htclcpos_1
Humidifier Relay	HUMIDRLY	R			0 - 1	BV:46	humidrly_1
HumidiMiZer 3-way Valve	HUM3WVAL	R			0 - 1	BV:47	hum3wval_1
HumidiMiZer Capacity	HMZRCAPC	R	%		0 - 100	AV:57	hmzrcapc_1
HVAC Mode Numerical Form	MODEHVAC	R			0 - 40	AV:1022	hvac_mode_1
IAQ - Discrete Input	IAQIN	W			0 - 1	BV:1050	iaq_status_1
IAQ - PPM Indoor CO2	IAQ	W			0 - 5000	AV:1009	iaq_1
IAQ Demand Vent Min.Flow	OACFMMIN	W	CFM	0	0 - 20000	AV:58	oacfmmin_1
IAQ Pre-Occ Purge Active	MODEIQPG	R			0 - 1	BV:56	modeiqpg_1
IAQ Purge Duration	IAQPTIME	W	min	15	5 - 60	AV:98	iaqptime_1
IAQ Purge OAT Lockout	IAQPNTLO	W	dF	50	35 - 70	AV:101	iaqpntlo_1
LAT Cutoff Mode	LATCMODE	R			0 - 1	BV:58	latcmode_1
Leaving Air Temperature	LAT	R	dF		-40 - 240	AV:1027	lvg_air_temperature_1
Local Machine Disable	UNITSTOP	W			0 - 1	BV:59	unitstop_1

See legend on page 235.

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	CNN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Local Schedule		R			n/a	BV:5	schedule_1
Low Temp Cap Override	LOW_TEMP	R			0 - 1	BV:61	low_temp_1
Mech Cooling Locked Out	MODELOCK	R			0 - 1	BV:63	modelock_1
Mixed Air Temperature	MAT	R	dF		-40 - 240	AV:1500	ma_temp_1
Modulating Gas Capacity	HTMG_CAP	R	%		0 - 100	AV:65	htmg_cap_1
OAEC- OA Enth Lockout?	OAECSTAT	R			0 - 1	BV:67	oaecstat_1
OAQ - PPM Outdoor CO2	OAQ	W			0 - 5000	AV:113	oaq_1
OAQ Lockout In Effect ?	OAQLOCKD	R			0 - 1	BV:68	oaqlockd_1
OAQ Lockout Value	OAQLOCK	W		0	0 - 2000	AV:112	oaqlock_1
OAT Sensor Bad ?	OAT_STAT	R			0 - 1	BV:69	oat_stat_1
Occupied Cool Mode End	OCCL_END	R			0 - 100	AV:114	occl_end_1
Occupied Cool Mode Start	OCCLSTRT	R			0 - 100	AV:115	occlstrt_1
Occupied Heat Mode End	OCHT_END	R			0 - 100	AV:116	ocht_end_1
Occupied Heat Mode Start	OCHTSTRT	R			0 - 100	AV:117	ochtstrt_1
Occupied Heating Enabled	HTOCCENA	W		No	0 - 1	BV:70	htoccena_1
Occupied?	OCCUPIED	W			0 - 1	BV:2008	occ_status_1
Outside Air CFM	OACFM	R	CFM		0 - 50000	AV:66	oacfm_1
Outside Air Humidity Ratio	OA_HUMR	R			-10000 - 10000	AV:118	oa_humr_1
Outside Air Relative Humidity	OARH	W	%		0 - 100	AV:119	oarh_1
Outside Air Temperature	OAT	W	dF		-40 - 240	AV:1003	oat_1
Override Time Limit	OTL	W	hr	1	0 - 4	AV:120	otl_1
Plenum Press.Safety Sw.	PPS	W			0 - 1	BV:48	pps_1
Power Exhaust On Setp.1	PES1	W	%	25	0 - 100	AV:122	pes1_1
Power Exhaust On Setp.2	PES2	W	%	75	0 - 100	AV:123	pes2_1
Power Exhaust Relay 1	PE1	R			0 - 1	BV:49	pe1_1
Power Exhaust Relay 2	PE2	R			0 - 1	BV:51	pe2_1
Pressurization Input	PRES	W			0 - 1	BV:1061	smk_press_1
Pull Down Cap Override	PULLDOWN	R			0 - 1	BV:75	pulldown_1
Relay 3 W1 Gas Valve 2	HS3	R			0 - 1	BV:76	hs3_1
Relay 4 W2 Gas Valve 2	HS4	R			0 - 1	BV:77	hs4_1
Relay 5 W1 Gas Valve 3	HS5	R			0 - 1	BV:78	hs5_1
Relay 6 W2 Gas Valve 3	HS6	R			0 - 1	BV:79	hs6_1
Remote Alarm/Aux Relay	ALRM	W			0 - 1	BV:2014	aux_relay_1
Remote Input State	RMTIN	W			0 - 1	BV:81	rmtin_1
Requested Heat Stage	HT_STAGE	R			0 - 20	AV:2003	heat_run_1
Reset Limit	LIMT	W	^F	10	0 - 20	AV:131	limt_1
Reset Ratio	RTIO	W		3	0 - 10	AV:132	rtio_1
Return Air CFM	RACFM	R	CFM		0 - 50000	AV:69	racfm_1
Return Air Enthalpy	RAE	R			-20 - 10000	AV:133	rae_1
Return Air Relative Humidity	RARH	W	%		0 - 100	AV:134	rarh_1
Return Air Temperature	RAT	W	dF		-40 - 240	AV:135	rat_1
Slow Change Cap Override	SLO_CHNG	R			0 - 1	BV:86	slo_chng_1
Smoke Purge Input	PURG	W			0 - 1	BV:1062	smk_purg_1
Soft Stop Request	SOFTSTOP	W			0 - 1	BV:87	softstop_1
SP High Alert Limit	SPH	W		2	0 - 5	AV:73	sph_1
SP Low Alert Limit	SPL	W		0	-0.5 - 5	AV:74	spl_1
SP Reset Limit	SPRLIMIT	W		0.75	0 - 2	AV:143	sprlimit_1
SP Reset Ratio	SPRRATIO	W		0.2	0 - 2	AV:144	sprratio_1
Space Enthalpy	SPE	R			-20 - 10000	AV:71	spe_1
Space Relative Humidity	SPRH	W	%		0 - 100	AV:72	sprh_1

See legend on page 235.

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	CNN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Space Temp Offset Range	SPTO_RNG	W		5	1 - 10	AV:139	spto_rng_1
Space Temperature	SPT	W	dF		-40 - 240	AV:137	spt_1
Space Temperature Offset	SPTO	W	^F		-10 - 10	AV:138	spto_1
SPT Override Enabled ?	SPT_OVER	W		Yes	0 - 1	BV:54	spt_over_1
Staged Gas Capacity Calc	HTSGCALC	R	%		0 - 100	AV:75	htsgcalc_1
Staged Gas LAT 1	LAT1SGAS	R	dF		-40 - 240	AV:150	lat1sgas_1
Staged Gas LAT 2	LAT2SGAS	R	dF		-40 - 240	AV:151	lat2sgas_1
Staged Gas LAT 3	LAT3SGAS	R	dF		-40 - 240	AV:152	lat3sgas_1
Staged Gas LAT Sum	LAT_SGAS	R	dF		-40 - 240	AV:153	lat_sgas_1
Staged Gas Limit Sw Temp	LIMSWTMP	R	dF		-40 - 240	AV:154	limswtmp_1
Stat. Pres. Reset Config	SPRSTCFG	W		0	0 - 4	AV:156	sprstcfg_1
Static Pressure	SP	R	" H20		-20 - 20	AV:1016	static_press_1
Static Pressure Reset	SPRESET	W			0 - 15	AV:157	spreset_1
Static Pressure Setpoint	SPSP	W	" H20	1.5	0 - 5	AV:3050	sa_static_stpt_1
Supply Air CFM	SACFM	R	CFM		0 - 50000	AV:78	sacfm_1
Supply Air Reset	MODESARS	R			0 - 1	BV:93	modesars_1
Supply Air Setpnt. Reset	SASPRSET	W	^F		0 - 20	AV:158	sasprset_1
Supply Air Setpoint	SASP	W	dF		45 - 75	AV:3007	sa_temp_stpt_1
Supply Fan not on 30s ?	SFONSTAT	R			0 - 1	BV:22	sfonstat_1
Supply Fan Relay	SFAN	R			0 - 1	BV:2001	sfan_1
Supply Fan Request	SFANFORC	W			0 - 1	BV:2004	sfan_forc_1
Supply Fan Status Switch	SFS	W			0 - 1	BV:95	sfs_1
Supply Fan VFD Speed	SFAN_VFD	R	%		0 - 100	AV:2050	sf_vfd_output_1
System Cooling Demand Level		R			n/a	AV:9006	cool_demand_level_1
System Demand Limiting		R			n/a	BV:7	dem_lmt_act_1
System Heating Demand Level		R			n/a	AV:9036	heat_demand_level_1
System OAT Master		R	dF		n/a	AV:80001	mstr_oa_temp_1
Temp Comp Start Cool Factor	TCSTCOOL	W	min	0	0 - 60	AV:159	tcstcool_1
Temp Comp Start Heat Factor	TCSTHEAT	W	min	0	0 - 60	AV:160	tcstheat_1
Temp Compensated Start	MODETCST	R			0 - 1	BV:96	modetcst_1
Temper Supply Air Setpt	SASPTEMP	W	dF		35 - 70	AV:15	sasptemp_1
Temper Vent Unocc	TEMPVUNC	W	dF		-20 - 80	AV:164	tempvunc_1
Tempering in Cool SASP	TEMPCOOL	W	dF		5 - 75	AV:161	tempcool_1
Tempering Purge SASP	TEMPPURG	W	dF		-20 - 80	AV:162	temppurg_1
Tempering Vent Occ SASP	TEMPVOCC	W	dF		-20 - 80	AV:163	tempvocc_1
Thermostat G Input	G	W			0 - 1	BV:1021	g_input_1
Thermostat W1 Input	W1	W			0 - 1	BV:1019	w1_input_1
Thermostat W2 Input	W2	W			0 - 1	BV:1020	w2_input_1
Thermostat Y1 Input	Y1	W			0 - 1	BV:1017	y1_input_1
Thermostat Y2 Input	Y2	W			0 - 1	BV:1018	y2_input_1
Timed Override In Effect	MODETOVR	R			0 - 1	BV:97	modetovr_1
Timed-Override in Effect	OVERLAST	R			0 - 1	BV:98	overlast_1
Un.Ec.Free Cool OAT Lock	UEFCNTLO	W	dF	50	40 - 70	AV:166	uefcntlo_1
Unoc Econ Free Cool Cfg	UEFC_CFG	W		0	0 - 2	AV:172	uefc_cfg_1
Unoc Econ Free Cool Time	UEFCTIME	W	min	120	0 - 720	AV:173	uefctime_1
Unoccupied Cool Mode End	UCCL_END	R			0 - 100	AV:168	uccl_end_1
Unoccupied Cool Mode Start	UCCLSTRT	R			0 - 100	AV:169	ucclstrt_1
Unoccupied Heat Mode End	UCHT_END	R			0 - 100	AV:170	ucht_end_1
Unoccupied Heat Mode Start	UCHTSTRT	R			0 - 100	AV:171	uchtstrt_1

See legend on page 235.

APPENDIX F — UPC OPEN CONTROLLER (cont)

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	CNN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
User Defined Analog 1		W				AV:2901	user_analog_1_1
User Defined Analog 2		W				AV:2902	user_analog_2_1
User Defined Analog 3		W				AV:2903	user_analog_3_1
User Defined Analog 4		W				AV:2904	user_analog_4_1
User Defined Analog 5		W				AV:2905	user_analog_5_1
User Defined Binary 1		W				BV:2911	user_binary_1_1
User Defined Binary 2		W				BV:2912	user_binary_2_1
User Defined Binary 3		W				BV:2913	user_binary_3_1
User Defined Binary 4		W				BV:2914	user_binary_4_1
User Defined Binary 5		W				BV:2915	user_binary_5_1
VAV Occ. Cool Off Delta	VAVOCOFF	W	deltaF		1 - 25	AV:180	vavocoff_1
VAV Occ. Cool On Delta	VAVOCON	W	deltaF		0 - 25	AV:181	vavocon_1
Vent Reheat RAT Offset	DHVRAOFF	W	^F	0	0 - 8	AV:183	dhvraoff_1
Vent Reheat Setpoint	DHVHT_SP	W	dF	70	55 - 95	AV:184	dhvht_sp_1
VFD Maximum Speed	STATPMAX	W	%	100	0 - 100	AV:188	statpmax_1
VFD Minimum Speed	STATPMIN	W	%	20	0 - 100	AV:189	statpmin_1
VFD/Act. Fire Speed/Pos.	BLDGPFSO	W	%	100	0 - 100	AV:186	bldgpfso_1
VFD/Act. Min. Speed/Pos.	BLDGPMIN	W	%	0	0 - 100	AV:105	bldgpmin_1
VFD1 Actual Motor Amps	VFD1AMPS	R	A		0 - 999	AV:79	vfd1amps_1
VFD1 Actual Motor Freq	VFD1FREQ	R			0 - 500	AV:80	vfd1freq_1
VFD1 Actual Motor Power	VFD1PWR	R			-150 - 150	AV:81	vfd1pwr_1
VFD1 Actual Motor RPM	VFD1RPM	R			0 - 30000	AV:82	vfd1rpm_1
VFD1 Cumulative kWh	VFD1KWH	R			0 - 65535	AV:84	vfd1kwh_1
VFD1 Cumulative Run Time	VFD1RUNT	R	hr		0 - 65535	AV:86	vfd1runt_1
VFD1 DC Bus Voltage	VFD1VDC	R	V		0 - 1000	AV:87	vfd1vdc_1
VFD1 Last Fault Code	VFD1LFC	R			0 - 65535	AV:88	vfd1lfc_1
VFD1 Output Voltage	VFD1VOUT	R	V		0 - 1000	AV:89	vfd1vout_1
VFD1 Status Word 1	VFD1STAT	R			0 - 0	AV:90	vfd1stat_1
VFD1 Transistor Temp (C)	VFD1TEMP	R			0 - 150	AV:91	vfd1temp_1
VFD2 Actual Motor Amps	VFD2AMPS	R	A		0 - 999	AV:92	vfd2amps_1
VFD2 Actual Motor Freq	VFD2FREQ	R			10 - 500	AV:93	vfd2freq_1
VFD2 Actual Motor Power	VFD2PWR	R			-150 - 150	AV:94	vfd2pwr_1
VFD2 Actual Motor RPM	VFD2RPM	R			50 - 30000	AV:95	vfd2rpm_1
VFD2 Cumulative kWh	VFD2KWH	R			0 - 65535	AV:96	vfd2kwh_1
VFD2 Cumulative Run Time	VFD2RUNT	R	hr		0 - 65535	AV:97	vfd2runt_1
VFD2 DC Bus Voltage	VFD2VDC	R	V		0 - 1000	AV:99	vfd2vdc_1
VFD2 Last Fault Code	VFD2LFC	R			0 - 65535	AV:100	vfd2lfc_1
VFD2 Output Voltage	VFD2VOUT	R	V		0 - 1000	AV:102	vfd2vout_1
VFD2 Status Word 1	VFD2STAT	R			0 - 0	AV:103	vfd2stat_1
VFD2 Transistor Temp (C)	VFD2TEMP	R			0 - 150	AV:104	vfd2temp_1
VFD-IGV Fire Speed Override	STATPFSO	W	%	100	0 - 100	AV:187	statpfso_1

LEGEND

BP — Building Pressure
DBC — Dry Bulb Changeover
DCV — Demand Controlled Ventilation
DDBC — Differential Dry Bulb Changeover
DEC — Differential Enthalpy Changeover
EDT — Evaporator Discharge Temperature
EXV — Electronic Expansion Valve
IAQ — Indoor Air Quality
IGV — Inlet Guide Vanes
LAT — Leaving Air Temperature
n/a — Not Available
OAEC — Outdoor Air Enthalpy Changeover
OAQ — Outdoor Air Quality
OAT — Outdoor Air Temperature
R — Read
RAT — Return Air Temperature
RH — Relative Humidity
SASP — Supply Air Set Point
SPT — Space Temperature
VAV — Variable Air Volume
VFD — Variable Frequency Drive
W — Write

APPENDIX G — OPTIONAL MOTORMASTER® V CONTROL

GENERAL

This appendix contains instructions for the start-up and service of the optional Motormaster V (MMV) control on 48/50P030-100 units.

The Motormaster V control is a motor speed control device which adjusts condenser fan motor speed in response to varying liquid refrigerant pressure. A properly applied Motormaster V control extends the operating range of air-conditioning systems and permits operation at lower outdoor ambient temperatures.

Location of Motormaster V device is shown in Fig. M-Q.

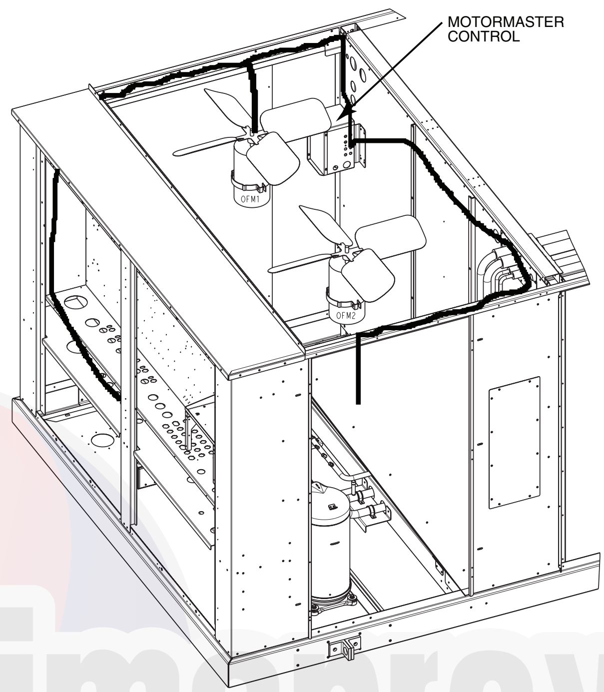


Fig. M — MMV Control Location — 48/50P030,035 Units

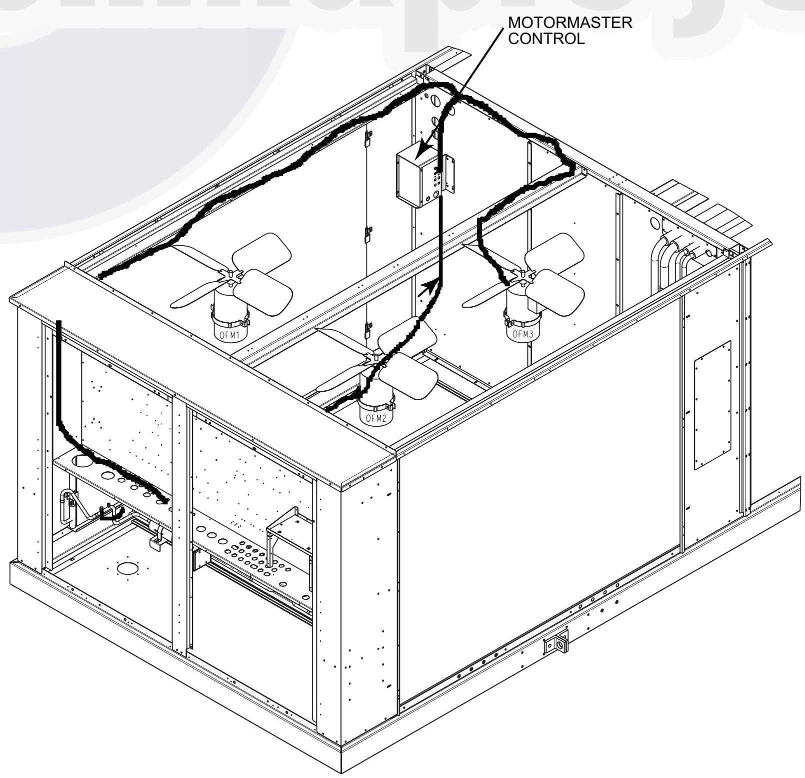


Fig. N — MMV Control Location — 48/50P040 Units

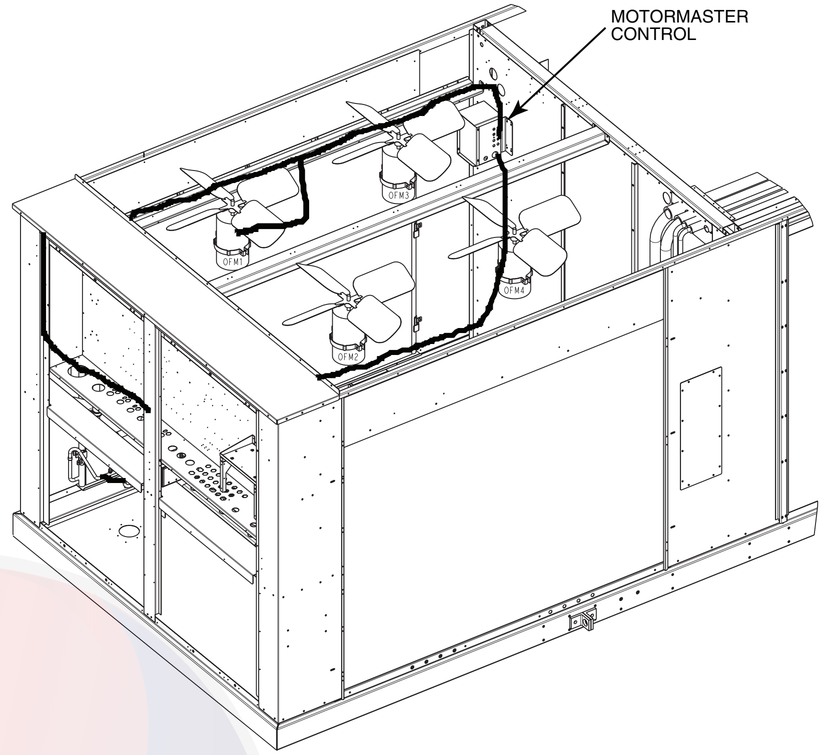


Fig. O — MMV Control Location — 48/50P050-060 Units

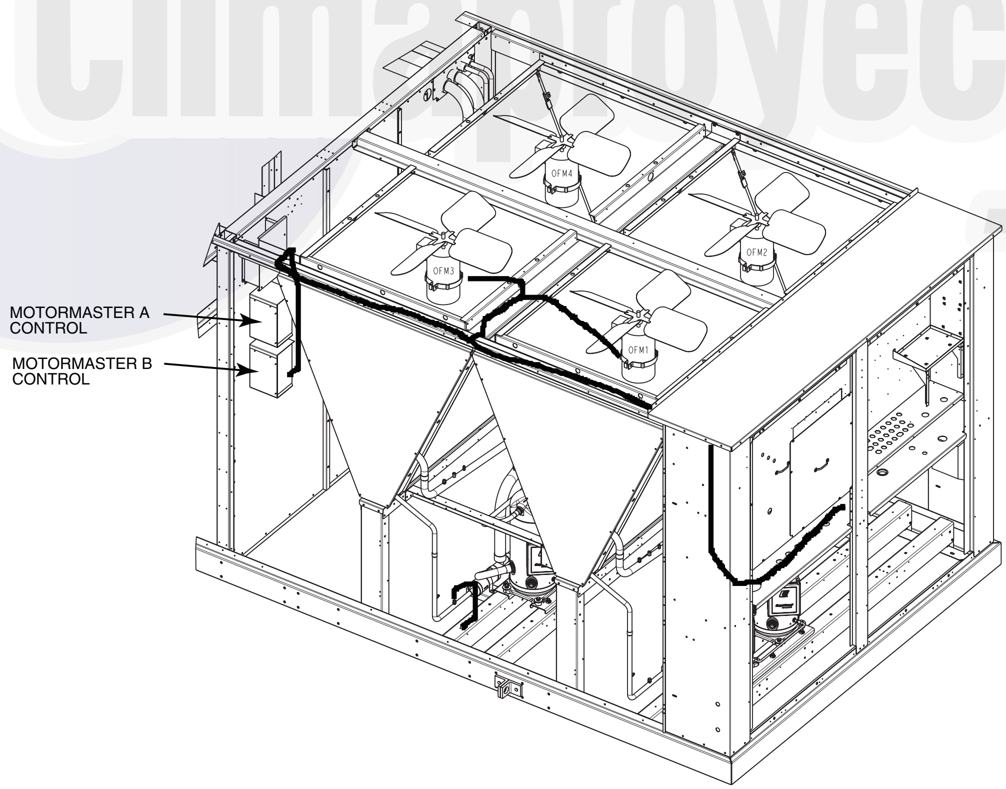


Fig. P — MMV Control Location — 48/50P070,075 Units

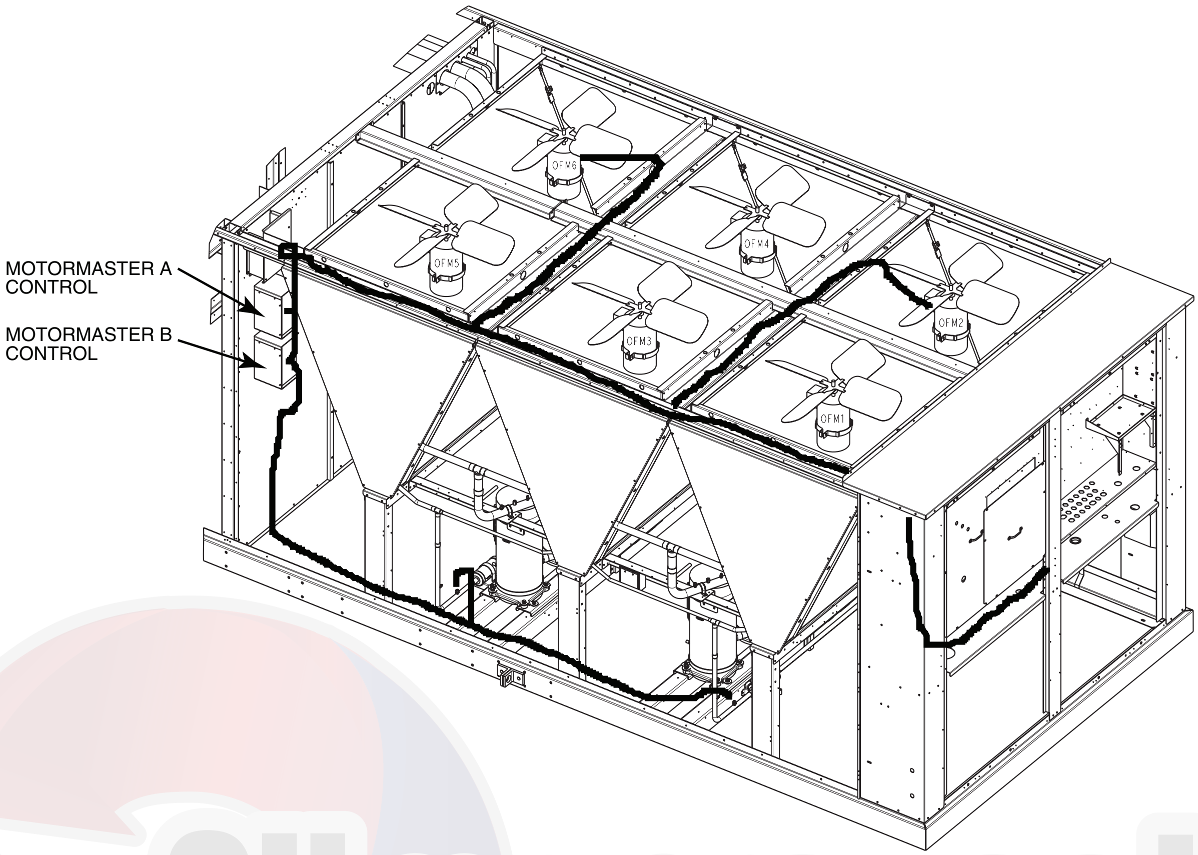


Fig. Q — MMV Control Location — 48/50P090,100 Units

Configure Motormaster® V Control — The Motormaster V control is configured for proportional integral (PI) control mode. The Motormaster V control varies the condenser fan motor speed to maintain a set point of 320 psig liquid line pressure in response to a 0 to 5 vdc feedback signal from the liquid line pressure transducer. No additional programming is required. See Table P. Note that the pressure transducer must be attached for proper configuration.

Table P — Configuration Table

NOMINAL VOLTAGE (V-Ph-Hz)	MODE	CONTROL INPUT (Pin 5)	START CONTACTS
230-3-60 460-3-60 575-3-60	1	Internal PI control, 0-5V feedback	TB 1,2
208-3-60 380-3-60	2		TB 13A,2
400-3-50	4		TB 13C,2

The following *Comfort*Link control configurations must be set when using a Motormaster V device:

- ***Configuration→COOL→M.M.*** = YES
- ***Configuration→COOL→LLAG*** = CIRCUIT A (size 030-060 units only)

Test Motormaster V Control — To test the control and motor in the test mode, run compressor no. 1. The Motormaster V electronic control adjusts the fan speed based on the liquid line pressure input. Ensure that fans are rotating clockwise (as viewed from above). If rotation is backward, lock out all power then swap 2 leads AFTER the Motormaster V control.

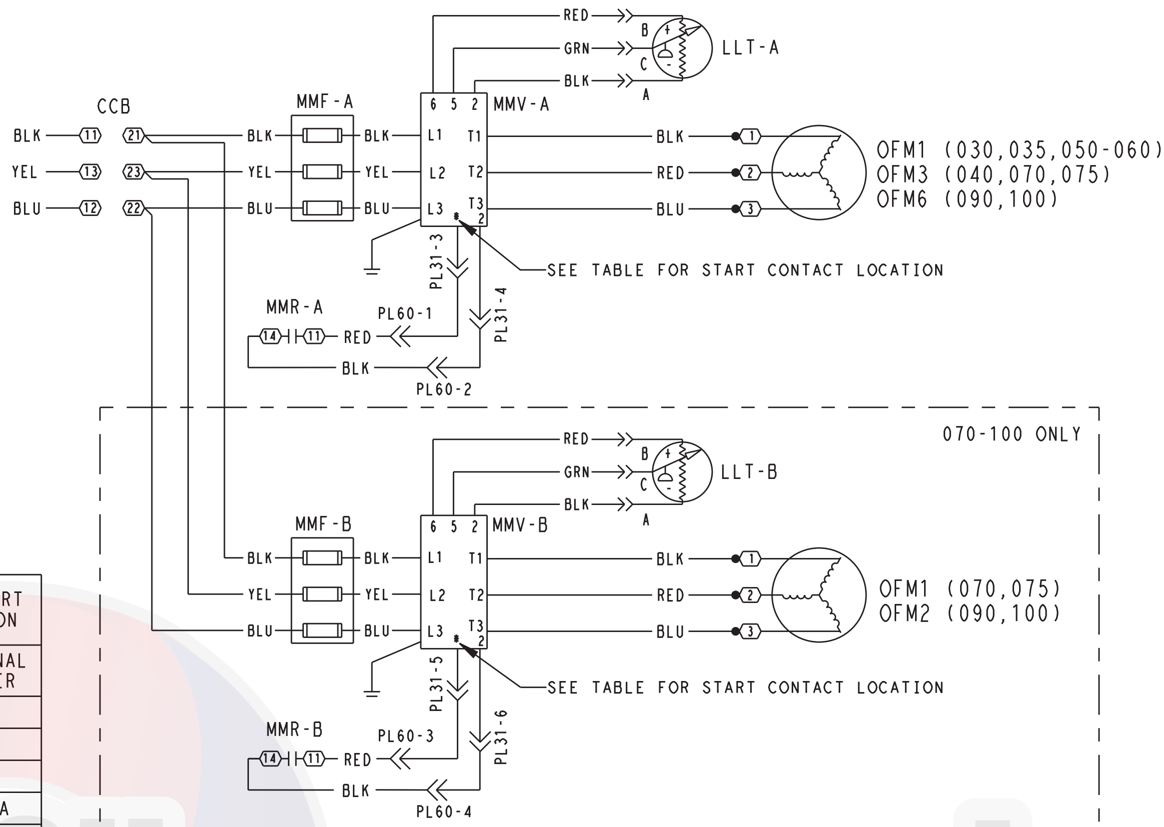
START-UP

The Motormaster V electronic control will be powered up as long as unit voltage is present. When the system calls for cooling, the Motormaster relay (MMR) will be energized to initiate the start-up sequence for the Motormaster V electronic control. The LED (light-emitting diode) will display the speed of the motor. The display range will be 8 to 60 Hz. The Motormaster V electronic control will start the condenser fan when the compressor engages. The control will adjust the fan speed to maintain approximately 320 psig. Above that pressure, the fan should operate at full speed.

For size 030-060 units, the Motormaster V control uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line service valve gage port on circuit A.

For size 070-100 units, two Motormaster V devices are used, one for each circuit. The circuit A Motormaster V control uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line service valve gage port on circuit A. The circuit B Motormaster V control uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line service valve gage port on circuit B.

The pressure transducer(s) are connected to terminals 2, 5 and 6 on the controller. See Fig. R. The controller is configured by jumper wires and sensor input types. No field programming is required. If controller does not function properly, the information provided in the Troubleshooting section can be used to program and troubleshoot the drive.



MOTORMASTER START CONTACT LOCATION	
UNIT VOLTAGE	TERMINAL NUMBER
575-3-60	1
208-3-60	1
230-3-60	1
380-3-60	13A
460-3-60	1

Fig. R — Motormaster® V Wiring (48/50P070-100 Units Shown)

LEGEND

CCB — Control Circuit Breaker
LLT — Liquid Line Transducer
MMF — Motormaster V Fuses
MMR — Motormaster Relay
MMV — Motormaster V Control
OFM — Outdoor-Fan Motor

Drive Programming — Table Q shows all program parameters for each of the operating modes. Refer to Troubleshooting section before attempting to change programming in the Motormaster V control.

⚠ CAUTION

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

TO ENTER PASSWORD AND CHANGE PROGRAM VALUES:

1. Press MODE.
2. The display will read “00” and the upper right-hand decimal point will be blinking. This will activate the PASSWORD prompt (if the password has not been disabled).
3. Use the UP and DOWN buttons to scroll to the password value (the factory default password is “111”) and press the MODE button. Once the correct password value is entered, the display will read “P01”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

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

4. Press MODE to display present parameter setting. The upper right decimal point blinks. Use UP and DOWN 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. Use the UP and DOWN buttons to change setting. Press MODE to store new setting.
6. Press MODE to store the new setting and also exit the PROGRAM mode. 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.
7. After two minutes, the password must be entered in order to access the parameters again.

TO CHANGE PASSWORD — Enter the current password then change P44 to the desired password.

TO RESET FACTORY DEFAULTS — To recognize a factory reset, the MMV controller must see a change in P48.

1. Cycle power from Motormaster® V control.
2. Enter PROGRAM mode by entering password.
3. Scroll to P48 by using UP and DOWN buttons and then press MODE. One of the 12 mode numbers will appear. (Modes 1, 2 and 4 are used for these units.)
4. Restore factory defaults by changing the value in P48 using UP and DOWN buttons and then storing the value by pressing MODE.
5. Press MODE again to re-display the value of P48.
6. Change the value of P48 to the desired factory default mode (see Table Q) using UP and DOWN buttons then press MODE. The Motormaster V control is now restored to factory settings.

TROUBLESHOOTING

Troubleshooting the Motormaster V control requires a combination of observing system operation and VFD display information.

If the liquid line pressure is above the set point and the VFD is running at full speed, this is a normal condition. The fan **CANNOT** go any faster to maintain set point.

If the VFD is not slowing down even though liquid line pressure is below set point, the VFD could be set for manual control or the control may be receiving faulty pressure transducer output. Corrective action would include:

- Check that VDC signal between TB5 and TB2 is between 0.5 v and 4.5 v.
- Restore VFD to automatic control.
- Change parameter P05 back to correct value shown in Table Q.

The MMV control also provides real time monitoring of key inputs and outputs. The collective group is displayed through parameters P50 to P56 and all values are read only. These values can be accessed without entering a password.

Press MODE twice and P50 will appear.

Press MODE again to display value.

To scroll to P51-P56 from P50, use UP and DOWN buttons then press MODE to display the value.

- **P50: FAULT HISTORY —** Last 8 faults
- **P51: SOFTWARE version**
- **P52: DC BUS VOLTAGE —** in percent of nominal. Usually rated input voltage x 1.4
- **P53: MOTOR VOLTAGE —** in percent of rated output voltage
- **P54: LOAD —** in percent of drives rated output current
- **P55: VDC INPUT —** in percent of maximum input: 100% will indicate full scale which is 5 v
- **P56: 4-20 mA INPUT —** in percent of maximum input. 20% = 4 mA, 100% = 20 mA

NOTE: The Motormaster V transducer is attached to circuit A. If circuit A compressor power is interrupted (overload, high pressure cutout, etc.) the outdoor fans will operate at a reduced speed resulting from erroneous low pressure readings. This process may cause a high pressure safety cutout on circuit B compressor. If only circuit B is capable of operating for a temporary period of time because of a circuit A problem, the transducer will have to be moved to the circuit B service port until circuit A can be repaired. Once the problem is repaired, move the transducer back to circuit A for proper unit operation.

Fault Lockout — If a fault lockout (LC) has occurred, view the fault history in P50 to find the last fault. Once P50 is displayed, use the arrow buttons to scroll through the last 8 faults. Any current faults or fault codes from the fault history can be analyzed using Table R.

TO DISABLE AUTOMATIC CONTROL MODE AND ENTER MANUAL SPEED CONTROL:

1. Change P05 to ‘01- keypad’.
2. Push UP and DOWN arrow button to set manual speed.
3. Set P05 to proper value to restore automatic control according to Table Q.

TO PROVIDE MANUAL START/STOP CONTROL — With power removed from VFD, remove start command jumper and install a switch between the appropriate start terminals as required in Table P.

APPENDIX G — OPTIONAL MOTORMASTER® V CONTROL (cont)

Table Q — Program Parameters for the Operating Mode

PARAMETERS	DESCRIPTION	MODE 1	MODE 2	MODE 4
P01	Line Voltage: 01 = low line, 02 = high line	01	02	02
P02	Carrier Freq: 01 = 4 kHz, 02 = 6 kHz, 03 = 8 kHz	01	01	01
P03	Startup mode: flying restart	06	06	06
P04	Stop mode: coast to stop	01	01	01
P05	Standard Speed source: 01 = keypad, 04 = 4-20mA (NO PI), 05 = R22 or R410A, 06 = R134a	05	05	05
P06	TB-14 output: 01 = none	01	01	01
P08	TB-30 output: 01 = none	01	01	01
P09	TB-31 Output: 01 = none	01	01	01
P10	TB-13A function sel: 01 = none	01	01	01
P11	TB-13B function sel: 01 = none	01	01	01
P12	TB-13C function sel: 01 = none	01	01	01
P13	TB-15 output: 01 = none	01	01	01
P14	Control: 01 = Terminal strip	01	01	01
P15	Serial link: 02 = enabled 9600,8,N,2 with timer	02	02	02
P16	Units editing: 02 = whole units	02	02	02
P17	Rotation: 01 = forward only, 03 = reverse only	01	01	01
P19	Acceleration time: 20 sec	20	20	20
P20	Deceleration time: 10 sec	10	10	10
P21	DC brake time: 0	0	0	0
P22	DC BRAKE VOLTAGE 0%	0	0	0
P23	Min freq = 8 Hz ~ 100 – 160 rpm	8	8	8
P24	Max freq	60	60	50
P25	Current limit: (%)	125	110	110
P26	Motor overload: 100	100	100	100
P27	Base freq: 60 or 50 Hz	60	60	50
P28	Fixed boost: 0.5% at low frequencies	0.5	0.5	0.5
P29	Accel boost: 0%	0	0	0
P30	Slip compensation: 0%	0	0	0
P31	Preset spd #1: speed if loss of control signal	57	57	47
P32	Preset spd #2: 0	0	0	0
P33	Preset spd #3: 0	0	0	0
P34	Preset spd 4 default — R22 and R410A setpoints. TB12-2 open	24.0	24.0	24.0
P35	Preset spd 5 default — R134a setpoint. TB12-2 closed	12.6	12.6	12.6
P36	Preset spd 6 default	0	0	0
P37	Preset spd 7 default	0	0	0
P38	Skip bandwidth	0	0	0
P39	Speed scaling	0	0	0
P40	Frequency scaling 50 or 60 Hz	60	60	50
P41	Load scaling: default (not used so NA)	200	200	200
P42	Accel/decel #2: default (not used so NA)	60	60	60
P43	Serial address	1	1	1
P44	Password:111	111	111	111
P45	Speed at min signal: 8 Hz; used when PID mode is disabled and 4-20 mA input is at 4 mA	8	8	8
P46	Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20 mA input is at 20 mA	60	60	50
P47	Clear history? 01 = maintain. (set to 02 to clear)	01	01	01
P48	Program selection: Program 1 – 12	01	02	04
P61	PI Mode: 05 = reverse, 0-5V, 01 = no PID	05	05	05
P62	Min feedback = 0 (0V *10)	0	0	0
P63	Max feedback = 50 (5V * 10)	50	50	50
P64	Proportional gain = 3.5%	3.5	3.5	3.5
P65	Integral gain = .2	.2	.2	.2
P66	PI accel/decel (setpoint change filter) = 10	10	10	10
P67	Min alarm	0	0	0
P68	Max alarm	0	0	0

LEGEND

NA — Not Applicable
PI — Proportional Integral
PID — Proportional Integral Derivative

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

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

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

Liquid Line Pressure Set Point Adjustment — Adjusting the set point may be necessary to avoid interaction with other head pressure control devices. If adjustment is necessary, use the set point parameter found in P-34 for R-410A. A lower value will result in a lower liquid line set point. As an example for R-410A, decreasing the P-34 from 24 to 23 will decrease the liquid line pressure by approximately 15 psig. It is recommended to adjust R-410A units by 1.

Table R — Fault Codes

CODE	DESCRIPTION	RESET METHOD	PROBABLE CAUSE	CORRECTIVE ACTION
AF	High Temperature Fault	Automatic	Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation.
CF	Control Fault	Manual	A blank EPM, or an EPM with corrupted data has been installed.	Perform a factory reset using Parameter 48 – PROGRAM SELECTION. See Drive Programming section.
cF	Incompatibility Fault	Manual	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.
F1	EPM Fault	Manual	The EPM is missing or damaged.	Install EPM or replace with new EPM.
F2—F9 Fo	Internal Faults	Manual	The control board has sensed a problem	Consult factory.
GF	Data Fault	Manual	User data and Carrier defaults in the EPM are corrupted.	Restore factory defaults by toggling P48 to another mode. Then set P48 to desired mode to restore all defaults for that mode. See Drive Programming section. If that does not work, replace EPM.
HF	High DC Bus Voltage Fault	Automatic	Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately.
JF	Serial Fault	Automatic	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.
LF	Low DC Bus Voltage Fault	Automatic	Line voltage is too low.	Check line voltage — set P01 appropriately.
OF	Output Transistor Fault	Automatic	Phase to phase or phase to ground short circuit on the output; Failed output transistor; Boost settings are too high; Acceleration rate is too fast.	Reduce boost or increase acceleration values. If unsuccessful, replace drive.
PF	Current Overload Fault	Automatic	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	Automatic	Single-phase input power has been applied to a three-phase drive.	Check input power phasing.
Drive displays '---' even though drive should be running	Start Contact is Not Closed	Automatic	Start contact is missing or not functioning.	Check fan relay.
VFD flashes "---" and LCS	Start Contact is Not Closed	Automatic	Start contact not closed.	Check FR for closed contact.
VFD flashes 57 (or 47) and LCS	Speed Signal Lost	Automatic	Speed signal lost. Drive will operate at 57 (or 47) Hz until reset or loss of start command. Resetting requires cycling start command (or power).	Transducer signal lost. Check VDC signal between TB5 and TB2. Should be in range of 0.5V to 4.5V. 5VDC output should be present between TB6 and TB2.

LEGEND

EPM — Electronic Programming Module
FR — Fan Relay
LCS — Loss of Control Signal
TB — Terminal Block
VFD — Variable Frequency Drive

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

INDEX

Accessory control components *145*
Accessory installation *7*
Accessory Navigator™ display *4, 147*
Actuators *35*
Adjustments *151*
Airflow control during
Fire/smoke modes *81*
Alarm output *38*
Alarms and alerts *114*
Alert limit configuration *91*
Auto view of run status *101*
Basic control usage *4*
Building pressure configuration *78*
Building pressure control *78*
Carrier Comfort Network® (CCN) *90*
CCN tables and display *6, 191*
CCN/Linkage display table *113*
Cleaning *153*
*Comfort*Link controls *4*
Complete unit stoppage *98*
Compressor removal *176*
Compressor replacement *176*
Compressor run hours display table *113*
Compressor starts display table *113, 114*
Configuring building pressure actuators *81*
Configuring the humidifier actuator *85*
Control circuit, 115 v *175*
Control circuit, 24 v *175*
Controls *7*
Controls operation *4, 40*
Controls quick start *32*
Controls set point and configuration
log *CL-1*
Conventions used in this manual *4*
Cool mode diagnostic help *50*
Cool mode selection process *48*
Cooling *37*
Cooling control *45*
Cooling information *111*
Crankcase heaters *7*
Dehumidification and reheat *86*
Demand limit control *39, 53*
Dirty filter switch *70*
Discrete switch logic configuration *93*
Display configuration *94*
Economizer *70*
Economizer changeover select *74*
Economizer diagnostic help *77*
Economizer integration with
mechanical cooling *54*
Economizer operation *73, 77*
Economizer options *33*
Economizer run status *111,112*
Economizer/outdoor air damper control *39*
Evaporator fan *7*
Exhaust fan VFD configuration *94*
Exhaust options *33*
Factory-installed components *124*
Fan status monitoring *70*
Fans *35*
Filter drier *175*
Fire shutdown mode *81*
Fire-smoke inputs *81*
Forcing inputs and outputs *101*
Gas heat (48P only) *7, 175*
Gas system adjustment (48P only) *174*
Head pressure control *53*
Heat mode diagnostic help *60*
Heat mode selection process *59*
Heating *38*
Heating control *58*
Hot gas bypass *96*
Humidification *85*
Humidi-MiZer® system *37, 88*
Humidi-MiZer troubleshooting *98*
HVAC modes *41*
Hydronic heating control *60*
Independent outputs *35*
Indoor air quality control *82*
Indoor air quality options *33*
Integrated gas control board logic *65*
Internal wiring *7*
Liquid line service valve *175*
Local display tables *177*
Lubrication *154*
Major system components *124*
Mode selection process *213, 214*
Mode trip helper *113, 114*
Modes *40*
Modulating gas heat control *61*
Moisture/liquid indicator *174*
Motormaster control *236*
Multi-stage constant volume units with
mechanical thermostat *32*
Multi-stage constant volume units
with space sensor *33*
Optional airflow station *85*
Outdoor air cfm control *76*
Pre-occupancy purge *84*
Pressurization mode *81*
Programming operating schedules *34*
Protective devices *175*
Refrigerant feed components *154*
Refrigeration circuits *154*
Relief devices *175*
Remote control switch input *96*
Remote switch *38*
Restart procedure *98*
Run status menu *101*
Safety considerations *2,3*
SCR electric heat control *61*
Scrolling marquee *4*
Sensor trim configuration *92*
Service *148-176*
Service access *148*
Service analysis *98*
Service test *35*
Service test mode logic *35*
Set clock on VFD (if installed) *34*
Single circuit stoppage *98*
Smoke control modes *81*
Smoke purge mode *81*
Software version numbers
display table *113*
Space temperature offset *96*
Staged gas heating control *61*
Start up *7-32*
Static pressure control *67*
Static pressure reset *69*
SUMZ cooling algoritm *50*
Supply air reset *38*
Supply fan status monitoring logic *70*
Supply fan VFD configuration *94*
System modes *40*
System Pilot™ interface *5*
Temperature compensated start *89*
Temperature compensated start logic *89*
Temperature driven heat mode
evaluation *59*
Tempering mode *66*
Thermistor troubleshooting *99*
Thermostat *38*
Thermostatic expansion valve (TXV) *154*
Third party control *38*
Time clock configuration *97*
Transducer troubleshooting *101*
Troubleshooting *98*
Two-stage gas and electric heat control *60*
Unit configuration (unit) submenu *43*
Unit preparation *7*
Unit staging tables *211,*
Unit start-up checklist *CL-8*
Unoccupied economizer free cooling *76*
UPC open controller *225*
Variable air volume units using return air
sensor or space temperature sensor *32*
VFD configurations *94*
VFD control *38*
VFD information *113, 213*

CONTROLS SET POINT AND CONFIGURATION LOG

MODEL NUMBER:		**Software Version**	
SERIAL NUMBER:		**MBB**	CESR131461--
DATE:		**RXB**	CESR131465--
TECHNICIAN:		**EXB**	CESR131465--
		NAVI	CESR130227--
		SCB	CESR131226--
		CEM	CESR131174--
		MARQ	CESR131171--
		CXB	CESR131173--
		EXV	CESR131172--

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
UNIT	UNIT CONFIGURATION			
→**C.TYP**	Machine Control Type	1 - 4 (multi-text strings)	4	
→**SIZE**	Unit Size (30-100)	3 - 100	30	
→**FN.MD**	Fan Mode (0=Auto, 1=Cont)	1 - 1 (multi-text strings)	1	
→**RM.CF**	Remote Switch Config	0 - 3 (multi-text strings)	0	
→**CEM**	CEM Module Installed	Yes/No	No	
→**TCS.C**	Temp.Cmp.Strt.Cool Factr	0 - 60 min	0	
→**TCS.H**	Temp.Cmp.Strt.Heat Factr	0 - 60 min	0	
→**SFS.S**	Fan Fail Shuts Down Unit	Yes/No	No	
→**SFS.M**	Fan Stat Monitoring Type	0 - 2 (multi-text strings)	0	
→**VAV.S**	VAV Unocc.Fan Retry Time	0 - 720 min	50	
→**50.HZ**	50 Hertz Unit ?	Yes/No	No	
→**MAT.S**	MAT Calc Config	0 - 2 (multi-text strings)	1	
→**MAT.R**	Reset MAT Table Entries?	Yes/No	No	
→**MAT.D**	MAT Outside Air Default	0 - 100%	20	
→**ALTI**	Altitude……..in feet:	0 - 60000	0	
→**DLAY**	Startup Delay Time	0 - 900 secs	0	
→**AUX.R**	Auxiliary Relay Config	0 - 3 (multi-text strings)	0	
→**SENS**	INPUT SENSOR CONFIG			
→**SENS**→**SPT.S**	Space Temp Sensor	Enable/Disable	Disable	
→**SENS**→**SP.O.S**	Space Temp Offset Sensor	Enable/Disable	Disable	
→**SENS**→**SP.O.R**	Space Temp Offset Range	1 - 10	5	
→**SENS**→**SRH.S**	Space Air RH Sensor	Enable/Disable	Disable	
→**SENS**→**RRH.S**	Return Air RH Sensor	Enable/Disable	Disable	
→**SENS**→**FLT.S**	Filter Stat.Sw.Enabled ?	Enable/Disable	Disable	
COOL	COOLING CONFIGURATION			
→**A1.EN**	Enable Compressor A1	Enable/Disable	Enable	
→**A2.EN**	Enable Compressor A2	Enable/Disable	Enable	
→**A3.EN**	Enable Compressor A3	Enable/Disable	Enable	
→**B1.EN**	Enable Compressor B1	Enable/Disable	Enable	
→**B2.EN**	Enable Compressor B2	Enable/Disable	Enable	
→**B3.EN**	Enable Compressor B3	Enable/Disable	Enable	
→**CS.A1**	CSB A1 Feedback Alarm	Enable/Disable	Enable	
→**CS.A2**	CSB A2 Feedback Alarm	Enable/Disable	Enable	
→**CS.A3**	CSB A3 Feedback Alarm	Enable/Disable	Enable	
→**CS.B1**	CSB B1 Feedback Alarm	Enable/Disable	Enable	
→**CS.B2**	CSB B2 Feedback Alarm	Enable/Disable	Enable	
→**CS.B3**	CSB B3 Feedback Alarm	Enable/Disable	Enable	
→**Z.GN**	Capacity Threshold Adjst	0.1 - 10	1	
→**MC.LO**	Compressor Lockout Temp	-20 - 55 dF	40	
→**LLAG**	Lead/Lag Configuration	0 - 2 (multi-text strings)	0	
→**M.M.**	Motor Master Control ?	Yes/No	No	
→**SCT.H**	Maximum Condenser Temp	100 - 150 dF	115	
→**SCT.L**	Minimum Condenser Temp	40 - 90 dF	72	
→**DG.A1**	A1 is a Digital Scroll	Yes/No	No	
→**MC.A1**	A1 Min Digital Capacit	10 - 100%	50	
→**DS.AP**	Dig Scroll Adjust Delta	0 - 100%	100	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
UNIT (cont)				
→DS.AD	Dig Scroll Adjust Delay	15 - 60 sec	20	
→DS.RP	Dig Scroll Reduce Delta	0 - 100%	6	
→DS.RD	Dig Scroll Reduce Delay	15 - 60 sec	30	
→DS.RO	Dig Scroll Reduction OAT	70 - 120 dF	95	
→DS.MO	Dig Scroll Max Only OAT	70 - 120 dF	105	
→MLV	Min Load Valve Enable	Enable/Disable	Disable	
→H.SST	Hi SST Alert Delay Time	5 - 30 min	10	
→RR.VF	Rev Rotation Verified ?	Yes/No	No	
→CS.HP	Use CSBs for HPS detect?	Yes/No	Yes	
EDT.R	EVAP.DISCHRGE TEMP RESET			
→RS.CF	EDT Reset Configuration	0 - 3 (multi-text strings)	2	
→RTIO	Reset Ratio	0 - 10	3	
→LIMT	Reset Limit	0 - 20 ^F	10	
→RES.S	EDT 4-20 ma Reset Input	Enable/Disable	Disable	
HEAT	HEATING CONFIGURATION			
→HT.CF	Heating Control Type	0 - 5	0	
→HT.SP	Heating Supply Air Setpt	80 - 120 dF	85	
→OC.EN	Occupied Heating Enabled	Yes/No	No	
→LAT.M	MBB Sensor Heat Relocate	Yes/No	No	
→SG.CF	STAGED HEAT CONFIGS			
→SG.CF→HT.ST	Staged Heat Type	0 - 5	0	
→SG.CF→CAP.M	Max Cap Change per Cycle	5 - 45	45	
→SG.CF→M.R.DB	S.Gas DB min.dF/PID Rate	0 - 5	0.5	
→SG.CF→S.G.DB	St.Gas Temp. Dead Band	0 - 5 ^F	2	
→SG.CF→RISE	Heat Rise dF/sec Clamp	0.05 - 0.2	0.06	
→SG.CF→LAT.L	LAT Limit Config	0 - 20 ^F	10	
→SG.CF→LIM.M	Limit Switch Monitoring?	Yes/No	Yes	
→SG.CF→SW.H.T	Limit Switch High Temp	80 - 210 dF	170	
→SG.CF→SW.L.T	Limit Switch Low Temp	80 - 210 dF	160	
→SG.CF→HT.P	Heat Control Prop. Gain	0 - 1.5	1	
→SG.CF→HT.D	Heat Control Derv. Gain	0 - 1.5	1	
→SG.CF→HT.TM	Heat PID Rate Config	60 - 300 sec	90	
→HH.CF	HYDRONIC HEAT CONFIGS			
→HH.CF→HW.P	Hydronic Ctl.Prop. Gain	0 - 1.5	1	
→HH.CF→HW.I	Hydronic Ctl.Integ. Gain	0 - 1.5	1	
→HH.CF→HW.D	Hydronic Ctl.Derv. Gain	0 - 1.5	1	
→HH.CF→HW.TM	Hydronic PID Rate Config	15 - 300 sec	90	
→HH.CF→ACT.C	HYDR.HEAT ACTUATOR CFGS.			
→HH.CF→ACTC→SN.1	Hydronic Ht.Serial Num.1	0 - 9999	0	
→HH.CF→ACTC→SN.2	Hydronic Ht.Serial Num.2	0 - 6	0	
→HH.CF→ACTC→SN.3	Hydronic Ht.Serial Num.3	0 - 9999	0	
→HH.CF→ACTC→SN.4	Hydronic Ht.Serial Num.4	0 - 254	0	
→HH.CF→ACTC→C.A.LM	Hydr.Ht.Ctl.Ang.Lo Limit	0-90	85	
SP	SUPPLY STATIC PRESS.CFG.			
→SP.CF	Static Pressure Config	Enable/Disable	Disable	
→SP.SV	Staged Air Volume Control	Enable/Disable	Disable	
→SP.S	Static Pressure Sensor	Enable/Disable	Disable	
→SP.LO	Static Press. Low Range	-10 - 0 in. W.C.	0	
→SP.HI	Static Press. High Range	0 - 10 in. W.C.	5	
→SP.SP	Static Pressure Setpoint	0 - 5 in. W.C.	1.5	
→SP.MN	VFD Minimum Speed	0 - 100%	20	
→SP.MX	VFD Maximum Speed	0 - 100%	100	
→SP.FS	VFD Fire Speed Over.	0 - 100%	100	
→SP.RS	Stat. Pres. Reset Config	0 - 4 (multi-text strings)	0	
→SP.RT	SP Reset Ratio	0.00 - 2.00	0.20	
→SP.LM	SP Reset Limit	0.00 - 2.00	0.75	
→SP.EC	SP Reset Econo Position	0 - 100%	5	
→S.PID	STAT.PRESS.PID CONFIGS			
→S.PID→SP.TM	Stat.Pres.PID Run Rate	5 - 120 sec	15	
→S.PID→SP.P	Static Press. Prop. Gain	0 - 5	0.5	
→S.PID→SP.I	Static Pressure Intg. Gain	0 - 2	0.5	
→S.PID→SP.D	Static Pressure Derv. Gain	0 - 5	0.3	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
ECON	ECONOMIZER CONFIGURATION			
→EC.EN	Economizer Installed?	Yes/No	Yes	
→EC2.E	Econ.Act.2 Installed?	Yes/No	No	
→EC.MN	Economizer Min.Position	0 - 100%	5	
→EC.MX	Economizer Max.Position	0 - 100%	98	
→E.TRM	Economzr Trim For SumZ ?	Yes/No	Yes	
→E.SEL	Econ ChangeOver Select	0 - 3 (multi-text strings)	0	
→OA.E.C	OA Enthalpy ChgOvr Selct	1 - 5 (multi-text strings)	4	
→OA.EN	Outdr.Enth Compare Value	18 - 28	24	
→OAT.L	High OAT Lockout Temp	-40 - 120 dF	60	
→O.DEW	OA Dewpoint Temp Limit	50 - 62 dF	55	
→ORH.S	Outside Air RH Sensor	Enable/Disable	Disable	
→CFM.C	OUTDOOR AIR CFM CONTROL			
→CFM.C→OCF.S	Outdoor Air CFM Sensor	Enable/Disable	Disable	
→CFM.C→O.C.MX	Economizer Min.Flow	0 - 20000 CFM	2000	
→CFM.C→O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000 CFM	0	
→CFM.C→O.C.DB	Econ.Min.Flow Deadband	200 - 1000 CFM	400	
→E.CFG	ECON.OPERATION CONFIGS			
→E.CFG→E.P.GN	Economizer Prop.Gain	0.7 - 3.0	1	
→E.CFG→E.RNG	Economizer Range Adjust	0.5 - 5 ^F	2.5	
→E.CFG→E.SPD	Economizer Speed Adjust	0.1 - 10	0.75	
→E.CFG→E.DBD	Economizer Deadband	0.1 - 2 ^F	0.5	
→UEFC	UNOCC.ECON.FREE COOLING			
→UEFC→FC.CF	Unoc Econ Free Cool Cfg	0-2 (multi-text strings)	0	
→UEFC→FC.TM	Unoc Econ Free Cool Time	0 - 720 min	120	
→UEFC→FC.L.O	Un.Ec.Free Cool OAT Lock	40 - 70 dF	50	
→ACT.C	ECON.ACTUATOR CONFIGS			
→ACTC→SN.1.1	Econ Serial Number 1	0 - 9999	0	
→ACTC→SN.1.2	Econ Serial Number 2	0 - 6	0	
→ACTC→SN.1.3	Econ Serial Number 3	0 - 9999	0	
→ACTC→SN.1.4	Econ Serial Number 4	0 - 254	0	
→ACTC→C.A.L1	Econ Ctrl Angle Lo Limit	0 - 90	85	
→ACTC→SN.2.1	Econ 2 Serial Number 1	0 - 9999	0	
→ACTC→SN.2.2	Econ 2 Serial Number 2	0 - 6	0	
→ACTC→SN.2.3	Econ 2 Serial Number 3	0 - 9999	0	
→ACTC→SN.2.4	Econ 2 Serial Number 4	0 - 254	0	
→ACTC→C.A.L2	Econ 2 Ctrl Angle Lo Limit	0 - 90	85	
→T.24.C	TITLE 24 CONFIGS			
→T.24.C→LOG.F	Log Title 24 Faults	Yes/No	No	
→T.24.C→EC.MD	T24 Econ Move Detect	1 - 10	1	
→T.24.C→EC.ST	T24 Econ Move SAT Test	10 - 20	10	
→T.24.C→S.CHG	T24 Econ Move SAT Change	0 - 5	0.2	
→T.24.C→E.SOD	T24 Econ RAT-OAT Diff	5 - 20	15	
→T.24.C→E.CHD	T24 Heat/Cool End Delay	0 - 60	25	
→T.24.C→ET.MN	T24 Test Minimum Pos.	0 - 50	15	
→T.24.C→ET.MX	T24 Test Maximum Pos.	50 - 100	85	
→T.24.C→SAT.T	SAT Settling Time	10 - 900	240	
→T.24.C→AC.EC	Economizer Deadband Temp	0 - 10	4	
→T.24.C→E.GAP	Econ Fault Detect Gap	2 - 100	5	
→T.24.C→E.TMR	Econ Fault Detect Timer	10 - 240	20	
→T.24.C→X.CFM	Excess Air CFM	400 - 4000	800	
→T.24.C→X.TMR	Excess Air Detect Timer	30 - 240	150	
→T.24.C→AC.MR	T24 AutoTest SF Run Time	1 - 10	2	
→T.24.C→AC.SP	T24 Auto-Test VFD Speed	10 - 50	20	
→T.24.C→AC.OP	T24 Auto-Test Econ % Opn	1 - 100	50	
→T.24.C→VF.PC	T24 Auto-Test VFD % Chng	1 - 20	10	
→T.24.C→EC.DY	T24 Econ Auto-Test Day	0=Never, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday	6=Saturday	
→T.24.C→EC.TM	T24 Econ Auto-Test Time	0 - 23	2	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
BP	BUILDING PRESS. CONFIGS			
→BP.CF	Building Press. Config	0 - 5 (multi-text strings)	0	
→BP.S	Building Pressure Sensor	Enable/Disable	Disable	
→BP.R	Bldg. Press. (+/-) Range	0.10 - 0.25 " H2O	0.25	
→BP.SP	Building Pressure Setp.	-0.25 - 0.25 " H2O	0.05	
→BP.SO	BP Setpoint Offset	0 - 0.5 " H2O	0.05	
→BP.P1	Power Exhaust On Setp.1	0 - 100%	25	
→BP.P2	Power Exhaust On Setp.2	0 - 100%	75	
→B.V.A	VFD/ACTUATOR CONFIG			
→B.V.A→BP.FS	VFD/Act. Fire Speed/Pos.	0 - 100%	100	
→B.V.A→BP.MN	VFD/Act. Min.Speed/Pos.	0 - 50%	0	
→B.V.A→BP.MX	VFD Maximum Speed	50 - 100%	100	
→B.V.A→BP.1M	BP 1 Actuator Max Pos.	85 - 100%	100	
→B.V.A→BP.2M	BP 2 Actuator Max Pos.	85 - 100%	100	
→B.V.A→BP.CL	BP Hi Cap VFD Clamp Val.	5 - 25%	10	
→FAN.T	FAN TRACKING CONFIG			
→FAN.T→FT.CF	Fan Track Learn Enable	Yes/No	No	
→FAN.T→FT.TM	Fan Track Learn Rate	5-60 min	15	
→FAN.T→FT.ST	Fan Track Initial DCFM	-20000 - 20000 CFM	2000	
→FAN.T→FT.MX	Fan Track Max Clamp	0 - 20000 CFM	4000	
→FAN.T→FT.AD	Fan Track Max Correction	0 -20000 CFM	1000	
→FAN.T→FT.OF	Fan Track Internl EEPROM	-20000 - 20000 CFM	0	
→FAN.T→FT.RM	Fan Track Internal RAM	-20000 - 20000 CFM	0	
→FAN.T→FT.RS	Fan Track Reset Internal	Yes/No	No	
→FAN.T→SCF.C	Supply Air CFM Config	1 - 2 (multi-text strings)	1	
→B.PID	BLDG.PRESS.PID CONFIGS			
→B.PID→BP.TM	Bldg.Pres.PID Run Rate	5 - 120 sec	10	
→B.PID→BP.P	Bldg.Press. Prop. Gain	0 - 5	0.5	
→B.PID→BP.I	Bldg.Press. Integ. Gain	0 - 2	0.5	
→B.PID→BP.D	Bldg.Press. Deriv. Gain	0 - 5	0.3	
→ACT.C	BLDG.PRES. ACTUATOR CFGS			
→ACT.C→BP.1	BLDG.PRES. ACT.1 CONFIGS			
→ACT.C→BP.1→SN.1	BP 1 Serial Number 1	0 - 9999	0	
→ACT.C→BP.1→SN.2	BP 1 Serial Number 2	0 - 6	0	
→ACT.C→BP.1→SN.3	BP 1 Serial Number 3	0 - 9999	0	
→ACT.C→BP.1→SN.4	BP 1 Serial Number 4	0 - 254	0	
→ACT.C→BP.1→C.A.LM	BP1 Cntrl Angle Lo Limit	0-90	35	
→ACT.C→BP.2	BLDG.PRES. ACT.2 CONFIGS			
→ACT.C→BP.2→SN.1	BP 2 Serial Number 1	0 - 9999	0	
→ACT.C→BP.2→SN.2	BP 2 Serial Number 2	0 - 6	0	
→ACT.C→BP.2→SN.3	BP 2 Serial Number 3	0 - 9999	0	
→ACT.C→BP.2→SN.4	BP 2 Serial Number 4	0 - 254	0	
→ACT.C→BP.2→C.A.LM	BP2 Cntrl Angle Lo Limit	0-90	35	
D.LV.T	COOL/HEAT SETPT. OFFSETS			
→L.H.ON	Dmd Level Lo Heat On	–1 - 2 ^F	1.5	
→H.H.ON	Dmd Level(+) Hi Heat On	0.5 - 20.0 ^F	0.5	
→L.H.OF	Dmd Level(-) Lo Heat Off	0.5 - 2.0 ^F	1.0	
→L.C.ON	Dmd Level Lo Cool On	–1 - 2 ^F	1.5	
→H.C.ON	Dmd Level(+) Hi Cool On	0.5 - 20.0 ^F	0.5	
→L.C.OF	Dmd Level(-) Lo Cool Off	0.5 - 2.0 ^F	1.0	
→C.T.LV	Cool Trend Demand Level	0.1 - 5.0 ^F	0.1	
→H.T.LV	Heat Trend Demand Level	0.1 - 5.0 ^F	0.1	
→C.T.TM	Cool Trend Time	30 - 600 sec	120	
→H.T.TM	Heat Trend Time	30 - 600 sec	120	
DMD.L	DEMAND LIMIT CONFIG.			
→DM.L.S	Demand Limit Select	0 - 3 (multi-text strings)	0	
→D.L.20	Demand Limit at 20 ma	0 - 100%	100	
→SH.NM	Loadshed Group Number	0 - 99	0	
→SH.DL	Loadshed Demand Delta	0 - 60%	0	
→SH.TM	Maximum Loadshed Time	0 - 120 min	60	
→D.L.S1	Demand Limit Sw.1 Setpt.	0 - 100%	80	
→D.L.S2	Demand Limit Sw.2 Setpt.	0 - 100%	50	
IAQ	INDOOR AIR QUALITY CFG.			
→DCV.C	DCV ECONOMIZER SETPOINTS			
→DCV.C→EC.MN	Economizer Min.Position	0 - 100%	5	
→DCV.C→IAQ.M	IAQ Demand Vent Min.Pos.	0 - 100%	0	
→DCV.C→O.C.MX	Economizer Min.Flow	0 - 20000 CFM	2000	
→DCV.C→O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000 CFM	0	
→DCV.C→O.C.DB	Econ.Min.Flow Deadband	200 - 1000 CFM	400	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
IAQ (cont)				
→AQ.CF	AIR QUALITY CONFIGS			
→AQ.CF→IQ.A.C	IAQ Analog Sensor Config	0 - 4 (multi-text strings)	0	
→AQ.CF→IQ.A.F	IAQ 4-20 ma Fan Config	0 - 2 (multi-text strings)	0	
→AQ.CF→IQ.I.C	IAQ Discrete Input Config	0 - 2 (multi-text strings)	0	
→AQ.CF→IQ.I.F	IAQ Disc.In. Fan Config	0 - 2 (multi-text strings)	0	
→AQ.CF→OQ.A.C	OAQ 4-20ma Sensor Config	0 - 2 (multi-text strings)	0	
→AQ.SP	AIR QUALITY SETPOINTS			
→AQ.SP→IQ.O.P	IAQ Econo Override Pos.	0 - 100%	100	
→AQ.SP→IQ.O.C	IAQ Override Flow	0 - 31000 CFM	10000	
→AQ.SP→DAQ.L	Diff.Air Quality LoLimit	0 - 1000	100	
→AQ.SP→DAQ.H	Diff. Air Quality HiLimit	100 - 2000	700	
→AQ.SP→D.F.OF	DAQ PPM Fan Off Setpoint	0 - 2000	200	
→AQ.SP→D.F.ON	DAQ PPM Fan On Setpoint	0 - 2000	400	
→AQ.SP→IAQ.R	Diff. AQ Responsiveness	-5 - 5	0	
→AQ.SP→OAQ.L	OAQ Lockout Value	0 - 2000	0	
→AQ.SP→OAQ.U	User Determined OAQ	0 - 5000	400	
→AQ.S.R	AIR QUALITY SENSOR RANGE			
→AQ.S.R→IQ.R.L	IAQ Low Reference	0 - 5000	0	
→AQ.S.R→IQ.R.H	IAQ High Reference	0 - 5000	2000	
→AQ.S.R→OQ.R.L	OAQ Low Reference	0 - 5000	0	
→AQ.S.R→OQ.R.H	OAQ High Reference	0 - 5000	2000	
→IAQ.P	IAQ PRE-OCCUPIED PURGE			
→IAQ.P→IQ.PG	IAQ Purge	Yes/No	No	
→IAQ.P→IQ.P.T	IAQ Purge Duration	5 - 60 min	15	
→IAQ.P→IQ.P.L	IAQ Purge LoTemp Min Pos	0 - 100%	10	
→IAQ.P→IQ.P.H	IAQ Purge HiTemp Min Pos	0 - 100%	35	
→IAQ.P→IQ.L.O	IAQ Purge OAT Lockout	35 - 70 dF	50	
HUMD	HUMIDITY CONFIGURATION			
→HM.CF	Humidifier Control Cfg.	0 - 4	0	
→HM.SP	Humidifier Setpoint	0 - 100%	40	
→H.PID	HUMIDIFIER PID CONFIGS			
→H.PID→HM.TM	Humidifier PID Run Rate	10 - 120 sec	30	
→H.PID→HM.P	Humidifier Prop. Gain	0 - 5	1	
→H.PID→HM.I	Humidifier Integral Gain	0 - 5	0.3	
→H.PID→HM.D	Humidifier Deriv. Gain	0 - 5	0.3	
→ACT.C	HUMIDIFIER ACTUATOR CFGS			
→ACTC→SN.1	Humd Serial Number 1	0 - 9999	0	
→ACTC→SN.2	Humd Serial Number 2	0 - 6	0	
→ACTC→SN.3	Humd Serial Number 3	0 - 9999	0	
→ACTC→SN.4	Humd Serial Number 4	0 - 254	0	
→ACTC→C.A.LM	Humd Ctrl Angle Lo Limit	0 - 90	85	
DEHU	DEHUMIDIFICATION CONFIG.			
→D.SEL	Dehumidification Config	0 - 3 (multi-text strings)	0	
→D.SEN	Dehumidification Sensor	1 - 3 (multi-text strings)	1	
→D.EC.D	Econ disable in DH mode?	Yes/No	Yes	
→D.V.CF	Vent Reheat Setpt Select	0 - 1 (multi-text strings)	0	
→D.V.RA	Vent Reheat RAT offset	0 - 8 delta F	0	
→D.V.HT	Vent Reheat Setpoint	55 - 95 dF	70	
→D.C.SP	Dehumidify Cool Setpoint	40 - 55 dF	45	
→D.RH.S	Dehumidify RH Setpoint	10 - 90%	55	
→HZ.RT	Humidimizer Adjust Rate	5-120 sec	30	
→HZ.PG	Humidimizer Prop. Gain	0-10	0.8	
CCN	CCN CONFIGURATION			
→CCNA	CCN Address	1 - 239	1	
→CCNB	CCN Bus Number	0 - 239	0	
→BAUD	CCN Baud Rate	1 - 5 (multi-text strings)	3	
→BROD	CCN BROADCST DEFINITIONS			
→BROD→TM.DT	CCN Time/Date Broadcast	ON/OFF	On	
→BROD→OAT.B	CCN OAT Broadcast	ON/OFF	Off	
→BROD→ORH.B	CCN OARH Broadcast	ON/OFF	Off	
→BROD→OAQ.B	CCN OAQ Broadcast	ON/OFF	Off	
→BROD→G.S.B	Global Schedule Broadcst	ON/OFF	Off	
→BROD→B.ACK	CCN Broadcast Ack'er	ON/OFF	Off	
→SC.OV	CCN SCHEDULES-OVERRIDES			
→SC.OV→SCH.N	Schedule Number	0 - 99	1	
→SC.OV→HOL.T	Accept Global Holidays?	YES/NO	No	
→SC.OV→O.T.L.	Override Time Limit	0 - 4 HRS	1	
→SC.OV→OV.EX	Timed Override Hours	0 - 4 HRS	0	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
CCN (cont)				
→SC.OV→SPT.O	SPT Override Enabled ?	YES/NO	Yes	
→SC.OV→T58.O	T58 Override Enabled ?	YES/NO	Yes	
→SC.OV→GL.OV	Global Sched. Override ?	YES/NO	No	
ALLM	ALERT LIMIT CONFIG.			
→SP.L.O	SPT lo alert limit/occ	-10 - 245 dF	60	
→SP.H.O	SPT hi alert limit/occ	-10 - 245 dF	85	
→SP.L.U	SPT lo alert limit/unocc	-10 - 245 dF	45	
→SP.H.U	SPT hi alert limit/unocc	-10 - 245 dF	100	
→SA.L.O	EDT lo alert limit/occ	-40 - 245 dF	40	
→SA.H.O	EDT hi alert limit/occ	-40 - 245 dF	100	
→SA.L.U	EDT lo alert limit/unocc	-40 - 245 dF	40	
→SA.H.U	EDT hi alert limit/unocc	-40 - 245 dF	100	
→RA.L.O	RAT lo alert limit/occ	-40 - 245 dF	60	
→RA.H.O	RAT hi alert limit/occ	-40 - 245 dF	90	
→RA.L.U	RAT lo alert limit/unocc	-40 - 245 dF	40	
→RA.H.U	RAT hi alert limit/unocc	-40 - 245 dF	100	
→OAT.L	OAT lo alert limit	-40 - 245 dF	-40	
→OAT.H	OAT hi alert limit	-40 - 245 dF	150	
→R.RH.L	RARH low alert limit	0 - 100%	0	
→R.RH.H	RARH high alert limit	0 - 100%	100	
→O.RH.L	OARH low alert limit	0 - 100%	0	
→O.RH.H	OARH high alert limit	0 - 100%	100	
→SP.L	SP low alert limit	0 - 5 " H2O	0	
→SP.H	SP high alert limit	0 - 5 " H2O	2	
→BP.L	BP lo alert limit	-0.25 - 0.25 " H2O	-0.25	
→BP.H	BP high alert limit	-0.25 - 0.25 " H2O	0.25	
→IAQ.H	IAQ high alert limit	0 - 5000	1200	
TRIM	SENSOR TRIM CONFIG.			
→SAT.T	Air Temp Lvg SF Trim	-10 - 10 ^F	0	
→RAT.T	RAT Trim	-10 - 10 ^F	0	
→OAT.T	OAT Trim	-10 - 10 ^F	0	
→SPT.T	SPT Trim	-10 - 10 ^F	0	
→L.SW.T	Limit Switch Trim	-10 - 10 ^F	0	
→CCT.T	Air Temp Lvg Evap Trim	-10 - 10 ^F	0	
→DTA.1	A1 Discharge Temp Trim	-10 - 10 ^F	0	
→SP.A.T	Suct.Press.Circ.A Trim	-50 - 50 PSIG	0	
→SP.B.T	Suct.Press.Circ.B Trim	-50 - 50 PSIG	0	
→DP.A.T	Dis.Press.Circ.A Trim	-50 - 50 PSIG	0	
→DP.B.T	Dis.Press.Circ.B Trim	-50 - 50 PSIG	0	
SW.LG	SWITCH LOGIC: NO / NC			
→FTS.L	Filter Status Inpt-Clean	Open/Close	Open	
→IGC.L	IGC Feedback - Off	Open/Close	Open	
→RMI.L	RemSw Off-Unoc-Strt-NoOv	Open/Close	Open	
→ENT.L	Enthalpy Input - Low	Open/Close	Close	
→SFS.L	Fan Status Sw. - Off	Open/Close	Open	
→DL1.L	Dmd.Lmt.Sw.1 - Off	Open/Close	Open	
→DL2.L	Dmd.Lmt.Sw.2 - Off	Open/Close	Open	
→IAQ.L	IAQ Disc.Input - Low	Open/Close	Open	
→FSD.L	Fire Shutdown - Off	Open/Close	Open	
→PRS.L	Pressurization Sw. - Off	Open/Close	Open	
→EVC.L	Evacuation Sw. - Off	Open/Close	Open	
→PRG.L	Smoke Purge Sw. - Off	Open/Close	Open	
→DH.LG	Dehumidify Sw. - Off	Open/Close	Open	
DISP	DISPLAY CONFIGURATION			
→TEST	Test Display LEDs	ON/OFF	Off	
→METR	Metric Display	ON/OFF	Off	
→LANG	Language Selection	0 - 1 (multi-text strings)	0	
→PAS.E	Password Enable	ENABLE/DISABLE	Enable	
→PASS	Service Password	0000 - 9999	1111	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
S.VFD	SUPPLY FAN VFD CONFIG			
→**N.VLT**	VFD1 Nominal Motor Volts	0 - 999 VOLTS	460*	
→**N.AMP**	VFD1 Nominal Motor Amps	0 - 999 AMPS	55.0*	
→**N.FRQ**	VFD1 Nominal Motor Freq	10 - 500	60	
→**N.RPM**	VFD1 Nominal Motor RPM	50 - 30000	1750	
→**N.PWR**	VFD1 Nominal Motor HPwr	0 - 500	40*	
→**M.DIR**	VFD1 Motor Direction	0 - 1 (multi-text strings)	0	
→**ACCL**	VFD1 Acceleration Time	0 - 1800 sec	30	
→**DECL**	VFD1 Deceleration Time	0 - 1800 sec	30	
→**SW.FQ**	VFD1 Switching Frequency	0 - 3 (multi-text strings)	2	
→**TYPE**	VFD1 Type	0 - 1 (multi-text strings)	0	
E.VFD	EXHAUST FAN VFD CONFIG			
→**N.VLT**	VFD2 Nominal Motor Volts	0 - 999 VOLTS	460*	
→**N.AMP**	VFD2 Nominal Motor Amps	0 - 999 AMPS	28.7*	
→**N.FRQ**	VFD2 Nominal Motor Freq	10 - 500	60	
→**N.RPM**	VFD2 Nominal Motor RPM	50 - 30000	1750	
→**N.PWR**	VFD2 Nominal Motor HPwr	0 - 500	20*	
→**M.DIR**	VFD2 Motor Direction	0 - 1 (multi-text strings)	0	
→**ACCL**	VFD2 Acceleration Time	0 - 1800 sec	30	
→**DECL**	VFD2 Deceleration Time	0 - 1800 sec	30	
→**SW.FQ**	VFD2 Switching Frequency	0 - 3 (multi-text strings)	2	
→**TYPE**	VFD2 Type	0 - 1 (multi-text strings)	0	

*Model number dependent.

UNIT START-UP CHECKLIST

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

MODEL NO.: ______________________ SERIAL NO.: ______________________

SOFTWARE VERSION: ______________ TECHNICIAN: ______________________

DATE: ______________________

PRE-START-UP:

☐ VERIFY THAT DIP SWITCH SETTINGS ARE CORRECT
☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
☐ REMOVE ALL COMPRESSOR SHIPPING HOLDDOWN BOLTS AND BRACKETS PER INSTRUCTIONS
☐ VERIFY INSTALLATION OF ECONOMIZER HOOD
☐ VERIFY INSTALLATION OF ALL OPTIONS AND ACCESSORIES
☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
☐ CHECK GAS PIPING FOR LEAKS (48P ONLY)
☐ CHECK THAT RETURN-AIR FILTER AND OUTDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
☐ VERIFY THAT UNIT IS LEVEL WITHIN TOLERANCES FOR PROPER CONDENSATE DRAINAGE
☐ CHECK FAN WHEELS AND PROPELLERS FOR LOCATION IN HOUSING/ORIFICE, AND SETSCREW IS TIGHT
☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
☐ VERIFY THAT SUCTION, DISCHARGE, AND LIQUID SERVICE VALVES ON EACH CIRCUIT ARE OPEN
☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ON 24 HOURS BEFORE START-UP.

START-UP:

ELECTRICAL

SUPPLY VOLTAGE	L1-L2	________	L2-L3	________	L3-L1	________	
COMPRESSOR AMPS — COMPRESSOR NO. 1	L1	________	L2	________	L2	________	
COMPRESSOR AMPS — COMPRESSOR NO. 2	L1	________	L2	________	L2	________	
SUPPLY FANS AMPS	(CV)	________	EXHAUST FAN AMPS	________			
	(VAV)	________ *					

*VAV fan supply amps reading must be taken with a true RMS meter for accurate readings.

TEMPERATURES

OUTDOOR-AIR TEMPERATURE ________ F DB (Dry Bulb)
RETURN-AIR TEMPERATURE ________ F DB ________ F WB (Wet Bulb)
COOLING SUPPLY AIR ________ F
GAS HEAT SUPPLY AIR ________ F (48P ONLY)
ELECTRIC HEAT SUPPLY AIR ________ F (50P ONLY, IF EQUIPPED)

PRESSURES

GAS INLET PRESSURE ________ IN. WG (48P ONLY)
GAS MANIFOLD PRESSURE STAGE NO. 1 ________ IN. WG STAGE NO. 2 ________ IN. WG (48P ONLY)
REFRIGERANT SUCTION CIRCUIT NO. 1 ________ PSIG CIRCUIT NO. 2 ________ PSIG
REFRIGERANT DISCHARGE CIRCUIT NO. 2 ________ PSIG CIRCUIT NO. 2 ________ PSIG

☐ ________________ VERIFY REFRIGERANT CHARGE.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE