WEATHERMASTER®
48/50Z030-105
Single Package Large Rooftop Units with *COMFORT*LINK™ Version 4.X Controls

Controls, Start-Up, Operation, Service and Troubleshooting

CONTENTS

CONTENTS (cont)

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.

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.

GENERAL

This book contains Start-Up, Controls, Operation, Troubleshooting and Service information for the 48/50Z Series rooftop units. See Table 1. These units are equipped with *Comfort*Link™ controls version 4.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 48/50Z Series units provide ventilation, cooling, and heating (when equipped) in variable air volume (VAV) and constant volume (CV) applications.

Table 1 — Z Series Product Line

UNIT	SIZE	APPLICATION
48ZG	All	Gas Heat, Vertical Supply CV 2-Stage
48ZN	All	Gas Heat, Vertical Supply VAV and CV Multi
50ZG	All	Vertical Supply, Optional Electric Heat CV 2-Stage
50ZN	All	Vertical Supply, Optional Electric Heat VAV and CV Multi
50Z2	All	Horizontal Supply CV 2-Stage
50Z3	All	Horizontal Supply VAV and CV Multi
48ZT	075-105	Gas Heat, Vertical Supply High-Capacity Power Exhaust CV 2-Stage
48ZW	075-105	Gas Heat, Vertical Supply High-Capacity Power Exhaust VAV and CV Multi
50ZT	075-105	Vertical Supply, Optional Electric Heat High-Capacity Power Exhaust CV 2-Stage
50ZW	075-105	Vertical Supply, Optional Electric Heat High-Capacity Power Exhaust VAV and CV Multi
50ZX	075-105	Horizontal Supply, Optional Electric Heat High-Capacity Power Exhaust CV 2-Stage
50ZZ	075-105	Horizontal Supply, Optional Electric Heat High-Capacity Power Exhaust VAV and CV Multi
48Z6	075-105	Gas Heat, Vertical Supply Return/Exhaust Fan CV 2-Stage
48Z8	075-105	Gas Heat, Vertical Supply Return/Exhaust Fan VAV and CV Multi
50Z6	075-105	Vertical Supply, Optional Electric Heat Return/Exhaust Fan CV 2-Stage
50Z7	075-105	Horizontal Supply, Vertical Return Optional Electric Heat Return/Exhaust Fan CV 2-Stage
50Z8	075-105	Vertical Supply, Optional Electric Heat Return/Exhaust Fan VAV and CV Multi
50Z9	075-105	Horizontal Supply, Vertical Return Optional Electric Heat Return/Exhaust Fan VAV and CV Multi

LEGEND

CV 2-Stage — Constant Volume, 2-Stage
CV Multi — Constant Volume, Multiple Adaptive Demand
VAV — Variable Air Volume

The 48/50Z 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 can be equipped with optional IGV (inlet guide vanes) or 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 suction pressure transducers and saturated discharge pressure transducers which allow for display of the unit's operational pressures.

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 quick test so that all the controlled components can be checked for proper operation.

Conventions Used in This Manual

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

Point names will be written with the Mode name first, then any submodes, then the point 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 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 parenthesis after the value. As an example, ***Configuration→IAQ→AQ.CF→IQ.AC*** **= 1** (IAQ Analog Input).

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description of the point 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 point names are also referenced in the local display tables for users configuring the unit with CCN software instead of the local display. The CCN tables are located in Appendix B of 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 two types of constant volume cooling control sequences, two variable air volume cooling control sequences, and heating control sequences for two-stage electric and gas systems, for multiple-stage gas heating, and hydronic heat in both Occupied and Unoccupied schedule modes. This control also manages:

- VAV duct pressure (through optional VFD or inlet guide vanes), with reset
- Building pressure through four different power exhaust systems
- Return fan applications using fan tracking
- Condenser fan cycling for low ambient head pressure control
- Dehumidification (with 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

System diagnostics are enhanced by the use of multiple external 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 via the Internet. Multiple 48/50Z 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. There is no need to bring a separate computer to this unit for 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

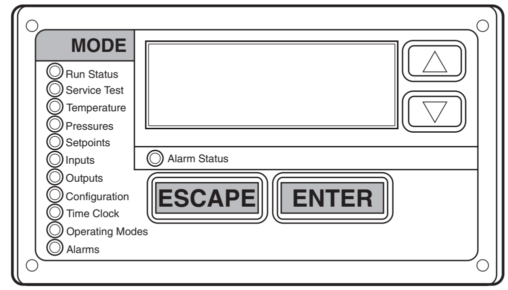


Fig. 1 — Scrolling Marquee

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

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 48/50Z 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 48/50Z 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.

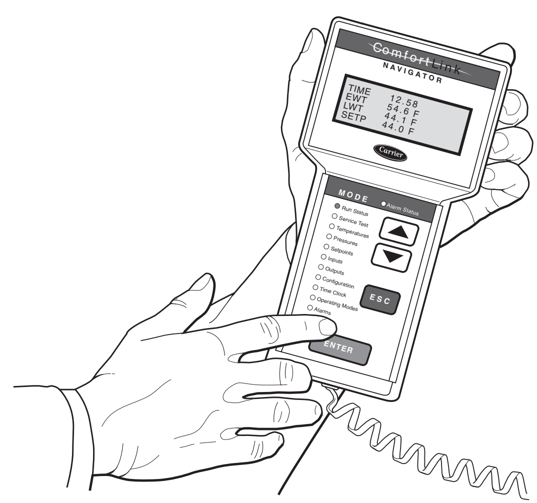


Fig. 2 — Accessory Navigator Display

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. 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 (MODE LED level) 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 of 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. 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 pressing the ▲ and ▼ arrow keys simultaneously.

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 serves 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 Service Tool or other CCN programs. Details on the CCN tables are summarized in Appendix B. The variable 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 variable names are included in the scrolling marquee tables and the scrolling marquee names 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 (Points, Config, Service-Config, Set Point, and Maintenance) 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. 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.

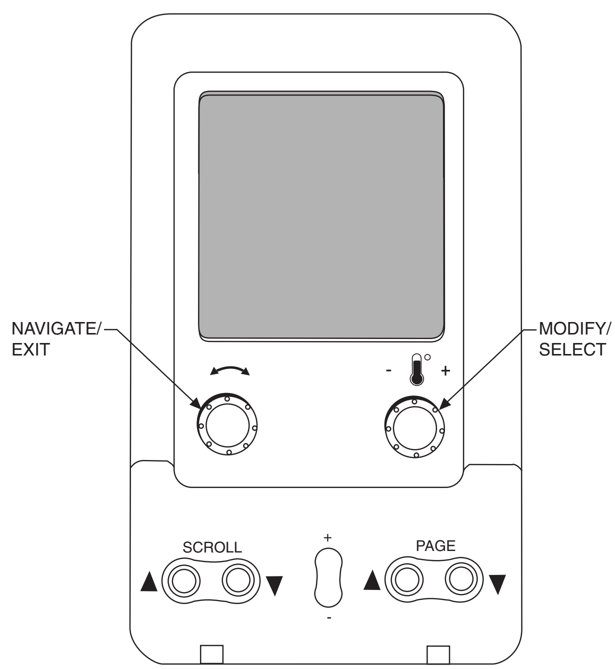


Fig. 3 — System Pilot User Interface

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)
Mode Trip Helper (TRIP) ↓	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)	
CCN Linkage (LINK) ↓	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)		
Compressor Run Hours (HRS) ↓	Test Fans (FANS) ↓			VAV Occ Cool On (V.C.ON) ↓	Air Quality Sensors (AIR.Q) ↓		Economizer Configuration (ECON) ↓			
Compressor Starts (STRT) ↓	Calibrate Test Actuators (ACT.C) ↓			VAV Occ Cool Off (V.C.OF) ↓	CFM Sensors (CFM) ↓		Building Press. Configs (BP) ↓			
Software Version Numbers (VERS)	Test Cooling (COOL) ↓			Supply Air Setpoint (SASP) ↓	Reset Inputs (RSET) ↓		Cool/Heat Setpt. Offsets (D.LV.T) ↓			
	Test Heating (HEAT)			Supply Air Setpoint Hi (SA.HI) ↓	4-20 Milliamp Inputs (4-20)		Demand Limit Config. (DMD.L) ↓			
				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)			

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.

START-UP

IMPORTANT: Do not attempt to start unit, even momentarily, until all items on the Start-Up Checklist (in installation instructions) and the following steps have been completed.

Unit Preparation — Check that unit has been installed in accordance with the installation instructions and applicable codes.

Unit Setup — 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 heat make sure that the LAT 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 3-25 for fan performance. Remove tape from fan pulley, and be sure that fans rotate in the proper direction. See Tables 26-28 for motor limitations. See Table 29 for air quantity limits. Static pressure drop is shown in Tables 30A-30C.

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 128 for belt installation procedure.

Controls — Use the following steps for the controls:

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, ComfortVIEW™ software or Service Tool 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. Start unit using 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 heat 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.

Table 3 — Fan Performance — 48ZG,ZN030 and 50ZG,ZN030 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) 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30A on page 32.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 4 — Fan Performance — 48ZG,ZN035 and 50ZG,ZN035 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] 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30A on page 32.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 5 — Fan Performance — 48ZG,ZN040 and 50ZG,ZN040 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) 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30A on page 32.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 6 — Fan Performance — 48ZG,ZN050 and 50ZG,ZN050 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) 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30A on page 32.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 7 — Fan Performance — 48ZG,ZN055 and 50ZG,ZN055 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) 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30B on page 32.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30B before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 8 — Fan Performance — 48ZG,ZN060 and 50ZG,ZN060 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) 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30B on page 32.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30B before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 9 — Fan Performance — 48ZG,ZN070 and 50ZG,ZN070 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] 48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30B on page 32.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30B before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 10 — Fan Performance — 50ZG,ZN030 Units With Discharge Plenum and 50Z2,Z3030 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) 50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 11 — Fan Performance — 50ZG,ZN035 Units With Discharge Plenum and 50Z2,Z3035 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) 50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 12 — Fan Performance — 50ZG,ZN040 Units With Discharge Plenum and 50Z2,Z3040 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) 50ZN,Z3 units only.
Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 13 — Fan Performance — 50ZG,ZN050 Units With Discharge Plenum and 50Z2,Z3050 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) 50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30A before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 14 — Fan Performance — 50ZG,ZN055 Units With Discharge Plenum and 50Z2,Z3055 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) 50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30B before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 15 — Fan Performance — 50ZG,ZN060 Units With Discharge Plenum and 50Z2,Z3060 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) 50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30B before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 16 — Fan Performance — 50ZG,ZN070 Units With Discharge Plenum and 50Z2,Z3070 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) 50ZN,Z3 units only.
Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Table 30B before using Fan Performance tables.
3. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 17 — Fan Performance — 48ZG,ZN,ZT,ZW,Z6,Z8 and 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 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) — 48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30C.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Table 30C before using Fan Performance tables.
4. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 18 — Fan Performance — 48ZG,ZN,ZT,ZW,Z6,Z8 and 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 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	622	3.32	673	4.27	721	5.24	768	6.27	815	7.33	859	8.44	903	9.57	945	10.63
16,000	657	3.86	705	4.85	751	5.87	795	6.93	839	8.02	882	9.15	924	10.32	965	11.43
18,000	727	5.11	771	6.20	812	7.30	853	8.42	892	9.58	931	10.66	970	11.92	1008	13.22
20,000	798	6.60	838	7.80	876	8.98	913	10.18	950	11.31	985	12.59	1021	13.91	1056	15.28
22,000	870	8.37	907	9.66	942	10.83	977	12.14	1010	13.47	1043	14.83	1076	16.22	1108	17.65
24,000	942	10.42	977	11.73	1010	13.13	1042	14.54	1073	15.96	1103	17.40	1134	18.87	1163	20.37
26,000	1015	12.73	1047	14.26	1078	15.77	1108	17.28	1137	18.79	1166	20.32	1194	21.87	1222	23.44
28,000	1088	15.52	1118	17.15	1147	18.77	1176	20.38	1203	21.99	1230	23.61	1257	25.25	1283	26.90
30,000	1162	18.68	1190	20.43	1218	22.15	1244	23.87	1270	25.58	1296	27.29	1321	29.01	1345	30.75

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	985	11.83	1024	13.05	1062	14.29	1098	15.54	1132	16.80	1166	18.07	1199	19.34	1230	20.63
16,000	1004	12.68	1042	13.95	1079	15.24	1114	16.55	1149	17.86	1182	19.19	1215	20.52	1246	21.87
18,000	1045	14.54	1081	15.90	1116	17.28	1150	18.69	1184	20.11	1216	21.54	1248	22.99	1279	24.45
20,000	1090	16.67	1124	18.10	1157	19.56	1190	21.05	1222	22.56	1253	24.09	1284	25.63	1314	27.19
22,000	1140	19.11	1171	20.61	1202	22.14	1233	23.69	1263	25.28	1293	26.88	1323	28.51	1352	30.16
24,000	1193	21.90	1222	23.45	1252	25.04	1280	26.67	1309	28.31	1337	29.99	1365	31.69	1393	33.42
26,000	1250	25.04	1277	26.67	1304	28.33	1331	30.01	1358	31.72	1385	33.46	1411	35.22	1437	37.01
28,000	1309	28.57	1335	30.27	1360	32.00	1386	33.75	1411	35.52	1436	37.32	1461	39.15	1486	40.99
30,000	1370	32.50	1394	34.28	1418	36.08	1442	37.89	1466	39.74	1490	41.60	1513	43.49	1537	45.40

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	1261	21.92	1291	23.22	1320	24.52	1348	25.84
16,000	1276	23.22	1306	24.58	1335	25.95	1363	27.32
18,000	1309	25.92	1338	27.40	1367	28.88	1395	30.37
20,000	1343	28.77	1372	30.35	1400	31.94	1428	33.55
22,000	1380	31.82	1408	33.50	1435	35.20	1462	36.90
24,000	1420	35.16	1447	36.92	1473	38.70	1499	40.49
26,000	1463	38.82	1489	40.66	1514	42.51	1539	44.38
28,000	1510	42.87	1535	44.77	1559	46.69	1583	48.63
30,000	1560	47.34	1583	49.30	1606	51.28	1629	53.28

LEGEND

(Shaded) — 48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30C.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Table 30C before using Fan Performance tables.
4. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 19 — Fan Performance — 48ZG,ZN,ZT,ZW,Z6,Z8 and 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9090 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) 48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30C.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Table 30C before using Fan Performance tables.
4. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 20 — Fan Performance — 48ZG,ZN,ZT,ZW,Z6,Z8 and 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9090 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	692	4.45	737	5.50	781	6.56	824	7.64	865	8.77	906	9.93	946	11.03	985	12.29
18,000	727	5.11	771	6.20	812	7.30	853	8.42	892	9.58	931	10.66	970	11.92	1008	13.22
20,000	798	6.60	838	7.80	876	8.98	913	10.18	950	11.31	985	12.59	1021	13.91	1056	15.28
22,000	870	8.37	907	9.66	942	10.83	977	12.14	1010	13.47	1043	14.83	1076	16.22	1108	17.65
24,000	942	10.42	977	11.73	1010	13.13	1042	14.54	1073	15.96	1103	17.40	1134	18.87	1163	20.37
26,000	1015	12.73	1047	14.26	1078	15.77	1108	17.28	1137	18.79	1166	20.32	1194	21.87	1222	23.44
28,000	1088	15.52	1118	17.15	1147	18.77	1176	20.38	1203	21.99	1230	23.61	1257	25.25	1283	26.90
30,000	1162	18.68	1190	20.43	1218	22.15	1244	23.87	1270	25.58	1296	27.29	1321	29.01	1345	30.75
32,000	1235	22.25	1262	24.12	1288	25.94	1313	27.76	1338	29.57	1362	31.38	1386	33.20	1409	35.02
34,000	1309	26.26	1335	28.23	1359	30.17	1383	32.09	1407	34.00	1430	35.91	1452	37.82	1475	39.73

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	1024	13.58	1061	14.90	1097	16.24	1132	17.59	1166	18.96	1199	20.35	1231	21.74	1262	23.14
18,000	1045	14.54	1081	15.90	1116	17.28	1150	18.69	1184	20.11	1216	21.54	1248	22.99	1279	24.45
20,000	1090	16.67	1124	18.10	1157	19.56	1190	21.05	1222	22.56	1253	24.09	1284	25.63	1314	27.19
22,000	1140	19.11	1171	20.61	1202	22.14	1233	23.69	1263	25.28	1293	26.88	1323	28.51	1352	30.16
24,000	1193	21.90	1222	23.45	1252	25.04	1280	26.67	1309	28.31	1337	29.99	1365	31.69	1393	33.42
26,000	1250	25.04	1277	26.67	1304	28.33	1331	30.01	1358	31.72	1385	33.46	1411	35.22	1437	37.01
28,000	1309	28.57	1335	30.27	1360	32.00	1386	33.75	1411	35.52	1436	37.32	1461	39.15	1486	40.99
30,000	1370	32.50	1394	34.28	1418	36.08	1442	37.89	1466	39.74	1490	41.60	1513	43.49	1537	45.40
32,000	1433	36.87	1456	38.72	1479	40.58	1501	42.48	1524	44.38	1546	46.32	1568	48.27	1591	50.25
34,000	1497	41.66	1519	43.60	1540	45.55	1562	47.52	1583	49.50	1605	51.50	1626	53.52	1647	55.56

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	1292	24.55	1322	25.97	1351	27.40	1379	28.83
18,000	1309	25.92	1338	27.40	1367	28.88	1395	30.37
20,000	1343	28.77	1372	30.35	1400	31.94	1428	33.55
22,000	1380	31.82	1408	33.50	1435	35.20	1462	36.90
24,000	1420	35.16	1447	36.92	1473	38.70	1499	40.49
26,000	1463	38.82	1489	40.66	1514	42.51	1539	44.38
28,000	1510	42.87	1535	44.77	1559	46.69	1583	48.63
30,000	1560	47.34	1583	49.30	1606	51.28	1629	53.28
32,000	1613	52.25	1635	54.27	1657	56.31	1678	58.37
34,000	1668	57.63	1689	59.70	1710	61.80	1730	63.93

LEGEND

(shaded) 48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30C.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Table 30C before using Fan Performance tables.
4. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 21 — Fan Performance — 48ZG,ZN,ZT,ZW,Z6,Z8 and 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9105 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) 48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30C.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Table 30C before using Fan Performance tables.
4. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 22 — Fan Performance — 48ZG,ZN,ZT,ZW,Z6,Z8 and 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9105 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	798	6.60	838	7.80	876	8.98	913	10.18	950	11.31	985	12.59	1021	13.91	1056	15.28
22,000	870	8.37	907	9.66	942	10.83	977	12.14	1010	13.47	1043	14.83	1076	16.22	1108	17.65
24,000	942	10.42	977	11.73	1010	13.13	1042	14.54	1073	15.96	1103	17.40	1134	18.87	1163	20.37
26,000	1015	12.73	1047	14.26	1078	15.77	1108	17.28	1137	18.79	1166	20.32	1194	21.87	1222	23.44
28,000	1088	15.52	1118	17.15	1147	18.77	1176	20.38	1203	21.99	1230	23.61	1257	25.25	1283	26.90
30,000	1162	18.68	1190	20.43	1217	22.15	1244	23.87	1270	25.58	1296	27.29	1321	29.01	1345	30.75
32,000	1235	22.25	1262	24.12	1288	25.94	1313	27.76	1338	29.57	1362	31.38	1386	33.20	1409	35.02
34,000	1309	26.26	1335	28.23	1359	30.17	1383	32.09	1407	34.00	1430	35.91	1452	37.82	1475	39.73
36,000	1383	30.73	1407	32.80	1431	34.85	1454	36.87	1476	38.89	1498	40.89	1520	42.90	1541	44.90
38,000	1457	35.67	1480	37.85	1503	40.00	1525	42.13	1546	44.24	1567	46.36	1588	48.46	1608	50.56
40,000	1532	41.12	1554	43.40	1575	45.65	1596	47.88	1616	50.10	1637	52.31	1657	54.51	1676	56.71

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
20,000	1090	16.67	1124	18.10	1157	19.56	1190	21.05	1222	22.56	1253	24.09	1284	25.63	1314	27.19
22,000	1140	19.11	1171	20.61	1202	22.14	1233	23.69	1263	25.28	1293	26.88	1323	28.51	1352	30.16
24,000	1193	21.90	1222	23.45	1252	25.04	1280	26.67	1309	28.31	1337	29.99	1365	31.69	1393	33.42
26,000	1250	25.04	1277	26.67	1304	28.33	1331	30.01	1358	31.72	1385	33.46	1411	35.22	1437	37.01
28,000	1309	28.57	1335	30.27	1360	32.00	1386	33.75	1411	35.52	1436	37.32	1461	39.15	1486	40.99
30,000	1370	32.50	1394	34.28	1418	36.08	1442	37.89	1466	39.74	1490	41.60	1513	43.49	1537	45.40
32,000	1433	36.87	1456	38.72	1479	40.58	1501	42.48	1524	44.38	1546	46.32	1568	48.27	1591	50.25
34,000	1497	41.66	1519	43.60	1540	45.55	1562	47.52	1583	49.50	1605	51.50	1626	53.52	1647	55.56
36,000	1562	46.92	1583	48.94	1604	50.97	1624	53.02	1645	55.08	1665	57.15	1685	59.25	1705	61.35
38,000	1628	52.66	1648	54.78	1668	56.89	1688	59.02	1707	61.16	1727	63.31	1746	65.47	1765	67.65
40,000	1696	58.91	1715	61.10	1734	63.31	1752	65.52	1771	67.74	1790	69.97	—	—	—	—

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	1343	28.77	1372	30.35	1400	31.94	1428	33.55
22,000	1380	31.82	1408	33.50	1435	35.20	1462	36.90
24,000	1420	35.16	1447	36.92	1473	38.70	1499	40.49
26,000	1463	38.82	1489	40.66	1514	42.51	1539	44.38
28,000	1510	42.87	1535	44.77	1559	46.69	1583	48.63
30,000	1560	47.34	1583	49.30	1606	51.28	1629	53.28
32,000	1613	52.25	1635	54.27	1657	56.31	1678	58.37
34,000	1668	57.63	1689	59.70	1710	61.80	1730	63.93
36,000	1725	63.48	1745	65.63	1765	67.79	1785	69.97
38,000	1784	69.85	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—

LEGEND

(shaded) — 48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 Series unit, be sure to add gas heat pressure drop from Table 30C.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Table 30C before using Fan Performance tables.
4. Conversion — Bhp to kW:

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

See Tables 26-28 for motor efficiency.

Table 23 — Fan Performance — Standard Capacity Power Exhaust

Size 030-050 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	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Size 055-155 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 — Return/Exhaust Fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9075-105 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
14,000	594	3.61	594	3.61	617	4.02	646	4.58	674	5.16	700	5.75	725	6.36	749	6.99	772	7.62	795	8.25
16,000	619	4.09	652	4.76	681	5.40	708	6.02	733	6.65	757	7.29	781	7.94	803	8.61	825	9.30	847	9.99
18,000	687	5.57	718	6.35	746	7.07	771	7.76	795	8.45	817	9.14	839	9.85	860	10.56	881	11.20	901	11.96
20,000	756	7.37	786	8.25	812	9.06	836	9.84	858	10.59	879	11.25	900	12.03	920	12.82	939	13.62	958	14.43
22,000	825	9.50	853	10.50	878	11.31	901	12.20	923	13.06	943	13.90	962	14.75	981	15.60	1000	16.46	1018	17.33
24,000	895	11.94	922	13.08	945	14.12	967	15.10	988	16.05	1007	16.99	1026	17.91	1044	18.83	1061	19.76	1079	20.69
26,000	965	14.94	990	16.21	1013	17.36	1034	18.46	1054	19.51	1073	20.53	1091	21.54	1108	22.54	1125	23.54	1141	24.54
28,000	1035	18.43	1059	19.81	1081	21.09	1101	22.29	1120	23.45	1138	24.57	1156	25.67	1172	26.76	1189	27.83	1204	28.91
30,000	1105	22.42	1128	23.93	1149	25.33	1169	26.65	1187	27.92	1205	29.14	1222	30.34	1238	31.51	1253	32.67	1269	33.83
32,000	1176	26.96	1198	28.59	1218	30.11	1237	31.55	1255	32.93	1272	34.26	1288	35.56	1304	36.83	1319	38.08	1333	39.32
34,000	1246	32.09	1267	33.83	1287	35.47	1305	37.03	1322	38.53	1339	39.97	1355	41.38	1370	42.75	1385	44.10	1399	45.43
36,000	1317	37.83	1337	39.69	1356	41.46	1374	43.14	1391	44.75	1407	46.31	—	—	—	—	—	—	—	—
38,000	1388	44.22	1407	46.21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	816	8.89	836	9.52	856	10.15	874	10.67	892	11.31	910	11.94	926	12.57	942	13.19	958	13.80	973	14.42
16,000	867	10.59	887	11.31	907	12.05	926	12.78	944	13.52	961	14.25	978	14.98	995	15.71	1011	16.44	1026	17.16
18,000	921	12.74	940	13.52	959	14.33	977	15.13	995	15.95	1012	16.77	1029	17.59	1046	18.42	1062	19.24	1078	20.07
20,000	977	15.25	995	16.10	1013	16.96	1031	17.82	1048	18.70	1065	19.59	1081	20.49	1097	21.39	1113	22.30	1129	23.21
22,000	1035	18.21	1052	19.10	1069	20.01	1086	20.93	1103	21.86	1119	22.81	1135	23.76	1150	24.73	1166	25.71	1181	26.69
24,000	1095	21.62	1112	22.58	1128	23.54	1144	24.51	1159	25.49	1175	26.49	1190	27.50	1205	28.52	1220	29.55	1234	30.58
26,000	1157	25.54	1173	26.55	1188	27.57	1203	28.59	1218	29.64	1233	30.68	1247	31.74	1262	32.81	1276	33.89	1290	34.98
28,000	1220	29.98	1235	31.06	1249	32.14	1264	33.23	1278	34.32	1292	35.42	1306	36.53	1320	37.65	1334	38.78	1347	39.93
30,000	1283	34.98	1298	36.13	1312	37.28	1326	38.42	1340	39.58	1353	40.74	1367	41.92	1380	43.09	1393	44.27	1406	45.46
32,000	1348	40.55	1362	41.78	1375	43.00	1389	44.22	1402	45.45	1415	46.67	—	—	—	—	—	—	—	—
34,000	1413	46.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: The 48Z6,Z8 and 50Z6,Z7,Z8,Z9 units come standard with economizer and exhaust/return power exhaust.

Table 25 — Fan Performance — High-Capacity Power Exhaust (48ZT,ZW075-105 and 50ZT,ZW,ZX,ZZ)

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 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	—	N/A	48.0	47.0	92.4
40	**29.80**	42.0	31.30	N/A	N/A	55.0	N/A	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 your 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 075-105)

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	47.0	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	48.0	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

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 your 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 — High-Capacity Power Exhaust Systems Motor Limitations (48ZT,ZW and 50ZT,ZW,ZX,ZZ Units)

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	47.0	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 your 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 29 — Unit Design Airflow Limit

UNIT SIZE	UNIT TYPE	MINIMUM COOLING CFM	MAXIMUM CFM
030	48ZG,ZN Low Heat	6,000	15,000
	48ZG,ZN High Heat	6,000	15,000
	50ZG,ZN,Z2,Z3	6,000	15,000
035	48ZG,ZN Low Heat	7,000	15,000
	48ZG,ZN High Heat	7,000	15,000
	50ZG,ZN,Z2,Z3	7,000	15,000
040	48ZG,ZN Low Heat	8,000	20,000
	48ZG,ZN High Heat	8,000	20,000
	50ZG,ZN,Z2,Z3	8,000	20,000
050	48ZG,ZN Low Heat	9,000	20,000
	48ZG,ZN High Heat	9,000	19,500
	50ZG,ZN,Z2,Z3	9,000	20,000
055	48ZG,ZN Low Heat	10,000	25,000
	48ZG,ZN High Heat	10,000	25,000
	50ZG,ZN,Z2,Z3	10,000	25,000
060	48ZG,ZN Low Heat	12,000	30,000
	48ZG,ZN High Heat	12,000	30,000
	50ZG,ZN,Z2,Z3	12,000	30,000
070	48ZG,ZN Low Heat	14,000	30,000
	48ZG,ZN High Heat	14,000	30,000
	50ZG,ZN,Z2,Z3	14,000	30,000
075	48ZG,ZN,ZT,ZW,Z6,Z8 Low Heat	15,000	30,000
	48ZG,ZN,ZT,ZW,Z6,Z8 High Heat	15,000 (VAV) 22,000 (CV)	30,000
	50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9	15,000 (VAV) 22,000 (CV)	30,000
090	48ZG,ZN,ZT,ZW,Z6,Z8 Low Heat	17,000 (VAV) 22,000 (CV)	34,000
	48ZG,ZN,ZT,ZW,Z6,Z8 High Heat	17,000 (VAV) 26,000 (CV)	34,000
	50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9	17,000 (VAV) 26,000 (CV)	34,000
105	48ZG,ZN,ZT,ZW,Z6,Z8 Low Heat	20,000 (VAV) 30,000 (CV)	44,000
	48ZG,ZN,ZT,ZW,Z6,Z8 High Heat	20,000 (VAV) 30,000 (CV)	36,500
	50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9	20,000 (VAV) 30,000 (CV)	44,000

LEGEND

CV — Constant Volume
VAV — Variable Air Volume

Table 30A — Component Pressure Drops (in. wg) (Size 030-050 Units)

COMPONENT	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	0.21	0.25	0.29	0.35
INLET GUIDE VANES	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.10
FILTERS								
Pleated (2-in.)	0.01	0.01	0.01	0.02	0.04	0.04	0.03	0.02
Bags With Prefilters*	0.36	0.38	0.41	0.51	0.64	0.77	0.91	1.01
POWER EXHAUST	0.07	0.08	0.09	0.13	0.18	0.24	0.32	0.41
LOW GAS HEAT	0.04	0.09	0.27	0.45	0.68	0.91	1.17	1.45
HIGH GAS HEAT	0.13	0.21	0.31	0.50	0.73	1.02	1.32	1.64
ELECTRIC HEAT†								
36 kW	0.03	0.04	0.07	0.11	0.17	0.25	0.35	0.47
72 kW	0.03	0.06	0.12	0.18	0.25	0.35	0.46	0.64
108 kW	0.09	0.12	0.18	0.26	0.34	0.45	0.59	0.78
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

*Bag filter cfm limit is 25,000.
†Available on vertical return and discharge units only.

Table 30B — Component Pressure Drops (in. wg) (Size 055-070 Units)

COMPONENT	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
INLET GUIDE VANES	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.15
FILTERS											
Pleated (2-in.)	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.04	0.04	0.05	0.05
Bags With Prefilters*	0.45	0.57	0.68	0.80	0.94	1.07	1.23	1.38	—	—	—
VERTICAL POWER EXHAUST	0.02	0.04	0.06	0.10	0.13	0.17	0.21	0.25	0.29	0.33	0.38
HORIZONTAL POWER EXHAUST*	0.12	0.16	0.21	0.27	0.34	0.41	0.49	0.58	0.68	0.78	0.89
LOW GAS HEAT	0.22	0.24	0.27	0.33	0.33	0.35	0.37	0.41	0.44	0.51	0.61
HIGH GAS HEAT	0.25	0.28	0.30	0.35	0.41	0.47	0.54	0.58	0.68	0.81	0.94
ELECTRIC HEAT†											
36 kW	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.24	0.28	0.33
72 kW	0.05	0.07	0.10	0.13	0.17	0.20	0.24	0.29	0.34	0.39	0.46
108 kW	0.07	0.09	0.13	0.17	0.22	0.27	0.32	0.38	0.44	0.51	0.59
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

*Bag filter cfm limit is 25,000.
†Available on vertical return and discharge units only.

Table 30C — Component Pressure Drops (in. wg) (Size 075-105 Units)

COMPONENT	CFM											
	15,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000	34,000	36,000	38,000	40,000
ECONOMIZER*	0.10	0.12	0.14	0.16	0.19	0.21	0.23	0.26	0.31	0.34	0.37	0.40
INLET GUIDE VANES	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.15	0.20	0.22	0.24	0.27
VERTICAL POWER EXHAUST*	0.08	0.13	0.17	0.21	0.25	0.29	0.33	0.38	0.46	0.51	0.55	0.60
HORIZONTAL POWER EXHAUST*	0.24	0.34	0.41	0.49	0.58	0.68	0.78	0.89	1.13	1.26	1.40	1.55
LOW GAS HEAT	0.09	0.14	0.19	0.23	0.29	0.35	0.42	0.49	0.67	0.76	0.86	0.97
HIGH GAS HEAT	0.27	0.37	0.46	0.55	0.65	0.77	0.89	1.03	1.33	1.50	1.68	1.87
108 kW ELECTRIC HEAT†	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.20	0.26	0.29	0.32	0.36
216 kW ELECTRIC HEAT†	0.08	0.12	0.14	0.17	0.20	0.24	0.28	0.32	0.41	0.46	0.51	0.57
30% PLEATED FILTER	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.06	0.07
65% PLEATED FILTER	0.14	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19	0.20	0.20
HIGH CAP COIL (075)	0.08	0.11	0.13	0.15	0.18	0.21	0.23	0.26	0.33	0.36	0.40	0.43
HIGH CAP COIL (090,105)	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.14	0.16	0.19	0.21

*The 48ZT,ZW and 50ZT,ZW,ZX,ZZ units come standard with economizer and high-capacity power exhaust.
†Available on vertical return and discharge units only.

NOTE: Power exhaust pressure drop does not need to be added to supply fan static pressure on return fan units (48Z6,Z8 and 50Z6,Z7,Z8,Z9075-105) and on high-capacity power exhaust units (48ZT,ZW and 50ZT,ZW,ZX,ZZ075-105).

CONTROLS QUICK START

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

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

1. The type of control is configured under ***Configuration →UNIT→C.TYP***. Set ***C.TYP*** to 4 (TSTAT 2 STG).
2. Remove jumpers from R-W2 and W2-W1 on TB202 in the control box.
3. See Economizer Options section on page 34 for additional economizer option configurations.
4. See Exhaust Options section on page 34 for additional exhaust option configurations.

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

1. The type of control is configured under ***Configuration →UNIT→C.TYP.*** Set ***C.TYP*** to 6 (SPT 2 STG).
2. Under ***Configuration→SENS→SPT.S***, enable the space sensor by setting ***SPT.S*** to ENBL (enable).
3. The space temperature 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 on pages 54 and 45 for further description on these configurations. Configure the following set points:

OHSP	Occupied Heat Setpoint
OCSP	Occupied Cool Setpoint
UHSP	Unoccupied Heat Setpoint
UCSP	Unoccupied Cool Setpoint
GAP	Heat-Cool Setpoint Gap

4. The degrees of demand from the space temperature set points are configured under the ***Configuration→D.LV.T*** submenu. See the Heating Control and Cooling Control sections for further description on these configurations. Configure the following set points:

L.H.ON	Demand Level Lo Heat On
H.H.ON	Demand Level Hi Heat On
L.H.OF	Demand Level Lo Heat Off
L.C.ON	Demand Level Lo Cool On
H.C.ON	Demand Level Hi Cool On
L.C.OF	Demand Level Lo Cool Off

5. Install jumpers between R-W2 and W2-W1.
6. Under ***Configuration→UNIT→CV.FN***, set ***CV.FN*** to 1 for continuous fan or 0 for automatic fan.
7. To program time schedules, set ***SCH.N***=1 under ***Configuration→CCN→SC.OV→SCH.N*** to configure the control to use local schedules.
8. Under the ***Timeclock→SCH.L*** submenu, enter the desired schedule. See Time Clock section for further descriptions of these configurations.
9. Under the ***Configuration→CCN→SC.OV*** submenu, the following schedules and overrides should be configured:

O.T.L.	Override time limit
SPT.O	SPT override enabled?
T58.O	T58 override enabled?

10. See Economizer Options section on page 34 for additional economizer option configurations.
11. See Exhaust Options section on page 34 for additional exhaust option configurations.

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.
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

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.

SP.SP	Static Pressure Set point

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

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

7. See the Economizer Options section on page 34 for additional economizer option configurations.
8. See the Exhaust Options section on page 34 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. Remove jumpers from R-W2 and W2-W1 on TB202 in the control box.
3. Under the **Setpoints** menu, set the following configurations:

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

4. See the Economizer Options section on this page for additional economizer option configurations.
5. See the Exhaust Options section on this page 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 5 (SPT MULTI).
2. Install jumpers between R-W2 and W2-W1.
3. Under the ***Setpoints*** menu, the following configurations should be set:

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

4. 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

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

Indoor Air Quality Options

DEMAND CONTROL 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 control 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 air flow 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 air flow 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				
	Constant Volume 2-Stage	Modulating Power Exhaust	S.O. VFD*	High-Capacity Power Exhaust†	Return Exhaust†
48ZG 50ZG,Z2	X	X	S.O.	NA	NA
48ZN 50ZN,Z3	NA	X	S.O.	NA	NA
48ZT,ZW 50ZT,ZW,ZX,ZZ	NA	NA	NA	STD	NA
48Z6,Z8 50Z6,Z7,Z8,Z9	NA	NA	NA	NA	STD

LEGEND

X — Available as Factory Option
S.O. — Available as Special Order
NA — Not Available on this Unit
STD — Standard Feature on this Unit

*Single VFD controlling both fan motors.
†Single VFD controlling one fan motor and staging the second fan motor.

<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

Configuration→BP→BF.CF*=2** (Modulating Power Exhaust with Two LEN Actuators Option) — 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/Pos.
BP.MN VFD/Act. Min. Speed/Pos.
BP.1M BP 1 Actuator Max Pos.
BP.2M BP 2 Actuator Max Pos.

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/Pos.
BP.MN VFD/Act. Min. Speed/Pos.
BP.MX VFD Maximum Speed

Configuration→BP→BP.CF*=4** (High-Capacity VFD Power Exhaust) — 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/Pos.
BP.MN VFD/Act. Min. Speed/Pos.
BP.MX VFD Maximum Speed
BP.CL BP Hi Cap VFD Clamp Val.
BP.WT BP Hi Cap VFD Clamp Time

Configuration→BP→BP.CF*=5** (Return/Exhaust — Fan Tracking Control) — Under ***Configuration → BP the following configurations 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/Pos.
BP.MN VFD/Act. Min. Speed/Pos.
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 Tracking learning is enabled. When fan tracking 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 can not 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 160 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 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.

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, ACT.C, COOL,*** and ***HEAT*** are sub-menus with separate items and functions. See Table 31.

Table 31 — Service Test

ITEM	EXPANSION	RANGE	UNITS	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	
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	
→**I.POS**	IGV Actuator Command Pos	0-100	%	IGVFNTST	
→**S.VFD**	Supply Fan VFD Speed	0-100	%	SGVFDTST	
→**P.E.1**	Power Exhaust Relay 1	ON/OFF		PE1_TST	
→**P.E.2**	Power Exhaust Relay 2	ON/OFF		PE2_TST	
→**BP1.P**	BP 1 Command Position	0-100	%	BLDPTST1	
→**BP2.P**	BP 2 Command Position	0-100	%	BLDPTST2	
→**E.VFD**	Exhaust Fan VFD Speed	0-100	%	EFVFDTST	
→**CD.F.A**	Condenser Fan Circuit A	ON/OFF		CNDA_TST	
→**CD.F.B**	Condenser Fan Circuit B	ON/OFF		CNDB_TST	
→**CD.MM**	Motormaster Condenser Fan	ON/OFF		PCFABTST	
ACT.C	CALIBRATE TEST-ACTUATORS				
→**ECN.C**	Economizer Act.Cmd.Pos.	0-100	%	ECONOTST	
→**E.CAL**	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	
→**IGV.C**	IGV Actuator Command Pos	0-100	%	SPIGVTST	
→**I.CAL**	IGV Act. Calibrate Cnd	YES/NO		IGV_CAL	
→**IGV.A**	IGV Act. Control Angle	read only		IGC_CANG	
→**IGV.M**	VFD-IGV Maximum Speed	0-100	%	STATPMAX	
→**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	
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	
→**LD.LG**	Lead/Lag Select Test	LEAD/LAG		LL_TST	
→**A1**	Compressor A1 Relay	ON/OFF		CMPA1TST	
→**U1.A1**	Unloader 1 - Comp A1	ON/OFF		UNL1_TST	
→**U2.A1**	Unloader 2 - Comp A1	ON/OFF		UNL2_TST	
→**A2**	Compressor A2 Relay	ON/OFF		CMPA2TST	
→**B1**	Compressor B1 Relay	ON/OFF		CMPB1TST	
→**U1.B1**	Unloader 1 - Comp B1	ON/OFF		UNL3_TST	
→**U2.B1**	Unloader 2 - Comp B1	ON/OFF		UNL4_TST	
→**B2**	Compressor B2 Relay	ON/OFF		CMPB2TST	
HEAT	TEST HEATING				
→**HT.ST**	Requested Heat Stage	0-n		HTST_TST	
→**HT.1**	Heat Relay 1	ON/OFF		HS1_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	

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 A and B.

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 or IGV position), 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 individually energized or together and their damper positions can be forced to any position.

Actuators — In the ***ACT.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 inlet guide vane actuator, 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.

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 and unloaders items 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.
- ***Service Test→COOL→LD.LG*** (Lead/Lag Select Test). This item may only be adjusted when the cooling stage pattern request item is set to zero. If the request pattern is zero, then the user may select whether the cooling stage request is based on lead or lag staging.
- Manual relay control of individual compressors and unloaders. If the cooling stage pattern request is set to zero, the user will have the ability to manually control compressors and unloaders. 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.

Heating — If unit has a thermostat connected (***C.TYP*** = 3 or 4), install the RED jumper wires between TB202, terminals R (1), W2 (3) and W1 (4). Terminal block TB202 is located in the unit control box. Remember to disconnect these jumpers when Test Mode is completed. 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→HTC.C*** (Ht Coil Command Position). If configured for this heat type, the user will be able to manually control the positioning of the actuator which controls hot water (0 to 100%).

NOTE: When service test has been completed, if unit has a thermostat connected (***C.TYP*** = 3 or 4), remove the RED jumper wires at TB202, terminals R (1), W2 (3) and W1 (4). Terminal block TB202 is located in the unit control box. Store these jumpers in the unit control box for future use.

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 (not available when the unit is configured for hot gas reheat), TB201-12 and TB201-11, will provide relay closure whenever the unit is under an alert or alarm condition.

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.CF*** to 0, under the ***Configuration→SP*** menu. This will disable the *Comfort*Link™ controls from varying the VFD speed in response to duct pressure with its 4 to 20 mA output.

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 (TB203-4 and TB203-5), will be linearized and range from 0º to 20 F. For example, 4 mA = 0º F reset, 12 mA = 10º F reset and 20 mA = 20º F 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).

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 TB204-11 and TB204-12. 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*** and ***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).

IQ.I.C **= 1** (IAQ Discrete) — 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

IQ.I.C* = 2** (IAQ Discrete Override) — 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 (if the supply fan is not already running), whether the IAQ discrete switch will start the fan, 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 kilo-ohms 0 to 100% economizer minimum position control

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

IQ.A.C* = 2** (IAQ Analog Input Used to Override) — 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 TB12 and TB11 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.SR*** 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.***

***IQ.A.C* = 3** (4 to 20 mA Damper Control) — 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 TB12 and TB11. 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 removing the enthalpy switch input at TB201-4 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 kilo-ohm 0 to 100% economizer minimum position control via configuration decisions at ***Configuration→IAQ→IQ.A.C.***

To disable the standard enthalpy control input function, remove the enthalpy switch input connection at TB201-4 and provide a jumper from TB201-3 to TB201-4 (see wiring diagrams in Major System Components section on page 102).

***IQ.A.C* = 4** (10 Kohm Potentiometer Damper Control) — This configuration will provide input for a 10 kilo-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 removing the enthalpy switch connection from terminal TB201-4.

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 and whether 2 stages or multiple stages of cooling capacity operation are controlled.

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 32.

Table 32 — 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

Currently Occupied (***OCC***) — This variable displays the current occupied state of the unit.

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

DCV Resetting Minimum Position (***DCV***) — This variable displays if the economizer position has been lowered from its maximum vent position.

Supply Air Reset (***SA.R***) — 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.

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

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

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

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

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

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

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

System Mode Off — 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 (traumatic 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) or through the factory service test control. The System Test modes are Factory Test Enabled and Service Test Enabled. See the Service Test section on page 36 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 dependant 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 parenthesis after the mode.

HVAC Mode — OFF (01) — The unit is off and no operating modes are active.

HVAC Mode — STARTING UP (02) — The unit is transitioning from the OFF mode to a different mode.

HVAC Mode — SHUTTING DOWN (03) — The unit is transitioning from a mode to the OFF mode.

HVAC Mode — DISABLED (04) — The unit is shut down due to a software command disable through the scrolling marquee, a CCN emergency stop command, a service test end, or a control-type change delay.

HVAC Mode — SOFTSTOP REQUEST (05) — The unit is off due to a soft stop request from the control.

HVAC Mode — REM SW.DISABLE (06) — The unit is off due to the remote switch.

HVAC Mode — COMP.STUCK ON (07) — The unit is shut down because there is an indication that a compressor is running even though it has been commanded off.

HVAC Mode — TEST (08) — The unit is in the self test mode which is entered through the Service Test menu.

HVAC Mode — VENT (09) — 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 — HIGH COOL (10) — This is a normal cooling mode where a high cooling demand is required.

HVAC Mode — LOW COOL (11) — This is a normal cooling mode where a low cooling demand is required.

HVAC Mode — UNOCC. FREE COOL (12) — 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.

HVAC Mode — TEMPERING HICOOL (13) — 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 or hydronic heat is used to temper the ventilation air.

HVAC Mode — TEMPERING LOCOOL (14) — 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 or hydronic heat is used to temper the ventilation air.

HVAC Mode — TEMPERING VENT (15) — The economizer is at minimum vent position but the supply-air temperature has dropped below the tempering vent set point. Staged gas heat or hydronic heat is used to temper the ventilation air.

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

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

HVAC Mode — FREEZESTAT TRIP (18) — 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 at minimum.

HVAC Mode — STATIC PRESSURE FAIL (19) — The unit is off due to failure of the static pressure sensor.

HVAC Mode — PLENUM PRESSURE FAIL (20) — The unit is off due to a plenum pressure switch trip.

HVAC Mode — FIRE SHUT DOWN (21) — The unit has been stopped due to a fire shutdown input (FSD) or two or more of the fire control modes, purge, evacuation, or pressurization have been requested simultaneously.

HVAC Mode — PRESSURIZATION (22) — 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 ***INPUT→FIRE*** submenu.

HVAC Mode — EVACUATION (23) — 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 ***INPUT→FIRE*** submenu.

HVAC Mode — SMOKE PURGE (24) — 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 ***INPUT→FIRE*** submenu.

HVAC Mode — DEHUMIDIFICATION (25) — The unit is operating in the Dehumidification mode.

HVAC Mode — RE-HEAT (26) — The unit is operating in Reheat mode.

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 33.

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 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 (TSTAT- 2 STG)

  This configuration will force the control to monitor the thermostat inputs to make a determination of mode and allow only 2 stages of control for both heating and cooling.

- ***C.TYP*** = 5 (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.

- ***C.TYP*** = 6 (SPT- 2 STG)

  This configuration will force the control to monitor the space temperature sensor to make a determination of mode and allow 2 stages of control for both heating and cooling.

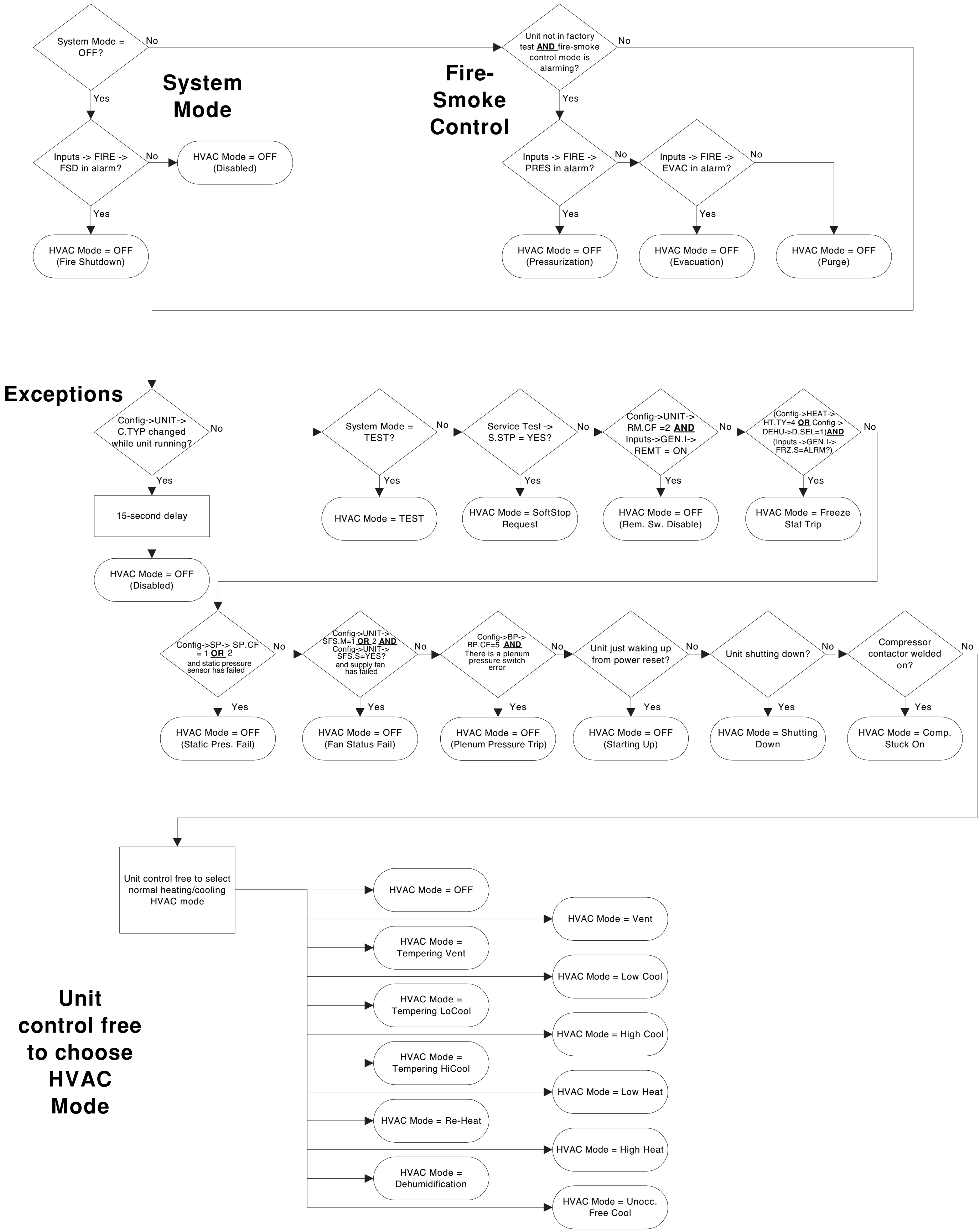


Fig. 4 — Mode Selection

Table 33 — Unit Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION				
C.TYP	Machine Control Type	1 - 6		CTRLTYPE	4
CV.FN	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
SIZE	Unit Size (30-105)	30 - 105		UNITSIZE	30
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

Fan Mode (***CV.FN***) — The Fan Mode configuration can be used for machine control types (***Configuration→UNIT→C.TYP***) 3, 4, 5, and 6. 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 1 and 2. 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)

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***) — 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.

VAV Unoccupied Fan Retry Time (***VAV.S***) — Machine control types 1 and 2 (VAV-RAT,VAV-SPT) include a process for sampling the return-air temperature during unoccupied periods to prove a valid demand for heating or cooling before initiating an unoccupied heating or cooling mode. If the sampling routine runs but concludes a valid demand condition does not exist, the sampling process will not be 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.

Unit Size (***SIZE***) — There are several unit sizes (tons) for the Z 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 both the ***SIZE*** and ***50.HZ*** configurations.

50 Hertz Unit? (***50.HZ***) — Some units are designed to run at 50 Hertz instead of 60 Hertz. Make sure this configuration matches the frequency called out by the model number of the unit. This is important as the cooling stage tables are directly determined based on both the ***SIZE*** and ***50.HZ*** configurations.

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

  The control will not attempt to learn MAT over time. The control will simply calculate MAT based on the position of the economizer, outside and return air temperature, linearly.
- ***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 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.

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 Configuration (***AUX.R***) — This configuration allows the user to configure the function of the auxiliary relay. The configuration can be set from 0 to 3. If ***AUX.R*** is set to 0, the auxiliary relay will be energized during an alarm. The relay 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 Z Series *Comfort*Link™ controls offer two basic control approaches to mechanical cooling: 2-stage cooling (CV) and multiple stages of cooling (VAV). In addition, the *Comfort*Link control offers 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, inlet guide vanes, 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 61 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 - 6	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 (TSTAT – 2 STG)

  This configuration will force the control to monitor the thermostat inputs to make a determination of mode.

- ***C.TYP*** **= 5** (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.

- ***C.TYP*** **= 6** (SPT – 2 STG)

This configuration will force the control to monitor the space temperature sensor to make a determination of mode and allow two stages of cooling.

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***) except 4 and 6. These configurations are located at the local display under ***Configuration→UNIT***. See Table 34.

Table 34 — Machine Dependent Configurations

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION			
SIZE	Unit Size (30-105)	30 - 105	UNITSIZE	*
50.HZ	50 Hertz Unit ?	Yes/No	UNIT_HZ	*

*Dependent on unit.

Unit Size (***SIZE***) — There are several unit sizes (tons) for the Z 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 both the ***SIZE*** and ***50.HZ*** configurations.

50 Hertz Unit? (***50.HZ***) — Some units are designed to run at 50 Hertz instead of 60 Hertz. Make sure this configuration matches the frequency called out by the model number of the unit. This is important as the cooling stage tables are directly determined based on both the ***SIZE*** and ***50.HZ*** configurations.

SET POINTS — The set points for both cooling and heating are located at the local display under ***Setpoints***. See Table 35.

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 5. The configurations for reset can be found at the local display under ***Configuration→EDT.R.*** See Table 36.

EDT Reset Configuration (***RS.CF***) — This configuration applies to several machine control types (***Configuration →UNIT →C.TYP*** = 1,2,3, and 5).

- 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 37.

Capacity Threshold Adjust (***Z.GN***) — This configuration is used for units using the "SumZ" algorithm for cooling capacity control (***Configuration→UNIT→C.TYP*** = 1, 2, 3 or 5). 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 0.5 to 4.0. As the value of ***Z.GN*** is increased, the cycling of cooling stages will be slowed.

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

Lead/Lag Operation? (***L.L.EN***) — This configuration allows for lead/lag compressor operation for the unit. If this configuration is set to Yes, every time cooling capacity drops to 0%, on the next call for cooling, the control will start up the first compressor on the circuit which did not start the previous cooling cycle. If set to No, circuit A will always start first.

Motormaster Control? (***M.M.***) — The condenser head pressure control for the unit is managed directly by the *Comfort*Link™ controls. There is no physical motormaster device in the unit. This configuration allows the head pressure control sequence to permit additional cycling control of the condenser fans. Setting this configuration to YES permits mechanical cooling operation down to 0° F (–18 C) outdoor temperature. If this configuration is set to NO, the mechanical cooling system is not suited for operation below 35 F (1.8 C) outdoor temperature.

Head Pressure Set Point (***HPSP***) — This is the head pressure set point used by the *Comfort*Link controls during condenser fan, head pressure control.

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

Enable Compressor A2 (***A2.EN***) — This configuration is used to disable the A2 compressor in case of failure.

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

Enable Compressor B2 (***B2.EN***) — This configuration is used to disable the B2 compressor in case of failure.

CSB A1 Feedback Alarm (***CS.A1***) — This configuration is used to enable or disable the compressor A1 feedback alarm (105 ton size units only). This configuration must be enabled at all times for 105 ton units.

Table 35 — 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 36 — 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	2
LIMT	Reset Limit	0 - 20	deltaF	LIMT	10
RES.S	EDT 4-20 ma Reset Input	Enable/Disable		EDTRSENS	Disable

Table 37 — Cooling Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
COOL	COOLING CONFIGURATION				
Z.GN	Capacity Threshold Adjst	–10 - 10		Z_GAIN	1
MC.LO	Compressor Lockout Temp	–25 - 55	dF	OATLCOMP	40
L.L.EN	Lead/Lag Operation ?	Yes/No		LLENABLE	No
M.M.	Motor Master Control ?	Yes/No		MOTRMAST	No
HPSP	Head Pressure Setpoint	80 - 150	dF	HPSP	113
A1.EN	Enable Compressor A1	Enable/Disable		CMPA1ENA	Enable
A2.EN	Enable Compressor A2	Enable/Disable		CMPA2ENA	Enable
B1.EN	Enable Compressor B1	Enable/Disable		CMPB1ENA	Enable
B2.EN	Enable Compressor B2	Enable/Disable		CMPB2ENA	Enable
CS.A1	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	Enable
CS.A2	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	Enable
CS.B1	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	Enable
CS.B2	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	Enable
HPS.A	CMPA1 Hi.Pr.Sw. Trip	365 - 415	PSIG	HPSATRIP	415
HPS.B	CMPB1 Hi.Pr.Sw. Trip	365 - 415	PSIG	HPSBTRIP	415
H.SST	Hi SST Alert Delay Time	5 - 30	min	HSSTTIME	10

CSB A2 Feedback Alarm (***CS.A2***) — This configuration is used to enable or disable the compressor A2 feedback alarm (105 ton size units only). This configuration must be enabled at all times for 105 ton units.

CSB B1 Feedback Alarm (***CS.B1***) — This configuration is used to enable or disable the compressor B1 feedback alarm (105 ton size units only). This configuration must be enabled at all times for 105 ton units.

CSB B2 Feedback Alarm (***CS.B2***) — This configuration is used to enable or disable the compressor B2 feedback alarm (105 ton size units only). This configuration must be enabled at all times for 105 ton units.

Compressor A1 High Pressure Switch Trip (***HPS.A***) — This configuration is used when high-pressure switches are used. This is true for all units except the 105 ton size units which incorporate current sensor boards (CSB). In the case of a high-pressure switch trip on compressor A1, the control will sample the discharge pressure on circuit A and store this value minus 3 psig and attempt to catch this failure the next time before the switch trips. The value is modifiable by the user but will still get overriden if the control does not catch a high pressure condition before the switch trips.

Compressor B1 High Pressure Switch Trip (***HPS.B***) — This configuration is used when high-pressure switches are used. This is true for all units except the 105 ton size units which incorporate current sensor boards (CSB). In the case of a high-pressure switch trip on compressor B1, the control will sample the discharge pressure on circuit B and store this value minus 3 psig and attempt to catch this failure the next time before the switch trips. The value is modifiable by the user but will still get overriden if the control does not catch a high pressure condition before the switch trips.

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

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

1. Thermostat (***C.TYP***=3 and 4): 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***=5 and 6) 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.

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

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 return-air temperature.

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.

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.

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**]*.

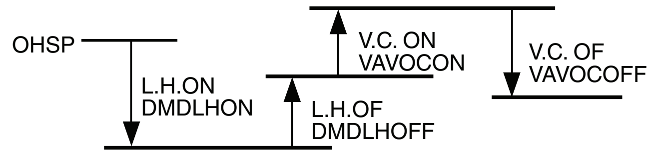


Fig. 5 — VAV Occupied Period Trip Logic

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 Z Series *Comfort*Link™ controls manage the staging of compressors to maintain supply-air temperature.

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=5 & 6***) — 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*** = 5 (SPT-MULTI) in both the occupied and unoccupied period
- ***C.TYP*** = 6 (SPT- 2 STG) 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 38.

Table 38 — 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

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

Cool Mode Evaluation Logic — 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.

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 types (***C.TYP***) = 5 and 6, because they 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.

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

***C.TYP* = 3 and** 4 (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.

Selecting the ***C.TYP*** = 4 (TSTAT – 2 STG) control type means that only two stages of cooling will be used. An HVAC mode of LOW COOL will energize one circuit and an HVAC mode of HIGH COOL will energize both circuits provided the economizer is not able to provide adequate free cooling. Refer to the section on Economizer Integration with Mechanical Cooling for more information.

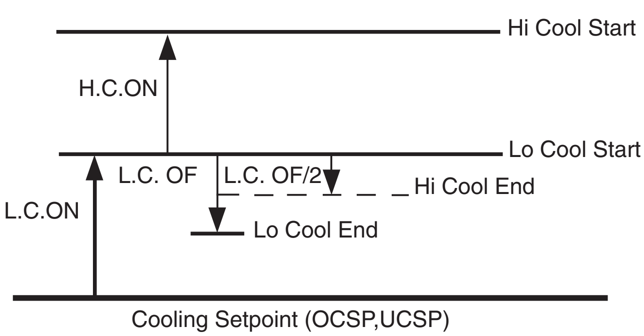


Fig. 6 — Cool Mode Evaluation

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 39.

Table 39 — 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 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

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.

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 5). 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 37.

Capacity Threshold Adjust (***Z.GN***) — This configuration is used on units using the "SumZ" algorithm for cooling capacity control (***Configuration→UNIT→C.TYP*** = 1, 2, 3 and 5). It 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 40.

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 (–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".

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 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

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.

Table 40 — 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	

SumZ Operation — The SumZ algorithm is an adaptive PID style of control. The PID 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→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

  The control will not attempt to learn MAT over time. The control will simply calculate MAT based on the position of the economizer, outside and return air temperature, linearly.

- ***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.

<u>SumZ Overrides</u> — 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***)

<u>Economizer Trim Override</u> — 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 were the unit could remove a cooling stage and open up the economizer further to make up the difference.

<u>Mechanical Cooling Lockout (***Configuration→COOL→MC.LO***)</u> **—** 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 41.

<u>Demand Limit Select (***DM.L.S***)</u> — 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 TB204 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 TB203 terminals 2 and 3.
- 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 (0-100% total capacity)

Demand Limit 2 Setpoint (***D.L.S2***) — Dmd Limit Switch Setpoint 2 (0-100% 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%

Table 41 — 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

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 48/50Z series is managed directly by the *Comfort*Link™ controls. The controls are able to cycle two stages of outdoor fans to maintain acceptable head pressure. Fan stages will react to discharge pressure sensors with the pressure converted to the corresponding saturated condensing temperature. Unit size is used to determine if the second stage fans are configured to respond to a particular circuit (independent control) or both circuits (common control).

An option to allow fan cycling on the first stage is configured by setting ***Configuration→COOL→M.M*** = Yes.

NOTE: The term Motormaster is used in the software to refer to a fan cycling on the first stage. An actual Motormaster® device is not used or required. Cycling is done by the *Comfort*Link controls.

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

Configuration→COOL→M.M. — Motormaster enable

Configuration→COOL→HPSP — Head Pressure Set point

There are three outputs provided to control head pressure:

Outputs→FANS→CD.F.A — Condenser Fan A

Outputs→FANS→CD.F.B — Condenser Fan B

Outputs→FANS→CD.MM — "Motor master" or the fan cycling output

Fan Stage 1 Operation — If Stage 1 Cycling (Motormaster) is not selected, the stage 1 fan output will be ON whenever mechanical cooling is ON (either circuit) and OFF when mechanical cooling is OFF (both circuits).

If Stage 1 Cycling (Motormaster) is selected, the first stage operates as follows:

The fan stage turns ON whenever either saturated condensing temperature (SCT) is greater than 138 F.

The fan stage 1 turns OFF whenever both SCTs are less than the ***HPSP*** – 37 F for 90 seconds and fan stage is 1.

Fan Stage 2 Operation (Sizes 030-050) — The control energizes fan ***CD.F.A*** when either of the SCTs exceeds ***HPSP*** and the Stage 1 Fan (***CD.MM***) has been energized for 60 seconds.

Fan ***CD.F.A*** is turned OFF when both SCTs have been less than the set point – 35 F for a period of 2 minutes. Fan stage 2 will turn OFF if both circuits are turned off.

Fan Stage 2 Operation (Sizes 055-105) — There are two conditions that may request the second stage fan for independent control:

- the control energizes fan stage 2 when the SCT for that circuit exceeds ***HPSP*** and the Stage 1 fan has been energized for 60 seconds.
- the control energizes fan stage 2 if the SCT for the particular circuit exceeds 143 F during the first 60 seconds after fan stage 1 has been turned on.

Fan stage 2 turns OFF when the SCT for the particular circuit has been less than ***HPSP*** – 35 F for a period of 2 minutes.

Head Pressure Control Exceptions — For size 105 units, current sensor boards are able to diagnose a compressor stuck on condition. If any of the current sensor boards for the four-compressor unit detects a compressor stuck on, then the first stage fan is turned on immediately (***CD.MM***). If compressors A1 or A2 are diagnosed as stuck on, the second stage fan for that circuit will be turned on (***CD.F.A***). If compressors B1 or B2 are diagnosed as stuck on, the second stage fan for that circuit will be turned on (***CD.F.B***).

If no compressors are stuck on, the next check will determine whether compressors are on or not. If any compressor has not been commanded on, the first stage fan is not allowed on. This is also true for the second stage fan and units configured for unit sizes 030-050. For unit sizes 055-105, if no compressors in a circuit are commanded on, the corresponding second stage fan is not allowed on (***CD.F.A***, ***CD.F.B***).

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 = 5 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.

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

C.TYP = 4 TSTAT-2 STG

C.TYP = 6 SPT-2 STG

If the economizer is able to provide free cooling at the start of a cooling session (for either a low cool or a high cool mode), the 2-stage cooling algorithm will start a 10-minute hold off timer on staging. Once this timer has expired, the 2-stage cooling algorithm will qualify both the temperature of the evaporator discharge temperature (EDT) and the outside-air temperature (OAT).

If either of these temperatures are less than the current cooling control point (***Run Status→VIEW→CL.C.P***) plus 1.5° F, mechanical cooling will be held off. But if both of these temperatures are above ***CL.C.P*** + 1.5° F, the first compressor will be requested and a 5-minute hold off timer will be started that will give the first compressor time to run before the second compressor may be started.

At this point, if the 5-minute timer expires and the cooling mode request is high or the cooling mode request is low and dehumidification is active (***Operating Modes→MODE→ DEHU***=ON), the 2-stage cooling algorithm checks whether EDT is 1.5° F greater than the current cooling control point (***CL.C.P***) and if it is, the second compressor will be requested.

Heating Control — The Z Series *Comfort*Link™ controls offers control for four different types of heating systems to satisfy general space heating requirements: 2-stage gas heat, 2-stage electric heat, multiple-stage 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 77.

Variable air volume (VAV) type applications (***C.TYP*** = 1, 2, 3, or 5) 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 Local Equipment Network (LEN) 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 LEN actuator is still required if unit control will be used to manage this heating sequence.

SETTING UP THE SYSTEM — The essential heating configurations located at the local display under ***Configuration→ HEAT***. See Table 42.

Table 42 — Heating Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HEAT	HEATING CONFIGURATION				
HT.CF	Heating Control Type	0 - 4		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 GAS CONFIGS				
HT.ST	Staged Gas Heat Type	0 - 4		HTSTGTYP	0*
CAP.M	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45*
M.R.DB	S.Gas DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5
S.G.DB	St.Gas 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	110 - 180	dF	HT_LIMHI	170*
SW.L.T	Limit Switch Low Temp	100 - 170	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	60 - 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 - 255		HTCL_SN1	0
SN.2	Hydronic Ht.Serial Num.2	0 - 255		HTCL_SN2	0
SN.3	Hydronic Ht.Serial Num.3	0 - 255		HTCL_SN3	0
SN.4	Hydronic Ht.Serial Num.4	0 - 255		HTCL_SN4	0
SN.5	Hydronic Ht.Serial Num.5	0 - 255		HTCL_SN5	0
C.A.LM	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85

*Some defaults are model number dependent.

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
4 = Hydronic Heat

Heating Supply Air Set Point (***HT.SP***) — In a low heat mode for either staged gas 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 des 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.

MBB Sensor Heat Relocate (***LAT.M***) — This option allows the user additional performance benefit when under CCN Linkage for the 2-stage electric and gas heating types. As two-stage heating types do not "modulate" to a supply air set point, no leaving air thermistor is required and none is provided. The evaporator discharge thermistor, which is initially installed upstream of the heater, can be repositioned downstream and the control can expect to sense this heat. While the control does not need this to energize stages of heat, the control can wait for a sufficient temperature rise before announcing a heating mode to a CCN Linkage system (ComfortID™).

If the sensor is relocated, the user will now have the capability to view the leaving-air temperature at all times at ***Temperatures→AIR.T→CTRL→LAT***.

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.

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.

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 SPT Multi-Stage and SPT-2 Stage, (***C.TYP*** = 5,6) except for the actual temperature compared against set point. See Temperature Driven Heat Mode Evaluation section.

Tstat-Multi-Stage (***C.TYP* = 3**) and Tstat-2 Stage (***C.TYP* = 4**) — There is no difference to consider for selecting a heat mode whether the control type is for TSTAT 2-stage or TSTAT multi-stage as this only refers to how cooling will be handled. 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 94.

SPT Multi-Stage (***C.TYP* = 5**) and SPT 2 Stage (***C.TYP* = 6**) — There is no difference to consider for selecting a heat mode whether the control type is for SPT 2-stage or SPT multi-stage as this only refers to how cooling will be handled. So, for a valid heating type selected (***HT.CF*** not equal to zero) 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 43.

Table 43 — 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

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.

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.

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.

See Fig. 7 for an example of offsets.

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*** = 5 and 6) because they 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 44 at the local display under ***Run Status→TRIP***.

Table 44 — 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

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.

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 IFO input 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***)*

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 IFO input controls the supply fan request
- The control will turn on Heat Relay 1 (***HS1***)
- 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.

HYDRONIC HEATING CONTROL (***HT.CF* = 4**) — Hydronic heating in Z Series units refers to a hot water coil controlled by an actuator. This actuator is a Local Equipment Network (LEN) 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 RCB, 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 45.

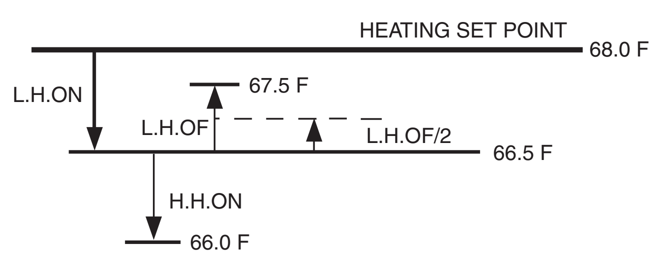


Fig. 7 — Heating Offsets

Table 45 — 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 - 255		HTCL_SN1	0
SN.2	Hydronic Ht.Serial Num.2	0 - 255		HTCL_SN2	0
SN.3	Hydronic Ht.Serial Num.3	0 - 255		HTCL_SN3	0
SN.4	Hydronic Ht.Serial Num.4	0 - 255		HTCL_SN4	0
SN.5	Hydronic Ht.Serial Num.5	0 - 255		HTCL_SN5	0
C.A.LM	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85

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 Z Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator over the local equipment network (LEN). 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. Five 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, SN.5***).

NOTE: The serial numbers for all LEN 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 HEATING CONTROL (***HT.CF = 3***) — As an option, the units with gas heat can be equipped with staged gas heat controls that will provide from 5 to 11 stages of heat capacity. This is intended for tempering mode and tempering economizer air when in a cooling mode and the dampers are fully closed. Tempering can also be used during a pre-occupancy purge to prevent low temperature air from being delivered to the space. Tempering for both staged 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 gas configurations are located at the local display under ***Configuration→HEAT→SG.CF***. See Table 46.

Staged Gas Heat Type (***HT.ST***) — This configuration instructs the control how many stages and in what order are they staged.

Max Cap Change per Cycle (***CAP.M***) — This configuration limits the maximum change in capacity per PID run time cycle.

S.Gas DB Min.dF/PID Rate (***M.R.DB***) — This configuration is a deadband minimum temperature per second rate. See capacity calculation logic on next page for more details.

St.Gas Temp.Dead Band (***S.G.DB***) — This configuration is a deadband delta temperature. See capacity calculation logic on next 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 Z Series as a limit switch temperature sensor is always present for staged gas operation.

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.

Table 46 — Staged Gas Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SG.CF	STAGED GAS CONFIGS				
HT.ST	Staged Gas Heat Type	0 - 4		HTSTGTYP	0*
CAP.M	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45*
M.R.DB	S.Gas DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5
S.G.DB	St.Gas 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	110 - 180	dF	HT_LIMHI	170*
SW.L.T	Limit Switch Low Temp	100 - 170	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	60 - 300	sec	HTSGPIDR	90

*Some configurations are model number dependent.

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 Gas Heating Logic

If the HVAC mode is HIGH HEAT:

- The supply fan for staged gas heating is controlled by the 48Z Integrated Gas Control (IGC) boards and unless the supply fan is on for a different reason, will be controlled by the IGC IFO input.
- Command all stages of heat ON

If the HVAC mode is LOW HEAT:

- The supply fan for staged 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.
- 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 gas is the heating supply air set point (***Setpoints→SA.HT***).

Staged Gas 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 staged gas 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 fast 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 Gas Capacity Calculation = "P + D" + old Staged Gas 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 model number. The selection of a set of staging patterns is controlled via the heat stage type configuration parameter (***HT.ST***). 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 5 staging patterns that the stage gas control will use. In addition to the staging patterns, the capacity for each stage is also determined by the staged gas heating PID control. Therefore, choosing the heat relay outputs is a function of the capacity desired, the heat staging patterns based on the 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 capacity of the control drops, the desired capacity 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 heat stage 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 board and outputs 3, 4, 5, and 6 are located on the SCB board. These outputs are used to yield from 2 to 9 stages as shown in Table 47. 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***) for the chosen set of staging patterns. See Tables 48-50.

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.GLS***) 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 to clamp or drop all gas stages.

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.GLS*** 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.GLS*** 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.GLS*** 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.GLS*** 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.

INTEGRATED GAS CONTROL BOARD LOGIC — All gas heat units are equipped with one or more integrated gas control (IGC) boards. This board provides control for the ignition system for the gas heat sections. On size 030-050 low heat units there will be one IGC board. On size 030-050 high heat units and 055-105 low heat units there are two IGC boards. On size 055-105 high heat units there are three IGC boards. 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 51 for LED explanations. Each board will ensure that the rollout switch and limit switch are closed. The induced-draft motor is then energized. When the speed of the motor is proven with the Hall Effect sensor on the motor, 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, 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. 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.

Table 47 — Staged Gas Heat

NUMBER OF STAGES	HT.ST CONFIGURATION	UNIT SIZE 48Z	HEAT SIZE
2	0	030-050	Low
5	1	030-050	High
		055-105	Low
9	3	055-105	High

Table 48 — 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 49 — 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 50 — Staged 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	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 51 — 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.

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-kilo-ohm 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 counter-effect 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 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

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 or hydronic heating (***Configuration→HEAT→HT.CF***=3 or 4).

If the control is configured for staged gas 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 the 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 vent trip point is ***T.CL***.
- If in a pre-occupied purge mode (***Operating Modes→MODE→IAQ.P***=ON), then the trip point is ***T.PRG***.
- If 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.

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.

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, there must be a minimum 10 minutes of delay allowed 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 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 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 either an optional variable frequency drive (VFD) or inlet guide vanes (IGV) for the supply fan. The speed of the fan or the position of the IGV 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 RCB board and is then used in a PID control routine that outputs a 4 to 20 mA signal to the VFD, or a digital LEN signal to the IGV.

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 three most fundamental configurations for most applications are ***Configuration→SP→SP.CF***, which is the static pressure control type, ***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 — On units equipped with either VFD or IGV 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 IGV or 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 TB203 terminals 6 and 7 (thereby facilitating third party control), or via CCN.

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.

SETTING UP THE SYSTEM — The options for static pressure control are found under the Local Display Mode ***Configuration→SP***. See Table 52.

Table 52 — Static Pressure Control Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SP	SUPPLY STATIC PRESS.CFG.				
→***SP.CF***	Static Pressure Config	0, 1, 2		STATICFG	0
→***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-IGV Minimum Speed	0 - 100	%	STATPMIN	20
→***SP.MX***	VFD-IGV Maximum Speed	0 - 100	%	STATPMAX	100
→***SP.FS***	VFD-IGV 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				
→***S.PID***→***SP.TM***	Static Press. PID Run Rate	5 - 120	sec	SPIDRATE	15
→***S.PID***→***SP.P***	Static Press. Prop. Gain	0 - 5		STATP_PG	0.5
→***S.PID***→***SP.I***	Static Pressure Intg. Gain	0 - 2		STATP_IG	0.5
→***S.PID***→***SP.D***	Static Pressure Derv. Gain	0 - 5		STATP_DG	0.3
→***ACT.C***	IGV ACTUATOR CONFIGS				
→***ACTC***→***SN.1***	IGV Serial Number 1	0 - 255		IGV_SN1	0
→***ACTC***→***SN.2***	IGV Serial Number 2	0 - 255		IGV_SN2	0
→***ACTC***→***SN.3***	IGV Serial Number 3	0 - 255		IGV_SN3	0
→***ACTC***→***SN.4***	IGV Serial Number 4	0 - 255		IGV_SN4	0
→***ACTC***→***SN.5***	IGV Serial Number 5	0 - 255		IGV_SN5	0
→***ACTC***→***C.A.LM***	IGV Cntrl Angle Lo Limit	0-90	deg	IGV_CALM	25

Static Pressure Configuration (***SP.CF***) — This variable is used to configure the use of *Comfort*Link™ controls for static pressure control. It has the following options:

0 (None) — 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 or IGV. In this latter case, a suitable means of control must be field installed.

1 (VFD Control) — This will enable the use of *Comfort*Link controls for static pressure control via a supply fan VFD.

2 (IGV Control) — This will enable the use of *Comfort*Link controls for static pressure control via supply fan inlet guide vanes (IGV).

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.

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 63, under Static Pressure Reset.

VFD-IGV Minimum Speed (***SP.MN***) — This is the minimum speed for the supply fan VFD or the minimum opening for the supply fan IGV. 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.

VFD-IGV Maximum Speed (***SP.MX***) — This is the maximum speed for the supply fan VFD or the maximum opening for the supply fan IGV. This is usually set to 100%.

VFD-IGV Fire Speed Override (***SP.FS***) — This is the speed that the supply fan VFD or the supply fan IGV 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 is the static pressure 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 (***SPSP***).

The calculation is as follows:

(Static Pressure Reset/***SPSP***) x (ECONOSPR – ECONOMIN)

As an example, the static pressure set point (***SPSP***) = 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%.

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.

IGV Actuator Configs (***ACT.C***) — Every actuator used in the Z Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator over the local equipment network (LEN). 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. Five individual numbers make up this serial number and these can be programmed to match the serial number of the actuator in its "IGV Actuator Configs" group, ***ACT.C*** (***SN.1, SN.2, SN.3, SN.4, SN.5***).

NOTE: The serial numbers for all LEN 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 use it to replace the old one inside the control panel doors. The format for the overall serial number is 111-222-333-444-555, where each of these segments can be 1, 2 or 3 digits in length. Valid numbers are in the range 1-255.

IGV Serial Number 1 (***ACT.C→SN.1***) — This variable records the first of the five segments of the IGV digital LEN actuator serial number. The complete serial number is used by the *Comfort*Link controls to communicate with the actuator.

IGV Serial Number 2 (***ACT.C→SN.2***) — This variable records the second segment of the IGV actuator serial number.

IGV Serial Number 3 (***ACT.C→SN.3***) — This variable records the third segment of the IGV actuator serial number.

IGV Serial Number 4 (***ACT.C→SN.4***) — This variable records the fourth segment of the IGV actuator serial number.

IGV Serial Number 5 (***ACT.C→SN.5***) — This variable records the fifth segment of the IGV actuator serial number.

IGV Control Angle Low Limit (***ACT.C→C.A.LM***) — The IGV 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 this internal calibration, it remembers what its "control angle range" is. From then on, the actuator will resolve this control angle and express its operation in a percentage (%) of this learned range.

If the IGV has not learned a sufficient control angle range during calibration, it will be unable to control itself properly. For this reason the IGV actuator used in the Z Series control system has a configurable control angle alarm low limit in its "Economizer Actuator Configs" group, ***ACT.C***. (***C.A.LM***). If the control angle learned through calibration is less than ***Configuration→SP→ACT.C→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.

STATIC PRESSURE RESET — The configuration for Static Pressure Reset is found under ***Configuration→UNIT***.

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULT
→SENS→SP.RS	Static Press. Reset Sensor.	Enable/ Disable	SPRSTSEN	Disable

Static Pressure Reset Sensor (***SP.RS***) — 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 4-20 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 TB203 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→UNIT →SENS→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 53.

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 TB203 terminals 6 and 7, from a third party control system.

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.

IGV Actuator Current Pos (***IGV.P***) — This output reflects the current position of the supply fan inlet guide vanes. This may be helpful in some cases for troubleshooting.

IGV Act. Commanded Pos (***IGV.C***) — This output reflects the commanded position of the supply fan inlet guide vanes. By comparing this to the actual position of the guide vanes, this may be helpful in some cases for troubleshooting.

Fan Status Monitoring

GENERAL — The Z 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 is an accessory that allows for the monitoring of a discrete switch, which trips above a differential pressure drop across the supply fan. 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 or inlet guide vanes 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 54.

Table 54 — 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 or 2 (VFD or IGV), 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 55.

Table 53 — 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	
→ ACTU → IGV.P	IGV Actuator Current Pos	0-100	%	IGV_RPOS	
→ ACTU → IGV.C	IGV Act. Commanded Pos	0-100	%	IGV_CPOS	

Table 55 — 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

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.

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 Z Series economizer damper is managed by a communicating actuator motor(s) over the unit’s Local Equipment Network (LEN). 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.

SETTING UP THE SYSTEM — The economizer configuration options are under the Local Display Mode ***Configuration →ECON***. See Table 56.

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 48/50Z055-105 units, a second economizer actuator is required. For sizes 055-105, 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 Z 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. 8 for a diagram showing the settings on the enthalpy switch.

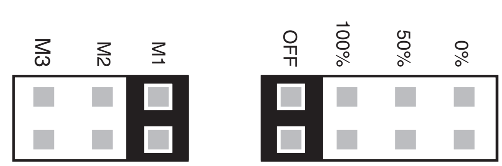


Fig. 8 — Enthalpy Switch Jumper Positions

Table 56 — 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
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 - 255		ECON_SN1	0
SN.1.2	Econ Serial Number 2	0 - 255		ECON_SN2	0
SN.1.3	Econ Serial Number 3	0 - 255		ECON_SN3	0
SN.1.4	Econ Serial Number 4	0 - 255		ECON_SN4	0
SN.1.5	Econ Serial Number 5	0 - 255		ECON_SN5	0
C.A.L1	Econ Ctrl Angle Lo Limit	0 - 90		ECONCALM	85
SN.2.1	Econ 2 Serial Number 1	0 - 255		ECN2_SN1	0
SN.2.2	Econ 2 Serial Number 2	0 - 255		ECN2_SN2	0
SN.2.3	Econ 2 Serial Number 3	0 - 255		ECN2_SN3	0
SN.2.4	Econ 2 Serial Number 4	0 - 255		ECN2_SN4	0
SN.2.5	Econ 2 Serial Number 5	0 - 255		ECN2_SN5	0
C.A.L2	Econ 2 Ctrl Angle Lo Limit	0 - 90		ECN2CALM	85

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 4-20 loop input. See Fig. 8 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.

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

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 and outside-air temperature is greater than return-air temperature, free cooling will not be allowed.

Outdoor Enthalpy Changeover — This option should be used in climates with higher humidity conditions. The Z 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. 9 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 3 and 4.

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→SENS→RRH.S***) must be enabled.

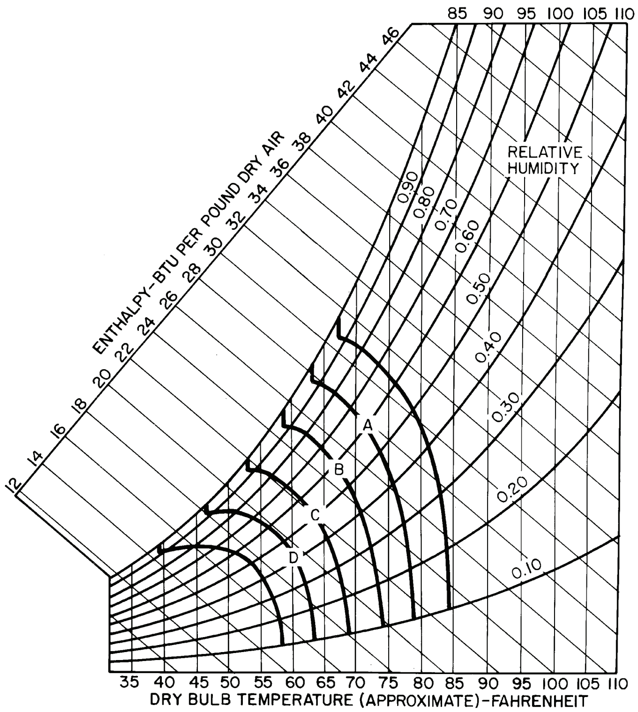
NOTE: If the user wishes to disable the standard enthalpy control from running concurrently, a field-supplied jumper must be installed between TB201 terminals 3 and 4.

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. 10 shows a horizontal limit line in the custom curve of the psychrometric chart. This is the outdoor air dewpoint limit boundary.

<u>Custom Psychrometric Curves</u> — Refer to the psychrometric chart and the standard Honeywell A-D curves in Fig. 9. 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. 10 for an example of a custom curve constructed on a psychrometric chart.

<u>Configuring the Economizer to Communicate Via Actuator Serial Number</u> — Every actuator used in the Z Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator over the local equipment network (LEN). 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. Five individual numbers make up this serial number and these can be programmed to match the serial number of the actuator in its Economizer Actuator Configs group, ***ACT.C*** (***SN1.1, SN1.2, SN1.3, SN1.4, SN1.5, SN2.1, SN2.2, SN2.3, SN2.4, SN2.5***).

NOTE: The serial numbers for all LEN 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 CURVE	CONTROL POINT (approx Deg) AT 50% RH
A	73
B	68
C	63
D	58

Fig. 9 — Psychrometric Chart for Enthalpy Control

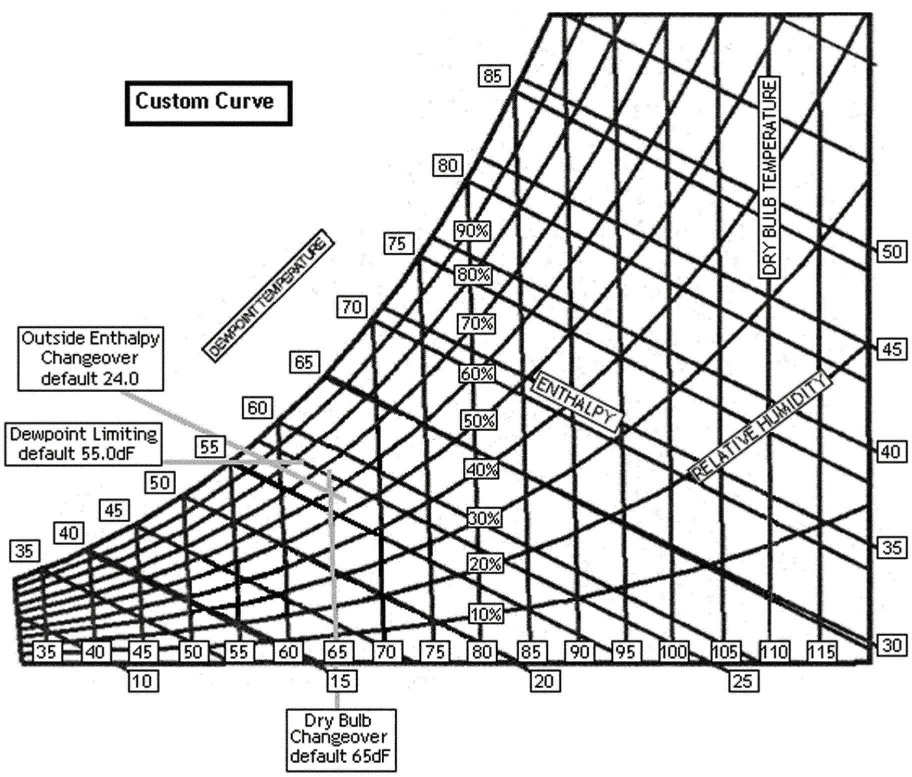


Fig. 10 — Custom Changeover Curve Example

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 Z 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 to 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 57.

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 6 types of control.

C.TYP = 1 VAV-RAT

C.TYP = 2 VAV-SPT

C.TYP = 3 TSTAT Multi-Staging

C.TYP = 4 TSTAT 2 Stage

C.TYP = 5 SPT Multi-Staging

C.TYP = 6 SPT 2 Stage

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***).

If the ***C.TYP*** is either 4 or 6, and the unit is in a cool mode, then:

If Stage = 0 ***EC.C.P*** = the Cooling Control Point (***Run Status→VIEW→CL.C.P***)

If Stage = 1 53.0 + economizer suction pressure reset

If Stage = 2 48.0 + economizer suction pressure reset

NOTE: To check the current cooling stage go to ***Run Status→Cool→CUR.S***.

If the ***C.TYP*** is either 1,2,3 or 5, and the unit is in a cool mode, then ***EC.C.P*** = the Cooling Control Point (***Run Status→VIEW→CL.C.P***).

Economizer Suction Pressure Reset for Two-Stage Cooling — If the unit's control type is set to either 2-stage thermostat or 2-stage space temperature control, then there is no cooling control point. Stages 1 and 2 are brought on based on demand, irrespective of the evaporator discharge temperature. In this case, the economizer monitors suction pressure and resets the economizer control point accordingly in order to protect the unit from freezing. For those conditions when the economizer opens up fully but is not able to make set point, and then a compressor comes on, it is conceivable that the coil might freeze. This can be indirectly monitored by checking suction pressure. Rather than fail a circuit, the control will attempt to protect the unit by resetting the economizer control point until the suction pressure rises out of freezing conditions.

If either circuit's suction pressure drops to within 5 psig of the low suction pressure trip point, the control will start adding reset to the economizer control point if it is active. It will be possible to reset the control point upwards, 10 degrees (2 degrees per psig), between the low suction pressure trip point of 48 psig and 5 psig above it. If this does not work, and if the suction pressure drops below the trip point, then the control will further reset the control point 1 degree every 15 seconds up to a maximum of 10 degrees. The resulting effect will be to warm up the mixed air entering the evaporator, thereby raising the suction pressure.

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†
48ZG, 50ZG,Z2	X	X	S.O.	NA	NA
48ZN, 50ZN,Z3	NA	X	S.O.	NA	NA
48ZT,ZW 50ZT,ZW,ZX,ZZ	NA	NA	NA	STD	NA
48Z6,Z8 50Z6,Z7,Z8,Z9	NA	NA	NA	NA	STD

LEGEND

X — Available as Factory Option
S.O. — Available as Special Order
NA — Not Available on this Unit
STD — Standard Feature on this Unit

*Single VFD controlling both fan motors.
†Single VFD controlling one fan motor and staging of the second fan motor.

Table 57 — 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 CONFIGURATION — The building pressure configurations are found at the local display under ***Configuration→BP***. See Table 58.

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 075-105 with high-capacity exhaust option)
- ***BP.CF*** = 5, used on sizes 075-105 with return/exhaust 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 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***.

Fan Track Learn Rate (***FT.TM***) — For ***BP.CF*** = 5, this return/exhaust control configuration is a timer that affects corrections to the delta cfm operation. The smaller this value, the more often corrections may be made based on building pressure error. This configuration is only valid when ***FT.CF*** = Yes.

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.

Table 58 — 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 - 255		BP_1_SN1	0
SN.2	BP 1 Serial Number 2	0 - 255		BP_1_SN2	0
SN.3	BP 1 Serial Number 3	0 - 255		BP_1_SN3	0
SN.4	BP 1 Serial Number 4	0 - 255		BP_1_SN4	0
SN.5	BP 1 Serial Number 5	0 - 255		BP_1_SN5	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 - 255		BP_2_SN1	0
SN.2	BP 2 Serial Number 2	0 - 255		BP_2_SN2	0
SN.3	BP 2 Serial Number 3	0 - 255		BP_2_SN3	0
SN.4	BP 2 Serial Number 4	0 - 255		BP_2_SN4	0
SN.5	BP 2 Serial Number 5	0 - 255		BP_2_SN5	0
C.A.LM	BP2 Cntrl Angle Lo Limit	0-90		BP2_CALM	35

*Some configurations are model number dependent.

Configuration→BP→BP.CF* = 2** (Modulating Power Exhaust) — Control is accomplished with two LEN communicating actuators in tandem and one exhaust fan relay. 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 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***). 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 position 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 can not 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 Z Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator over the local equipment network (LEN). 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. Five 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, SN.5***).

NOTE: The serial numbers for all LEN 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 ***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 Z 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 board (MBB) on terminals TB201-5 and 6. The unit may also be equipped with a factory-installed return air smoke detector that is wired to TB201-5,6 and will shut the unit down if a smoke condition is determined. Field-monitoring wiring can be connected to terminal TB201-13 and 14 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 TB204 as shown below. Refer to Major System Components section on page 102 for wiring diagrams.

Pressurization — TB204-5 and 6

Evacuation — TB204-7 and 8

Smoke Purge — TB204-9 and 10

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 SHUTDOWN
Economizer	100%	100%	0%	0%
Indoor Fan — VFD/IGV	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/IGV fire speed override configurable speed.

RELEVANT ITEMS:

The economizer’s commanded output can be found in ***Outputs→ECON→ECN.C***.

The configurable fire speed override for supply fan VFD/IGV 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 inlet guide vane’s commanded position can be found in ***Outputs→ACTU→IGV.C***.

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 Control 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-kilo-ohm 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 and must include its own 24-v supply. The sensor connects to TB202 terminals 11 and 12. Be sure to leave the 182-ohm resistor in place on terminals 11 and 12.

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. 11. 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. 11. 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. 12.

SETTING UP THE SYSTEM — The IAQ configuration options are under the Local Display Mode ***Configuration→IAQ***. See Table 59.

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 TB202 terminal 11 and 12, 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 TB202 terminal 11 and 12, the economizer minimum position will be scaled linearly from 0% (0 kilo-ohms) to ***EC.MN*** (10 kilo-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 TB204 terminal 11 and 12.

Table 59 — 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

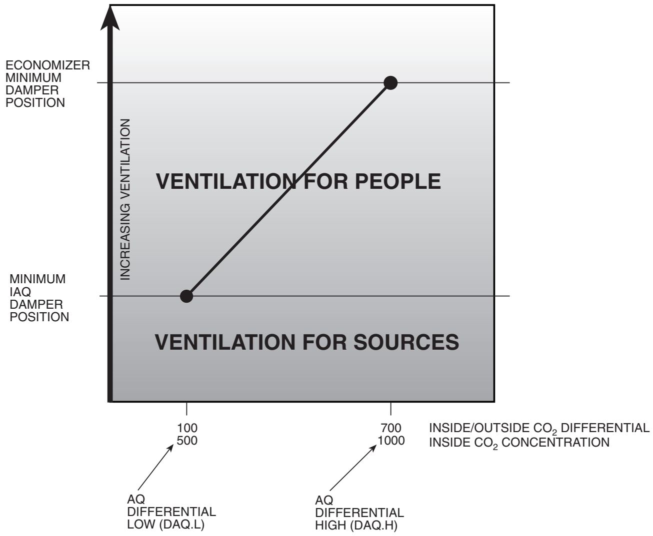
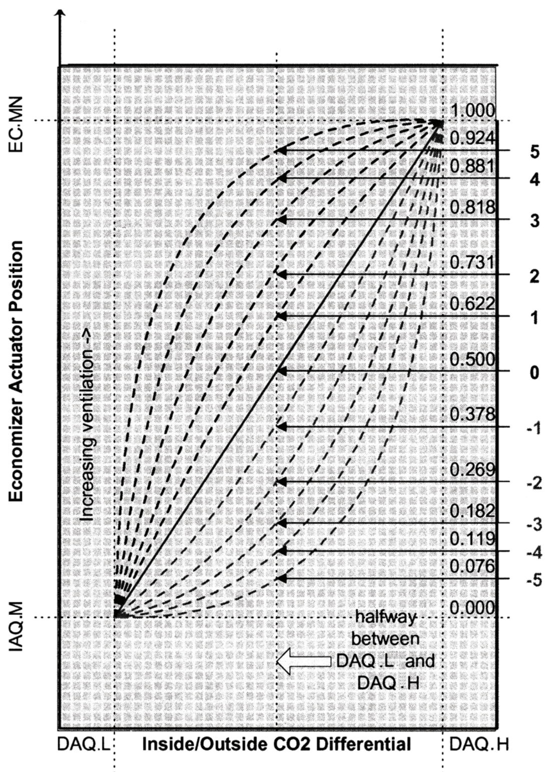


Fig. 11 — IAQ Control



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. 12 — IAQ Response Curve

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.P.O*** (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.

OAQ 4-20 mA Sensor Config (***Configuration→IAQ→AQ.CF→OQ.A.C***) — This is used to configure the type of outdoor sensor that will be used for OAQ levels. It has the following configuration options:

- ***OQ.A.C*** = 0 (No Sensor) — No sensor will be used and the internal software reference setting will be used.
- ***OQ.A.C*** = 1 (OAQ Sensor with DAQ) — An outdoor CO_2 sensor will be used.
- ***OQ.A.C*** = 2 (4 to 20 mA Sensor without DAQ).

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. 12.

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 055-105.

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 Z 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 LEN actuator (Carrier Part No. HF23BJ049) must be adapted to the humidifier manufacturer's steam valve. Contact Belimo Aircontrols for information on actuator linkage adapter packages required to mount the LEN actuator on the specific brand and type of steam valve mounted by the humidifier manufacturer.

The LEN actuator address must be programmed into the *Comfort*Link unit's humidifier actuator serial number variables.

NOTE: If the unit has the IGV option installed, it will be necessary to fabricate a LEN harness extension to connect the humidifier LEN actuator to the unit's LEN harness.

SETTING UP THE SYSTEM — These humidity configuration are located in the local displays under ***Configuration→HUMD***. See Table 60. Related points are shown in Table 61.

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.

Table 60 — Humidity Configuration

ITEM	EXPANSION	CCN POINT	RANGE	UNITS	DEFAULT
HUMD	HUMIDITY CONFIGURATION				
HM.CF	Humidifier Control Cfg.	HUMD_CFG	0 - 4		0
HM.SP	Humidifier Setpoint	HUSP	0 - 100	%	40
H.PID	HUMIDIFIER PID CONFIGS				
HM.TM	Humidifier PID Run Rate	HUMDRATE	10 - 120	sec	30
HM.P	Humidifier Prop. Gain	HUMID_PG	0 - 5		1
HM.I	Humidifier Integral Gain	HUMID_IG	0 - 5		0.3
HM.D	Humidifier Deriv. Gain	HUMID_DG	0 - 5		0.3
ACT.C	HUMIDIFIER ACTUATOR CFGS				
SN.1	Humd Serial Number 1	HUMD_SN1	0 - 255		0
SN.2	Humd Serial Number 2	HUMD_SN2	0 - 255		0
SN.3	Humd Serial Number 3	HUMD_SN3	0 - 255		0
SN.4	Humd Serial Number 4	HUMD_SN4	0 - 255		0
SN.5	Humd Serial Number 5	HUMD_SN5	0 - 255		0
C.A.LM	Humd Ctrl Angle Lo Limit	HUMDCALM	0-90		85

Table 61 — 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	

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 Z Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator over the local equipment network (LEN). 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. Five 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, SN.5***)

NOTE: The serial numbers for all LEN 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.

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 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).

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 or 4), 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 62.

Dehumidification Configuration (***D.SEL***) — The dehumidification configuration can be set for the following settings:

- ***D.SEL*** = 0 — No dehumidification and reheat.

Table 62 — Dehumidification Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
DEHU	DEHUMIDIFICATION CONFIG.				
D.SEL	Dehumidification Config	0-3		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

- ***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.

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 or 4) 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 or 4) and the economizer is able to provide cooling, a dehumidification mode may be called out, but the control will not request mechanical cooling.

If a 2-stage control type is selected (***Configuration→UNIT→C.TYP*** = 4 or 6), then the economizer, if active, locks out mechanical cooling during the Dehumidification mode.

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.

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 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.

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 63.

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.

Table 63 — CCN Configuration

ITEM	EXPANSION	RANGE	UNITS	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

Alert Limit Configuration — The ALLM submenu is used to configure the alert limit set points. A list is shown in Table 64.

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

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→RRHS***), 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 (***DP.L***), then Alert 310 will occur. The unit will continue to run and the alert will automatically reset.

Table 64 — Alert Limit Configuration

ITEM	EXPANSION	RANGE	UNITS	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

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 65.

> IMPORTANT: Sensor trim must not be used to extend unit operation past the allowable operating range. Doing so may void the 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.

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.

Table 65 — Sensor Trim Configuration

ITEM	EXPANSION	RANGE	UNITS	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
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

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 66.

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.

Enthaply 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.

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 67.

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.

Table 66 — 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

Table 67 — Display Configuration

ITEM	EXPANSION	RANGE	UNITS	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

Remote Control Switch Input — The remote switch input is located on the RCB board and connected to TB201 terminals 1 and 2. The switch can be used for several remote control functions. See Table 68.

Table 68 — 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 Input State (***Inputs→GEN.I→REMT***) — This is the actual real time state of the remote input.

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 69.

Hot Gas Bypass — Hot gas bypass is an automatically operating system used to limit evaporator suction pressure during periods of low evaporator loading. This system is not controlled by the *Comfort*Link™ control system and it is available to operate whenever circuit A is running.

The hot gas bypass option consists of a pressure regulating valve, a manual service valve and tubing connecting the circuit A hot gas refrigerant line to the circuit A evaporator distributors (one distributor on sizes 030-035, two distributors on sizes 040-105). The pressure regulating valve opens the bypass circuit as the evaporator suction pressure decreases into a range that might generate frost formation on the evaporator surface if sustained compressor operation occurs. The hot gas refrigerant enters the evaporator coil and adds refrigeration load to the compressor circuit to offset a low load situation in the mixed air temperature condition. Total bypass capacity is approximately 5 tons.

The hot gas bypass system is a factory-installed option, installed on circuit A only. When this option is provided, the control function for Lead-Lag sequencing must be disabled (***Configuration→ Cool→ L.L.EN*** is set to No).

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 either 2-Stage SPT or Multi-Stage SPT control (***Configuration→UNIT→C.TYP*** = 5 and 6).

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 69 — 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 70.

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, 2005).

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 36 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 70 — Time Clock Menu

ITEM	EXPANSION	RANGE	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. 2003	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 94, 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 71-73 and Fig. 13.

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.

Thermistor Troubleshooting — The EDT, OAT, RAT, LAT, T55, T56, and T58 space temperature sensors use 10K thermistors. Resistances at various temperatures are listed in Tables 74 and 75.

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

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the main base board.
2. Using the voltage reading obtained, read the sensor temperature from Tables 74 and 75.
3. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature-measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be 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 shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J8 terminal, or by determining the resistance with unit shut down and thermistor disconnected from J8. Compare the values determined with the value read by the control in the Temperatures mode using the scrolling marquee display.

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 76 and 77. The accuracy of these transducers can be verified by connecting an accurate pressure gage to the second refrigerant port in the suction line.

Table 71 — 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 72 — 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 valve adjustment in Installation, Start-up, and Service 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 73 — 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 74 — 10K Thermistor vs Resistance (T55, T56, OAT, RAT, EDT, LAT Sensors) (F)

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	4.758	196,453
–24	4.750	189,692
–23	4.741	183,300
–22	4.733	177,000
–21	4.724	171,079
–20	4.715	165,238
–19	4.705	159,717
–18	4.696	154,344
–17	4.686	149,194
–16	4.676	144,250
–15	4.665	139,443
–14	4.655	134,891
–13	4.644	130,402
–12	4.633	126,183
–11	4.621	122,018
–10	4.609	118,076
–9	4.597	114,236
–8	4.585	110,549
–7	4.572	107,006
–6	4.560	103,558
–5	4.546	100,287
–4	4.533	97,060
–3	4.519	94,020
–2	4.505	91,019
–1	4.490	88,171
0	4.476	85,396
1	4.461	82,729
2	4.445	80,162
3	4.429	77,662
4	4.413	75,286
5	4.397	72,940
6	4.380	70,727
7	4.363	68,542
8	4.346	66,465
9	4.328	64,439
10	4.310	62,491
11	4.292	60,612
12	4.273	58,781
13	4.254	57,039
14	4.235	55,319
15	4.215	53,693
16	4.195	52,086
17	4.174	50,557
18	4.153	49,065
19	4.132	47,627
20	4.111	46,240
21	4.089	44,888
22	4.067	43,598
23	4.044	42,324
24	4.021	41,118
25	3.998	39,926
26	3.975	38,790
27	3.951	37,681
28	3.927	36,610
29	3.903	35,577
30	3.878	34,569
31	3.853	33,606
32	3.828	32,654
33	3.802	31,752
34	3.776	30,860
35	3.750	30,009
36	3.723	29,177
37	3.697	28,373
38	3.670	27,597
39	3.654	26,838
40	3.615	26,113
41	3.587	25,396
42	3.559	24,715
43	3.531	24,042
44	3.503	23,399
45	3.474	22,770
46	3.445	22,161
47	3.416	21,573
48	3.387	20,998
49	3.357	20,447
50	3.328	19,903
51	3.298	19,386
52	3.268	18,874
53	3.238	18,384
54	3.208	17,904
55	3.178	17,441
56	3.147	16,991
57	3.117	16,552
58	3.086	16,131
59	3.056	15,714
60	3.025	15,317
61	2.994	14,925
62	2.963	14,549
63	2.932	14,180
64	2.901	13,824
65	2.870	13,478
66	2.839	13,139
67	2.808	12,814
68	2.777	12,493
69	2.746	12,187
70	2.715	11,884
71	2.684	11,593
72	2.653	11,308
73	2.622	11,031
74	2.592	10,764
75	2.561	10,501
76	2.530	10,249
77	2.500	10,000
78	2.470	9,762
79	2.439	9,526
80	2.409	9,300
81	2.379	9,078
82	2.349	8,862
83	2.319	8,653
84	2.290	8,448
85	2.260	8,251
86	2.231	8,056
87	2.202	7,869
88	2.173	7,685
89	2.144	7,507
90	2.115	7,333
91	2.087	7,165
92	2.059	6,999
93	2.030	6,838
94	2.003	6,683
95	1.975	6,530
96	1.948	6,383
97	1.921	6,238
98	1.894	6,098
99	1.867	5,961
100	1.841	5,827
101	1.815	5,698
102	1.789	5,571
103	1.763	5,449
104	1.738	5,327
105	1.713	5,210
106	1.688	5,095
107	1.663	4,984
108	1.639	4,876
109	1.615	4,769
110	1.591	4,666
111	1.567	4,564
112	1.544	4,467
113	1.521	4,370
114	1.498	4,277
115	1.475	4.185
116	1.453	4,096
117	1.431	4,008
118	1.409	3,923
119	1.387	3,840
120	1.366	3,759
121	1.345	3,681
122	1.324	3,603
123	1.304	3,529
124	1.284	3,455
125	1.264	3,383
126	1.244	3,313
127	1.225	3,244
128	1.206	3,178
129	1.187	3,112
130	1.168	3,049
131	1.150	2,986
132	1.132	2,926
133	1.114	2,866
134	1.096	2,809
135	1.079	2,752
136	1.062	2,697
137	1.045	2,643
138	1.028	2,590
139	1.012	2,539
140	0.996	2,488
141	0.980	2,439
142	0.965	2,391
143	0.949	2,343
144	0.934	2,297
145	0.919	2,253
146	0.905	2,209
147	0.890	2,166
148	0.876	2,124
149	0.862	2,083
150	0.848	2,043
151	0.835	2,003
152	0.821	1,966
153	0.808	1,928
154	0.795	1,891
155	0.782	1,855
156	0.770	1,820
157	0.758	1,786
158	0.745	1,752
159	0.733	1,719
160	0.722	1,687
161	0.710	1,656
162	0.699	1,625
163	0.687	1,594
164	0.676	1,565
165	0.666	1,536
166	0.655	1,508
167	0.645	1,480
168	0.634	1,453
169	0.624	1,426
170	0.614	1,400
171	0.604	1,375
172	0.595	1,350
173	0.585	1,326
174	0.576	1,302
175	0.567	1,278
176	0.558	1,255
177	0.549	1,233
178	0.540	1,211
179	0.532	1,190
180	0.523	1,169
181	0.515	1,148
182	0.507	1,128
183	0.499	1,108
184	0.491	1,089
185	0.483	1,070
186	0.476	1,052
187	0.468	1,033
188	0.461	1,016
189	0.454	998
190	0.447	981
191	0.440	964
192	0.433	947
193	0.426	931
194	0.419	915
195	0.413	900
196	0.407	885
197	0.400	870
198	0.394	855
199	0.388	841
200	0.382	827
201	0.376	814
202	0.370	800
203	0.365	787
204	0.359	774
205	0.354	762
206	0.349	749
207	0.343	737
208	0.338	725
209	0.333	714
210	0.328	702
211	0.323	691
212	0.318	680
213	0.314	670
214	0.309	659
215	0.305	649
216	0.300	639
217	0.296	629
218	0.292	620
219	0.288	610
220	0.284	601
221	0.279	592
222	0.275	583
223	0.272	574
224	0.268	566
225	0.264	557

Table 75 — 10K Thermistor vs Resistance (T55, T56, OAT, RAT, EDT, LAT Sensor) (C)

TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–32	4.762	200,510	**15**	3.056	15,714	**62**	0.940	2,315
–31	4.748	188,340	**16**	3.000	15,000	**63**	0.913	2,235
–30	4.733	177,000	**17**	2.944	14,323	**64**	0.887	2,157
–29	4.716	166,342	**18**	2.889	13,681	**65**	0.862	2,083
–28	4.700	156,404	**19**	2.833	13,071	**66**	0.837	2,011
–27	4.682	147,134	**20**	2.777	12,493	**67**	0.813	1,943
–26	4.663	138,482	**21**	2.721	11,942	**68**	0.790	1,876
–25	4.644	130,402	**22**	2.666	11,418	**69**	0.767	1,813
–24	4.624	122,807	**23**	2.610	10,921	**70**	0.745	1,752
–23	4.602	115,710	**24**	2.555	10,449	**71**	0.724	1,693
–22	4.580	109,075	**25**	2.500	10,000	**72**	0.703	1,637
–21	4.557	102,868	**26**	2.445	9,571	**73**	0.683	1,582
–20	4.533	97,060	**27**	2.391	9,164	**74**	0.663	1,530
–19	4.508	91,588	**28**	2.337	8,776	**75**	0.645	1,480
–18	4.482	86,463	**29**	2.284	8,407	**76**	0.626	1,431
–17	4.455	81,662	**30**	2.231	8,056	**77**	0.608	1,385
–16	4.426	77,162	**31**	2.178	7,720	**78**	0.591	1,340
–15	4.397	72,940	**32**	2.127	7,401	**79**	0.574	1,297
–14	4.367	68,957	**33**	2.075	7,096	**80**	0.558	1,255
–13	4.335	65,219	**34**	2.025	6,806	**81**	0.542	1,215
–12	4.303	61,711	**35**	1.975	6,530	**82**	0.527	1,177
–11	4.269	58,415	**36**	1.926	6,266	**83**	0.512	1,140
–10	4.235	55,319	**37**	1.878	6,014	**84**	0.497	1,104
–9	4.199	52,392	**38**	1.830	5,774	**85**	0.483	1,070
–8	4.162	49,640	**39**	1.784	5,546	**86**	0.470	1,037
–7	4.124	47,052	**40**	1.738	5,327	**87**	0.457	1,005
–6	4.085	44,617	**41**	1.692	5,117	**88**	0.444	974
–5	4.044	42,324	**42**	1.648	4,918	**89**	0.431	944
–4	4.003	40,153	**43**	1.605	4,727	**90**	0.419	915
–3	3.961	38,109	**44**	1.562	4,544	**91**	0.408	889
–2	3.917	36,182	**45**	1.521	4,370	**92**	0.396	861
–1	3.873	34,367	**46**	1.480	4,203	**93**	0.386	836
0	3.828	32,654	**47**	1.439	4,042	**94**	0.375	811
1	3.781	31,030	**48**	1.400	3,889	**95**	0.365	787
2	3.734	29,498	**49**	1.362	3,743	**96**	0.355	764
3	3.686	28,052	**50**	1.324	3,603	**97**	0.345	742
4	3.637	26,686	**51**	1.288	3,469	**98**	0.336	721
5	3.587	25,396	**52**	1.252	3,340	**99**	0.327	700
6	3,537	24,171	**53**	1.217	3,217	**100**	0.318	680
7	3.485	23,013	**54**	1.183	3,099	**101**	0.310	661
8	3.433	21,918	**55**	1.150	2,986	**102**	0.302	643
9	3.381	20,883	**56**	1.117	2,878	**103**	0.294	626
10	3.328	19,903	**57**	1.086	2,774	**104**	0.287	609
11	3.274	18,972	**58**	1.055	2,675	**105**	0.279	592
12	3.220	18,090	**59**	1.025	2,579	**106**	0.272	576
13	3.165	17,255	**60**	0.996	2,488	**107**	0.265	561
14	3.111	16,474	**61**	0.968	2,400			

Table 76 — Suction Pressure Transducer Pressure (psig) vs Voltage (SSP-A, SSP-B)

PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)
0	0.290	**34**	1.436	**68**	2.582	**102**	3.728
1	0.324	**35**	1.470	**69**	2.615	**103**	3.761
2	0.357	**36**	1.503	**70**	2.649	**104**	3.795
3	0.391	**37**	1.537	**71**	2.683	**105**	3.829
4	0.425	**38**	1.571	**72**	2.717	**106**	3.862
5	0.458	**39**	1.604	**73**	2.750	**107**	3.896
6	0.492	**40**	1.638	**74**	2.784	**108**	3.930
7	0.526	**41**	1.672	**75**	2.818	**109**	3.964
8	0.560	**42**	1.705	**76**	2.851	**110**	3.997
9	0.593	**43**	1.739	**77**	2.885	**111**	4.031
10	0.627	**44**	1.773	**78**	2.919	**112**	4.065
11	0.661	**45**	1.807	**79**	2.952	**113**	4.098
12	0.694	**46**	1.840	**80**	2.986	**114**	4.132
13	0.728	**47**	1.874	**81**	3.020	**115**	4.166
14	0.762	**48**	1.908	**82**	3.054	**116**	4.200
15	0.795	**49**	1.941	**83**	3.087	**117**	4.233
16	0.829	**50**	1.975	**84**	3.121	**118**	4.267
17	0.863	**51**	2.009	**85**	3.155	**119**	4.301
18	0.897	**52**	2.042	**86**	3.188	**120**	4.334
19	0.930	**53**	2.076	**87**	3.222	**121**	4.368
20	0.964	**54**	2.110	**88**	3.256	**122**	4.402
21	0.998	**55**	2.144	**89**	3.290	**123**	4.435
22	1.031	**56**	2.177	**90**	3.323	**124**	4.469
23	1.065	**57**	2.211	**91**	3.357	**125**	4.503
24	1.099	**58**	2.245	**92**	3.391	**126**	4.537
25	1.132	**59**	2.278	**93**	3.424	**127**	4.570
26	1.166	**60**	2.312	**94**	3.458	**128**	4.604
27	1.200	**61**	2.346	**95**	3.492	**129**	4.638
28	1.234	**62**	2.380	**96**	3.525	**130**	4.671
29	1.267	**63**	2.413	**97**	3.559	**131**	4.705
30	1.301	**64**	2.447	**98**	3.593	**132**	4.739
31	1.335	**65**	2.481	**99**	3.627	**133**	4.772
32	1.368	**66**	2.514	**100**	3.660	**134**	4.806
33	1.402	**67**	2.548	**101**	3.694	**135**	4.840

Table 77 — Discharge Pressure Transducer Pressure (psig) vs Voltage

PRESSURE (psig)	VOLTAGE DROP (v)
0	0.466
10	0.564
20	0.663
30	0.761
40	0.860
50	0.958
60	1.056
70	1.155
80	1.253
90	1.352
100	1.450
110	1.549
120	1.647
130	1.745
140	1.844
150	1.942
160	2.041
170	2.139
180	2.238
190	2.336
200	2.434
210	2.533
220	2.631
230	2.730
240	2.828
250	2.927
260	3.025
270	3.124
280	3.222
290	3.320
300	3.419
310	3.517
320	3.616
330	3.714
340	3.813
350	3.911
360	4.009
370	4.108
380	4.206
390	4.305
400	4.403
410	4.502
420	4.600

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. Please 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 78.

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.

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).

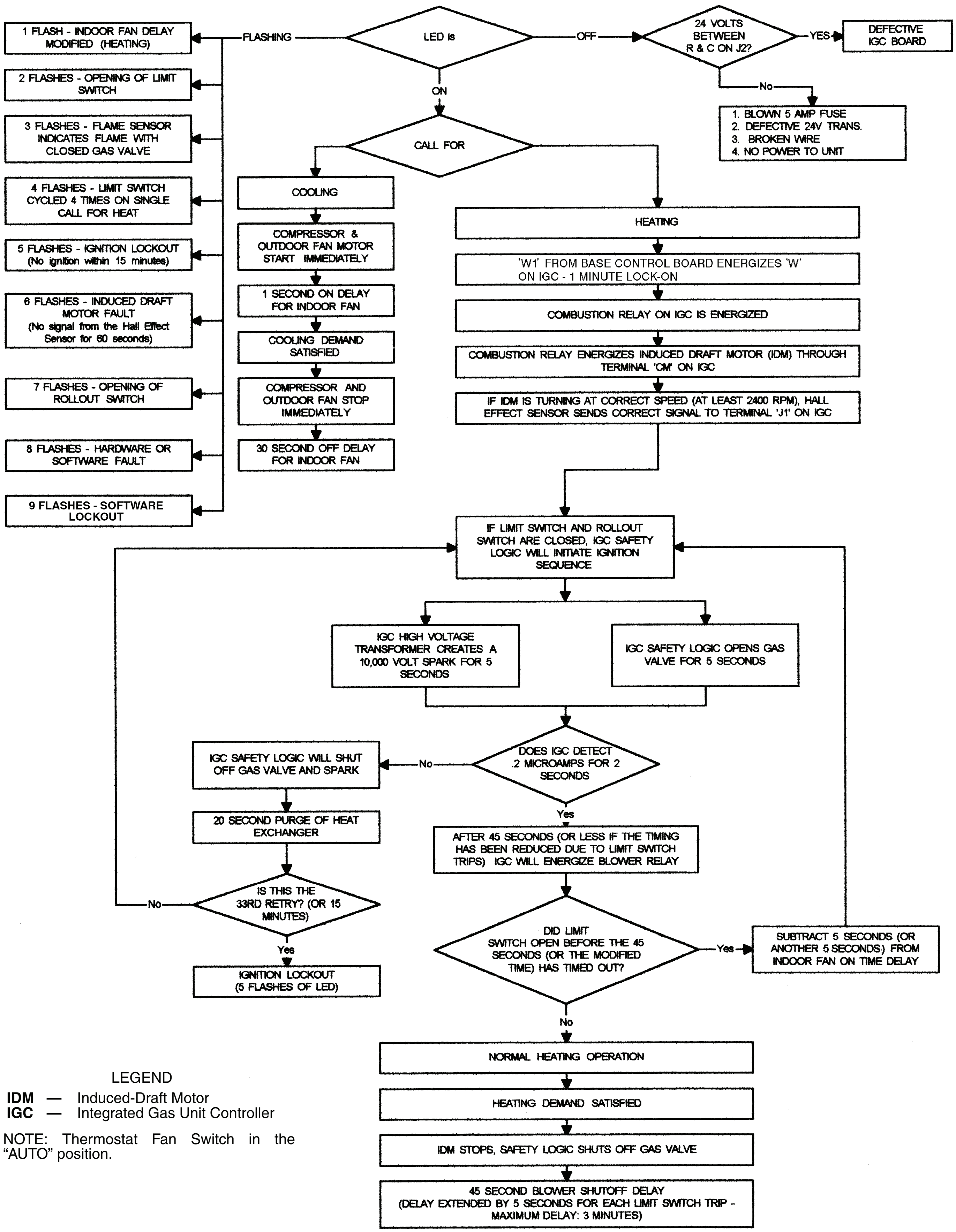
Run Status→VIEW→C.CAP — Displays the current amount of unit cooling capacity (in percent of maximum). Compare to staging tables in Appendix C.

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 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.



LEGEND

IDM — Induced-Draft Motor
IGC — Integrated Gas Unit Controller

NOTE: Thermostat Fan Switch in the "AUTO" position.

Fig. 13 — IGC Service Analysis Logic

Table 78 — Auto View of Run Status Display Table

ITEM	EXPANSION	RANGE	UNITS	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	

ECONOMIZER RUN STATUS — The Economizer Run Status display table provides information about the economizer and can be used to troubleshoot economizer problems. See Table 79. 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 of the unit. See Table 80.

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

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.

MODE TRIP HELPER — The Mode Trip Helper table provides information on the unit modes and when the modes start and stop. See Table 81. This information can be used to help determine why the unit is in the current mode.

Table 79 — Economizer Run Status Display Table

ITEM	EXPANSION	RANGE	UNITS	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				
→***DISA***→***UNV.1***	Econ Act. Unavailable?	YES/NO		ECONUNAV	
→***DISA***→***UNV.2***	Econ2 Act. Unavailable?	YES/NO		ECN2UNAV	
→***DISA***→***ENTH***	Enth. Switch Read High ?	YES/NO		ENTH	
→***DISA***→***DBC***	DBC - OAT Lockout?	YES/NO		DBC_STAT	
→***DISA***→***DEW***	DEW - OA Dewpt.Lockout?	YES/NO		DEW_STAT	
→***DISA***→***DDBC***	DDBD- OAT > RAT Lockout?	YES/NO		DDBCSTAT	
→***DISA***→***OAEC***	OAEC- OA Enth Lockout?	YES/NO		OAECSTAT	
→***DISA***→***DEC***	DEC - Diff.Enth.Lockout?	YES/NO		DEC_STAT	
→***DISA***→***EDT***	EDT Sensor Bad?	YES/NO		EDT_STAT	
→***DISA***→***OAT***	OAT Sensor Bad ?	YES/NO		OAT_STAT	
→***DISA***→***FORC***	Economizer Forced ?	YES/NO		ECONFORC	
→***DISA***→***SFON***	Supply Fan Not On 30s ?	YES/NO		SFONSTAT	
→***DISA***→***CLOF***	Cool Mode Not In Effect?	YES/NO		COOL_OFF	
→***DISA***→***OAQL***	OAQ Lockout in Effect ?	YES/NO		OAQLOCKD	
→***DISA***→***HELD***	Econ Recovery Hold Off?	YES/NO		ECONHELD	
→***DISA***→***DH.DS***	Dehumid. Disabled Econ.?	YES/NO		DHDISABL	
→***O.AIR***	OUTSIDE AIR INFORMATION				
→***O.AIR***→***OAT***	Outside Air Temperature		dF	OAT	forcible
→***O.AIR***→***OA.RH***	Outside Air Rel. Humidity		%	OARH	forcible
→***O.AIR***→***OA.E***	Outside Air Enthalpy			OAE	
→***O.AIR***→***OA.D.T***	OutsideAir Dewpoint Temp		dF	OADEWTMP	

Table 80 — Cooling Information Display Table

ITEM	EXPANSION	RANGE	UNITS	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				
→***SUMZ***→***SMZ***	Capacity Load Factor	-100 → +100		SMZ	
→***SUMZ***→***ADD.R***	Next Stage EDT Decrease		^F	ADDRISE	
→***SUMZ***→***SUB.R***	Next Stage EDT Increase		^F	SUBRISE	
→***SUMZ***→***R.PCT***	Rise Per Percent Capacity			RISE_PCT	
→***SUMZ***→***Y.MIN***	Cap Deadband Subtracting			Y_MINUS	
→***SUMZ***→***Y.PLU***	Cap Deadband Adding			Y_PLUS	
→***SUMZ***→***Z.MIN***	Cap Threshold Subtracting			Z_MINUS	
→***SUMZ***→***Z.PLU***	Cap Threshold Adding			Z_PLUS	
→***SUMZ***→***H.TMP***	High Temp Cap Override			HI_TEMP	
→***SUMZ***→***L.TMP***	Low Temp Cap Override			LOW_TEMP	
→***SUMZ***→***PULL***	Pull Down Cap Override			PULLDOWN	
→***SUMZ***→***SLOW***	Slow Change Cap Override			SLO_CHNG	

Table 81 — Mode Trip Helper Display Table

ITEM	EXPANSION	RANGE	UNITS	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	

CCN/LINKAGE DISPLAY TABLE — The CCN/Linkage display table provides information on unit linkage. See Table 82.

COMPRESSOR RUN HOURS DISPLAY TABLE — The Compressor Run Hours Display Table displays the number of run time hours for each compressor. See Table 83.

COMPRESSOR STARTS DISPLAY TABLE — The Compressor Starts Display Table displays the number of starts for each compressor. See Table 84.

SOFTWARE VERSION NUMBERS DISPLAY TABLE — The Software Version Numbers Display Table displays the software version numbers of the unit boards and devices. See Table 85.

Table 82 — CCN/Linkage Display Table

ITEM	EXPANSION	RANGE	UNITS	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 83 — Compressor Run Hours Display Table

ITEM	EXPANSION	RANGE	UNITS	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.B1***	Compressor B1 Run Hours	0-999999	HRS	HOURS_B1	config
→***HR.B2***	Compressor B2 Run Hours	0-999999	HRS	HOURS_B2	config

Table 84 — Compressor Starts Display Table

ITEM	EXPANSION	RANGE	UNITS	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.B1***	Compressor B1 Starts	0-999999		CY_B1	config
→***ST.B2***	Compressor B2 Starts	0-999999		CY_B2	config

Table 85 — Software Version Numbers Display Table

ITEM	EXPANSION	RANGE	UNITS	POINT	WRITE STATUS
VERS	SOFTWARE VERSION NUMBERS				
→***MBB***	CESR131292-xx-xx			string	
→***RCB***	CESR131249-xx-xx			string	
→***ECB***	CESR131249-xx-xx			string	
→***SCB***	CESR131226-xx-xx			string	
→***CEM***	CESR131174-xx-xx			string	
→***ECON***	xx-xx-xxx-xxx-xx			string	
→***IGV***	xx-xx-xxx-xxx-xx			string	
→***HUMD***	xx-xx-xxx-xxx-xx			string	
→***HEAT***	xx-xx-xxx-xxx-xx			string	
→***BP1***	xx-xx-xxx-xxx-xx			string	
→***BP2***	xx-xx-xxx-xxx-xx			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.

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 or TXXX where XXX is the alarm/alert number. All alerts start with “T” and all alarms start with “A”. 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.

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 shutdown 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 86.

Table 86 — Alert and Alarm Codes

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
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
T055	Circuit B, Compressor 1 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A055	Circuit B, Compressor 1 Stuck On Failure	Compressor locked off	Manual
T056	Circuit B, Compressor 2 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A056	Circuit B, Compressor 2 Stuck On Failure	Compressor locked off	Manual
T057	Circuit A, High Pressure Switch Failure	Compressor locked off	Automatic then manual
T058	Circuit B, High Pressure Switch Failure	Compressor locked off	Automatic then manual
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
T094	Circ A Discharge Press exceeded 440 psig	Circuit shut down	Manual
T095	Circ B Discharge Press exceeded 440 psig	Circuit shut down	Manual
T130	Low Suction Pressure Circuit A	Circuit staged down	Automatic then manual after 3 strikes
T131	Low Suction Pressure Circuit B	Circuit staged down	Automatic then manual after 3 strikes
T132	High Suction Pressure Circuit A	Circuit shut down	Automatic then manual after 3 strikes
T133	High Suction Pressure Circuit B	Circuit shut down	Automatic then manual after 3 strikes
T134	High Discharge Pressure Circuit A	Circuit staged down	Automatic then manual after 3 strikes
T135	High Discharge Pressure Circuit B	Circuit staged down	Automatic then manual after 3 strikes
T136	Compressor A1 low differential pressure	Circuit shut down	Manual
T137	Compressor A2 low differential pressure	Circuit shut down	Manual
T138	Compressor B1 low differential pressure	Circuit shut down	Manual
T139	Compressor B2 low differential pressure	Circuit shut down	Manual
T140	Circ A Max Diff Operating Press Exceeded	Circuit shut down	Manual
T141	Circ B Max Diff Operating Press Exceeded	Circuit shut down	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
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	RCB board Communication Failure	Unit shut down	Automatic
A174	ECB board Communication Failure	Unit shut down	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

Table 86 — Alert and Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
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
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
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
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
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 Comm Fail, Daughter Brd-MFT	No economizer functions	Automatic
A620	IGV Actuator Out of Calibration	Alarm only	Automatic
A621	IGV Actuator Communication Failure	No IGV functions	Automatic
T622	IGV Actuator Control Range Increased	Alert only	Automatic
A623	IGV Actuator Overload, Setpnt Not Reached	Alarm only	Automatic
A624	IGV Actuator Comm Fail, Daughter Board-MFT	No IGV functions	Automatic
T630	Humidifier Actuator Out of Calibration	Alert only	Automatic
T631	Humidifier Actuator Communication Failure	No humidifer functions	Automatic
T632	Humidifier Actuator Control Range Increased	Alert only	Automatic
T633	Humidifier Act Overload, Setpt Not Reached	Alert only	Automatic
T634	Humidifier Act Comm Fail, Daughter Brd-MFT	No humidifer functions	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 Act Com Fail, Daughter Board-MFT	No heating coil functions	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	BP Actuator 1 Com Fail, Daughter Board-MFT	No building pressure control	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, Setpnt Pos Not Reached	Alarm only	Automatic
A664	BP Actuator 2 Com Fail, Daughter Board-MFT	No building pressure control	Automatic
T670	Economizer 2 Actuator Out of Calibration	Alert only	Automatic
T671	Economizer 2 Actuator Comm Failure	No economizer functions	Automatic
T672	Economizer 2 Actuator Control Range Increased	Alert only	Automatic
T673	Econ2 Overload, Setpt Not Reached	Alert only	Automatic
T674	Econ2 Actuator Comm Fail, Daughter Brd-MFT	No economizer functions	Automatic
A700	Air Temp Lvg Supply Fan Thermistor Failure	Unit shut down	Automatic
T701	Staged Gas 1 Thermistor Failure	Average remaning sensors	Automatic
T702	Staged Gas 2 Thermistor Failure	Average remaning sensors	Automatic
T703	Staged Gas 3 Thermistor Failure	Average remaning sensors	Automatic
A704	Staged Gas Lvg Air Temp Sum Total Failure	No staged gas function	Automatic
T705	Limit Switch Thermistor Failure	No software limit switch function	Automatic
A706	Hydronic Evap Discharge Thermistor Failure	Unit shut down	Automatic

DIAGNOSTIC ALARM CODES AND POSSIBLE CAUSES

T051 (Circuit A, Compressor 1 Failure)
T052 (Circuit A, Compressor 2 Failure)
T055 (Circuit B, Compressor 1 Failure)
T056 (Circuit B, Compressor 2 Failure)

NOTE: These alerts only occur on units with a current sensor board (CSB) (48/50Z105 only).

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 called out on the affected compressor. If three successive strikes occur the compressor will be locked out requiring a manual reset or power reset of the circuit board. 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 (HPS) open. The high-pressure switch is wired in series with the compressor relays off of the MBB. If the high-pressure switch opens while the MBB is commanding the compressor on, the compressor stops and the CSB no longer detects current, causing the control to activate the alert.
- Circuit breaker trip.
- Wiring error.

To check out alerts T051, T052, T055, T056:

1. Turn on the compressor in question using Service Test mode. If the compressor does not start, then most likely the problem is one of the following: HPS open, circuit breaker trip, incorrect safety 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. If the compressor is off and there is no current, verify 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 after compressor starts.

A051 (Circuit A, Compressor 1 Stuck On Failure)
A052 (Circuit A, Compressor 2 Stuck On Failure)
A055 (Circuit B, Compressor 1 Stuck On Failure)
A056 (Circuit B, Compressor 2 Stuck On Failure)

NOTE: These alarms only occur on units with a current sensor board (CSB) (48/50Z105 only).

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

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

1. As A1 and B1 both have 1 unloader, the control will energize the particular unloader for these compressors if the failure occurs.
2. If any of the 4 compressors are diagnosed as stuck on and the current sensor board is on and the request is off, the control will request the supply fan which will automatically start building air flow control.
3. Heating will be disabled while any one of the compressors has this problem.

The reset method will be manual for these alarms.

The possible causes are:

- Welded contact on compressor relay or contactor.
- Frozen compressor relay on MBB.

To check out alerts A051, A052, A055, A056:

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

T057 (Circuit A, High Pressure Switch Failure)
T058 (Circuit B, High Pressure Switch Failure) — These alerts occur on all units except the 48/50Z105 units (current sensor board units).

If the high-pressure switch trips on a circuit with compressors commanded on, the discharge pressure is sampled. If the discharge pressure is between 368 and 418 psig, then the discharge pressure trip point (***Configuration→Cool→HPS.A, HPS.B***) is adjusted to the previously sampled trip point minus 3 psig. This is done to make a rough calibration of the high pressure trip point which is used by the high discharge pressure diagnostics.

When the trip happens, all mechanical cooling on the circuit is shut down for 15 minutes. After 15 minutes, the circuit will be allowed to come back on. An internal flag is set which needs to sense the lead compressor on a circuit go from on to off, indicating the circuit came back on after the 15-minute delay and successfully completed a cooling cycle. If the high-pressure switch trips again, the high pressure alarm occurs which will then require a manual reset of the unit.

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.

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.

T094 (Circ A Discharge Press exceeded 440 psig)
T095 (Circ B Discharge Press exceeded 440 psig) — Should the discharge pressure read by a discharge pressure transducer exceed 440 psig for any reason, the circuit will be stopped which requires a manual reset for recovery. The unit high-pressure switch should trip before the discharge pressure reaches this value. Check for failed a high-pressure switch or a discharge pressure transducer out of calibration.

T130 (Low Suction Pressure Circuit A)
T131 (Low Suction Pressure Circuit B) — If a circuit is equipped with unloaders and the suction pressure drops below 48 psig for 15 seconds, then that circuit is staged down until either the pressure remains above 48 psig or the compressor is staged off naturally, due to lessening demand. Each subsequent circuit stage will then be turned off every 15 seconds.

There will be a start-up delay if the outside-air temperature is too low. When the outdoor ambient is below 60 F, during initial start-up, suction pressure is ignored for a period of 5 minutes.

The alarm and recovery of the low pressure condition will follow the basic three strike methodology.

If a low suction pressure condition is detected while the circuit is ON and action has been taken to lower capacity, a "strike" is called out (only if the circuit is staged off in this condition). If less than three strikes have occurred, the alarm will show up in alarm history and locally at the display, but will not be broadcast (just as in the high discharge pressure condition).

To recover (if the alarm is not manual), both a 10-minute timer must expire and the suction pressure must recover above 54 psig. 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 alerts may be stored but not broadcast in this condition. If all compressors in the circuit go down twice due to low suction pressure, the next low suction pressure condition is a manual alarm and the circuit is locked out and the alarm broadcast to the network.

If the circuit operates with capacity for 15 continuous minutes and the low discharge pressure alarm condition is not manual, all strikes will be cleared.

T132 (High Suction Pressure Circuit A)
T133 (High Suction Pressure Circuit B) — During operation, the suction pressure cannot exceed 100 psig (60 F saturated). If after 5 minutes of operation, suction pressure exceeds this value, then all compressors in that circuit are stopped and the alarm is tripped. Reset method is automatic after time guards have expired. The three strike rule applies which means the third time is a manual reset and CCN broadcast for the alert/alarm.

T134 (High Discharge Pressure Circuit A)
T135 (High Discharge Pressure Circuit B) — There is a configuration for each circuit which monitors high discharge pressure (***Configuration→Cool→HPS.A, HPS.B***). This configuration is adjusted to compensate for calibration whenever a high pressure switch fault occurs. If discharge pressure rises above this trip point, the individual circuit starts staging down 1 stage every 5 seconds. To recover, both a 10-minute timer must expire and the discharge pressure must fall 25 psig below the trip point. If the circuit recovers, the circuit will stage back up (if the alarm is not manual), allowing one stage every 5 seconds. The timer starts 10 minutes since the last circuit stage was decreased. The alarming and recovery of the high discharge pressure condition will follow the basic three strike methodology. A strike is tied to the circuit going off entirely, not reducing capacity and recovering. Therefore it is possible, multiple alerts may be stored but not broadcast in this condition.

If the circuit operates with capacity for 15 continuous minutes and the high discharge pressure alarm condition is not manual, all strikes will be cleared.

T136 (Compressor A1 Low Differential Pressure)
T137 (Compressor A2 Low Differential Pressure)
T138 (Compressor B1 Low Differential Pressure)
T139 (Compressor B2 Low Differential Pressure) — If the pressure differential between the discharge and suction pressure transducers is less than 50 psig for more than 15 minutes when the circuit is running, an alert will be issued and the circuit shut down. Any compressor that is currently on at the time of the alert will have its own individual alarm sent. Reset is manual.

T140 (Circ A Max Diff Operating Press Exceeded)
T141 (Circ B Max Diff Operating Press Exceeded) — Depending on the compressor loading, after 5 minutes of operation if the discharge versus suction pressure ratios exceed the curves in Fig. 14, then all compressors in that circuit are stopped and the alert tripped. Reset is manual.

A150 (Unit is in Emergency Stop) — 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".

A152 (Unit Down Due to Failure) — 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 can not 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 can not 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.

A171 (Staged Gas Control Board Comm Failure) — Staged Gas 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 (RCB Board Communication Failure) — As the RCB board is integral to all Z 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 RCB board, or damage to the RS-485 drivers on the LEN bus.

A174 (ECB Board Communication Failure) — The ECB 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 ECB board, 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 RCB 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 RCB 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 4-20 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 ECB 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 ECB 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.

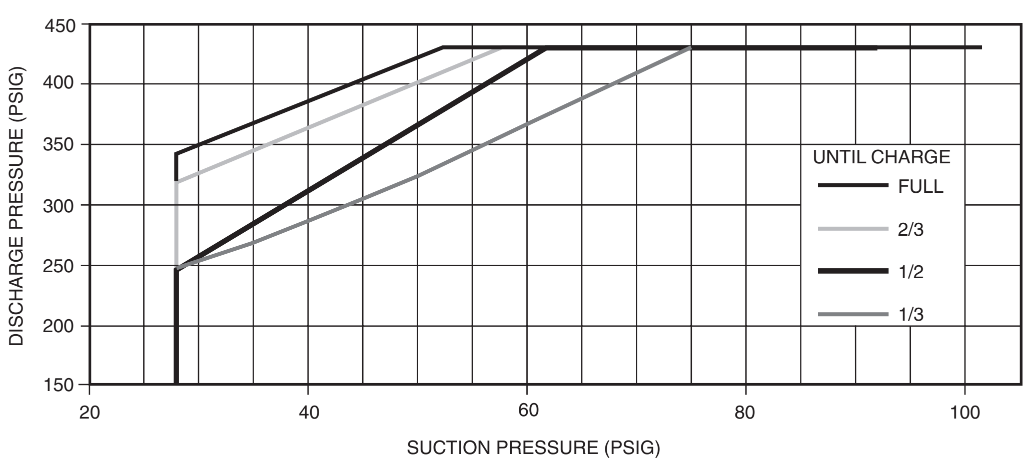


Fig. 14 — Differential Pressure Chart

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.

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 (IGV/no gas heat)	2 minutes	4 minutes
VAV (VFD/no gas heat)	1 minute	1 minute
VAV (IGV/gas heat)	4 minutes	4 minutes
VAV (VFD/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.

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.

T500 (Current Sensor Board Failure - A1)
T501 (Current Sensor Board Failure - A2)
T502 (Current Sensor Board Failure - B1)
T503 (Current Sensor Board Failure - B2)

NOTE: These alerts are only applicable to size 105 units.

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 (IGV 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)
T670 (Economizer 2 Actuator Out of Calibration — Each of the Belimo LEN communicating 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 (IGV Actuator Communication 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)
T671 (Economizer 2 Actuator 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 (IGV 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)
T672 (Economizer 2 Actuator 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 (IGV Actuator Overload, Setpnt 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)
T673 (Econ2 Actuator Overload, Setpt 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 (Econ Actuator Comm Fail, Daughter Brd-MFT)
A624 (IGV Actuator Comm Fail, Daughter Board-MFT)
T634 (Humidifier Act Comm Fail, Daughter Brd-MFT)
A644 (Heat Coil Act Com Fail, Daughter Board-MFT)
A654 (BP Actuator 1 Com Fail, Daughter Board-MFT)
A664 (BP Actuator 2 Com Fail, Daughter Board-MFT)
T674 (Econ2 Actuator Comm Fail, Daughter Brd-MFT) — Each of the actuators has an internal daughter card, which translates communications from the LEN bus to Belimo's MFT (Multi-Function Technology®) communication bus and back. If communication breaks down between the actuator and its internal daughter card, this alarm/alert will result. This makes the actuator unusable and any functions associated with the particular actuator are shut down. Recovery is automatic, but this error will probably require actuator replacement as this problem is internal to the Belimo actuator itself.

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.GL1-3***) fails, an alert will be generated and the remaining thermistors will be averaged together (***Temperatures→AIR.T→S.GLS***) 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 Gas Lvg Air Temp Sum Total Failure) — If all three staged gas thermistors (***Temperatures→AIR.T→ S.GL1,2,3***) fail, staged gas 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.GLM***) 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).

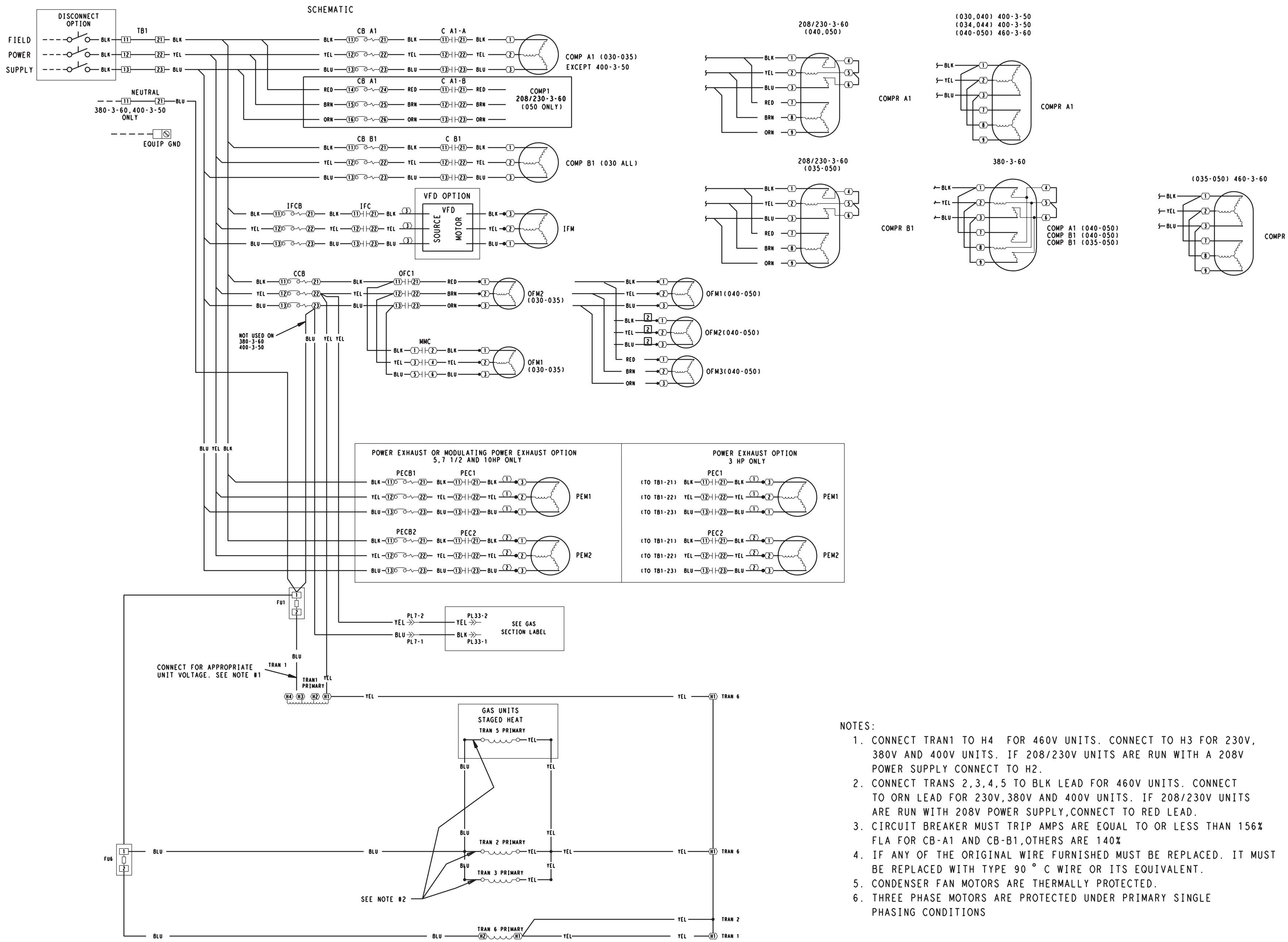
A706 (Hydronic Evap Discharge Thermistor Failure) — If the unit is configured for hot water heating (hydronic), then the unit has a thermistor (***Temperatures→AIR.T→CCT***) installed between the evaporator coil and the hot water coils that functions as the evaporator discharge temperature thermistor 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 ECB control board.

MAJOR SYSTEM COMPONENTS

General — The 48/50Z Series package rooftop units with electric cooling and with gas heating (48Z units) or electric cooling and electric or hydronic heating (50Z 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. 15-22 for typical control and power component schematics. Figures 23-25 show the layout of the control box.

Factory-Installed Components

MAIN BASE BOARD (MBB) — See Fig 26. 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 87 for the inputs and output assignments. The MBB also continuously monitors additional data from the ECB, RCB, 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.



NOTES:

1. CONNECT TRAN1 TO H4 FOR 460V UNITS. CONNECT TO H3 FOR 230V, 380V AND 400V UNITS. IF 208/230V UNITS ARE RUN WITH A 208V POWER SUPPLY CONNECT TO H2.
2. CONNECT TRANS 2,3,4,5 TO BLK LEAD FOR 460V UNITS. CONNECT TO ORN LEAD FOR 230V,380V AND 400V UNITS. IF 208/230V UNITS ARE RUN WITH 208V POWER SUPPLY,CONNECT TO RED LEAD.
3. CIRCUIT BREAKER MUST TRIP AMPS ARE EQUAL TO OR LESS THAN 156% FLA FOR CB-A1 AND CB-B1,OTHERS ARE 140%
4. IF ANY OF THE ORIGINAL WIRE FURNISHED MUST BE REPLACED. IT MUST BE REPLACED WITH TYPE 90 ° C WIRE OR ITS EQUIVALENT.
5. CONDENSER FAN MOTORS ARE THERMALLY PROTECTED.
6. THREE PHASE MOTORS ARE PROTECTED UNDER PRIMARY SINGLE PHASING CONDITIONS

Fig. 15 — Typical Power Schematic (Sizes 030-050 Shown)

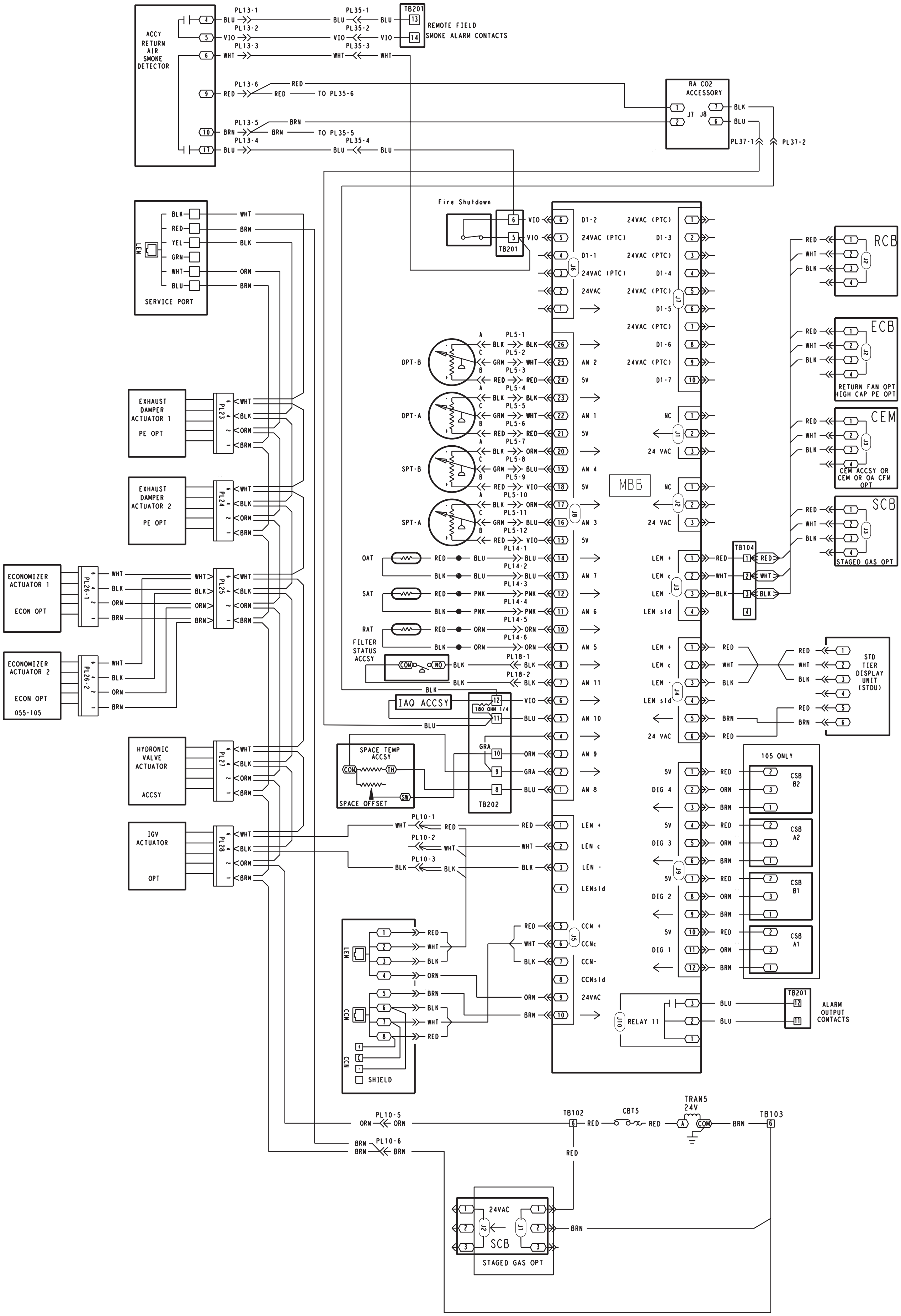


Fig. 16 — Main Base Board Input/Output Connections

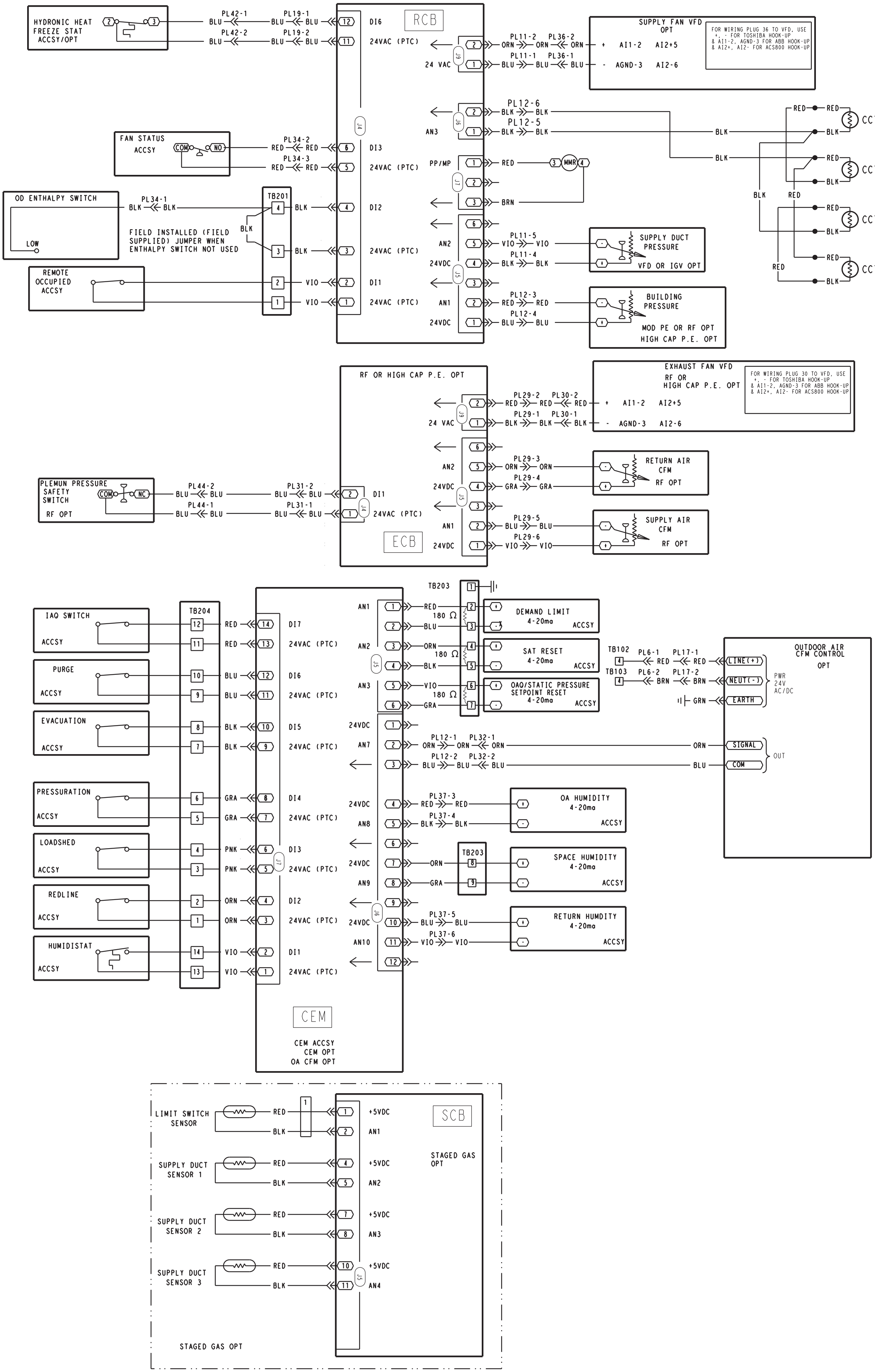


Fig. 17 — RCB, ECB, CEM, SCB Input/Output Connections

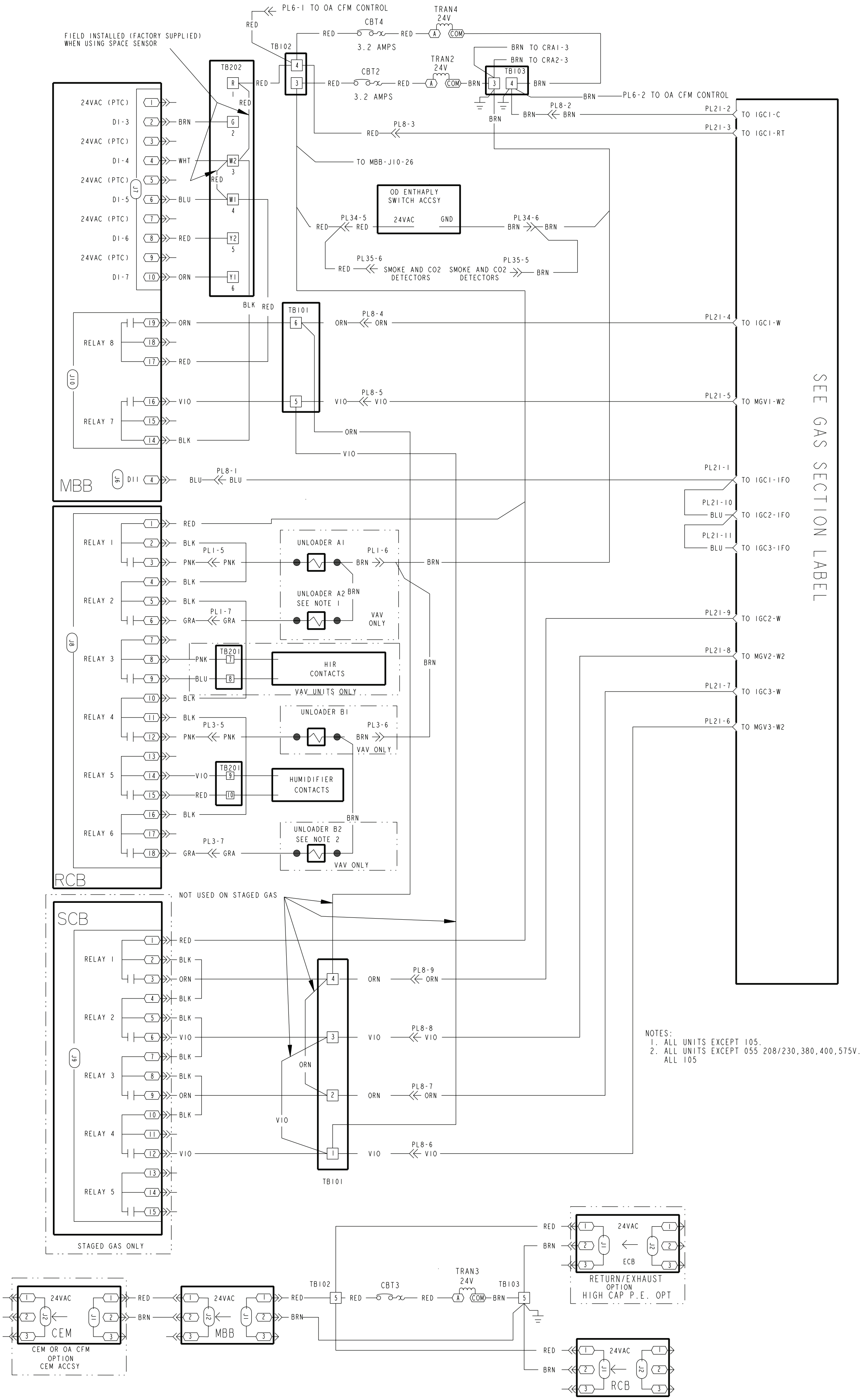
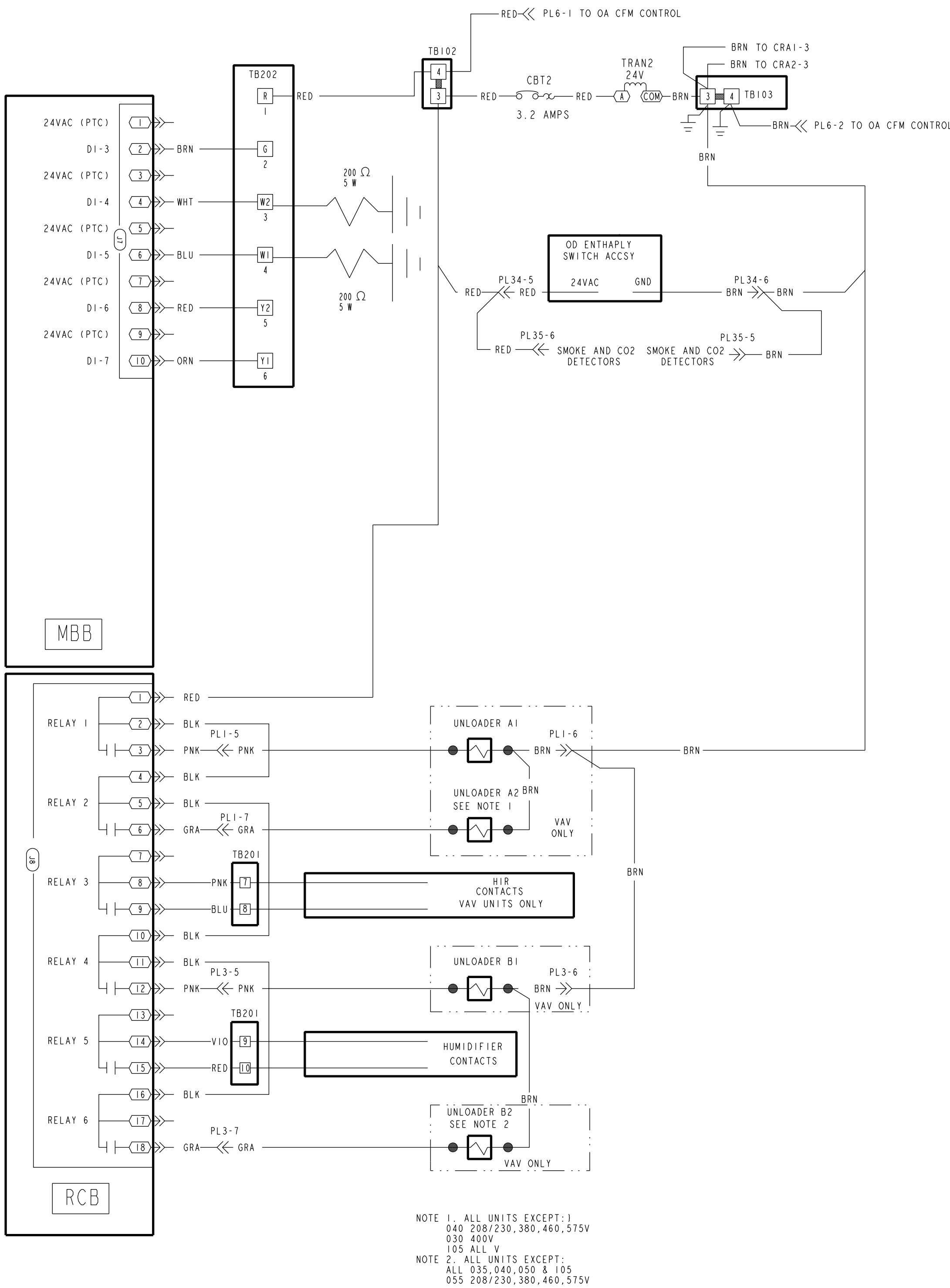


Fig. 18 — Typical Gas Heat Unit Control Wiring (48Z055-105 Units Shown)



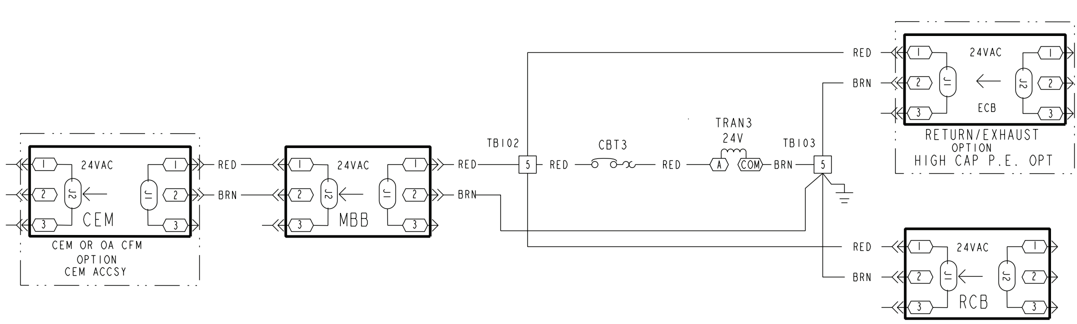


Fig. 19 — Typical Electric Heat Unit Control Wiring (50Z055-105 Units Shown)

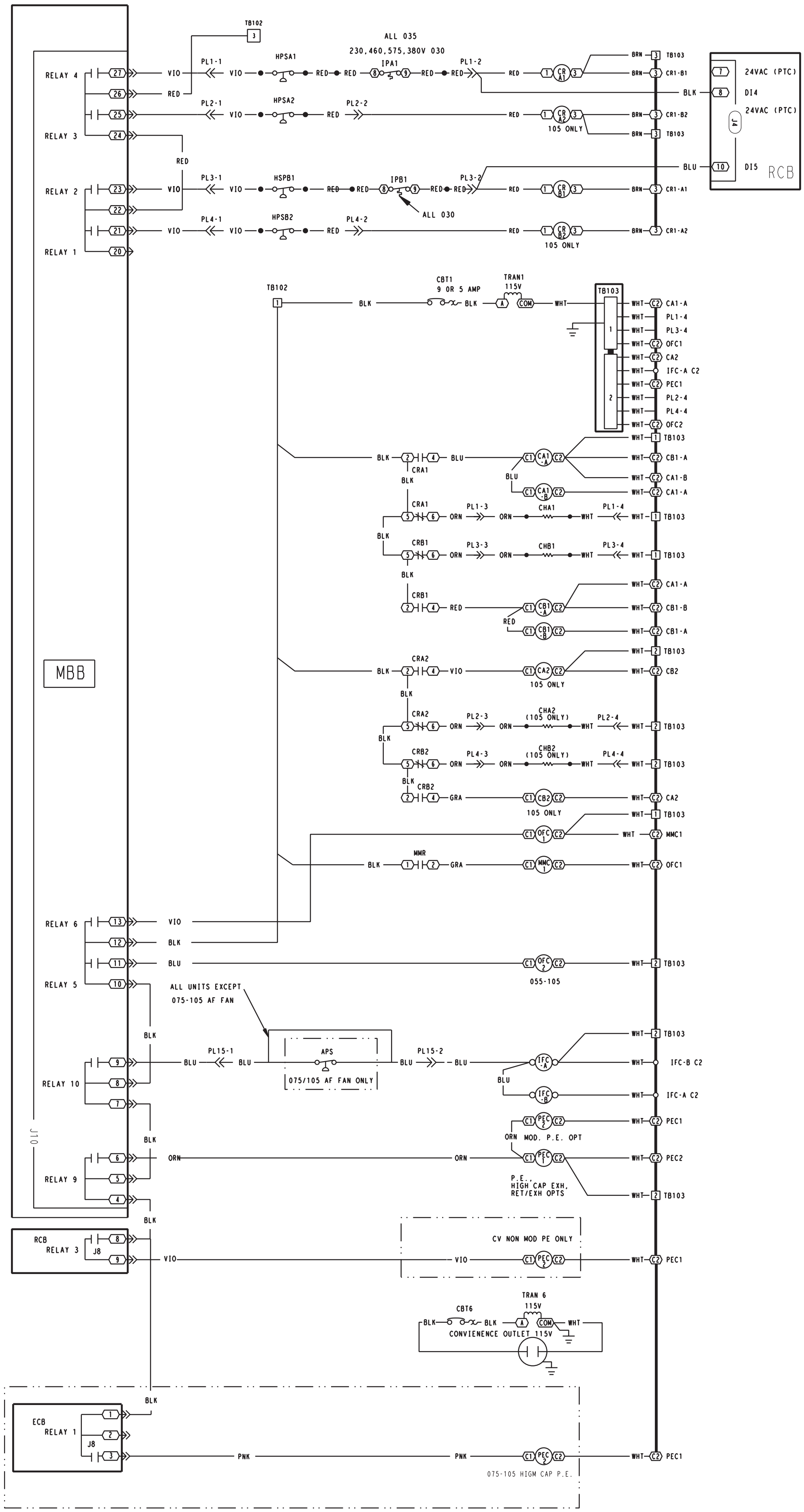


Fig. 20 — Typical Power Wiring (115-V) (48Z Units)

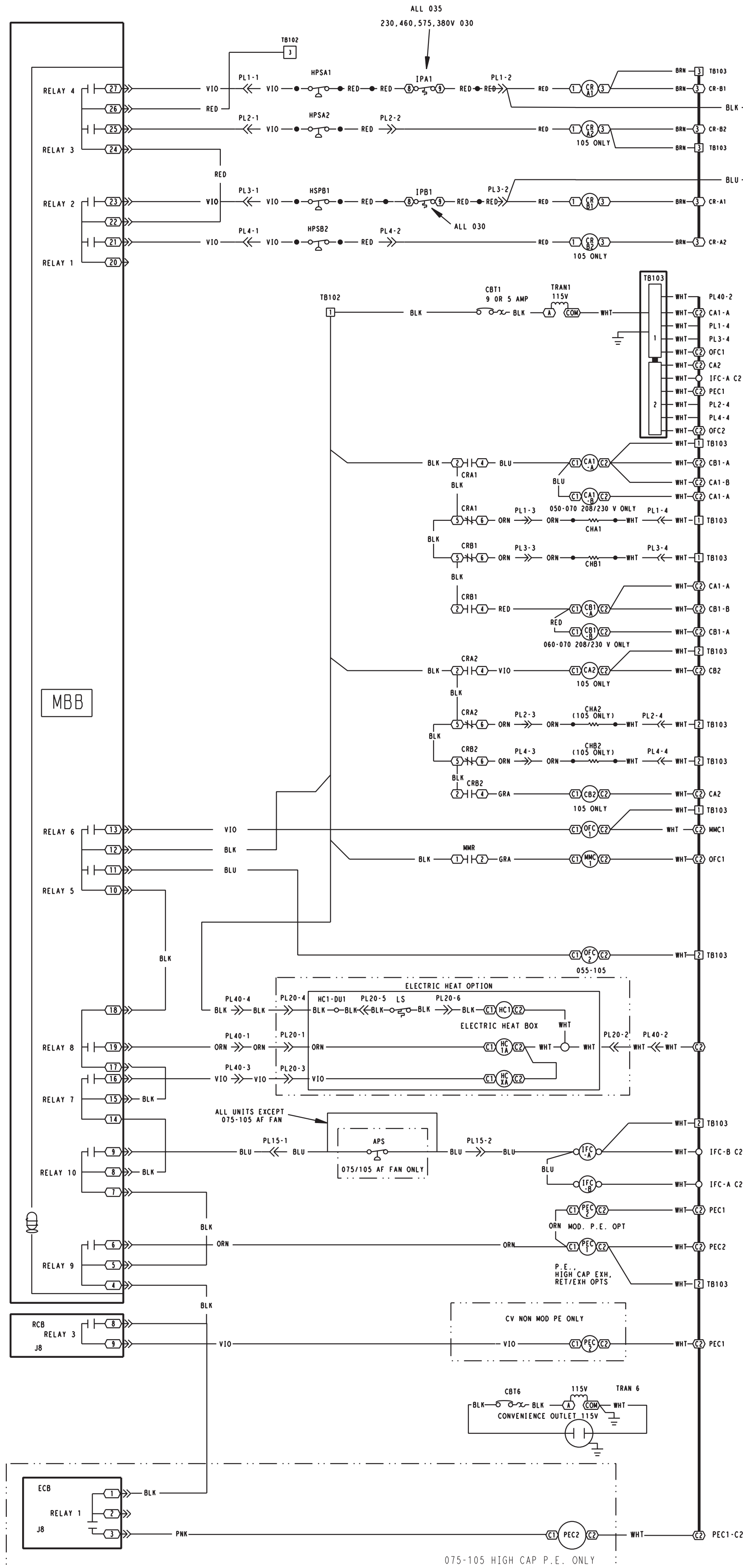


Fig. 21 — Typical Power Wiring (115-V) (50Z Units)

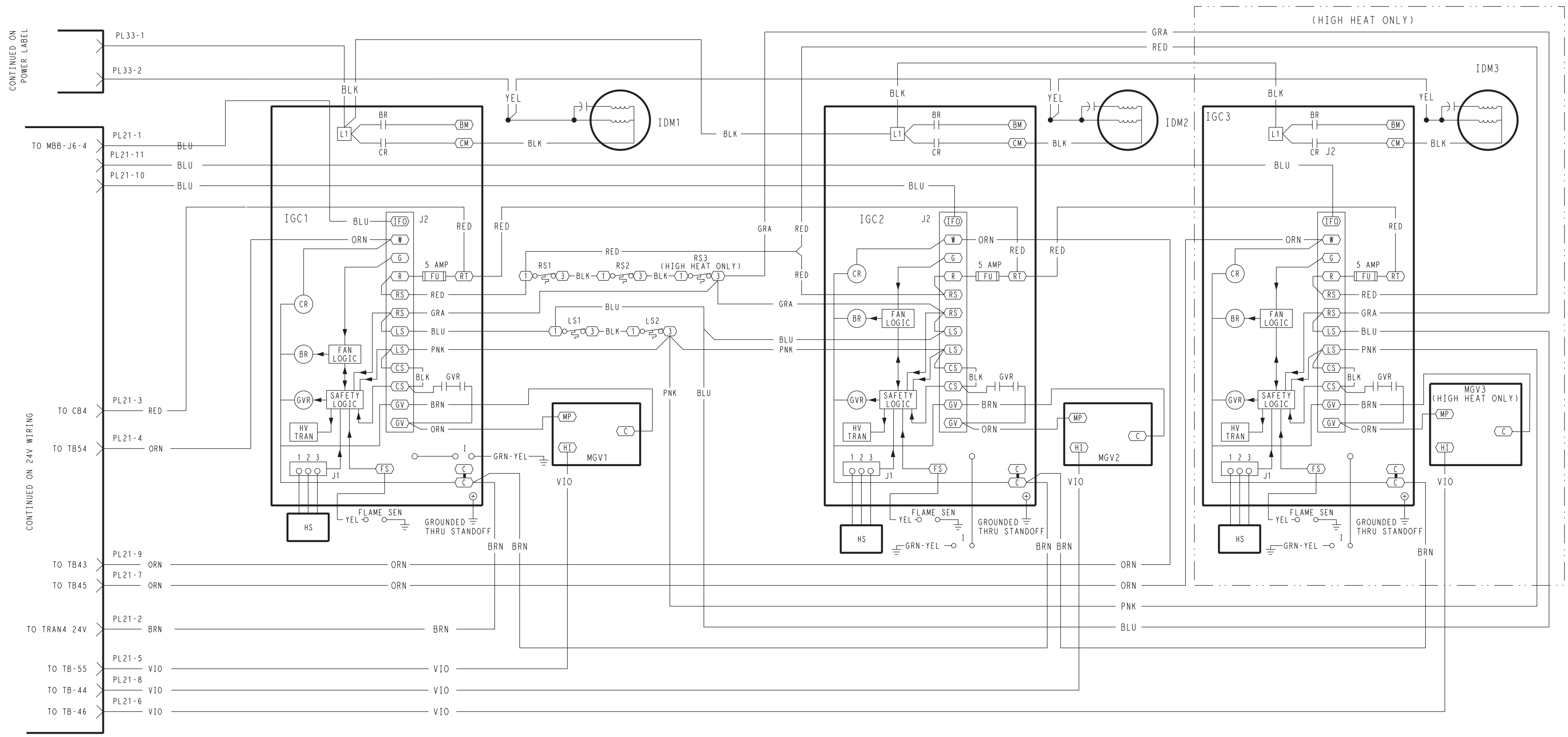


Fig. 22 — Typical Gas Heat Section (Size 055-105 Units Shown)

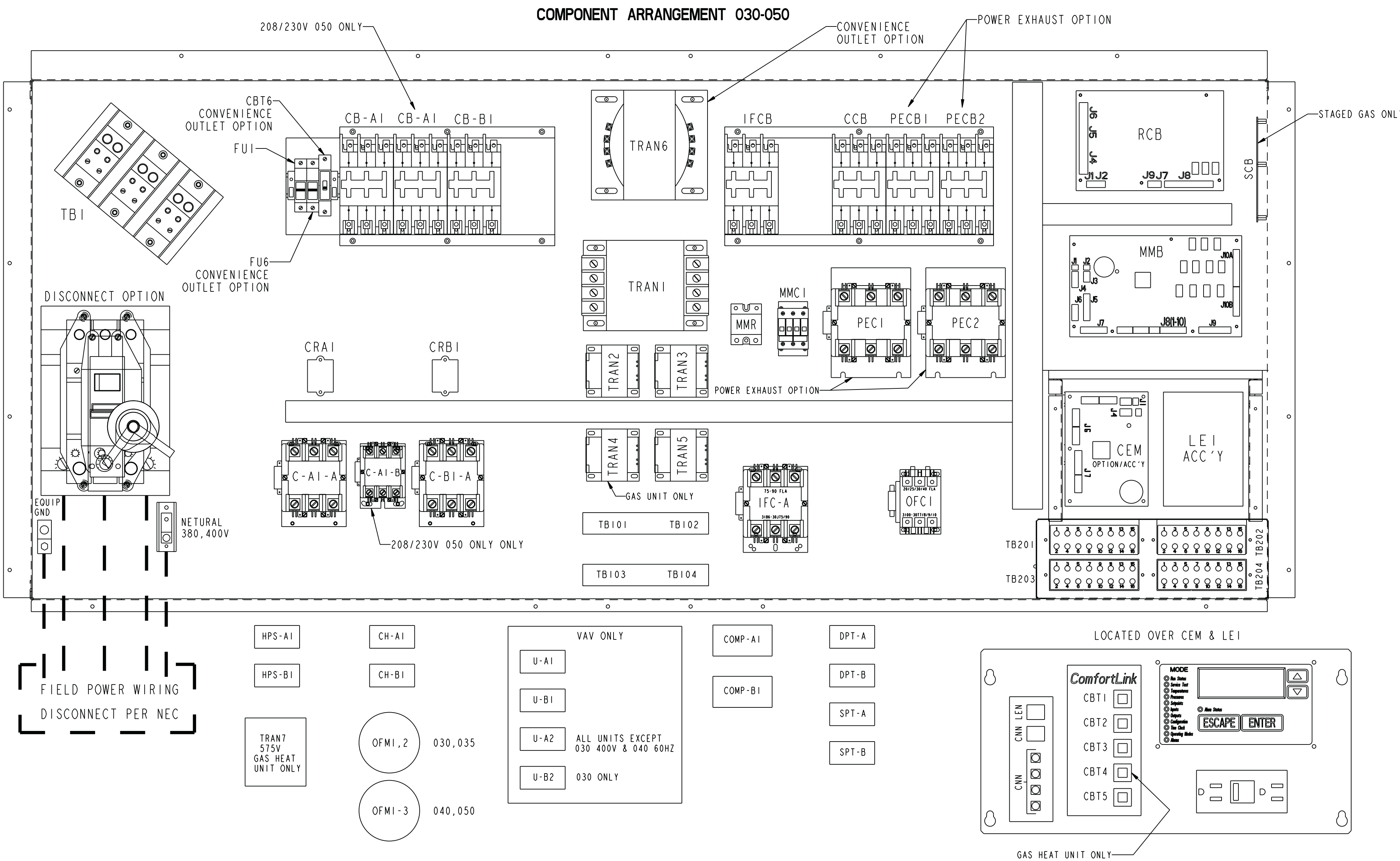


Fig. 23 — Component Arrangement (Size 030-050 Units)

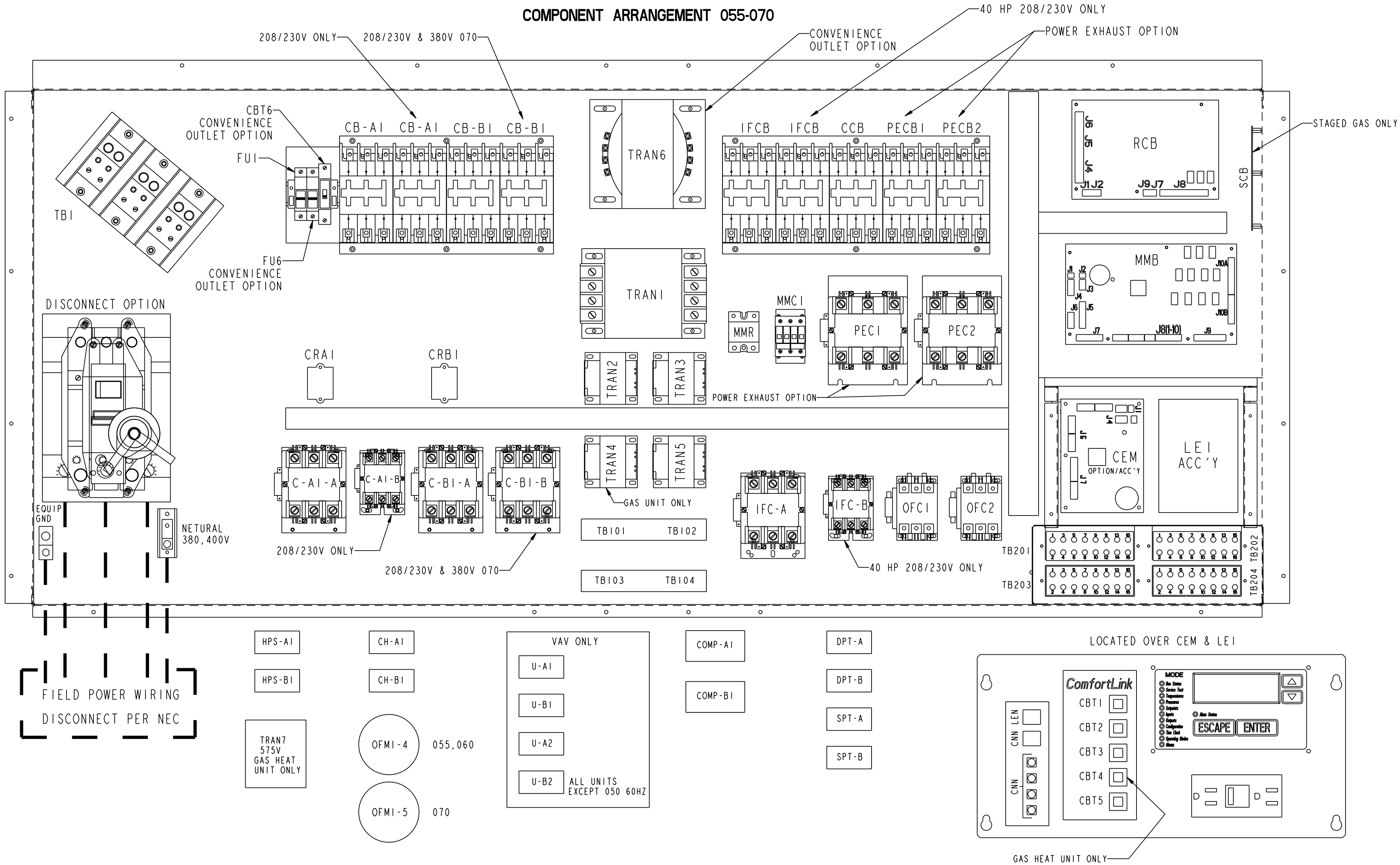


Fig. 24 — Component Arrangement (Size 055-070 Units)

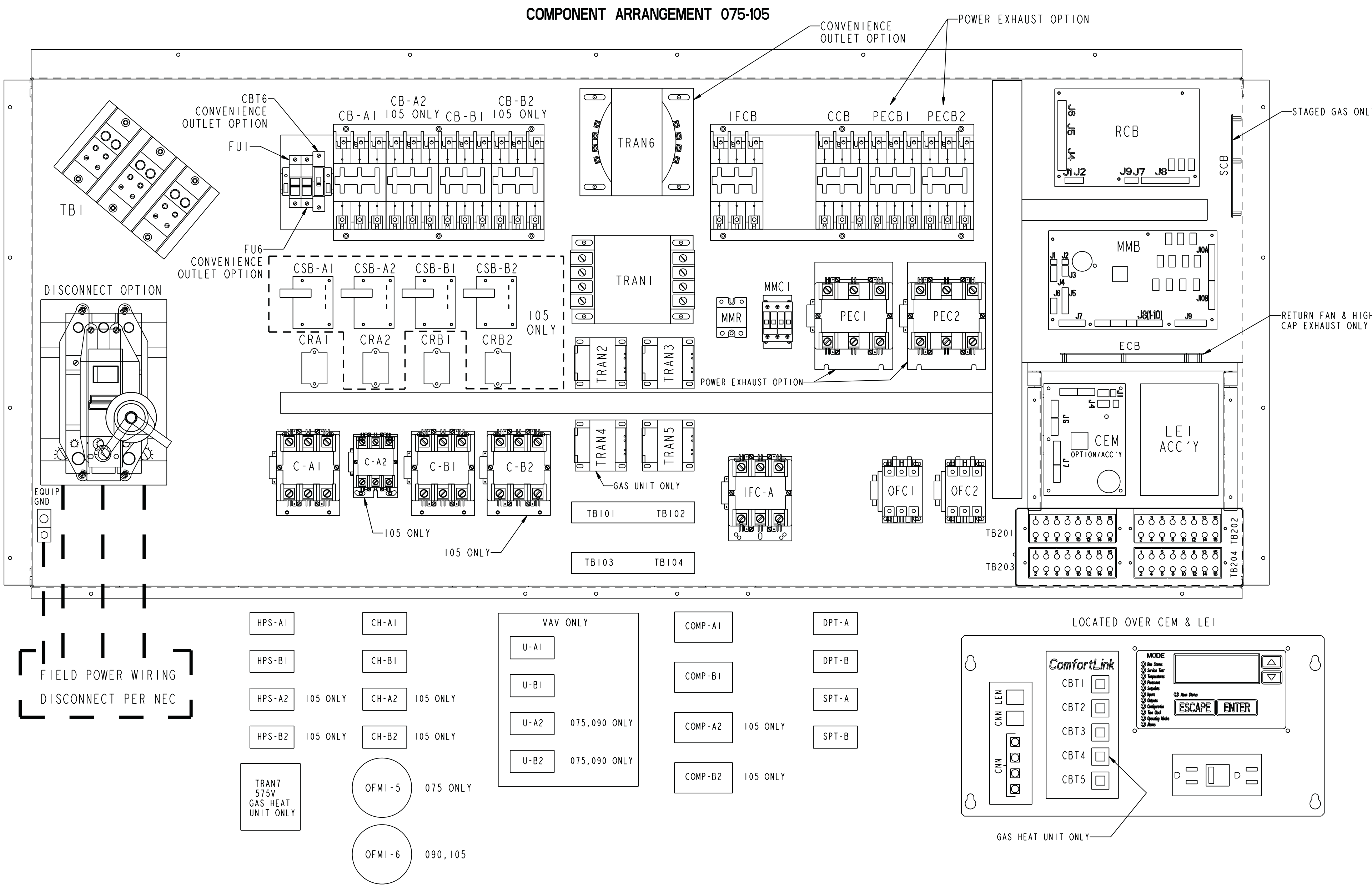


Fig. 25 — Component Arrangement (Size 075-105 Units)

LEGEND FOR FIG. 15-25

ACCSY	Accessory
ACC'Y	Accessory
AF	Airfoil
AN	Analog
APS	Air Pressure Switch
BM	Blower Motor
BR	Blower Relay
C	Compressor Contactor
CB	Compressor Circuit Breaker
CBT	Circuit Breaker, Transformer
CCB	Control Circuit Breaker
CCN	Carrier Comfort Network®
CCT	Cooling Coil Thermistor
CEM	Controls Expansion Module
CH	Crankcase Heater
CM	Combustion Motor
COMP	Compressor
CR	Control Relay
CSB	Current Sensor Board
CV	Constant Volume
DI	Digital Input
DPT	Discharge Pressure Transducer
ECB	Economizer Control Board
ECON	Economizer
EQUIP	Equipment
FU	Fuse
GND	Ground
GVR	Gas Valve Relay
HC	Heater Contactor
HIR	Heat Interlock Relay
HPS	High-Pressure Switch
HS	Hall Effect Sensor
HV	High Voltage
I	Ignitor
IAQ	Indoor Air Quality
IDM	Induced Draft Motor
IFC	Indoor Fan Contactor
IFCB	Indoor Fan Circuit Breaker
IFM	Indoor Fan Motor
IGC	Integrated Gas Controller
IGV	Inlet Guide Vane
IP	Internal Protector
LEI	Local Equipment Interface
LEN	Local Equipment Network
LS	Limit Switch
MBB	Main Base Board
MGV	Main Gas Valve
MMC	Motormaster® Contactor
MMR	Motormaster Relay
MOD PE	Modulating Power Exhaust
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
OPT	Option
PE	Power Exhaust
PEC	Power Exhaust Contactor
PECB	Power Exhaust Circuit Breaker
PEM	Power Exhaust Motor
PL	Plug Assembly
PTC	Positive Temperature Coefficient Power Reference
RA	Return Air
RAT	Return Air Thermistor
RCB	Rooftop Control Board
RF	Return Fan
RS	Rollout Switch
SAT	Supply Air Thermistor
SCB	Staged Gas Control Board
SEN	Sensor
SPT	Suction Pressure Transducer
STDU	Standard Tier Display Unit
TB	Terminal Block
TRAN	Transformer
U	Unloader
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

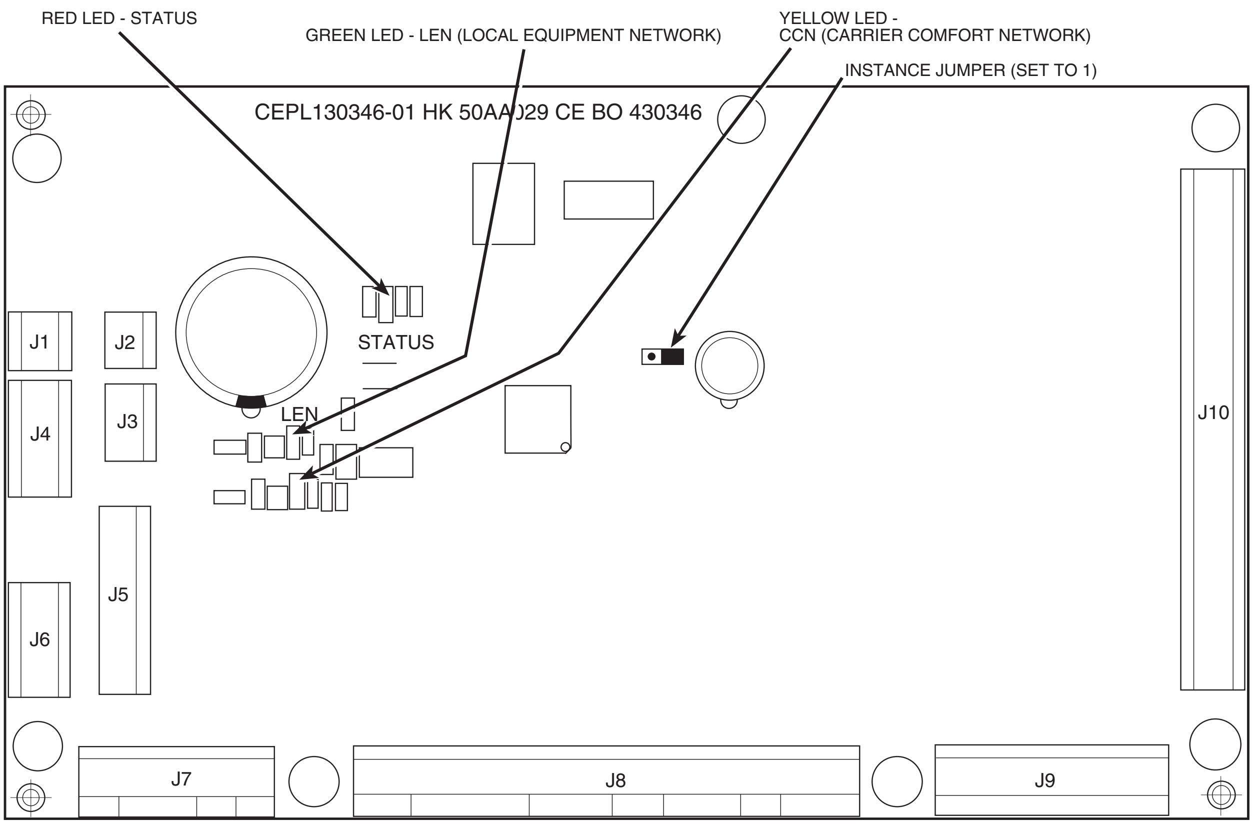


Fig. 26 — Main Base Board (MBB)

ROOFTOP CONTROL BOARD (RCB) — The RCB has additional inputs and outputs required for the control of the unit. All units have an RCB board. See Fig. 27. The board has 9 inputs and 8 outputs. Details can be found in Table 88. The RCB board is located in the main control box.

ECONOMIZER CONTROL BOARD (ECB) — The ECB is used on size 075-105 units with high-capacity power exhaust or return/exhaust fan. See Fig. 27. The ECB board sends a 4 to 20 mA signal to the VFD to control the exhaust fan speed. The board also 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 89.

STAGED GAS HEAT BOARD (SCB) — When optional staged gas heat is used, the SCB board is installed and controls additional stages of gas heat. See Fig. 28. The SCB also provides additional sensors for monitoring of the supply-air and limit switch temperatures. This board is located in the main unit control box. The inputs and outputs are summarized in Table 90.

Table 87 — Main Control Board (MBB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	I/O POINT NAME	PLUG AND PIN REFERENCE	SIGNAL PIN(S)	PORT STATE
INPUTS					
IGCIFO	IGC IFO input	DI1	J6, 3-4	4	0 = 24vac, 1= 0vac
FSD	Fire Shutdown Switch	DI2	J6, 5-6	6	0 = 24vac, 1= 0vac
G	Thermostat G input	DI3	J7, 1-2	2	0 = 24vac, 1= 0vac
W2	Thermostat W2 input	DI4	J7, 3-4	4	0 = 24vac, 1= 0vac
W1	Thermostat W1 input	DI5	J7, 5-6	6	0 = 24vac, 1= 0vac
Y2	Thermostat Y2 input	DI6	J7, 7-8	8	0 = 24vac, 1= 0vac
Y1	Thermostat Y1 input	DI7	J7, 9-10	10	0 = 24vac, 1= 0vac
CSB_A1	Compressor A1 Feedback	DIG1	J9, 10-12	10=5v, 11=Vin, 12=GND	0 = 5vdc, 1 = 0vdc
CSB_B1	Compressor B1 Feedback	DIG2	J9, 7-9	7=5v, 8=Vin, 9=GND	0 = 5vdc, 1 = 0vdc
CSB_A2	Compressor A2 Feedback	DIG3	J9, 4-6	4=5v, 5=Vin, 6 =GND	0 = 5vdc, 1 = 0vdc
CSB_B2	Compressor B2 Feedback	DIG4	J9, 1-3	1=5v, 2=Vin, 3=GND	0 = 5vdc, 1 = 0vdc
DP_A	Cir A Discharge Pressure	AN1	J8, 21-23	21=5v, 22=Vin, 23=GND (thermistor 21-22)	(0-5VDC, thermistor, ohms)
DP_B	Cir B Discharge Pressure	AN2	J8, 24-26	24=5v, 25=Vin, 26=GND (thermistor 24-25)	(0-5VDC, thermistor, ohms)
SP_A	Cir A Suction Pressure	AN3	J8, 15-17	15=5v, 16=Vin, 17=GND (thermistor 15-16)	(0-5VDC, thermistor, ohms)
SP_B	Cir B Suction Pressure	AN4	J8, 18-20	18=5v, 19=Vin, 20=GND (thermistor 18-20)	(0-5VDC, thermistor, ohms)
RAT	Return Air Temperature	AN5	J8, 9-10	9	(thermistor, ohms)
SAT	Air Temp Lvg Supply Fan	AN6	J8, 11-12	11	(thermistor, ohms)
OAT	Outside Air Temperature	AN7	J8, 13-14	13	(thermistor, ohms)
SPT	Space Temperature	AN8	J8, 1-2	1	(thermistor, ohms)
SPTO	Space Temperature Offset	AN9	J8, 3-4	3	(thermistor, ohms)
IAQ	IAQ - PPM Return CO2 (IAQANCFG = 1,2)	AN10	J8, 5-6	5	(thermistor, ohms)
IAQINMOV	4-20ma/10k pot MinPosOver(IAQANCFG = 3,4)	AN10	J8, 5-6	5	(thermistor, ohms)
FLTS	Filter Status Switch	AN11	J8, 7-8	7	(thermistor, ohms)
OUTPUTS					
CMPB2	Compressor B2	RLY 1	J10, 20-21	20 = RLY1A (=RLY2A), 21 = RLY1B	1 = Closes RLY1A / RLY1B
CMPB1	Compressor B1	RLY 2	J10, 22-23	22 = RLY2A (=RLY1A), 23 = RLY2B	1 = Closes RLY2A / RLY2B
CMPA2	Compressor A2	RLY 3	J10, 24-25	24 = RLY3A (=RLY4A), 25 = RLY3B	1 = Closes RLY3A / RLY3B
CMPA1	Compressor A1	RLY 4	J10, 26-27	26 = RLY4A (=RLY3A), 27 = RLY4B	1 = Closes RLY4A / RLY4B
CONDFANB	Condenser Fan Circuit B	RLY 5	J10, 10-11	10 = RLY5A (=RLY6A), 11 = RLY5B	1 = Closes RLY5A / RLY5B
CONDFANA	Condenser Fan Circuit A	RLY 6	J10, 12-13	12 = RLY6A (=RLY5A), 13 = RLY6B	1 = Closes RLY6A / RLY6B
HS2	Heat Relay 2	RLY7	J10, 14-16	14 = 15 = RLY7A, 16 = RLY7B	1 = Closes RLY7A / RLY7B
HS1	Heat Relay 1	RLY 8	J10, 17-19	17 = 18 = RLY8A, 19 = RLY8B	1 = Closes RLY8A / RLY8B
PE1	Power Exhaust Relay 1	RLY 9	J10, 4-6	4 = 5 = RLY9A, 6 = RLY9B	1 = Closes RLY9A / RLY9B
SFAN	Supply Fan Relay	RLY 10	J10, 7-9	7 = 8 = RLY10A, 9 = RLY10B	1 = Closes RLY10A / RLY10B
ALRM	Remote Alarm Relay	RLY 11	J10, 1-3	1 = 2 = RLY11A, 3 = RLY11B	1 = Closes RLY11A / RLY11B

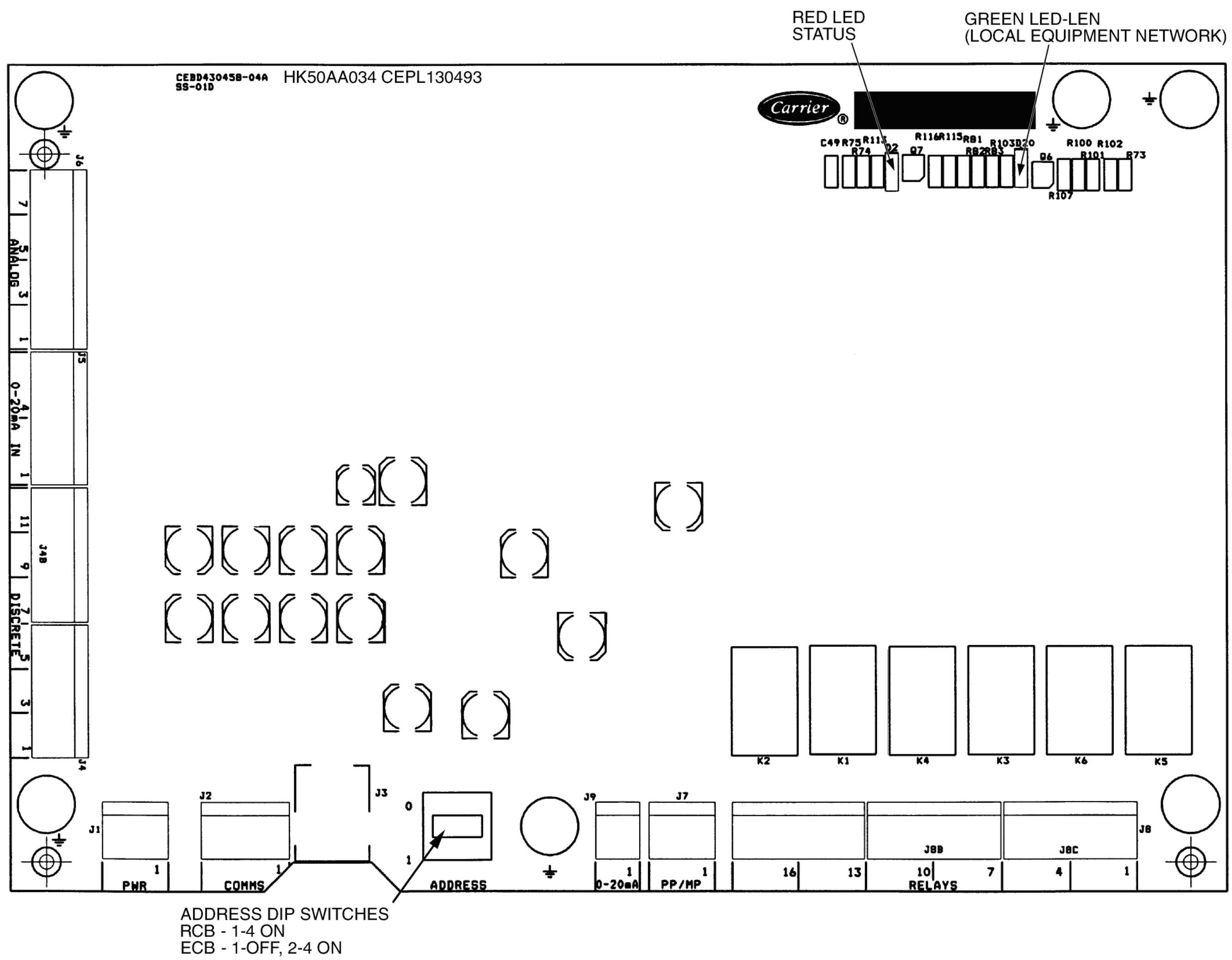


Fig. 27 — Economizer Control Board (ECB) and Rooftop Control Board (RCB)

Table 88 — Rooftop Control Board (RCB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	I/O POINT NAME	PLUG AND PIN REFERENCE	SIGNAL PIN(S)	PORT STATE
INPUTS					
RMTIN	Remote Input State	DI1	J4, 1-2	2	24VAC = 1, 0VAC = 0
ENTH	Enth. Switch Read High ?	DI2	J4, 3-4	4	24VAC = 1, 0VAC = 0
SFS	Supply Fan Status Switch	DI3	J4, 5-6	6	24VAC = 1, 0VAC = 0
CIRCAHPS	Circ A High Press.Switch	DI4	J4, 7-8	8	24VAC = 1, 0VAC = 0
CIRCBHPS	Circ B High Press.Switch	DI5	J4, 9-10	10	24VAC = 1, 0VAC = 0
FRZ	Freeze Status Switch	DI6	J4, 11-12	12	24VAC = 1, 0VAC = 0
BP	Building Pressure	AN1	J5, 1-3	1=24VDC, 2=0-20mA in, 3=GND	0-20mA
SP	Static Pressure	AN2	J5, 4-6	4=24VDC, 5=0-20mA in, 6=GND	0-20mA
CCT	Air Temp Lvg Evap Coil	AN3	J6, 1-2	1	(thermistor, ohms)
		AN4	J6, 3-4	3	(thermistor, ohms)
		AN5	J6, 5-6	5	(thermistor, ohms)
		AN6	J6, 7-8	7	(thermistor, ohms)
OUTPUTS					
SFAN_VFD	Supply Fan VFD Speed	AO1	J9, 1-2	1=0-20mA, 2=GND	0-20mA OUT
PULSCFAB	Pulsed Condenser Fan A-B	PP/MP	J7, 1-3	1=PP/MP Data, 2=24VAC, 3=GND	Belimo PP/MP Protocol
UNL_1_A1	Unloader 1 - Comp A1	RLY1	J8, 1-3	1 = 2 = RLY1A, 3 = RLY1B	1 = Closes RLY1A / RLY1B
UNL_2_A1	Unloader 2 - Comp A1	RLY 2	J8, 4-6	4 =5 = RLY2A, 6 = RLY2B	1 = Closes RLY2A / RLY2B
PE2	Power Exhaust Relay 2 (BLDG_CFG = 1)	RLY 3	J8, 7-9	7 = 8 = RLY3A, 9 = RLY3B	1 = Closes RLY3A / RLY3B
HIR	Heat Interlock Relay (BLDG_CFG not 1)	RLY 3	J8, 7-9	7 = 8 = RLY3A, 9 = RLY3B	1 = Closes RLY3A / RLY3B
UNL_1_B1	Unloader 1 - Comp B1	RLY 4	J8, 10-12	10 = 11 = RLY4A, 12 = RLY4B	1 = Closes RLY4A / RLY4B
HUMIDRLY	Humidifier Relay	RLY 5	J8, 13-15	13 = 14 = RLY5A, 15 = RLY5B	1 = Closes RLY5A / RLY5B
UNL_2_B1	Unloader 2 - Comp B1	RLY 6	J8, 16-18	16 = 17 = RLY6A, 18 = RLY6B	1 = Closes RLY6A / RLY6B

Table 89 — Economizer Control Board (ECB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	I/O POINT NAME	PLUG AND PIN REFERENCE	SIGNAL PIN(S)	PORT STATE
INPUTS					
PPS	Plenum Press.Safety Sw.	DI1	J4, 1-2	2	24VAC = 1, 0VAC = 0
		DI2	J4, 3-4	4	24VAC = 1, 0VAC = 0
	NA	DI3	J4, 5-6	6	24VAC = 1, 0VAC = 0
	NA	DI4	J4, 7-8	8	24VAC = 1, 0VAC = 0
	NA	DI5	J4, 9-10	10	24VAC = 1, 0VAC = 0
	NA	DI6	J4, 11-12	12	24VAC = 1, 0VAC = 0
SACFM	Supply Air CFM	AN1	J5, 1-3	1=24VDC, 2=0-20mA in, 3=GND	0-20mA
RACFM	Return Air CFM	AN2	J5, 4-6	4=24VDC, 5=0-20mA in, 6=GND	0-20mA
	NA	AN3	J6, 1-2	1	(thermistor, ohms)
	NA	AN4	J6, 3-4	3	(thermistor, ohms)
	NA	AN5	J6, 5-6	5	(thermistor, ohms)
	NA	AN6	J6, 7-8	7	(thermistor, ohms)
OUTPUTS					
EFAN_VFD	Exhaust Fan VFD Speed	AO1	J9, 1-2	1=0-20mA, 2=GND	0-20mA OUT
		PP/MP	J7, 1-3	1=PP/MP Data, 2=24VAC, 3=GND	Belimo PP/MP Protocol
PE2	Power Exh. VFD Stage 2 (BLDG_CFG = 4)	RLY1	J8, 1-3	1 = 2 = RLY1A, 3 = RLY1B	1 = Closes RLY1A / RLY1B
		RLY 2	J8, 4-6	4 =5 = RLY2A, 6 = RLY2B	1 = Closes RLY2A / RLY2B
		RLY 3	J8, 7-9	7 = 8 = RLY3A, 9 = RLY3B	1 = Closes RLY3A / RLY3B
	NA	RLY 4	J8, 10-12	10 = 11 = RLY4A, 12 = RLY4B	1 = Closes RLY4A / RLY4B
	NA	RLY 5	J8, 13-15	13 = 14 = RLY5A, 15 = RLY5B	1 = Closes RLY5A / RLY5B
		RLY 6	J8, 16-18	16 = 17 = RLY6A, 18 = RLY6B	1 = Closes RLY6A / RLY6B

Table 90 — Staged Gas Control Board (SCB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	I/O POINT NAME	PLUG AND PIN REFERENCE	SIGNAL PIN(S)	PORT STATE
INPUTS					
LIMSWTMP	Limit Switch Temperature	AN1	J5, 1-3	1=5v, 2=Vin, 3=GND (thermistor 1-2)	(0-5VDC, thermistor, ohms)
LAT1SGAS	Staged Gas LAT 1	AN2	J5, 4-6	4=5v, 5=Vin, 6=GND (thermistor 4-5)	(0-5VDC, thermistor, ohms)
LAT2SGAS	Staged Gas LAT 2	AN3	J5, 7-9	7=5v, 8=Vin, 9=GND (thermistor 7-8)	(0-5VDC, thermistor, ohms)
LAT3SGAS	Staged Gas LAT 3	AN4	J5, 10-12	10=5v, 11=Vin, 12=GND (thermistor 10-11)	(0-5VDC, thermistor, ohms)
		AN5	J5, 13-15	13=5v, 14=Vin, 15=GND (thermistor 13-14)	(0-5VDC, thermistor, ohms)
		AN6	J6, 1-3	1=5v, 2=Vin, 3=GND (thermistor 1-2)	(0-5VDC, thermistor, ohms)
		AN7	J6, 4-6	4=5v, 5=Vin, 6=GND (thermistor 4-5)	(0-5VDC, thermistor, ohms)
		AN8	J6, 7-9	7=5v, 8=Vin, 9=GND (thermistor 7-8)	(0-5VDC, thermistor, ohms)
		AN9	J7, 1-2	1	(thermistor, ohms)
		AN10	J7, 3-4	3	(thermistor, ohms)
OUTPUTS					
HTSGCALC	Staged Gas Capacity Calc	AO1	J8, 1-2	1=0-20mA, 2=GND	0-20mA OUT
		AO2	J8, 3-4	3=0-20mA, 4=GND	0-20mA OUT
HS3	Relay 3 W1 Gas Valve 2	RLY1	J9, 1-3	1 = 2 = RLY1A, 3 = RLY1B	1 = Closes RLY1A / RLY1B
HS4	Relay 4 W2 Gas Valve 2	RLY2	J9, 4-6	4 =5 = RLY2A, 6 = RLY2B	1 = Closes RLY2A / RLY2B
HS5	Relay 5 W1 Gas Valve 3	RLY3	J9, 7-9	7 = 8 = RLY3A, 9 = RLY3B	1 = Closes RLY3A / RLY3B
HS6	Relay 6 W2 Gas Valve 3	RLY4	J9, 10-12	10 = 11 = RLY4A, 12 = RLY4B	1 = Closes RLY4A / RLY4B
		RLY5	J9, 13-15	13 = 14 = RLY5A, 15 = RLY5B	1 = Closes RLY5A / RLY5B

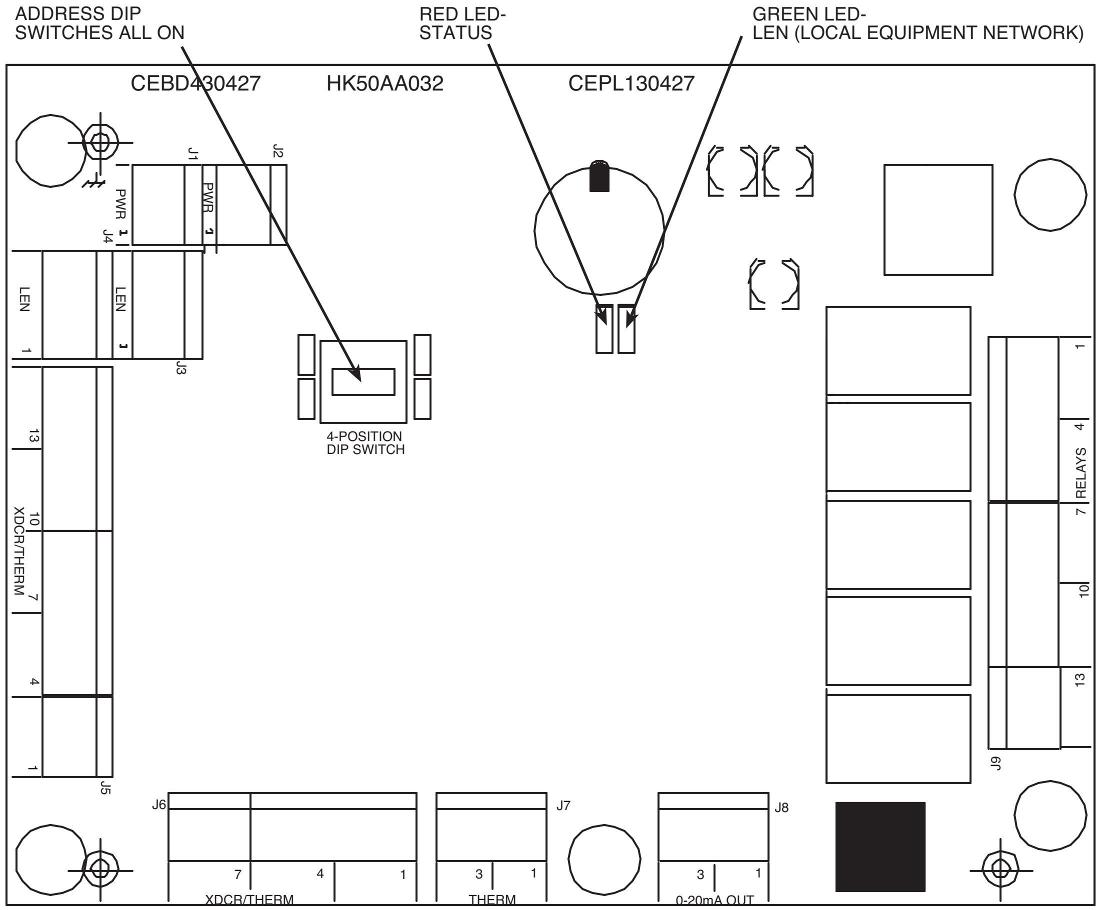


Fig. 28 — Staged Gas Heat Control Board (SCB)

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. 29. 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 91.

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.

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 92. 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 055-105 units. Three are used on high heat 055-105 units. The IGC controls the direct spark ignition system and monitors the rollout switch, limit switches, and induced-draft motor Hall Effect switch. The IGC is equipped with an LED (light-emitting diode) for diagnostics. See Table 93.

COMPRESSOR PROTECTION BOARD (CSB) (Size 105 Units Only) — 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.

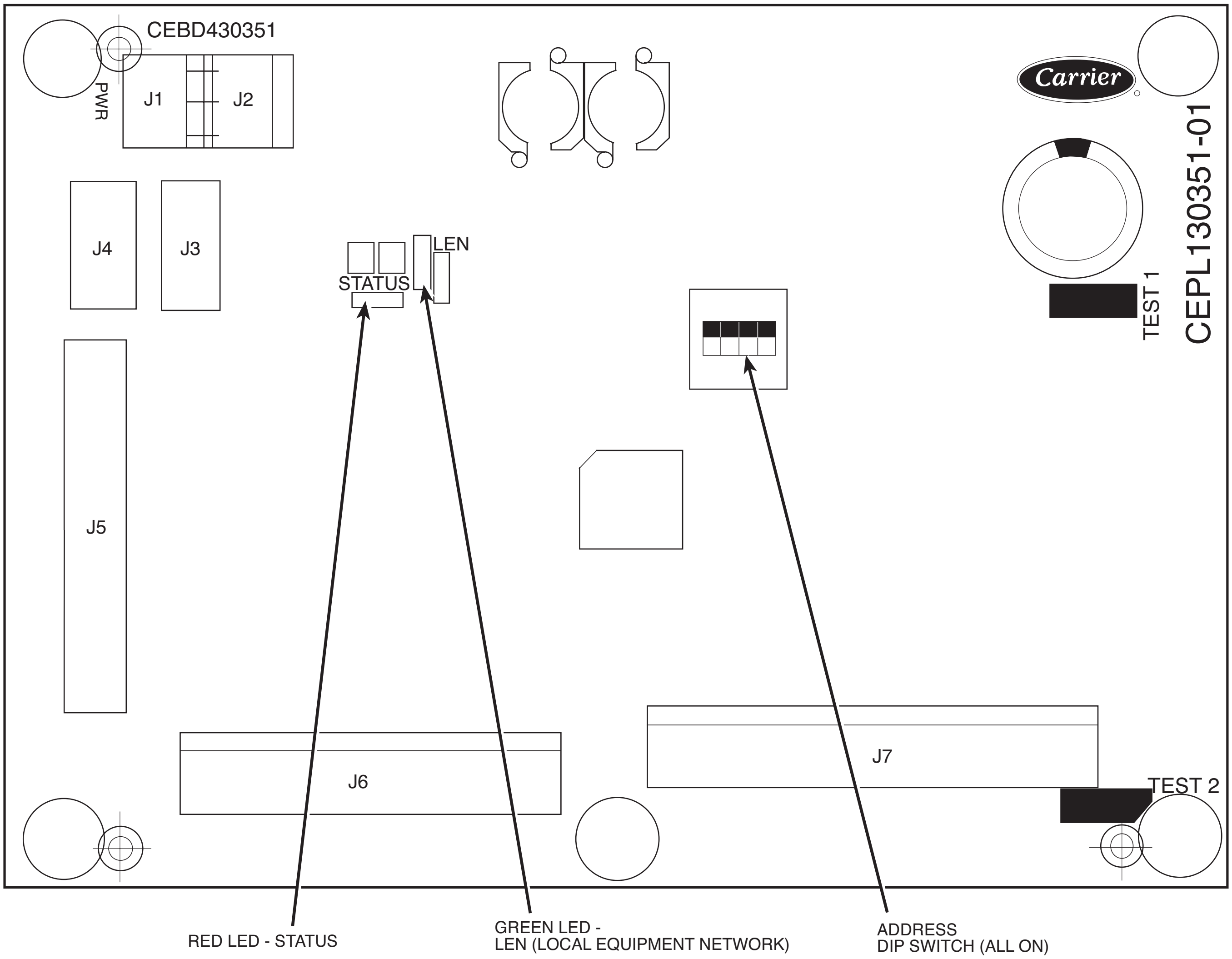


Fig. 29 — Controls Expansion Board (CEM)

Table 91 — Control Expansion Module (CEM) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	I/O POINT NAME	PLUG AND PIN REFERENCE	SIGNAL PIN(S)	PORT STATE
INPUTS					
DHDISCIN	Dehumidify Switch Input	DI 1	J7, 1-2	2	0 = 24vac, 1= 0vac
DMD_SW1	Demand Limit Switch 1	DI 2	J7, 3-4	4	0 = 24vac, 1= 0vac
DMD_SW2	Demand Limit Switch 2	DI 3	J7, 5-6	6	0 = 24vac, 1= 0vac
PRES	Pressurization	DI 4	J7, 7-8	8	0 = 24vac, 1= 0vac
EVAC	Evacuation	DI 5	J7, 9-10	10	0 = 24vac, 1= 0vac
PURG	Smoke Purge	DI 6	J7, 11-12	12	0 = 24vac, 1= 0vac
IAQIN	IAQ - Discrete Input	DI 7	J7, 13-14	14	0 = 24vac, 1= 0vac
OACFM	Outside Air CFM	AN7	J6, 1-3	2 (1 = loop power)	(0-20mA input)
OARH	Outside Air Rel.Humidity	AN8	J6, 4-6	5 (4 = loop power)	(0-20mA input)
SPRH	Space Relative Humidity	AN9	J6, 7-9	8 (7 = loop power)	(0-20mA input)
RARH	Return Air Rel.Humidity	AN10	J6, 10-12	11 (10 = loop power)	(0-20mA input)
DMDLMTMA	4-20ma Demand Signal	AN1	J5, 1-2	1	(thermistor, ohms)
EDTRESMA	EDT Reset milliampere	AN2	J5, 3-4	3	(thermistor, ohms)
OAQ	OAQ - PPM Return CO2	AN3	J5, 5-6	5	(thermistor, ohms)
SPRESET	SP Reset milliamps	AN3	J5, 5-6	5	(thermistor, ohms)
		AN4	J5, 7-8	7	(thermistor, ohms)
		AN5	J5, 9-10	9	(thermistor, ohms)
		AN6	J5, 11-12	11	(thermistor, ohms)

Table 92 — 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	
CCN COMMUNICATIONS (in Main Control Box)			
Comm Port	1	LEN +	5 vdc, logic
	2	LEN C	5 vdc, logic
	3	LEN –	5 vdc, logic
	4	24 vac	24 vac
	5	CCN +	5 vdc, logic
	7	CCN c	5 vdc, logic
	7	CCN –	5 vdc, logic
	8	Grd	ground
TB201 - FIELD CONNECTIONS (in Main Control Box)			
TB201	1	Remote Occupied/Economizer Enable 24 vac out	external contact (maximum 24 vac, 3 A)
	2	Remote Occupied/Economizer Enable 24 vac in	external contact (maximum 24 vac, 3 A)
	3	Not Used	—
	4	OD Enthalpy Switch in	24 vac
	5	Fire Shut Down	external contact (maximum 24 vac, 3 A)
	6	Fire Shut Down	external contact (maximum 24 vac, 3 A)
	7	VAV Heater Interlock Relay	external contact (maximum 24 vac, 3 A)
	8	VAV Heater Interlock Relay	external contact (maximum 24 vac, 3 A)
	9	Humidifier Output, Ground	external contact (maximum 24 vac, 3 A)
	10	Humidifier Output, 24 VAC	external contact (maximum 24 vac, 3 A)
	11	Unit Alarm Output	external contact (maximum 24 vac, 3 A)
	12	Unit Alarm Output	external contact (maximum 24 vac, 3 A)
	13	Smoke Detector Alarm Input	external contact (maximum 24 vac, 3 A)
	14	Smoke Detector Alarm Input	external contact (maximum 24 vac, 3 A)
	15	Not Used	—
	16	Not Used	—
TB202 - THERMOSTAT CONNECTIONS (in Main Control Box)			
TB202	1	Thermostat R	24 vac output
	2	Thermostat G	24 vac input
	3	Thermostat W2	24 vac input
	4	Thermostat W1	24 vac input
	5	Thermostat Y2	24 vac input
	6	Thermostat Y1	24 vac input
	7	Not Used	—
	8	Space Sensor TH	Thermistor input
	9	Space Sensor COM	Thermistor input
	10	Space Sensor Offset SW	Thermistor input
	11	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
	12	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
	13	Not Used	
	14	Not Used	
	15	Not Used	
	16	Not Used	
TB203 - FIELD CONNECTIONS (in Main Control Box)			
TB203	1	Ground	ground
	2	Demand Limit 4-20 mA (+)	4 to 20 mA loop power
	3	Demand Limit 4-20 mA (-)	4 to 20 mA loop power
	4	Supply Air Reset 4-20 mA (+)	4 to 20 mA loop power
	5	Supply Air Reset 4-20 mA (-)	4 to 20 mA signal
	6	Outdoor Air IAQ 4-20 mA (+)	4 to 20 mA loop power
	7	Outdoor Air IAQ 4-20 mA (-)	4 to 20 mA signal
	8	Space Humidity 4-20 mA (+)	4 to 20 mA loop power
	9	Space Humidity 4-20 mA (-)	4 to 20 mA signal
	10	Not Used	—
	11	Not Used	—
	12	Not Used	—
	13	Not Used	—
	14	Not Used	—
	15	Not Used	—
	16	Not Used	—

LEGEND

IAQ — Indoor Air Quality
VAV — Variable Air Volume

Table 92 — Field Terminal Connections (cont)

BOARD NO.	TERMINAL NUMBER	DESCRIPTION	TYPE
TB204 - FIELD CONNECTIONS (in Main Control Box)			
TB204	1	Demand Limit Redline 24 vac out	external contact (maximum 24 vac, 3 A)
	2	Demand Limit Redline 24 vac in	external contact (maximum 24 vac, 3 A)
	3	Demand Limit Loadshed 24 vac out	external contact (maximum 24 vac, 3 A)
	4	Demand Limit Loadshed 24 vac in	external contact (maximum 24 vac, 3 A)
	5	Fire Pressuration 24 vac out	external contact (maximum 24 vac, 3 A)
	6	Fire Pressuration 24 vac in	external contact (maximum 24 vac, 3 A)
	7	Fire Evacuation 24 vac out	external contact (maximum 24 vac, 3 A)
	8	Fire Evacuation 24 vac in	external contact (maximum 24 vac, 3 A)
	9	Fire Smoke Purge 24 vac out	external contact (maximum 24 vac, 3 A)
	10	Fire Smoke Purge 24 vac in	external contact (maximum 24 vac, 3 A)
	11	IAQ Switch 24 vac out	external contact (maximum 24 vac, 3 A)
	12	IAQ Switch 24 vac in	external contact (maximum 24 vac, 3 A)
	13	Not Used	—
	14	Not Used	—
	15	Not Used	—
	16	Not Used	—

LEGEND

IAQ — Indoor Air Quality
VAV — Variable Air Volume

Table 93 — 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	

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. 30. 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

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 48/50Z030-050 units are equipped with a single 25 x 25-in. forward-curved fan. The 48/50Z055-070 units are equipped with a single 30 x 27-in. forward-curved fan. The 48/50Z075-105 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 variable air volume units with optional VFD, the supply fan speed is controlled by a 3-phase VFD. The VFD is located in the supply fan section (030-050 units) or mixing box section (055-105 units) behind an access door. The VFD speed is controlled directly by the *Comfort*Link™ controls through a 4 to 20 mA signal based on a supply duct pressure sensor. The VFD has a display, which can be used for service diagnostics, but setup of the building pressure and control loop factors should be done through the scrolling marquee display. The VFD is powered during normal operation to prevent condensation from forming on the boards during the off mode and is stopped by driving the speed to 0 (by sending a 4 mA signal to the VFD).

The Z Series units use ABB VFDs. The interface wiring for the VFDs is shown in Fig. 31. Terminal designations are shown in Table 94.

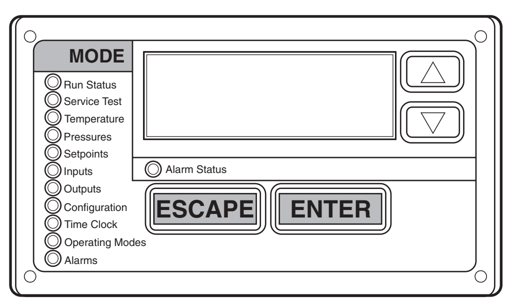


Fig. 30 — Scrolling Marquee

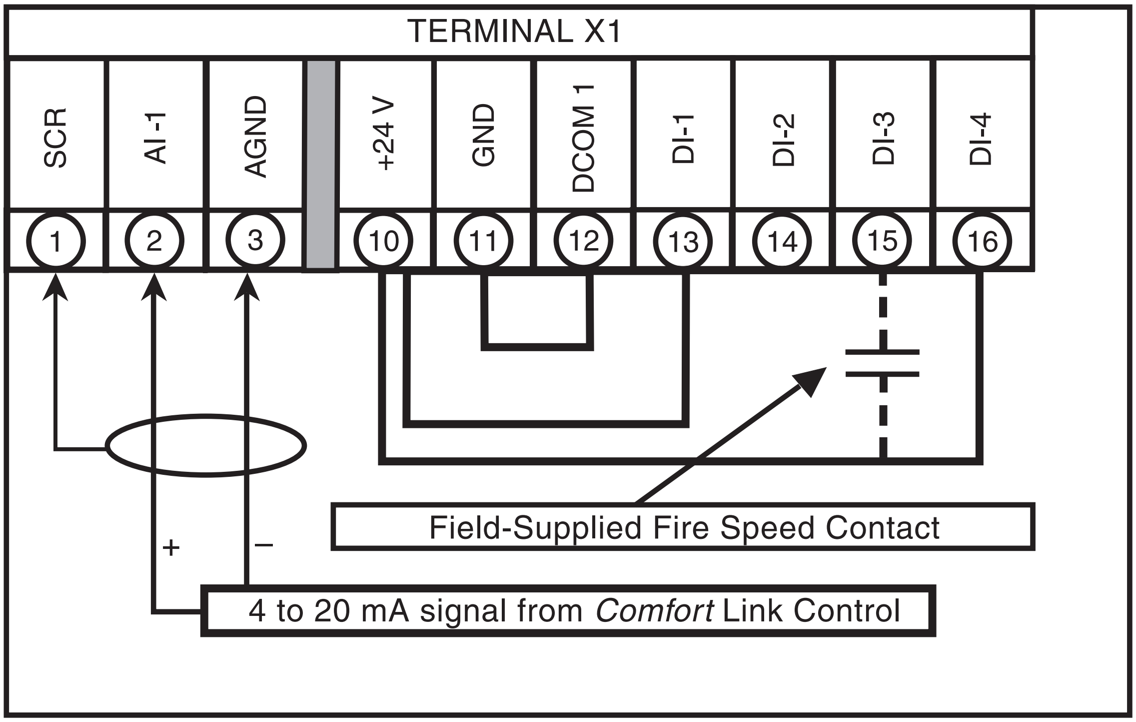


Fig. 31 — VFD Wiring

Table 94 — 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 (COMMON)**	Factory-supplied jumper
X1-10 (24 VDC) **X1-13 (DI-1)**	Run (factory-supplied jumper)
X1-10 (24 VDC) **X1-16 (DI-4)**	Start Enable 1 (factory-supplied jumper). When opened the drive goes to emergency stop.
X1-2 (AI-1) **X1-3 (AGND)**	Factory wired for 4 to 20 mA remote input

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 control based on building pressure sensed by the building pressure transducer. The fan output is modulated via discharge dampers with LEN communicating actuators to maintain the building pressure set point.

HIGH CAPACITY POWER EXHAUST (Sizes 075-105 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/EXHAUST FAN (Sizes 075-105 Only) — The return/exhaust 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. An LEN communicating economizer motor(s) controls their position. The motor position is controlled by the MBB through the LEN 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 95.

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 accessory smoke detector located in the return air. 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 5 and 6. The sensor is located in the return 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.

Table 95 — 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 60.)	HH79NZ039
LAT 1,2,3	Leaving Air Thermistors, provided with Staged Gas Control option. Shipped in the heating compartment. 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
DPA	Discharge Pressure (refrigerant), Circuit A. Located on compressor A1 high-side connections.	HK05YZ007
DPB	Discharge Pressure (refrigerant), Circuit B. Located on compressor B1 high-side connections.	HK05YZ007
SPA	Suction Pressure (refrigerant), Circuit A. Located on compressor A1 low-side connections.	HK05YZ001
SPB	Suction Pressure (refrigerant), Circuit B. Located on compressor B1 low-side connections.	HK05YZ001
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 075-105 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 075-105 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 (075-105)

LEGEND
VAV — Variable Air Volume

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. 26. 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
RCB	0	0	0	0
ECB	1	0	0	0
SCB	0	0	0	0
CEM	0	0	0	0

0 = On; 1 = Off

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. Although the unit can be configured for normal 2-stage control, it is recommended that the multi-stage control be used. The room thermostat is connected to TB202.

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 TB202 terminals 8, 9, and 10. 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 TB202 for the heat function to work correctly.

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 TB202 terminals 11 and 12.

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 48/50Z series units. See Fig. 32. The Navigator display operates the same way as the scrolling marquee device. The RCB and ECB 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. 26-29. 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 48/50Z Series units can be connected to the CCN if desired. See Fig. 33. 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. 16. Consult the CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20-AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20 C to 60 C is required.

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.

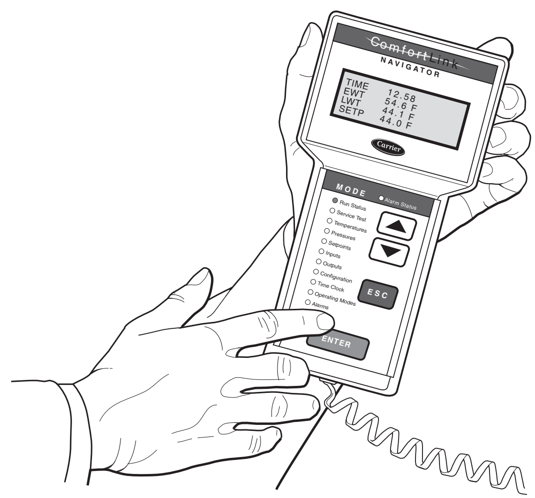
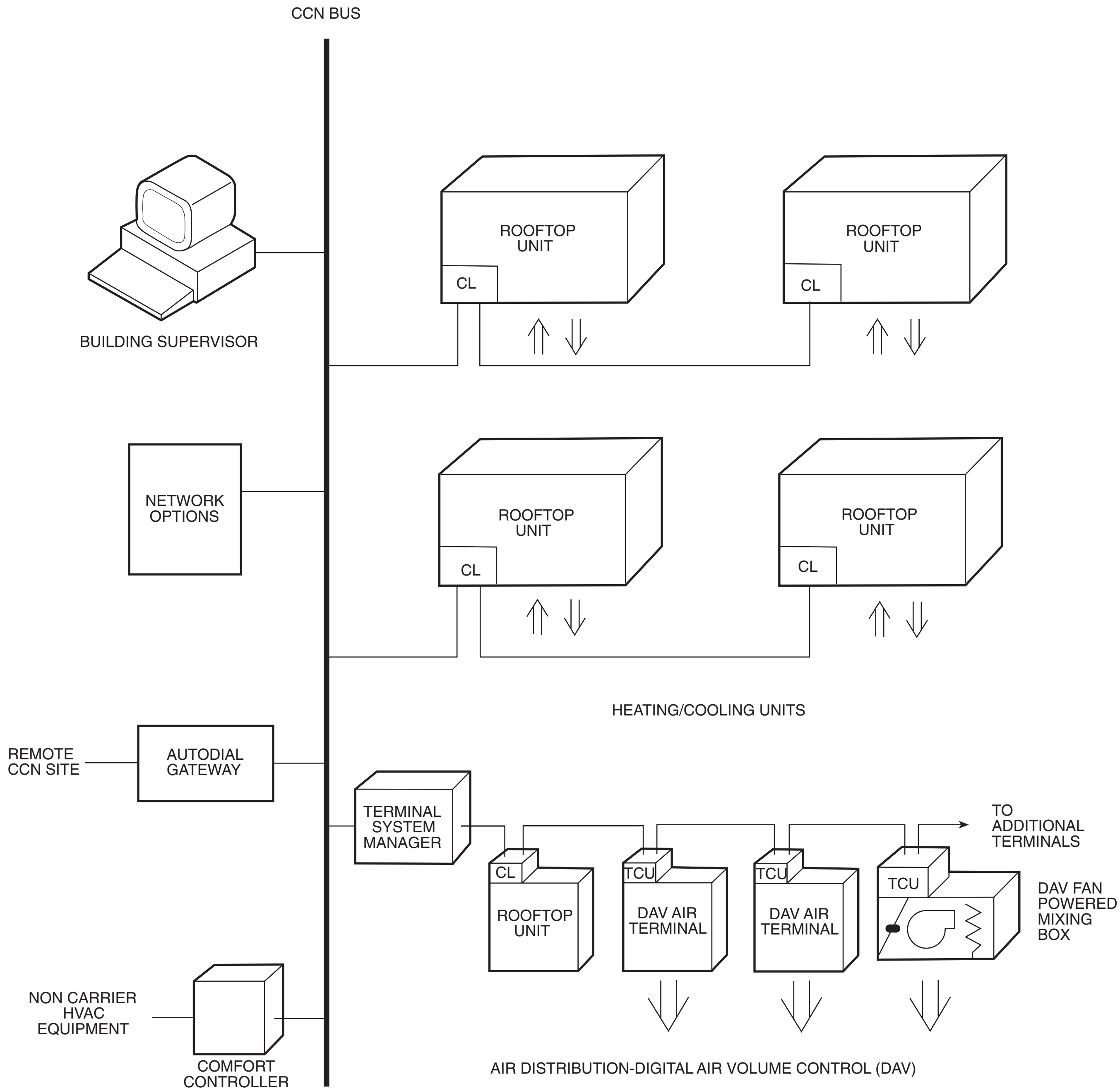


Fig. 32 — Accessory Navigator Display



LEGEND

CCN — Carrier Comfort Network®
CL — *Comfort*Link™ Controls
DAV — Digital Air Volume
HVAC — Heating, Ventilation, and Air Conditioning
TCU — Terminal Control Unit

Fig. 33 — 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. 34.

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 030-050 — Access to the compressors is through the doors on the condenser end of the unit. This door also provides access to the discharge and suction service valves, the crankcase heaters, and the high-pressure and low-pressure switches. Compressor no. 1 is always the compressor on the left when facing main control box.

Sizes 055-105 — The oil pump end (compressor access) of each compressor is readily accessible from sides of unit. Access the motor end of the compressor through the condenser end of the unit or by removing compressor.

LIQUID SERVICE VALVES, FILTER DRIERS, AND SIGHT GLASSES

Sizes 030-050 — Access to these components is through the access panel on the right side of the unit. See Fig. 35. There is also a Schrader port in each suction line that is accessible through this same panel. When charging unit, route service line through the round holes and replace panel to minimize air bypass.

Sizes 055-105 — 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. 36.

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 (48Z 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). See Fig. 37 and 38.

All gas system components are in the gas section.

MAIN BURNERS (48Z Only) — At the beginning of each heating season, inspect for deterioration due to corrosion or other causes. Observe the main burner flames and adjust if necessary. See Gas System Adjustment section on page 131.

FLUE GAS PASSAGEWAYS (48Z 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. 39). Refer to Main Burners Removal and Replacement section on page 131 for burner removal sequence. 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. 40.

COMBUSTION-AIR BLOWERS (48Z 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. 41). 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.

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.

INLET GUIDE VANE MOTOR — The inlet guide vane motor is located on the evaporator-fan sled on the side opposite the fan motor. See Fig. 42A and 42B. Access is through the door labeled FAN SECTION.

25% OUTDOOR-AIR DAMPER — Access to adjust the damper is through the hoods. Remove filters to gain access into unit to adjust linkage arms.

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. 36.

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.

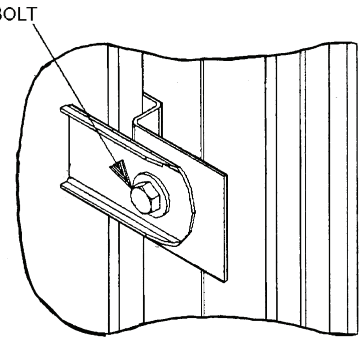


Fig. 34 — Door Latch

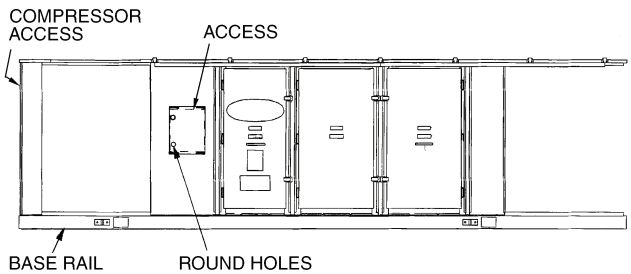


Fig. 35 — Typical Filter Drier and Liquid Service Valve Access

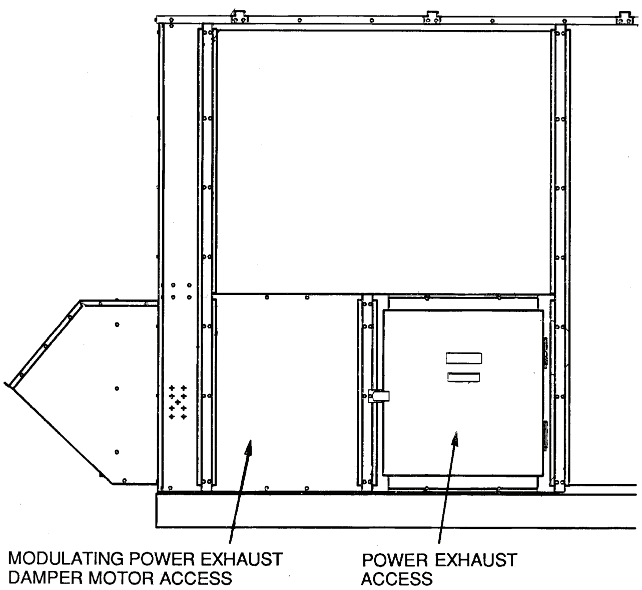
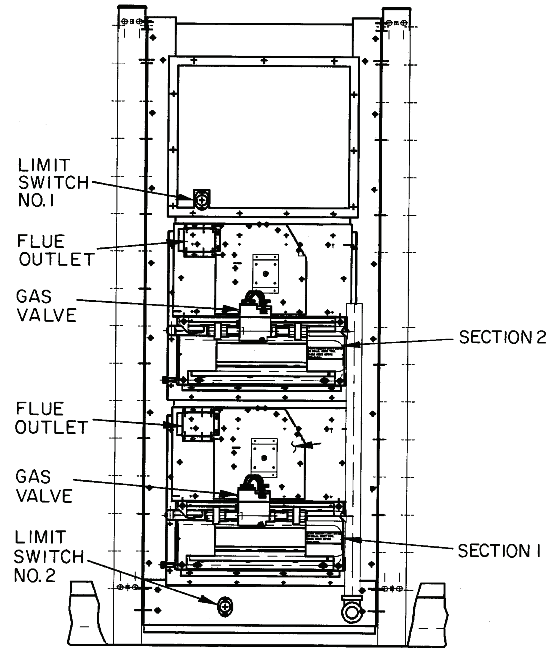
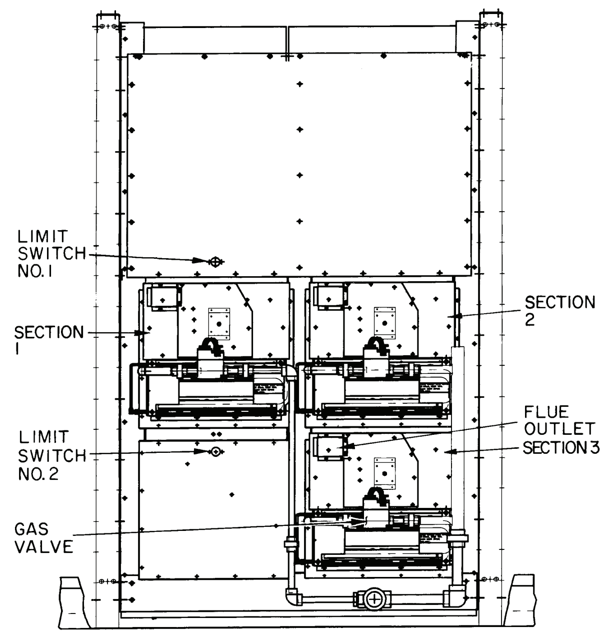


Fig. 36 — Modulating Power Exhaust Motor Access (Both Sides)



NOTE: High heat consists of sections 1 and 2. Low heat consists of section 1 only.

Fig. 37 — Gas Section Detail, Sizes 030-050



NOTE: High heat consists of sections 1-3. Low heat consists of sections 1 and 2 only.

Fig. 38 — Gas Section Detail, Sizes 055-105

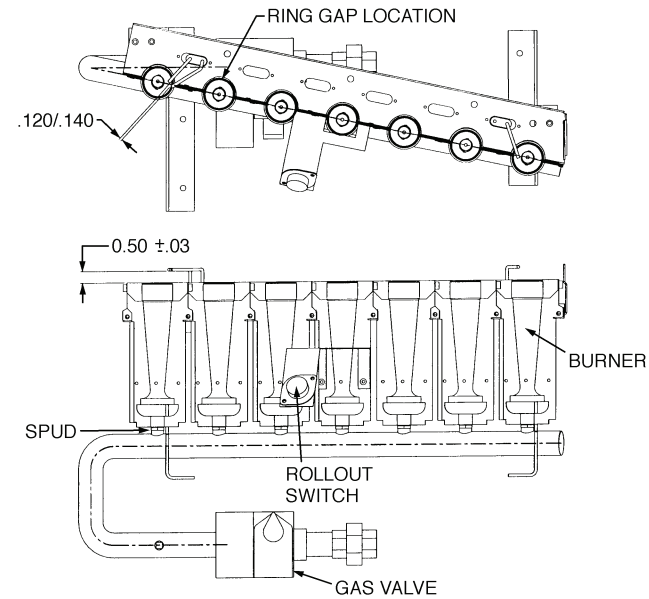
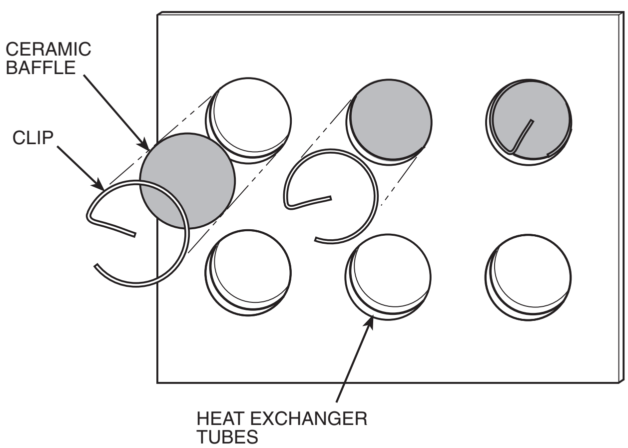


Fig. 39 — Burner Section Detail



NOTE: One baffle and clip will be in each upper tube of the heat exchanger.

Fig. 40 — Removing Heat Exchanger Ceramic Baffles and Clips

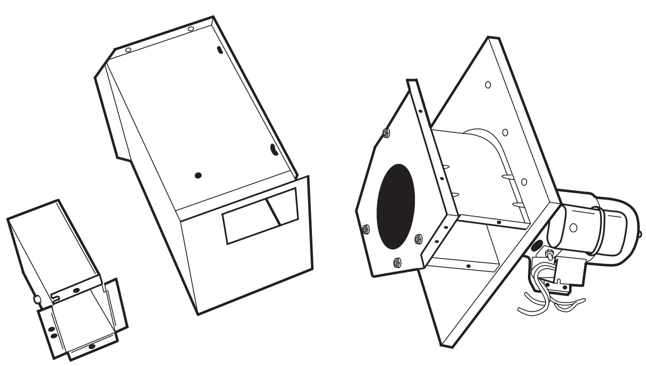


Fig. 41 — Combustion Blower Removal

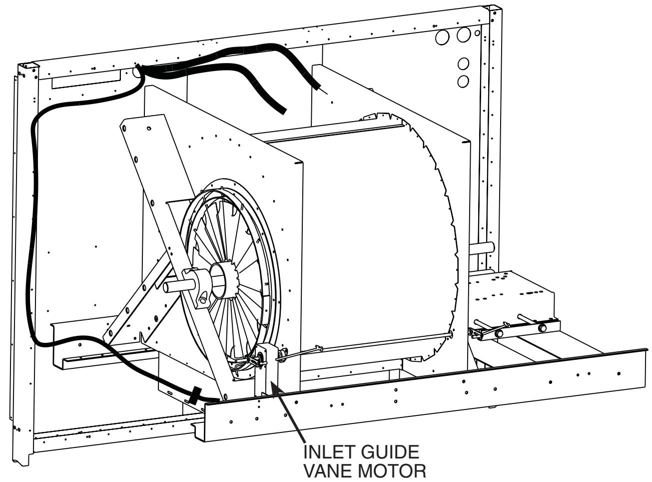


Fig. 42A — Inlet Guide Vane Motor (Sizes 055-070)

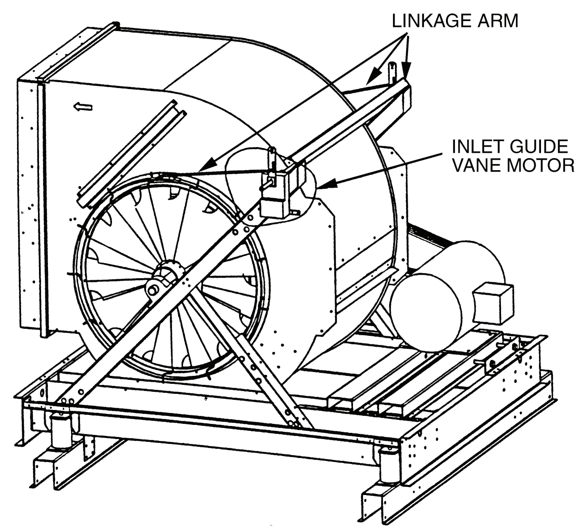


Fig. 42B — Inlet Guide Vane Motor (Sizes 075-105)

Adjustments

RETURN/EXHAUST FAN MOTOR PLATE

Adjust using a $^3/_4$-in. wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 43).
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.

SUPPLY FAN AND POWER EXHAUST MOTOR PLATE — Adjust using a $^{15}/_{16}$-in. wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 44.)
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.

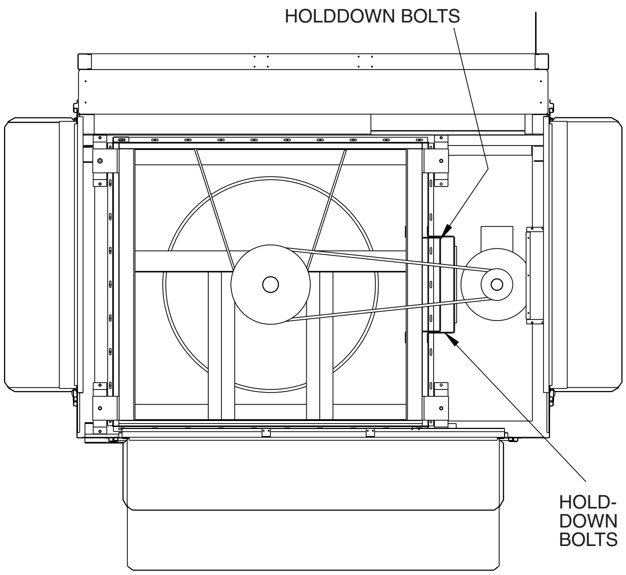


Fig. 43 — Return/Exhaust Fan Motor Plate Adjustment

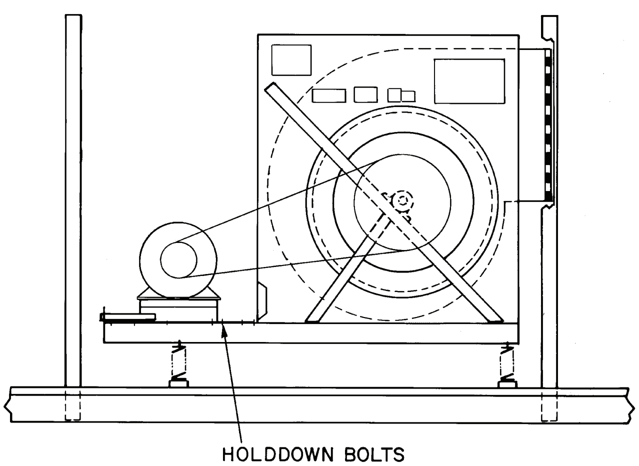


Fig. 44 — Motor Plate Adjustment

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.
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. 45. 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 050, 070, 075 Units with High-Capacity Evaporator Coil)

1. Turn off unit power.
2. Remove fan guard and loosen fan hub setscrew.
3. See Fig. 46 and adjust fan height using a straight edge laid across the fan deck.
4. Tighten setscrew 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.

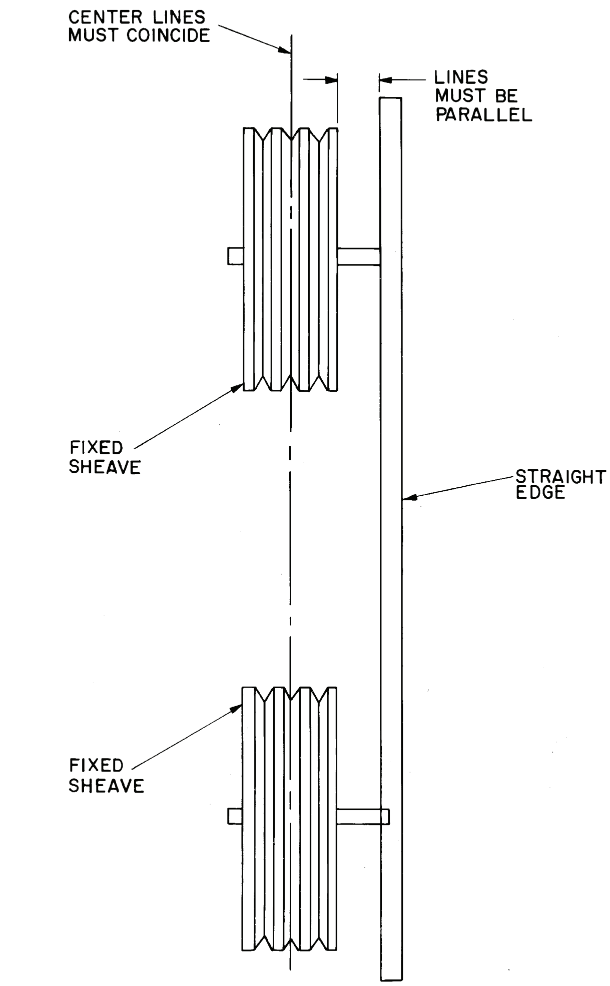


Fig. 45 — Pulley Alignment

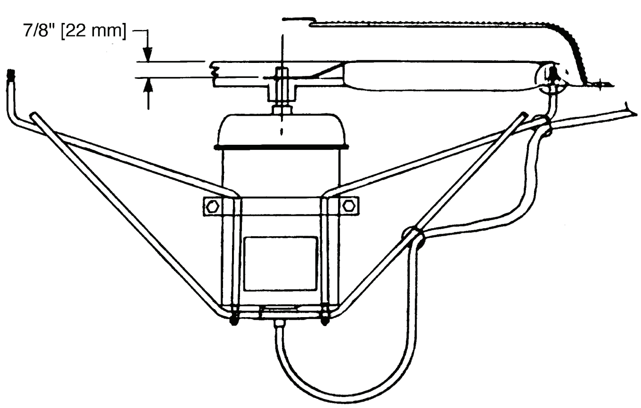


Fig. 46 — Condenser-Fan Adjustment (Standard Units)

CONDENSER FAN ADJUSTMENT (Sizes 050,070,075 With High-Capacity Evaporator Coil Option) — 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. 47. 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. 48.
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. 48).
6. Reinstall the transducer in the unit.
7. Restore power to the unit.

Cleaning — Inspect unit at the beginning of each heating and cooling season and during each season as operating conditions may require.

Clean condenser coil with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Coil cleaning should be a part of the planned maintenance program. Clean evaporator coil with a stiff bristle brush (not wire), vacuum cleaner, or compressed air.

Check and clean condensate drain annually at the start of the cooling season.

Replace return-air filters at the start of each heating and cooling season or as often as necessary during each season, depending on operating conditions.

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.

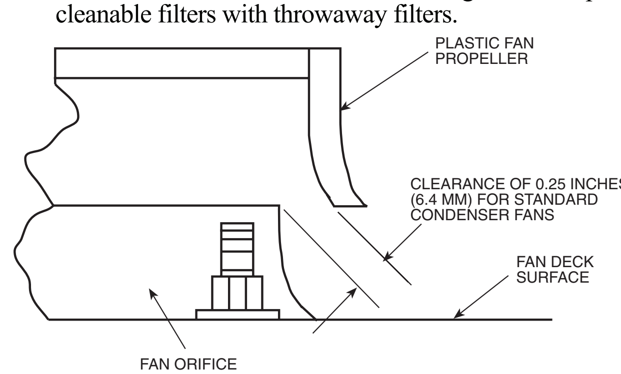


Fig. 47 — Condenser Fan Position (Units with High Capacity Evaporator Coil Option)

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

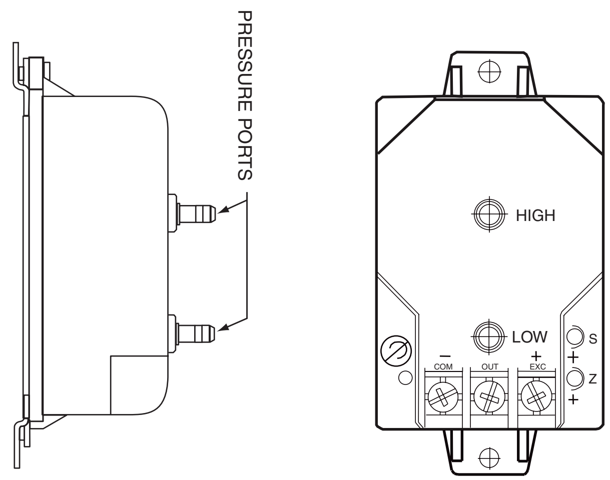


Fig. 48 — Transducer Details

Lubrication

COMPRESSORS — Each compressor is correctly charged at the factory. Refer to 06D and 06E Compressor Service Manuals if additional information regarding compressor lubrication system is required.

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.

INLET GUIDE VANE BEARINGS (Units With Optional Inlet Guide Vanes) — These bearings are oil impregnated. Lubricate annually with a few drops of nondetergent SAE (Society of Automotive Engineers) 20 oil.

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 size 040 and 050, each circuit has 2. The superheat is nonadjustable. On sizes 055-105, 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-22 (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 (Refer to Unit Nameplate) — At the liquid line connection point on each circuit is a factory-installed liquid line service valve. On each valve is a $^1/_4$-in. Schrader connection for charging liquid refrigerant.

All units are shipped with a complete operating charge of R-22. See unit nameplate and for amount of charge. When adding a complete charge, evacuate system using standard evacuating procedures and weigh in the specified amount of charge. All units use the same charging chart. See Fig. 49.

Charging with Unit Off and Evacuated — Close liquid line service valve before charging. Weigh in charge shown in unit nameplate. Open liquid line service valve; start unit and allow it to run several minutes fully loaded. Check for a clear sight glass. Be sure clear condition is liquid and not vapor. Complete charging the unit.

Charging with Unit Running — If charge is to be added while unit is operating, it is necessary to have all condenser fans and compressors operating. It may be necessary to block condenser coils at low-ambient temperatures to raise condensing pressure to approximately 280 psig to turn all condenser fans on. Do not totally block a coil to do this. Partially block all coils in uniform pattern. Charge vapor into compressor low-side service port located above oil pump crankshaft housing. Charge each circuit until sight glass shows clear liquid.

Oil Charge — All units are factory charged with oil. Acceptable oil level for each compressor is shown in Table 96.

When additional oil or a complete charge is required, use only Carrier-approved compressor oil.

Approved oils are:
Petroleum Specialties, Inc. — Cryol 150A (factory oil charge)
Texaco, Inc. — Capella WF-32-150
Witco Chemical Co. — Suniso 3GS

Do not reuse drained oil, and do not use any oil that has been exposed to atmosphere as oil is highly hygroscopic and rapidly absorbs moisture.

ADD OIL — Close suction shutoff valve and pump down crankcase to 2 psig. (Low-pressure cutout must be jumpered.) Wait a few minutes and repeat until pressure remains steady at 2 psig. Remove oil fill plug above the oil level sight glass, add oil through plug hole, and replace plug. Run compressor for 20 minutes and check oil level.

REMOVE OIL — Pump down compressor to 2 psig. Loosen the $^1/_4$-in. pipe plug at the compressor base and allow the oil to seep out past the threads of the plug.

NOTE: The crankcase will be slightly pressurized. Do not remove the plug, or the entire oil charge will be lost.

Small amounts of oil can be removed through the oil pump discharge connection while the compressor is running.

Table 96 — Oil Charge

COMPRESSOR	OIL CHARGE (Pints)
06D	10.0
06E 299	19.0
All other 06E	20.0

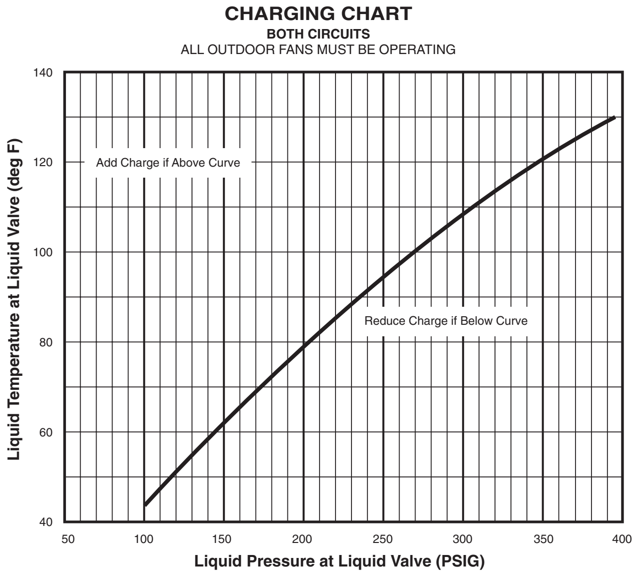


Fig. 49 — Charging Chart — 48/50Z030-105 Units

Gas System Adjustment (48Z Only)

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. 50).
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.

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 ignitor 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.

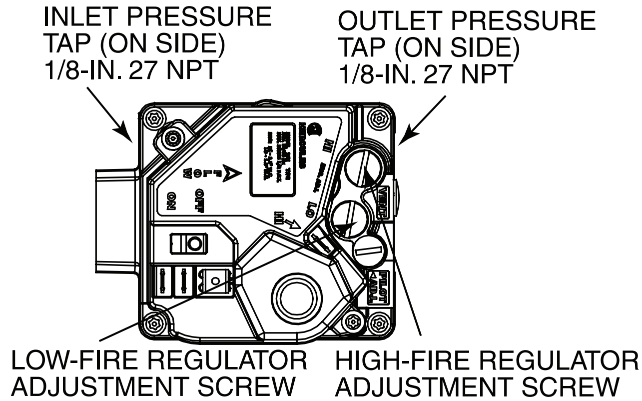


Fig. 50 — Gas Valve

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 Valve — Located immediately ahead of the filter drier, this valve has a $^1/_4$-in. flare connection for field charging. With the liquid circuit shut, the compressor can be used to pump the refrigerant down into the high side. The refrigerant can then be stored there by closing the compressor discharge valve.

Compressor Discharge Service Valve — Each compressor has one.

Compressor Suction Service Valve — Each compressor has one.

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 06D compressor has an internal protector to protect it against excessively high discharge gas temperatures. Each 06E compressor has an external discharge gas thermostat. See Fig. 51. They will reset, but the circuit will automatically be locked out by the control board. Unit must be manually reset by interrupting control power.

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.

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 over-temperature. They are also protected against a severe over-current 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 — See Fig. 51 for compressor mounting locations. Settings for these switches are shown in Tables 97A and 97B. If either switch trips, that refrigerant circuit will be automatically locked out by the controls. To reset, recycle control power to unit.

Table 97A — Pressure Switch Settings (psig)

SWITCH	CUTOUT	CUT-IN
High	426 ± 7	320 ± 20

Table 97B — Pressure Switch Settings (Pa)

SWITCH	CUTOUT	CUT-IN
High	2937 ± 48	2206 ± 138

Relief Devices — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side.

Control Circuit, 115 V — This control circuit is protected against overcurrent by a 5-amp (sizes 030-090) or 9-amp (size 105) 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 a 3.2-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Gas Heat (48Z 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.

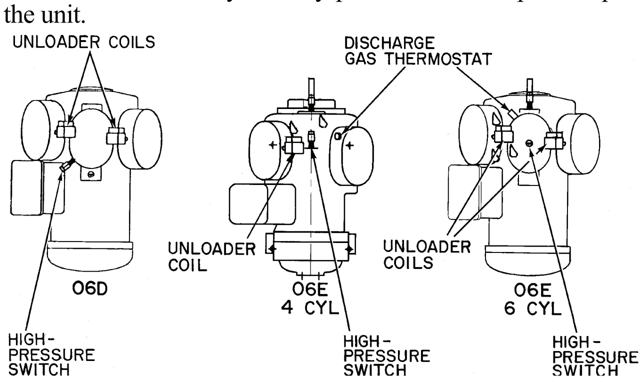


Fig. 51 — Typical Compressor Overtemperature and High-Pressure Switch Locations

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.

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, a defective inducer motor, or a loose combustion blower.

Compressor Removal — Access to the pump end of the compressor is from the compressor side of the unit. Access to the motor end of the compressor is from the inside of the unit. 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. Remove:
   a. Fan-cycling pressure switch (FCPS)
   b. High-pressure switch
5. Disconnect power wires at terminal box and disconnect conduit.
6. Disconnect wires from crankcase heater.
7. Disconnect service valves from compressor.
8. Remove 4 locknuts securing compressor to the spring assemblies.
9. Lift compressor off mounting bolts and remove.

Compressor Replacement — Perform the following:

1. Reverse procedure in Compressor Removal section to end of Step 4.
2. Reinstall service valves and safety switches, and tighten to torques as listed:

TORQUE	COMPRESSOR(S)
Tighten discharge valves to —	
20-25 ft-lb (27- 34 N-m)	06E-250, 06D-537
80-90 ft-lb (109-122 N-m)	06E-265,275,299
Tighten suction valves to —	
80- 90 ft-lb (109-122 N-m)	06E-250, 06D-537
90-120 ft-lb (122-163 N-m)	06E-265,275,299
Tighten the following fittings as specified —	
120 in.-lb (13.5 N-m)	High-Pressure Switch

3. Leak-check and evacuate system, recover refrigerant.
4. Recharge system per pre-start-up and start-up sequences. Recheck oil levels.
5. 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		90,92
→***OCC***	Occupied ?	YES/NO		OCCUPIED	forcible	90,92
→***MAT***	Mixed Air Temperature		dF	MAT		90,92
→***EDT***	Evaporator Discharge Tmp		dF	EDT		90,92
→***LAT***	Leaving Air Temperature		dF	LAT		90,92
→***EC.C.P***	Economizer Control Point		dF	ECONCPNT		90,92
→***ECN.P***	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS		90,92
→***EC2.P***	Economzr Act.Curr.Pos.	0-100	%	ECON2POS		90,92
→***CL.C.P***	Cooling Control Point		dF	COOLCPNT		90,92
→***C.CAP***	Current Running Capacity			CAPTOTAL		90,92
→***CL.ST***	Requested Cool Stage			CL_STAGE		90,92
→***HT.C.P***	Heating Control Point		dF	HEATCPNT		90,92
→***HT.ST***	Requested Heat Stage			HT_STAGE		90,92
→***H.MAX***	Maximum Heat Stages			HTMAXSTG		90,92
ECON	ECONOMIZER RUN STATUS					
→***ECN.P***	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS		69,93
→***EC2.P***	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS		69,93
→***ECN.C***	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible	69,93
→***ACTV***	Economizer Active ?	YES/NO		ECACTIVE		69,93
→***DISA***	ECON DISABLING CONDITIONS					
→***DISA***→***UNV.1***	Econ Act. Unavailable?	YES/NO		ECONUNAV		69,93
→***DISA***→***UNV.2***	Econ2 Act. Unavailable?	YES/NO		ECN2UNAV		69,93
→***DISA***→***ENTH***	Enth. Switch Read High ?	YES/NO		ENTH		69,93
→***DISA***→***DBC***	DBC - OAT Lockout?	YES/NO		DBC_STAT		69,93
→***DISA***→***DEW***	DEW - OA Dewpt.Lockout?	YES/NO		DEW_STAT		69,93
→***DISA***→***DDBC***	DDBD- OAT > RAT Lockout?	YES/NO		DDBCSTAT		69,93
→***DISA***→***OAEC***	OAEC- OA Enth Lockout?	YES/NO		OAECSTAT		69,93
→***DISA***→***DEC***	DEC - Diff.Enth.Lockout?	YES/NO		DEC_STAT		69,93
→***DISA***→***EDT***	EDT Sensor Bad?	YES/NO		EDT_STAT		69,93
→***DISA***→***OAT***	OAT Sensor Bad ?	YES/NO		OAT_STAT		69,93
→***DISA***→***FORC***	Economizer Forced ?	YES/NO		ECONFORC		69,93
→***DISA***→***SFON***	Supply Fan Not On 30s ?	YES/NO		SFONSTAT		69,93
→***DISA***→***CLOF***	Cool Mode Not In Effect?	YES/NO		COOL_OFF		69,93
→***DISA***→***OAQL***	OAQ Lockout in Effect ?	YES/NO		OAQLOCKD		69,93
→***DISA***→***HELD***	Econ Recovery Hold Off?	YES/NO		ECONHELD		69,93
→***DISA***→***DH.DS***	Dehumid. Disabled Econ.?	YES/NO		DHDISABL		69,93
→***O.AIR***	OUTSIDE AIR INFORMATION					69,93
→***O.AIR***→***OAT***	Outside Air Temperature		dF	OAT	forcible	69,93
→***O.AIR***→***OA.RH***	Outside Air Rel. Humidity		%	OARH	forcible	69,93
→***O.AIR***→***OA.E***	Outside Air Enthalpy			OAE		69,93
→***O.AIR***→***OA.D.T***	OutsideAir Dewpoint Temp		dF	OADEWTMP		69,93
COOL	COOLING INFORMATION					
→***C.CAP***	Current Running Capacity		%	CAPTOTAL		92,93
→***CUR.S***	Current Cool Stage			COOL_STG		92,93
→***REQ.S***	Requested Cool Stage			CL_STAGE		92,93
→***MAX.S***	Maximum Cool Stages			CLMAXSTG		92,93
→***DEM.L***	Active Demand Limit		%	DEM_LIM	forcible	92,93
→***SUMZ***	COOL CAP. STAGE CONTROL					
→***SUMZ***→***SMZ***	Capacity Load Factor	-100 → +100		SMZ		92,93
→***SUMZ***→***ADD.R***	Next Stage EDT Decrease		^F	ADDRISE		92,93
→***SUMZ***→***SUB.R***	Next Stage EDT Increase		^F	SUBRISE		92,93
→***SUMZ***→***R.PCT***	Rise Per Percent Capacity			RISE_PCT		92,93
→***SUMZ***→***Y.MIN***	Cap Deadband Subtracting			Y_MINUS		92,93
→***SUMZ***→***Y.PLU***	Cap Deadband Adding			Y_PLUS		92,93
→***SUMZ***→***Z.MIN***	Cap Threshold Subtracting			Z_MINUS		92,93
→***SUMZ***→***Z.PLU***	Cap Threshold Adding			Z_PLUS		92,93
→***SUMZ***→***H.TMP***	High Temp Cap Override			HI_TEMP		92,93
→***SUMZ***→***L.TMP***	Low Temp Cap Override			LOW_TEMP		92,93
→***SUMZ***→***PULL***	Pull Down Cap Override			PULLDOWN		92,93
→***SUMZ***→***SLOW***	Slow Change Cap Override			SLO_CHNG		92,93
TRIP	MODE TRIP HELPER					
→***UN.C.S***	Unoccup. Cool Mode Start			UCCLSTRT		93
→***UN.C.E***	Unoccup. Cool Mode End			UCCL_END		93
→***OC.C.S***	Occupied Cool Mode Start			OCCLSTRT		93
→***OC.C.E***	Occupied Cool Mode End			OCCL_END		93
→***TEMP***	Ctl.Temp RAT,SPT or Zone			CTRLTEMP		93
→***OC.H.E***	Occupied Heat Mode End			OCHT_END		93
→***OC.H.S***	Occupied Heat Mode Start			OCHTSTRT		93
→***UN.H.E***	Unoccup. Heat Mode End			UCHT_END		93
→***UN.H.S***	Unoccup. Heat Mode Start			UCHTSTRT		93
→***HVAC***	ascii string spelling out the hvac modes			string		93
LINK	CCN - LINKAGE					
→***MODE***	Linkage Active - CCN	ON/OFF		MODELINK		94
→***L.Z.T***	Linkage Zone Control Tmp		dF	LZT		94
→***L.C.SP***	Linkage Curr. Cool Setpt		dF	LCSP		94
→***L.H.SP***	Linkage Curr. Heat Setpt		dF	LHSP		94
HRS	COMPRESSOR RUN HOURS					
→***HR.A1***	Compressor A1 Run Hours	0-999999	HRS	HOURS_A1	config	94
→***HR.A2***	Compressor A2 Run Hours	0-999999	HRS	HOURS_A2	config	94
→***HR.B1***	Compressor B1 Run Hours	0-999999	HRS	HOURS_B1	config	94
→***HR.B2***	Compressor B2 Run Hours	0-999999	HRS	HOURS_B2	config	94
STRT	COMPRESSOR STARTS					
→***ST.A1***	Compressor A1 Starts	0-999999		CY_A1	config	94
→***ST.A2***	Compressor A2 Starts	0-999999		CY_A2	config	94
→***ST.B1***	Compressor B1 Starts	0-999999		CY_B1	config	94
→***ST.B2***	Compressor B2 Starts	0-999999		CY_B2	config	94
VERS	SOFTWARE VERSION NUMBERS					
→***MBB***	CESR131292-xx-xx			string		94
→***RCB***	CESR131249-xx-xx			string		94
→***ECB***	CESR131249-xx-xx			string		94
→***SCB***	CESR131226-xx-xx			string		94
→***CEM***	CESR131174-xx-xx			string		94
→***ECON***	xx-xx-xxx-xxx-xx			string		94
→***IGV***	xx-xx-xxx-xxx-xx			string		94
→***HUMD***	xx-xx-xxx-xxx-xx			string		94
→***HEAT***	xx-xx-xxx-xxx-xx			string		94
→***BP1***	xx-xx-xxx-xxx-xx			string		94
→***BP2***	xx-xx-xxx-xxx-xx			string		94
→***MARQ***	CESR131171-xx-xx			string		94
→***NAVI***	CESR130227-xx-xx			string		94

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		36,37
STOP	Local Machine Disable	YES/NO		UNITSTOP	config	36,37
S.STP	Soft Stop Request	YES/NO		SOFTSTOP	forcible	36,37
FAN.F	Supply Fan Request	YES/NO		SFANFORC	forcible	36,37
INDP	TEST INDEPENDENT OUTPUTS					
→***HUM.R***	Humidifier Relay	ON/OFF		HUMR_TST		37
→***ALRM***	Remote Alarm / Aux Relay	ON/OFF		ALRM_TST		37
FANS	TEST FANS					
→***F.MOD***	Fan Test Automatic?	YES/NO		FANAUTO		37,38
→***E.POS***	Econo Damper Command Pos		%	ECONFANS		37
→***S.FAN***	Supply Fan Relay	ON/OFF		SFAN_TST		37
→***I.POS***	IGV Actuator Command Pos	0-100	%	IGVFNTST		37
→***S.VFD***	Supply Fan VFD Speed	0-100	%	SGVFDTST		37
→***P.E.1***	Power Exhaust Relay 1	ON/OFF		PE1_TST		37
→***P.E.2***	Power Exhaust Relay 2	ON/OFF		PE2_TST		37
→***BP1.P***	BP 1 Command Position	0-100	%	BLDPTST1		37
→***BP2.P***	BP 2 Command Position	0-100	%	BLDPTST2		37
→***E.VFD***	Exhaust Fan VFD Speed	0-100	%	EFVFDTST		37
→***CD.F.A***	Condenser Fan Circuit A	ON/OFF		CNDA_TST		37
→***CD.F.B***	Condenser Fan Circuit B	ON/OFF		CNDB_TST		37
→***CD.MM***	Motormaster Condensr Fan	ON/OFF		PCFABTST		37
ACT.C	CALIBRATE TEST-ACTUATORS					
→***ECN.C***	Economizer Act.Cmd.Pos.	0-100	%	ECONOTST		37
→***E.CAL***	Economizer Calibrate Cmd	YES/NO		ECONOCAL		37
→***ECN.A***	Econ Act. Control Angle	read only		ECONCANG		37
→***EC2.C***	Economzr 2 Act.Cmd.Pos.	0-100	%	ECON2TST		37
→***E2.CL***	Economzr 2 Calibrate Cmd	YES/NO		ECON2CAL		37
→***EC2.A***	Econ2 Act. Control Angle	read only		ECN2CANG		37
→***IGV.C***	IGV Actuator Command Pos	0-100	%	SPIGVTST		37
→***I.CAL***	IGV Act. Calibrate Cnd	YES/NO		IGV_CAL		37
→***IGV.A***	IGV Act. Control Angle	read only		IGC_CANG		37
→***IGV.M***	VFD-IGV Maximum Speed	0-100	%	STATPMAX		37
→***BP1.C***	BP 1 Command Position	0-100	%	BLDG1TST		37
→***B1.CL***	BP 1 Actuator Cal Cmd	YES/NO		BLDG1CAL		37
→***BP1.A***	BP Act.1 Control Angle	read only		BP1_CANG		37
→***BP1.M***	BP 1 Actuator Max Pos.	0-100	%	BP1SETMX		37
→***BP2.C***	BP 2 Command Position	0-100	%	BLDG2TST		37
→***B2.CL***	BP 2 Actuator Cal Cmd	YES/NO		BLDG2CAL		37
→***BP2.A***	BP Act.2 Control Angle	read only		BP2_CANG		37
→***BP2.M***	BP 2 Actuator Max Pos.	0-100	%	BP2SETMX		37
→***HTC.C***	Ht.Coil Command Position	0-100	%	HTCLACTC		37
→***HT.CL***	Heating Coil Act. Cal.Cmd	YES/NO		HCOILCAL		37
→***HTC.A***	Heat Coil Act.Ctl.Angle	read only		HTCLCANG		37
→***HMD.C***	Humidifier Command Pos.	0-100	%	HUMD_TST		37
→***HM.CL***	Humidifier Act. Cal.Cmd	YES/NO		HUMIDCAL		37
→***HMD.A***	Humidifier Act.Ctrl.Ang.	read only		HUMDCANG		37
COOL	TEST COOLING					
→***E.POS***	Econo Damper Command Pos	0-100	%	ECONCOOL		37,38
→***SP.SP***	Static Pressure Setpoint	0-5	"H2O	SPSP_TST		37,38
→***CL.ST***	Requested Cool Stage	0-n		CLST_TST		37,38
→***LD.LG***	Lead/Lag Select Test	LEAD/LAG		LL_TST		37,38
→***A1***	Compressor A1 Relay	ON/OFF		CMPA1TST		37,38
→***U1.A1***	Unloader 1 - Comp A1	ON/OFF		UNL1_TST		37
→***U2.A1***	Unloader 2 - Comp A1	ON/OFF		UNL2_TST		37
→***A2***	Compressor A2 Relay	ON/OFF		CMPA2TST		37
→***B1***	Compressor B1 Relay	ON/OFF		CMPB1TST		37
→***U1.B1***	Unloader 1 - Comp B1	ON/OFF		UNL3_TST		37
→***U2.B1***	Unloader 2 - Comp B1	ON/OFF		UNL4_TST		37
→***B2***	Compressor B2 Relay	ON/OFF		CMPB2TST		37
HEAT	TEST HEATING					
→***HT.ST***	Requested Heat Stage	0-n		HTST_TST		37,38
→***HT.1***	Heat Relay 1	ON/OFF		HS1_TST		37,38
→***HT.2***	Heat Relay 2	ON/OFF		HS2_TST		37,38
→***HT.3***	Relay 3 W1 Gas Valve 2	ON/OFF		HS3_TST		37,38
→***HT.4***	Relay 4 W2 Gas Valve 2	ON/OFF		HS4_TST		37,38
→***HT.5***	Relay 5 W1 Gas Valve 3	ON/OFF		HS5_TST		37,38
→***HT.6***	Relay 6 W2 Gas Valve 3	ON/OFF		HS6_TST		37,38
→***H.I.R***	Heat Interlock Relay	ON/OFF		HIR_TST		37,38
→***HTC.C***	Ht.Coil Command Position	0-100	%	HTCLHEAT		37,38

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 Gas LAT Sum		dF	LAT_SGAS	
→***S.G.L1***	Staged Gas LAT 1		dF	LAT1SGAS	
→***S.G.L2***	Staged Gas LAT 2		dF	LAT2SGAS	
→***S.G.L3***	Staged Gas 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	

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

APPENDIX A — LOCAL DISPLAY TABLES (cont)

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.B1***	Compressor B1 Feedback	ON/OFF		CSB_B1	
→***CS.B2***	Compressor B2 Feedback	ON/OFF		CSB_B2	
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	
→CD.F.A	Condenser Fan Circuit A	ON/OFF		CONDFANA	
→CD.F.B	Condenser Fan Circuit B	ON/OFF		CONDFANB	
→CD.MM	Motormaster Condensr Fan	ON/OFF		PULSCFAB	
COOL	COOLING				
→A1	Compressor A1 Relay	ON/OFF		CMPA1	
→U1.A1	Unloader 1 - Comp A1	ON/OFF		UNL_1_A1	
→U2.A1	Unloader 2 - Comp A1	ON/OFF		UNL_2_A1	
→A2	Compressor A2 Relay	ON/OFF		CMPA2	
→B1	Compressor B1 Relay	ON/OFF		CMPB1	
→U1.B1	Unloader 1 - Comp B1	ON/OFF		UNL_1_B1	
→U2.B1	Unloader 2 - Comp B1	ON/OFF		UNL_2_B1	
→B2	Compressor B2 Relay	ON/OFF		CMPB2	
HEAT	HEATING				
→HT.1	Heat Relay 1	ON/OFF		HS1	
→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
→IGV.P	IGV Actuator Current Pos	0-100	%	IGV_RPOS	
→IGV.C	IGV Actuator Command Pos	0-100	%	IGV_CPOS	
→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

MODE — CONFIGURATION

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
UNIT	UNIT CONFIGURATION					
→C.TYP	Machine Control Type	1 - 6 (multi-text strings)		CTRLTYPE	4	42,44
→CV.FN	Fan Mode (0=Auto, 1=Cont)	0 - 1 (multi-text strings)		FAN_MODE	1	44
→RM.CF	Remote Switch Config	0 - 3 (multi-text strings)		RMTINCFG	0	44
→CEM	CEM Module Installed	Yes/No		CEM_BRD	No	44
→TCS.C	Temp.Cmp.Strt.Cool Factr	0 - 60	min	TCSTCOOL	0	44
→TCS.H	Temp.Cmp.Strt.Heat Factr	0 - 60	min	TCSTHEAT	0	44
→SFS.S	Fan Fail Shuts Down Unit	Yes/No		SFS_SHUT	No	44
→SFS.M	Fan Stat Monitoring Type	0 - 2 (multi-text strings)		SFS_MON	0	44
→VAV.S	VAV Unocc.Fan Retry Time	0 - 720	min	SAMPMINS	50	44
→SIZE	Unit Size (30-105)	30 - 105		UNITSIZE	30	44
→50.HZ	50 Hertz Unit ?	Yes/No		UNIT_HZ	No	44,45
→MAT.S	MAT Calc Config	0 - 2 (multi-text strings)		MAT_SEL	1	44,45
→MAT.R	Reset MAT Table Entries?	Yes/No		MATRESET	No	44,45
→MAT.D	MAT Outside Air Default	0 -100	%	MATOAPOS	20	44,45
→ALTI	Altitude……..in feet:	0 - 60000		ALTITUDE	0	44,45
→DLAY	Startup Delay Time	0 -900	secs	DELAY	0	
→AUX.R	Auxiliary Relay Config	0 - 3 (multi-text strings)		AUXRELAY	0	
→SENS	INPUT SENSOR CONFIG					
→SENS→SPT.S	Space Temp Sensor	Enable/Disable		SPTSENS	Disable	44,45
→SENS→SP.O.S	Space Temp Offset Sensor	Enable/Disable		SPTOSENS	Disable	44,45
→SENS→SP.O.R	Space Temp Offset Range	1 - 10		SPTO_RNG	5	44,45
→SENS→SRH.S	Space Air RH Sensor	Enable/Disable		SPRHSENS	Disable	44,45
→SENS→RRH.S	Return Air RH Sensor	Enable/Disable		RARHSENS	Disable	44,45
→SENS→FLT.S	Filter Stat.Sw.Enabled ?	Enable/Disable		FLTS_ENA	Disable	44,45
COOL	COOLING CONFIGURATION					
→Z.GN	Capacity Threshold Adjst	-10 - 10		Z_GAIN	1	46,47
→MC.LO	Compressor Lockout Temp	-25 - 55	dF	OATLCOMP	40	46,47
→L.L.EN	Lead/Lag Operation ?	Yes/No		LLENABLE	No	46,47
→M.M.	Motor Master Control ?	Yes/No		MOTRMAST	No	46,47
→HPSP	Head Pressure Setpoint	80 - 150	dF	HPSP	113	46,47
→A1.EN	Enable Compressor A1	Enable/Disable		CMPA1ENA	Enable	46,47
→A2.EN	Enable Compressor A2	Enable/Disable		CMPA2ENA	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
→CS.A1	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	Enable	46,47
→CS.A2	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	Enable	47
→CS.B1	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	Enable	47
→CS.B2	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	Enable	47
→HPS.A	CMPA1 Hi.Pr.Sw. Trip	365 - 415	PSIG	HPSATRIP	415	47
→HPS.B	CMPB1 Hi.Pr.Sw. Trip	365 - 415	PSIG	HPSBTRIP	415	47
→H.SST	Hi SST Alert Delay Time	5 - 30	min	HSSTTIME	10	47

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
EDT.R	EVAP.DISCHRGE TEMP RESET					
→RS.CF	EDT Reset Configuration	0 - 3 (multi-text strings)		EDRSTCFG	2	46,47
→RTIO	Reset Ratio	0 - 10		RTIO	3	46,47
→LIMT	Reset Limit	0 - 20	deltaF	LIMT	10	46,47
→RES.S	EDT 4-20 ma Reset Input	Enable/Disable		EDTRSENS	Disable	46,47
HEAT	HEATING CONFIGURATION					
→HT.CF	Heating Control Type	0 - 4		HEATTYPE	0	54,55
→HT.SP	Heating Supply Air Setpt	80 - 120	dF	SASPHEAT	85	54,55
→OC.EN	Occupied Heating Enabled	Yes/No		HTOCCENA	No	54,55
→LAT.M	MBB Sensor Heat Relocate	Yes/No		HTLATMON	No	54,55
→SG.CF	STAGED GAS CONFIGS					
→SG.CF→HT.ST	Staged Gas Heat Type	0 - 4		HTSTGTYP	0	54,57,58
→SG.CF→CAP.M	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45	54,57,58
→SG.CF→M.R.DB	S.Gas DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5	54,57,58
→SG.CF→S.G.DB	St.Gas Temp. Dead Band	0 - 5	^F	HT_SG_DB	2	54,57,58
→SG.CF→RISE	Heat Rise dF/sec Clamp	0.05 - 0.2		HTSGRISE	0.06	54,57,58
→SG.CF→LAT.L	LAT Limit Config	0 - 20	^F	HTLATLIM	10	54,57,58
→SG.CF→LIM.M	Limit Switch Monitoring?	Yes/No		HTLIMMON	Yes	54,57,58
→SG.CF→SW.H.T	Limit Switch High Temp	110 - 180	dF	HT_LIMHI	170	54,57,58
→SG.CF→SW.L.T	Limit Switch Low Temp	100 - 170	dF	HT_LIMLO	160	54,57,58
→SG.CF→HT.P	Heat Control Prop. Gain	0 - 1.5		HT_PGAIN	1	54,57,58
→SG.CF→HT.D	Heat Control Derv. Gain	0 - 1.5		HT_DGAIN	1	54,58
→SG.CF→HT.TM	Heat PID Rate Config	60 - 300	sec	HTSGPIDR	90	54,58
→HH.CF	HYDRONIC HEAT CONFIGS					
→HH.CF→HW.P	Hydronic Ctl.Prop. Gain	0 - 1.5		HW_PGAIN	1	54,57
→HH.CF→HW.I	Hydronic Ctl.Integ. Gain	0 - 1.5		HW_IGAIN	1	54,57
→HH.CF→HW.D	Hydronic Ctl.Derv. Gain	0 - 1.5		HW_DGAIN	1	54,57
→HH.CF→HW.TM	Hydronic PID Rate Config	15 - 300	sec	HOTWPIDR	90	54,57
→HH.CF→ACT.C	HYDR.HEAT ACTUATOR CFGS.					
→HH.CF→ACTC→SN.1	Hydronic Ht.Serial Num.1	0 - 255		HTCL_SN1	0	54,57
→HH.CF→ACTC→SN.2	Hydronic Ht.Serial Num.2	0 - 255		HTCL_SN2	0	54,57
→HH.CF→ACTC→SN.3	Hydronic Ht.Serial Num.3	0 - 255		HTCL_SN3	0	54,57
→HH.CF→ACTC→SN.4	Hydronic Ht.Serial Num.4	0 - 255		HTCL_SN4	0	54,57
→HH.CF→ACTC→SN.5	Hydronic Ht.Serial Num.5	0 - 255		HTCL_SN5	0	54,57
→HH.CF→ACTC→C.A.LM	Hydr.Ht.Ctl.Ang.Lo Limit	0-90		HTCLCALM	85	54,57
SP	SUPPLY STATIC PRESS.CFG.					
→SP.CF	Static Pressure Config	0-2 (multi-text strings)		STATICFG	0	62
→SP.S	Static Pressure Sensor	Enable/Disable		SPSENS	Disable	62
→SP.LO	Static Press. Low Range	-10 - 0		SP_LOW	0	62
→SP.HI	Static Press. High Range	0 - 10		SP_HIGH	5	62
→SP.SP	Static Pressure Setpoint	0 - 5		SPSP	1.5	62
→SP.MN	VFD-IGV Minimum Speed	0 - 100		STATPMIN	20	62
→SP.MX	VFD-IGV Maximum Speed	0 - 100		STATPMAX	100	62
→SP.FS	VFD-IGV Fire Speed Over.	0 - 100		STATPFSO	100	62
→SP.RS	Stat. Pres. Reset Config	0 - 4 (multi-text strings)		SPRSTCFG	0	62
→SP.RT	SP Reset Ratio	0.00 - 2.00		SPRRATIO	0.20	62
→SP.LM	SP Reset Limit	0.00 - 2.00		SPRLIMIT	0.75	62
→SP.EC	SP Reset Econo. Position	0 - 100	%	ECONOSPR	5	62,63
→S.PID	STAT.PRESS.PID CONFIGS					
→S.PID→SP.TM	Stat.Pres.PID Run Rate	5 - 120		SPIDRATE	15	62,63
→S.PID→SP.P	Static Press. Prop. Gain	0 - 5		STATP_PG	0.5	62,63
→S.PID→SP.I	Static Pressure Intg. Gain	0 - 2		STATP_IG	0.5	62,63
→S.PID→SP.D	Static Pressure Derv. Gain	0 - 5		STATP_DG	0.3	62,63
→ACT.C	IGV ACTUATOR CONFIGS					
→ACTC→SN.1	IGV Serial Number 1	0 - 255		IGV_SN1	0	62,63
→ACTC→SN.2	IGV Serial Number 2	0 - 255		IGV_SN2	0	62,63
→ACTC→SN.3	IGV Serial Number 3	0 - 255		IGV_SN3	0	62,63
→ACTC→SN.4	IGV Serial Number 4	0 - 255		IGV_SN4	0	62,63
→ACTC→SN.5	IGV Serial Number 5	0 - 255		IGV_SN5	0	62,63
→ACTC→C.A.LM	IGV Cntrl Angle Lo Limit	0-90		IGV_CALM	25	62,63
ECON	ECONOMIZER CONFIGURATION					
→EC.EN	Economizer Installed?	Yes/No		ECON_ENA	Yes	65,66
→EC2.E	Econ.Act.2 Installed?	Yes/No		ECON_TWO	No	65,66
→EC.MN	Economizer Min.Position	0 - 100	%	ECONOMIN	5	65,66
→EC.MX	Economizer Max.Position	0 - 100	%	ECONOMAX	98	65,66
→E.TRM	Economzr Trim For SumZ ?	Yes/No		ECONTRIM	Yes	65,66
→E.SEL	Econ ChangeOver Select	0 - 3 (multi-text strings)		ECON_SEL	0	66
→OA.E.C	OA Enthalpy ChgOvr Selct	1 - 5 (multi-text strings)		OAEC_SEL	4	66
→OA.EN	Outdr.Enth Compare Value	18 - 28		OAEN_CFG	24	66
→OAT.L	High OAT Lockout Temp	-40 - 120	dF	OAT_LOCK	60	66
→O.DEW	OA Dewpoint Temp Limit	50 - 62	dF	OADEWCFG	55	66,67
→ORH.S	Outside Air RH Sensor	Enable/Disable		OARHSENS	Disable	66
→CFM.C	OUTDOOR AIR CFM CONTROL					
→CFM.C→OCF.S	Outdoor Air CFM Sensor	Enable/Disable		OCFMSENS	Disable	66,68
→CFM.C→O.C.MX	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000	66,68
→CFM.C→O.C.MN	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0	66,68
→CFM.C→O.C.DB	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400	66,68
→E.CFG	ECON.OPERATION CONFIGS					
→E.CFG→E.P.GN	Economizer Prop.Gain	0.7 - 3.0		EC_PGAIN	1	66
→E.CFG→E.RNG	Economizer Range Adjust	0.5 - 5	^F	EC_RANGE	2.5	66
→E.CFG→E.SPD	Economizer Speed Adjust	0.1 - 10		EC_SPEED	0.75	66
→E.CFG→E.DBD	Economizer Deadband	0.1 - 2	^F	EC_DBAND	0.5	66
→UEFC	UNOCC.ECON.FREE COOLING					
→UEFC→FC.CF	Unoc Econ Free Cool Cfg	0-2 (multi-text strings)		UEFC_CFG	0	66,68
→UEFC→FC.TM	Unoc Econ Free Cool Time	0 - 720	min	UEFCTIME	120	66,68
→UEFC→FC.L.O	Un.Ec.Free Cool OAT Lock	40 - 70	dF	UEFCNTLO	50	66,68
→ACT.C	ECON.ACTUATOR CONFIGS					
→ACTC→SN.1.1	Econ Serial Number 1	0 - 255		ECON_SN1	0	66,67
→ACTC→SN.1.2	Econ Serial Number 2	0 - 255		ECON_SN2	0	66,67
→ACTC→SN.1.3	Econ Serial Number 3	0 - 255		ECON_SN3	0	66,67
→ACTC→SN.1.4	Econ Serial Number 4	0 - 255		ECON_SN4	0	66,67
→ACTC→SN.1.5	Econ Serial Number 5	0 - 255		ECON_SN5	0	66,67
→ACTC→C.A.L1	Econ Ctrl Angle Lo Limit	0 - 90		ECONCALM	85	66
→ACTC→SN.2.1	Econ 2 Serial Number 1	0 - 255		ECN2_SN1	0	66,67
→ACTC→SN.2.2	Econ 2 Serial Number 2	0 - 255		ECN2_SN2	0	66,67
→ACTC→SN.2.3	Econ 2 Serial Number 3	0 - 255		ECN2_SN3	0	66,67
→ACTC→SN.2.4	Econ 2 Serial Number 4	0 - 255		ECN2_SN4	0	66,67
→ACTC→SN.2.5	Econ 2 Serial Number 5	0 - 255		ECN2_SN5	0	66,67
→ACTC→C.A.L2	Ecn2 Ctrl Angle Lo Limit	0 - 90		ECN2CALM	85	66

APPENDIX A — LOCAL DISPLAY TABLES (cont)

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	70,71
→***BP.S***	Building Pressure Sensor	Enable/Disable		BPSENS	Disable	70,71
→***BP.R***	Bldg. Press. (+/-) Range	0.10 - 0.25	"H2O	BP_RANGE	0.25	70,71
→***BP.SP***	Building Pressure Setp.	-0.25 - 0.25	"H2O	BPSP	0.05	70,71
→***BP.SO***	BP Setpoint Offset	0 - 0.5	"H2O	BPSO	0.05	70,71
→***BP.P1***	Power Exhaust On Setp.1	0 - 100	%	PES1	25	70,71
→***BP.P2***	Power Exhaust On Setp.2	0 - 100	%	PES2	75	70,71
→***B.V.A***	VFD/ACTUATOR CONFIG					
→***B.V.A***→***BP.FS***	VFD/Act. Fire Speed/Pos.	0 - 100	%	BLDGPFSO	100	70,71
→***B.V.A***→***BP.MN***	VFD/Act. Min.Speed/Pos.	0 - 50	%	BLDGPMIN	0	70,71
→***B.V.A***→***BP.MX***	VFD Maximum Speed	50 - 100	%	BLDGPMAX	100	70,71
→***B.V.A***→***BP.1M***	BP 1 Actuator Max Pos.	85 - 100	%	BP1SETMX	100	70,71
→***B.V.A***→***BP.2M***	BP 2 Actuator Max Pos.	85 - 100	%	BP2SETMX	100	70,71
→***B.V.A***→***BP.CL***	BP Hi Cap VFD Clamp Val.	5 - 25	%	BLDGCLMP	10	70,71
→***FAN.T***	FAN TRACKING CONFIG					
→***FAN.T***→***FT.CF***	Fan Track Learn Enable	Yes/No		DCFM_CFG	No	70,71
→***FAN.T***→***FT.TM***	Fan Track Learn Rate	5-60	min	DCFMRATE	15	70,71
→***FAN.T***→***FT.ST***	Fan Track Initial DCFM	-20000 - 20000	CFM	DCFMSTRT	2000	70,71
→***FAN.T***→***FT.MX***	Fan Track Max Clamp	0 - 20000	CFM	DCFM_MAX	4000	70,71
→***FAN.T***→***FT.AD***	Fan Track Max Correction	0 -20000	CFM	DCFM_ADJ	1000	70,71
→***FAN.T***→***FT.OF***	Fan Track Internl EEPROM	-20000 - 20000	CFM	DCFM_OFF	0	70,71
→***FAN.T***→***FT.RM***	Fan Track Internal RAM	-20000 - 20000	CFM	DCFM_RAM	0	70,71
→***FAN.T***→***FT.RS***	Fan Track Reset Internal	Yes/No		DCFMRSET	No	70,71
→***FAN.T***→***SCF.C***	Supply Air CFM Config	1 - 2 (multi-text strings)		SCFM_CFG	1	70,71
→***B.PID***	BLDG.PRESS.PID CONFIGS					
→***B.PID***→***BP.TM***	Bldg.Pres.PID Run Rate	5 - 120	sec	BPIDRATE	10	70,71
→***B.PID***→***BP.P***	Bldg.Press. Prop. Gain	0 - 5		BLDGP_PG	0.5	70,71
→***B.PID***→***BP.I***	Bldg.Press. Integ. Gain	0 - 2		BLDGP_IG	0.5	70,71
→***B.PID***→***BP.D***	Bldg.Press. Deriv. Gain	0 - 5		BLDGP_DG	0.3	70,71
→***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 - 255		BP_1_SN1	0	70-72
→***ACT.C***→***BP.1***→***SN.2***	BP 1 Serial Number 2	0 - 255		BP_1_SN2	0	70-72
→***ACT.C***→***BP.1***→***SN.3***	BP 1 Serial Number 3	0 - 255		BP_1_SN3	0	70-72
→***ACT.C***→***BP.1***→***SN.4***	BP 1 Serial Number 4	0 - 255		BP_1_SN4	0	70-72
→***ACT.C***→***BP.1***→***SN.5***	BP 1 Serial Number 5	0 - 255		BP_1_SN5	0	70-72
→***ACT.C***→***BP.1***→***C.A.LM***	BP1 Cntrl Angle Lo Limit	0-90		BP1_CALM	35	70-72
→***ACT.C***→***BP.2***	BLDG.PRES. ACT.2 CONFIGS					
→***ACT.C***→***BP.2***→***SN.1***	BP 2 Serial Number 1	0 - 255		BP_2_SN1	0	70-72
→***ACT.C***→***BP.2***→***SN.2***	BP 2 Serial Number 2	0 - 255		BP_2_SN2	0	70-72
→***ACT.C***→***BP.2***→***SN.3***	BP 2 Serial Number 3	0 - 255		BP_2_SN3	0	70-72
→***ACT.C***→***BP.2***→***SN.4***	BP 2 Serial Number 4	0 - 255		BP_2_SN4	0	70-72
→***ACT.C***→***BP.2***→***SN.5***	BP 2 Serial Number 5	0 - 255		BP_2_SN5	0	70-72
→***ACT.C***→***BP.2***→***C.A.LM***	BP2 Cntrl Angle Lo Limit	0-90		BP2_CALM	35	70-72
D.LV.T	COOL/HEAT SETPT. OFFSETS					
→***L.H.ON***	Dmd Level Lo Heat On	-1 - 2	^F	DMDLHON	1.5	48,55,56
→***H.H.ON***	Dmd Level(+) Hi Heat On	0.5 - 20.0	^F	DMDHHON	0.5	48,55,56
→***L.H.OF***	Dmd Level(-) Lo Heat Off	0.5 - 2.0	^F	DMDLHOFF	1	48,55,56
→***L.C.ON***	Dmd Level Lo Cool On	-1 - 2	^F	DMDLCON	1.5	48,49,55
→***H.C.ON***	Dmd Level(+) Hi Cool On	0.5 - 20.0	^F	DMDHCON	0.5	48,49,55
→***L.C.OF***	Dmd Level(-) Lo Cool Off	0.5 - 2.0	^F	DMDLCOFF	1	48,49,55
→***C.T.LV***	Cool Trend Demand Level	0.1 - 5.0	^F	CTRENDLV	0.1	48,49,55
→***H.T.LV***	Heat Trend Demand Level	0.1 - 5.0	^F	HTRENDLV	0.1	48,55,56
→***C.T.TM***	Cool Trend Time	30 - 600	sec	CTRENDTM	120	48,49,55
→***H.T.TM***	Heat Trend Time	30 - 600	sec	HTRENDTM	120	48,55,56
DMD.L	DEMAND LIMIT CONFIG.					
→***DM.L.S***	Demand Limit Select	0 - 3 (multi-text strings)		DMD_CTRL	0	52,53
→***D.L.20***	Demand Limit at 20 ma	0 - 100	%	DMT20MA	100	53
→***SH.NM***	Loadshed Group Number	0 - 99		SHED_NUM	0	53
→***SH.DL***	Loadshed Demand Delta	0 - 60	%	SHED_DEL	0	53
→***SH.TM***	Maximum Loadshed Time	0 - 120	min	SHED_TIM	60	53
→***D.L.S1***	Demand Limit Sw.1 Setpt.	0 - 100	%	DLSWSP1	80	53
→***D.L.S2***	Demand Limit Sw.2 Setpt.	0 - 100	%	DLSWSP2	50	53
IAQ	INDOOR AIR QUALITY CFG.					
→***DCV.C***	DCV ECONOMIZER SETPOINTS					
→***DCV.C***→***EC.MN***	Economizer Min.Position	0 - 100	%	ECONOMIN	5	74-76
→***DCV.C***→***IAQ.M***	IAQ Demand Vent Min.Pos.	0 - 100	%	IAQMINP	0	74,75
→***DCV.C***→***O.C.MX***	Economizer Min.Flow	0 - 20000	CFM	OACFMMAX	2000	74
→***DCV.C***→***O.C.MN***	IAQ Demand Vent Min.Flow	0 - 20000	CFM	OACFMMIN	0	74
→***DCV.C***→***O.C.DB***	Econ.Min.Flow Deadband	200 - 1000	CFM	OACFM_DB	400	74
→***AQ.CF***	AIR QUALITY CONFIGS					
→***AQ.CF***→***IQ.A.C***	IAQ Analog Sensor Config	0 - 4 (multi-text strings)		IAQANCFG	0	74
→***AQ.CF***→***IQ.A.F***	IAQ 4-20 ma Fan Config	0 - 2 (multi-text strings)		IAQANFAN	0	74
→***AQ.CF***→***IQ.I.C***	IAQ Discrete Input Config	0 - 2 (multi-text strings)		IAQINCFG	0	74,75
→***AQ.CF***→***IQ.I.F***	IAQ Disc.In. Fan Config	0 - 2 (multi-text strings)		IAQINFAN	0	74,75
→***AQ.CF***→***OQ.A.C***	OAQ 4-20ma Sensor Config	0 - 2 (multi-text strings)		OAQANCFG	0	74,75
→***AQ.SP***	AIR QUALITY SETPOINTS					
→***AQ.SP***→***IQ.O.P***	IAQ Econo Override Pos.	0 - 100	%	IAQOVPOS	100	74,75
→***AQ.SP***→***IQ.O.C***	IAQ Override Flow	0 - 31000	CFM	IAQOVCFM	10000	74
→***AQ.SP***→***DAQ.L***	Diff.Air Quality LoLimit	0 - 1000		DAQ_LOW	100	74-76
→***AQ.SP***→***DAQ.H***	Diff. Air Quality HiLimit	100 - 2000		DAQ_HIGH	700	74-76
→***AQ.SP***→***D.F.OF***	DAQ PPM Fan Off Setpoint	0 - 2000		DAQFNOFF	200	74,75
→***AQ.SP***→***D.F.ON***	DAQ PPM Fan On Setpoint	0 - 2000		DAQFNON	400	74,75
→***AQ.SP***→***IAQ.R***	Diff. AQ Responsiveness	-5 - 5		IAQREACT	0	74,76
→***AQ.SP***→***OAQ.L***	OAQ Lockout Value	0 - 2000		OAQLOCK	0	74,75
→***AQ.SP***→***OAQ.U***	User Determined OAQ	0 - 5000		OAQ_USER	400	74
→***AQ.S.R***	AIR QUALITY SENSOR RANGE					
→***AQ.S.R***→***IQ.R.L***	IAQ Low Reference	0 - 5000		IAQREFL	0	74,75
→***AQ.S.R***→***IQ.R.H***	IAQ High Reference	0 - 5000		IAQREFH	2000	74,75
→***AQ.S.R***→***OQ.R.L***	OAQ Low Reference	0 - 5000		OAQREFL	0	74,76
→***AQ.S.R***→***OQ.R.H***	OAQ High Reference	0 - 5000		OAQREFH	2000	74,76
→***IAQ.P***	IAQ PRE-OCCUPIED PURGE					
→***IAQ.P***→***IQ.PG***	IAQ Purge	Yes/No		IAQPURGE	No	74,76
→***IAQ.P***→***IQ.P.T***	IAQ Purge Duration	5 - 60	min	IAQPTIME	15	74,76
→***IAQ.P***→***IQ.P.L***	IAQ Purge LoTemp Min Pos	0 - 100	%	IAQPLTMP	10	74,76
→***IAQ.P***→***IQ.P.H***	IAQ Purge HiTemp Min Pos	0 - 100	%	IAQPHTMP	35	74,76
→***IAQ.P***→***IQ.L.O***	IAQ Purge OAT Lockout	35 - 70	dF	IAQPNTLO	50	74,76

APPENDIX A — LOCAL DISPLAY TABLES (cont)

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
HUMD	HUMIDITY CONFIGURATION					
→***HM.CF***	Humidifier Control Cfg.	0 - 4		HUMD_CFG	0	76,77
→***HM.SP***	Humidifier Setpoint	0 - 100	%	HUSP	40	76,77
→***H.PID***	HUMIDIFIER PID CONFIGS					
→***H.PID***→***HM.TM***	Humidifier PID Run Rate	10 - 120	sec	HUMDRATE	30	76,77
→***H.PID***→***HM.P***	Humidifier Prop. Gain	0 - 5		HUMID_PG	1	76,77
→***H.PID***→***HM.I***	Humidifier Integral Gain	0 - 5		HUMID_IG	0.3	76,77
→***H.PID***→***HM.D***	Humidifier Deriv. Gain	0 - 5		HUMID_DG	0.3	76,77
→***ACT.C***	HUMIDIFIER ACTUATOR CFGS					
→***ACTC***→***SN.1***	Humd Serial Number 1	0 - 255		HUMD_SN1	0	77
→***ACTC***→***SN.2***	Humd Serial Number 2	0 - 255		HUMD_SN2	0	77
→***ACTC***→***SN.3***	Humd Serial Number 3	0 - 255		HUMD_SN3	0	77
→***ACTC***→***SN.4***	Humd Serial Number 4	0 - 255		HUMD_SN4	0	77
→***ACTC***→***SN.5***	Humd Serial Number 5	0 - 255		HUMD_SN5	0	77
→***ACTC***→***C.A.LM***	Humd Ctrl Angle Lo Limit	0-90		HUMDCALM	85	77
DEHU	DEHUMIDIFICATION CONFIG.					
→***D.SEL***	Dehumidification Config	0-3(multi-text strings)		DHSELECT	0	77,78
→***D.SEN***	Dehumidification Sensor	1-3(multi-text strings)		DHSENSOR	1	78
→***D.EC.D***	Econ disable in DH mode?	Yes/No		DHECDISA	Yes	78
→***D.V.CF***	Vent Reheat Setpt Select	0-1(multi-text strings)		DHVHTCFG	0	78
→***D.V.RA***	Vent Reheat RAT offset	0-8	^F	DHVRAOFF	0	78
→***D.V.HT***	Vent Reheat Setpoint	55-95	dF	DHVHT_SP	70	78
→***D.C.SP***	Dehumidify Cool Setpoint	40-55	dF	DHCOOLSP	45	78
→***D.RH.S***	Dehumidify RH Setpoint	10-90	%	DHRELHSP	55	78
CCN	CCN CONFIGURATION					
→***CCNA***	CCN Address	1 - 239		CCNADD	1	79,80
→***CCNB***	CCN Bus Number	0 - 239		CCNBUS	0	79,80
→***BAUD***	CCN Baud Rate	1 - 5 (multi-text strings)		CCNBAUDD	3	79,80
→***BROD***	CCN BROADCST DEFINITIONS					
→***BROD***→***TM.DT***	CCN Time/Date Broadcast	ON/OFF		CCNBC	On	79,80
→***BROD***→***OAT.B***	CCN OAT Broadcast	ON/OFF		OATBC	Off	79,80
→***BROD***→***ORH.B***	CCN OARH Broadcast	ON/OFF		OARHBC	Off	79,80
→***BROD***→***OAQ.B***	CCN OAQ Broadcast	ON/OFF		OAQBC	Off	79,80
→***BROD***→***G.S.B***	Global Schedule Broadcst	ON/OFF		GSBC	Off	79,80
→***BROD***→***B.ACK***	CCN Broadcast Ack'er	ON/OFF		CCNBCACK	Off	79,80
→***SC.OV***	CCN SCHEDULES-OVERRIDES					
→***SC.OV***→***SCH.N***	Schedule Number	0 - 99		SCHEDNUM	1	79,80
→***SC.OV***→***HOL.T***	Accept Global Holidays?	YES/NO		HOLIDAYT	No	79,80
→***SC.OV***→***O.T.L.***	Override Time Limit	0 - 4	HRS	OTL	1	79,80
→***SC.OV***→***OV.EX***	Timed Override Hours	0 - 4	HRS	OVR_EXT	0	79,80
→***SC.OV***→***SPT.O***	SPT Override Enabled ?	YES/NO		SPT_OVER	Yes	79,80
→***SC.OV***→***T58.O***	T58 Override Enabled ?	YES/NO		T58_OVER	Yes	79,80
→***SC.OV***→***GL.OV***	Global Sched. Override ?	YES/NO		GLBLOVER	No	79,80
ALLM	ALERT LIMIT CONFIG.					
→***SP.L.O***	SPT lo alert limit/occ	-10-245	dF	SPLO	60	80,81
→***SP.H.O***	SPT hi alert limit/occ	-10-245	dF	SPHO	85	80,81
→***SP.L.U***	SPT lo alert limit/unocc	-10-245	dF	SPLU	45	80,81
→***SP.H.U***	SPT hi alert limit/unocc	-10-245	dF	SPHU	100	80,81
→***SA.L.O***	EDT lo alert limit/occ	-40-245	dF	SALO	40	80,81
→***SA.H.O***	EDT hi alert limit/occ	-40-245	dF	SAHO	100	80,81
→***SA.L.U***	EDT lo alert limit/unocc	-40-245	dF	SALU	40	80,81
→***SA.H.U***	EDT hi alert limit/unocc	-40-245	dF	SAHU	100	80,81
→***RA.L.O***	RAT lo alert limit/occ	-40-245	dF	RALO	60	80,81
→***RA.H.O***	RAT hi alert limit/occ	-40-245	dF	RAHO	90	80,81
→***RA.L.U***	RAT lo alert limit/unocc	-40-245	dF	RALU	40	80,81
→***RA.H.U***	RAT hi alert limit/unocc	-40-245	dF	RAHU	100	80,81
→***OAT.L***	OAT lo alert limit	-40-245	dF	OATL	-40	80,81
→***OAT.H***	OAT hi alert limit	-40-245	dF	OATH	150	80,81
→***R.RH.L***	RARH low alert limit	0-100	%	RRHL	0	80,81
→***R.RH.H***	RARH high alert limit	0-100	%	RRHH	100	80,81
→***O.RH.L***	OARH low alert limit	0-100	%	ORHL	0	80,81
→***O.RH.H***	OARH high alert limit	0-100	%	ORHH	100	80,81
→***SP.L***	SP low alert limit	0-5	"H2O	SPL	0	80,81
→***SP.H***	SP high alert limit	0-5	"H2O	SPH	2	81
→***BP.L***	BP lo alert limit	-0.25-0.25	"H2O	BPL	-0.25	81
→***BP.H***	BP high alert limit	-0.25-0.25	"H2O	BPH	0.25	81
→***IAQ.H***	IAQ high alert limit	0-5000		IAQH	1200	81
TRIM	SENSOR TRIM CONFIG.					
→***SAT.T***	Air Temp Lvg SF Trim	-10 - 10	^F	SAT_TRIM	0	81,82
→***RAT.T***	RAT Trim	-10 - 10	^F	RAT_TRIM	0	81,82
→***OAT.T***	OAT Trim	-10 - 10	^F	OAT_TRIM	0	81,82
→***SPT.T***	SPT Trim	-10 - 10	^F	SPT_TRIM	0	81,82
→***L.SW.T***	Limit Switch Trim	-10 - 10	^F	LSW_TRIM	0	81,82
→***CCT.T***	Air Temp Lvg Evap Trim	-10 - 10	^F	CCT_TRIM	0	81,82
→***SP.A.T***	Suct.Press.Circ.A Trim	-50 - 50	PSIG	SPA_TRIM	0	81,82
→***SP.B.T***	Suct.Press.Circ.B Trim	-50 - 50	PSIG	SPB_TRIM	0	81,82
→***DP.A.T***	Dis.Press.Circ.A Trim	-50 - 50	PSIG	DPA_TRIM	0	81,82
→***DP.B.T***	Dis.Press.Circ.B Trim	-50 - 50	PSIG	DPB_TRIM	0	81,82
SW.LG	SWITCH LOGIC: NO / NC					
→***FTS.L***	Filter Status Inpt-Clean	Open/Close		FLTSLOGC	Open	82
→***IGC.L***	IGC Feedback - Off	Open/Close		GASFANLG	Open	82
→***RMI.L***	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG	Open	82
→***ENT.L***	Enthalpy Input - Low	Open/Close		ENTHLOGC	Close	82
→***SFS.L***	Fan Status Sw. - Off	Open/Close		SFSLOGIC	Open	82
→***DL1.L***	Dmd.Lmt.Sw.1 - Off	Open/Close		DMD_SW1L	Open	82
→***DL2.L***	Dmd.Lmt.Sw.2 - Off	Open/Close		DMD_SW2L	Open	82
→***IAQ.L***	IAQ Disc.Input - Low	Open/Close		IAQINLOG	Open	82
→***FSD.L***	Fire Shutdown - Off	Open/Close		FSDLOGIC	Open	82
→***PRS.L***	Pressurization Sw. - Off	Open/Close		PRESLOGC	Open	82
→***EVC.L***	Evacuation Sw. - Off	Open/Close		EVACLOGC	Open	82
→***PRG.L***	Smoke Purge Sw. - Off	Open/Close		PURGLOGC	Open	82
→***DH.LG***	Dehumidify Sw. - Off	Open/Close		DHDISCLG	Open	82
DISP	DISPLAY CONFIGURATION					
→***TEST***	Test Display LEDs	ON/OFF		TEST	Off	82,83
→***METR***	Metric Display	ON/OFF		DISPUNIT	Off	82,83
→***LANG***	Language Selection	0 - 1 (multi-text strings)		LANGUAGE	0	82,83
→***PAS.E***	Password Enable	ENABLE/DISABLE		PASS_EBL	Enable	82,83
→***PASS***	Service Password	0000 - 9999		PASSWORD	1111	82,83

MODE — TIMECLOCK

ACRONYM	NAME	RANGE	UNITS	CNN POINT	DEFAULTS	PAGE NO.
TIME	TIME OF DAY					
→HH.MM	Hour and Minute	00:00		TIME		84,85
DATE	MONTH,DATE,DAY AND YEAR					
→MNTH	Month of Year	multi-text strings		MOY		84,85
→DOM	Day of Month	0-31		DOM		84,85
→DAY	Day of Week	multi-text strings		DOWDISP		84,85
→YEAR	Year	e.g. 2003		YOCDISP		84,85
SCH.L	LOCAL TIME SCHEDULE					
→PER.1	PERIOD 1					84,85
→PER.1→DAYS	DAY FLAGS FOR PERIOD 1				Period 1 only	84,85
→PER.1→DAYS→MON	Monday in Period	YES/NO		PER1MON	Yes	84,85
→PER.1→DAYS→TUE	Tuesday in Period	YES/NO		PER1TUE	Yes	84,85
→PER.1→DAYS→WED	Wednesday in Period	YES/NO		PER1WED	Yes	84,85
→PER.1→DAYS→THU	Thursday in Period	YES/NO		PER1THU	Yes	84,85
→PER.1→DAYS→FRI	Friday in Period	YES/NO		PER1FRI	Yes	84,85
→PER.1→DAYS→SAT	Saturday in Period	YES/NO		PER1SAT	Yes	84,85
→PER.1→DAYS→SUN	Sunday in Period	YES/NO		PER1SUN	Yes	84,85
→PER.1→DAYS→HOL	Holiday in Period	YES/NO		PER1HOL	Yes	84,85
→PER.1→OCC	Occupied from	00:00		PER1_OCC	00:00	84,85
→PER.1→UNC	Occupied to	00:00		PER1_UNC	24:00	84,85
Repeated for periods 2 to 8						
HOL.L	LOCAL HOLIDAY SCHEDULES					
→HD.01	HOLIDAY SCHEDULE 01					84,85
→HD.01→MON	Holiday Start Month	0-12		HOL_MON1		84,85
→HD.01→DAY	Start Day	0-31		HOL_DAY1		84,85
→HD.01→LEN	Duration (Days)	0-99		HOL_LEN1		84,85
Repeated for holidays 2 to 30						84,85
DAY.S	DAYLIGHT SAVINGS TIME					
DS.ST	DAYLIGHT SAVINGS START					84,85
DS.ST→ST.MN	Month	1 - 12		STARTM	4	84,85
DS.ST→ST.WK	Week	1 - 5		STARTW	1	84,85
DS.ST→ST.DY	Day	1 - 7		STARTD	7	84,85
DS.ST→MIN.A	Minutes to Add	0 - 90		MINADD	60	84,85
DS.SP	DAYLIGHTS SAVINGS STOP					
DS.SP→SP.MN	Month	1 - 12		STOPM	10	84,85
DS.SP→SP.WK	Week	1 - 5		STOPW	5	85
DS.SP→SP.DY	Day	1 - 7		STOPD	7	85
DS.SP→MIN.S	Minutes to Subtract	0 - 90		MINSUB	60	85

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 Z 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	
	Curr.Calc. Cool Capacity		%	COOLCALC	
	Current Cool Stage			COOL_STG	
	Requested Cool Stage			CL_STAGE	
	Maximum Cool Stages			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	
	Current Cool Stage A			CLSTAGEA	
	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	
	Compressor A1 Relay			CMPA1	
	Unloader 1 - Comp A1			UNL_1_A1	
	Unloader 2 - Comp A1			UNL_2_A1	
	Compressor A2 Relay			CMPA2	
	Compressor A1 Feedback			CSB_A1	
	Compressor A2 Feedback			CSB_A2	
	Circ A High Press.Switch			CIRCAHPS	
	Circuit A Stage Inhibit			CIRAFAIL	
COOL_B					
	Current Cool Stage			COOL_STG	
	Current Cool Stage B			CLSTAGEB	
	Cir B Discharge Pressure		PSIG	DP_B	
	Cir B Suction Pressure		PSIG	SP_B	
	Cir B Sat.Condensing Tmp		dF	SCTB	
	Cir B Sat.Suction Temp.		dF	SSTB	
	Compressor B1 Relay			CMPB1	
	Unloader 1 - Comp B1			UNL_1_B1	
	Unloader 2 - Comp B1			UNL_2_B1	
	Compressor B2 Relay			CMPB2	
	Compressor B1 Feedback			CSB_B1	
	Compressor B2 Feedback			CSB_B2	
	Circ B High Press.Switch			CIRCBHPS	
	Circuit B Stage Inhibit			CIRBFAIL	
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 150				
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	
	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
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	
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

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
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 Gas LAT Sum		dF	LAT_SGAS	
	Staged Gas LAT 1		dF	LAT1SGAS	
	Staged Gas LAT 2		dF	LAT2SGAS	
	Staged Gas 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
UOUTPUTS					
	FANS				
	Supply Fan Relay	On/Off		SFAN	
	Supply Fan VFD Speed	0-100	%	SFAN_VFD	
	Supply Fan Request	Yes/No		SFANFORC	forcible
	Exhaust Fan VFD Speed	0-100	%	EFAN_VFD	
	Power Exhaust Relay 1	On/Off		PE1	
	Power Exhaust Relay 2	On/Off		PE2	
	Condenser Fan Circuit A	On/Off		CONDFANA	
	Condenser Fan Circuit B	On/Off		CONDFANB	
	MotorMaster Condensr Fan	On/Off		PULSCFAB	
	COOLING				
	Compressor A1 Relay	On/Off		CMPA1	
	Unloader 1 - Comp A1	On/Off		UNL_1_A1	
	Unloader 2 - Comp A1	On/Off		UNL_2_A1	
	Compressor A2 Relay	On/Off		CMPA2	
	Compressor B1 Relay	On/Off		CMPB1	
	Unloader 1 - Comp B1	On/Off		UNL_1_B1	
	Unloader 2 - Comp B1	On/Off		UNL_2_B1	
	Compressor B2 Relay	On/Off		CMPB2	
	HEATING				
	Heat Relay 1	On/Off		HS1	
	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
	IGV Actuator Current Pos	0-100	%	IGV_RPOS	
	IGV Actuator Command Pos	0-100	%	IGV_CPOS	
	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

APPENDIX B — CCN TABLES (cont)

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
ALARMDEF					
	Alarm Routing Control	00000000-11111111		ALRM_CNT	1100000
	Equipment Priority	0 - 7		EQP_TYPE	5
	Comm Failure Retry Time	1 - 240	min	RETRY_TM	10
	Re-Alarm Time	1 - 255	min	RE-ALARM	30
	Alarm System Name	up to 8 alphanum		ALRM_NAM	Z-SERIES
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
Ctlr-ID					
	Device Name:	Z-Series			
	Description:	Z Series Rooftop			
	Location:				
	Software Part Number:	CESR131292-XX-XX			
	Model Number:				
	Serial Number:				
	Reference Number:				
HOLIDAY	Broadcast Supervisory				
HOLDY01S	Holiday Start Month	1-12		HOL-MON	0
to	Start Day	1-31		HOL-DAY	0
HOLDY30S	Duration (days)	1-99		HOL-LEN	0
OCCDEFCS	Occupancy Supervisory				
	Timed Override Hours	0		OVR-EXT	
	Period 1 DOW (MTWTFSSH)	00000000		DOW1	
	Occupied From	0:00		OCCTOD1	
	Occupied To	0:00		UNOCTOD1	
	Period 2 DOW (MTWTFSSH)	00000000		DOW2	
	Occupied From	0:00		OCCTOD2	
	Occupied To	0:00		UNOCTOD2	
	Period 3 DOW (MTWTFSSH)	00000000		DOW3	
	Occupied From	0:00		OCCTOD3	
	Occupied To	0:00		UNOCTOD3	
	Period 4 DOW (MTWTFSSH)	00000000		DOW4	
	Occupied From	0:00		OCCTOD4	
	Occupied To	0:00		UNOCTOD4	
	Period 5 DOW (MTWTFSSH)	00000000		DOW5	
	Occupied From	0:00		OCCTOD5	
	Occupied To	0:00		UNOCTOD5	
	Period 6 DOW (MTWTFSSH)	00000000		DOW6	
	Occupied From	0:00		OCCTOD6	
	Occupied To	0:00		UNOCTOD6	
	Period 7 DOW (MTWTFSSH)	00000000		DOW7	
	Occupied From	0:00		OCCTOD7	
	Occupied To	0:00		UNOCTOD7	
	Period 8 DOW (MTWTFSSH)	00000000		DOW8	
	Occupied From	0:00		OCCTOD8	
	Occupied To	0:00		UNOCTOD8	

CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
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
SET_PNT					
	Occupied Heat Setpoint	55-80	dF	OHSP	68
	Occupied Cool Setpoint	55-80	dF	OCSP	75
	Unoccupied Heat Setpoint	40-80	dF	UHSP	55
	Unoccupied Cool Setpoint	75-95	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

SERVICE-CONFIG TABLES

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
	Bldg.Pressure Fire Speed	0 - 100	%	BLDGPFSO	100
	Bldg.Pressure Min. Speed	0 - 100	%	BLDGPMIN	10
	Bldg.Pressure Max. 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
	BP Hi Cap VFD Clamp Time	30 - 255	sec	BLDGWAIT	60
	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

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
BP__ (cont)					
	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 - 255		BP_1_SN1	0
	BP 1 Serial Number 2	0 - 255		BP_1_SN2	0
	BP 1 Serial Number 3	0 - 255		BP_1_SN3	0
	BP 1 Serial Number 4	0 - 255		BP_1_SN4	0
	BP 1 Serial Number 5	0 - 255		BP_1_SN5	0
	BP1 Cntrl Angle Lo Limit	0-90		BP1_CALM	35
	BP 2 Serial Number 1	0 - 255		BP_2_SN1	0
	BP 2 Serial Number 2	0 - 255		BP_2_SN2	0
	BP 2 Serial Number 3	0 - 255		BP_2_SN3	0
	BP 2 Serial Number 4	0 - 255		BP_2_SN4	0
	BP 2 Serial Number 5	0 - 255		BP_2_SN5	0
	BP2 Cntrl Angle Lo Limit	0-90		BP2_CALM	35
COOL					
	Capacity Threshold Adjst	-10 - 10		Z_GAIN	1
	Compressor Lockout Temp	-25 - 55	dF	OATLCOMP	40
	Lead/Lag Operation ?	Yes/No		LLENABLE	No
	Motor Master Control ?	Yes/No		MOTRMAST	No
	Head Pressure Setpoint	80 - 150	dF	HPSP	113
	Enable Compressor A1	Enable/Disable		CMPA1ENA	Enable
	Enable Compressor A2	Enable/Disable		CMPA2ENA	Enable
	Enable Compressor B1	Enable/Disable		CMPB1ENA	Enable
	Enable Compressor B2	Enable/Disable		CMPB2ENA	Enable
	CSB A1 Feedback Alarm	Enable/Disable		CSB_A1EN	Enable
	CSB A2 Feedback Alarm	Enable/Disable		CSB_A2EN	Enable
	CSB B1 Feedback Alarm	Enable/Disable		CSB_B1EN	Enable
	CSB B2 Feedback Alarm	Enable/Disable		CSB_B2EN	Enable
	CMPA1 Hi.Pr.Sw. Trip	365-415	PSIG	HPSATRIP	415
	CMPB1 Hi.Pr.Sw. Trip	365-415	PSIG	HPSBTRIP	415
	Hi SST Alert Delay Time	5 - 30	min	HSSTTIME	10
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
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	0-255		ECON_SN1	
	Econ Serial Number 2	0-255		ECON_SN2	
	Econ Serial Number 3	0-255		ECON_SN3	
	Econ Serial Number 4	0-255		ECON_SN4	
	Econ Serial Number 5	0-255		ECON_SN5	
	Econ Ctrl Angle Lo Limit	0-90		ECONCALM	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 - 4		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 Gas Heat Type	0 - 4		HTSTGTYP	0
	Max Cap Change per Cycle	5 - 45		HTCAPMAX	45
	S.Gas DB min.dF/PID Rate	0 - 5		HT_MR_DB	0.5
	St.Gas 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	60 - 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 - 255		HTCL_SN1	0
	Hydronic Ht.Serial Num.2	0 - 255		HTCL_SN2	0
	Hydronic Ht.Serial Num.3	0 - 255		HTCL_SN3	0
	Hydronic Ht.Serial Num.4	0 - 255		HTCL_SN4	0
	Hydronic Ht.Serial Num.5	0 - 255		HTCL_SN5	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 - 255		HUMD_SN1	0
	Humd Serial Number 2	0 - 255		HUMD_SN2	0
	Humd Serial Number 3	0 - 255		HUMD_SN3	0
	Humd Serial Number 4	0 - 255		HUMD_SN4	0
	Humd Serial Number 5	0 - 255		HUMD_SN5	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 Config	0 - 2		STATICFG	0
	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-IGV Minimum Speed	0 - 100	%	STATPMIN	10
	VFD-IGV Maximum Speed	0 - 100	%	STATPMAX	100
	VFD-IGV 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
	IGV Serial Number 1	0 - 255		IGV_SN1	0
	IGV Serial Number 2	0 - 255		IGV_SN2	0
	IGV Serial Number 3	0 - 255		IGV_SN3	0
	IGV Serial Number 4	0 - 255		IGV_SN4	0
	IGV Serial Number 5	0 - 255		IGV_SN5	0
	IGV Cntrl Angle Lo Limit	0-90		IGV_CALM	25
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
	Pressurization Sw. - 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
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
	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

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
UNIT					
	Machine Control Type	1-6		CTRLTYPE	4
	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
	Unit Size (30-105)	30-105		UNITSIZE	30
	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
	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
	Stat. Pres. Reset Sensor	Enable/Disable		SPRSTSEN	Disable
generics					
	POINT_01 Definition	8 CHAR ASCII		POINT_01	
	POINT_02 Definition	8 CHAR ASCII		POINT_02	
	POINT_03 Definition	8 CHAR ASCII		POINT_03	
	POINT_04 Definition	8 CHAR ASCII		POINT_04	
	POINT_05 Definition	8 CHAR ASCII		POINT_05	
	POINT_06 Definition	8 CHAR ASCII		POINT_06	
	POINT_07 Definition	8 CHAR ASCII		POINT_07	
	POINT_08 Definition	8 CHAR ASCII		POINT_08	
	POINT_09 Definition	8 CHAR ASCII		POINT_09	
	POINT_10 Definition	8 CHAR ASCII		POINT_10	
	POINT_11 Definition	8 CHAR ASCII		POINT_11	
	POINT_12 Definition	8 CHAR ASCII		POINT_12	
	POINT_13 Definition	8 CHAR ASCII		POINT_13	
	POINT_14 Definition	8 CHAR ASCII		POINT_14	
	POINT_15 Definition	8 CHAR ASCII		POINT_15	
	POINT_16 Definition	8 CHAR ASCII		POINT_16	
	POINT_17 Definition	8 CHAR ASCII		POINT_17	
	POINT_18 Definition	8 CHAR ASCII		POINT_18	
	POINT_19 Definition	8 CHAR ASCII		POINT_19	
	POINT_20 Definition	8 CHAR ASCII		POINT_20	

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					
COMPRESR					
	Compressor A1 Relay	On/Off		CMPA1	
	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 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	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
COMPRESR (cont)					
	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
COMPTRIP					
	Comp. Security Password	0-10000		COMPPASS	config
	Low SP Circ.A Trip 48.0			LSPATRIP	config
	Low SP Circ.B Trip 48.0			LSPBTRIP	config
	MOP 1/3 Lo SP Trip 28.0		PSIG	SP13L_T	config
	MOP 1/3 Lo DP Trip 242.7		PSIG	DP13L_T	config
	MOP 1/3 Hi SP Trip 75.0		PSIG	SP13H_T	config
	MOP 1/3 Hi DP Trip 430.0		PSIG	DP13H_T	config
	MOP 1/3 Mm DP Trip 3.985			DP13Mm_T	config
	MOP 1/3 Mb DP Tr 131.117			DP13Mb_T	config
	MOP 1/2 Lo SP Trip 28.0		PSIG	SP12L_T	config
	MOP 1/2 Lo DP Trip 242.7		PSIG	DP12L_T	config
	MOP 1/2 Hi SP Trip 61.5		PSIG	SP12H_T	config
	MOP 1/2 Hi DP Trip 430.0		PSIG	DP12H_T	config
	MOP 1/2 Mm DP Trip 5.591			DP12Mm_T	config
	MOP 1/2 Mb DP Trp 156.55			DP12Mb_T	config
	MOP 2/3 Lo SP Trip 28.0		PSIG	SP23L_T	config
	MOP 2/3 Lo DP Trip 316.2		PSIG	DP23L_T	config
	MOP 2/3 Hi SP Trip 57.4		PSIG	SP23H_T	config
	MOP 2/3 Hi DP Trip 430.0		PSIG	DP23H_T	config
	MOP 2/3 Mm DP Trip 3.871			DP23Mm_T	config
	MOP 2/3 Mb DP Trp 207.82			DP23Mb_T	config
	MOP Ful Lo SP Trip 28.0		PSIG	SPFLL_T	config
	MOP Ful Lo DP Trip 340.0		PSIG	DPFLL_T	config
	MOP Ful Hi SP Trip 52.4		PSIG	SPFLH_T	config
	MOP Ful Hi DP Trip 430.0		PSIG	DPFLH_T	config
	MOP Ful Mm DP Trip 3.689			DPFLMm_T	config
	MOP Ful Mb DP Trp 103.28			DPFLMb_T	config
DMANDLIM					
	Active Demand Limit	0-100	%	DEM_LIM	forcible
	Percent Total 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
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

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
LEN_ACTU					
	Economizer Act.Curr.Pos.	0-100	%	ECONOPOS	
	Economzr 2 Act.Curr.Pos.	0-100	%	ECON2POS	
	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
	IGV Actuator Current Pos.	0-100	%	IGV_RPOS	
	IGV Actuator Command Pos	0-100	%	IGV_CPOS	
	Humidifier Act.Curr.Pos.	0-100	%	HUMDRPOS	
	Humidifier Command Pos.	0-100	%	HUMDCPOS	
	Ht.Coil Act.Curr.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	
	Find LEN bus actuator ?	Yes/No		BELSERCH	config
	BELx Serial Number-			BELXSNUM	
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 VFD Speed		%	SFAN_VFD	
	IGV Actuator Current Pos		%	IGV_RPOS	
	IGV Actuator Command Pos		%	IGV_CPOS	
	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 Gas LAT Sum		dF	LAT_SGAS	
	Staged Gas LAT 1		dF	LAT1SGAS	
	Staged Gas LAT 2		dF	LAT2SGAS	
	Staged Gas LAT 3		dF	LAT3SGAS	
	Staged Gas Limit Sw.Temp		dF	LIMSWTMP	
	Heat PID Timer		sec	HTSGTIMR	
	Staged Gas 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 B1 Run Hours		hours	HR_B1	config
	Compressor B2 Run Hours		hours	HR_B2	config
	Compressor A1 Starts			CY_A1	config
	Compressor A2 Starts			CY_A2	config
	Compressor B1 Starts			CY_B1	config
	Compressor B2 Starts			CY_B2	config
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
	Econo Damper Current 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	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
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
TESTACTC					
	Economizer Act.Cmd.Pos.	0-100	%	ECONOTST	
	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	
	IGV Actuator Command Pos	0-100	%	SPIGVTST	
	IGV Act. Calibrate Cnd	YES/NO		IGV_CAL	
	IGV Act. Control Angle	read only		IGC_CANG	
	VFD-IGV Maximum Speed	0-100	%	STATPMAX	
	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	
	Lead/Lag Select Test	LEAD/LAG		LL_TST	
	Compressor A1 Relay	ON/OFF		CMPA1TST	
	Unloader 1 - Comp A1	ON/OFF		UNL1_TST	
	Unloader 2 - Comp A1	ON/OFF		UNL2_TST	
	Compressor A2 Relay	ON/OFF		CMPA2TST	
	Compressor B1 Relay	ON/OFF		CMPB1TST	
	Unloader 1 - Comp B1	ON/OFF		UNL3_TST	
	Unloader 2 - Comp B1	ON/OFF		UNL4_TST	
	Compressor B2 Relay	ON/OFF		CMPB2TST	
TESTFANS					
	Fan Test Automatic?	YES/NO		FANAUTO	
	Econo Damper Command Pos		%	ECONFANS	
	Supply Fan Relay	ON/OFF		SFAN_TST	
	IGV Actuator Command Pos	0-100	%	IGVFNTST	
	Supply Fan VFD Speed	0-100	%	SGVFDTST	
	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 VFD Speed	0-100	%	EFVFDTST	
	Condenser Fan Circuit A	ON/OFF		CNDA_TST	
	Condenser Fan Circuit B	ON/OFF		CNDB_TST	
	Motormaster Condensr Fan	ON/OFF		PCFABTST	
TESTHEAT					
	Requested Heat Stage	0-n		HTST_TST	
	Heat Relay 1	ON/OFF		HS1_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	
TESTINDP					
	Humidifier Relay	ON/OFF		HUMR_TST	
	Remote Alarm / Aux Relay	ON/OFF		ALRM_TST	
VERSIONS					
	MBB CESR131292-	ascii version#		MBB_SW	
	RCB CESR131249-	ascii version#		RCB_SW	
	ECB CESR131249-	ascii version#		ECB_SW	
	SCB CESR131226-	ascii version#		SCB_SW	
	CEM CESR131174-	ascii version#		CEM_SW	
	Economizr Serial Number-	ascii serial num		ECONSNUM	
	IGV Serial Number-	ascii serial num		IGV_SNUM	
	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

STAGING SEQUENCE — SIZE 030 UNITS — 60 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	16%
	2	1	1	0	0	0	0	0	0	32%
	3	1	0	0	0	0	0	0	0	50%
	4	1	0	0	0	1	1	1	0	66%
	5	1	0	0	0	1	1	0	0	82%
	6	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	16%
	2	0	0	0	0	1	1	0	0	32%
	3	0	0	0	0	1	0	0	0	50%
	4	1	1	1	0	1	0	0	0	66%
	5	1	1	0	0	1	0	0	0	82%
	6	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 030 UNITS — 50 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	0	0	0	0	0	0	29%
	2	1	1	0	0	1	1	1	0	43%
	3	1	1	0	0	1	1	0	0	57%
	4	1	0	0	0	1	1	1	0	71%
	5	1	0	0	0	1	1	0	0	85%
	6	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	14%
	2	0	0	0	0	1	1	0	0	28%
	3	1	1	0	0	1	1	1	0	43%
	4	1	1	0	0	1	1	0	0	57%
	5	1	0	0	0	1	1	1	0	71%
	6	1	0	0	0	1	1	0	0	85%
	7	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 035 UNITS

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	14%
	2	1	1	0	0	0	0	0	0	28%
	3	1	1	1	0	1	1	0	0	43%
	4	1	1	0	0	1	1	0	0	57%
	5	1	1	1	0	1	0	0	0	71%
	6	1	1	0	0	1	0	0	0	85%
	7	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	0	0	29%
	2	1	1	1	0	1	1	0	0	43%
	3	1	1	0	0	1	1	0	0	57%
	4	1	1	1	0	1	0	0	0	71%
	5	1	1	0	0	1	0	0	0	85%
	6	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

APPENDIX C — UNIT STAGING TABLES (cont)

STAGING SEQUENCE — SIZE 040 UNITS — 60 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	0	0	0	0	0	0	25%
	2	1	0	0	0	0	0	0	0	50%
	3	1	0	0	0	1	1	0	0	75%
	4	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	0	0	25%
	2	0	0	0	0	1	0	0	0	50%
	3	1	1	0	0	1	0	0	0	75%
	4	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 040 UNITS — 50 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	19%
	2	1	1	0	0	0	0	0	0	37%
	3	1	1	1	0	1	1	0	0	41%
	4	1	1	0	0	1	1	0	0	59%
	5	1	1	1	0	1	0	0	0	62%
	6	1	1	0	0	1	0	0	0	80%
	7	1	0	0	0	1	1	0	0	89%
	8	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	0	0	22%
	2	0	0	0	0	1	0	0	0	43%
	3	1	1	0	0	1	1	0	0	59%
	4	1	1	1	0	1	0	0	0	62%
	5	1	1	0	0	1	0	0	0	80%
	6	1	0	0	0	1	1	0	0	89%
	7	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 050 UNITS

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	19%
	2	1	1	0	0	0	0	0	0	37%
	3	1	0	0	0	0	0	0	0	57%
	4	1	1	1	0	1	0	0	0	62%
	5	1	1	0	0	1	0	0	0	80%
	6	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	0	0	22%
	2	1	1	1	0	1	1	0	0	41%
	3	1	1	0	0	1	1	0	0	59%
	4	1	1	1	0	1	0	0	0	62%
	5	1	1	0	0	1	0	0	0	80%
	6	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 055 UNITS — 60 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	20%
	2	1	1	0	0	0	0	0	0	40%
	3	1	0	0	0	0	0	0	0	60%
	4	1	0	0	0	1	1	0	0	80%
	5	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	0	0	20%
	2	0	0	0	0	1	0	0	0	40%
	3	1	1	1	0	1	0	0	0	60%
	4	1	1	0	0	1	0	0	0	80%
	5	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

APPENDIX C — UNIT STAGING TABLES (cont)

STAGING SEQUENCE — SIZE 055 UNITS — 50 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	19%
	2	1	1	0	0	0	0	0	0	37%
	3	1	1	1	0	1	1	0	0	48%
	4	1	1	0	0	1	1	1	0	51%
	5	1	1	1	0	1	0	0	0	62%
	6	1	1	0	0	1	1	0	0	66%
	7	1	0	0	0	1	1	1	0	71%
	8	1	1	0	0	1	0	0	0	80%
	9	1	0	0	0	1	1	0	0	86%
	10	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	14%
	2	0	0	0	0	1	1	0	0	29%
	3	1	1	1	0	1	1	1	0	33%
	4	1	1	1	0	1	1	0	0	48%
	5	1	1	0	0	1	1	1	0	51%
	6	1	1	1	0	1	0	0	0	62%
	7	1	1	0	0	1	1	0	0	66%
	8	1	0	0	0	1	1	1	0	71%
	9	1	1	0	0	1	0	0	0	80%
	10	1	0	0	0	1	1	0	0	86%
	11	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 060 UNITS — 60 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	17%
	2	1	1	0	0	0	0	0	0	33%
	3	1	0	0	0	0	0	0	0	50%
	4	1	0	0	0	1	1	1	0	67%
	5	1	0	0	0	1	1	0	0	83%
	6	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	17%
	2	0	0	0	0	1	1	0	0	33%
	3	0	0	0	0	1	0	0	0	50%
	4	1	1	1	0	1	0	0	0	67%
	5	1	1	0	0	1	0	0	0	83%
	6	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 060 UNITS — 50 Hz

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	17%
	2	1	1	0	0	0	0	0	0	33%
	3	1	0	0	0	0	0	0	0	50%
	4	1	0	0	0	1	1	1	0	67%
	5	1	0	0	0	1	1	0	0	83%
	6	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	17%
	2	0	0	0	0	1	1	0	0	33%
	3	0	0	0	0	1	0	0	0	50%
	4	1	1	1	0	1	0	0	0	67%
	5	1	1	0	0	1	0	0	0	83%
	6	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

APPENDIX C — UNIT STAGING TABLES (cont)

STAGING SEQUENCE — SIZE 070 AND 075 UNITS

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	14%
	2	1	1	0	0	0	0	0	0	29%
	3	1	0	0	0	0	0	0	0	43%
	4	1	1	1	0	1	1	0	0	51%
	5	1	1	0	0	1	1	0	0	66%
	6	1	1	1	0	1	0	0	0	71%
	7	1	1	0	0	1	0	0	0	86%
	8	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	19%
	2	1	1	1	0	1	1	1	0	33%
	3	1	1	0	0	1	1	1	0	48%
	4	1	1	1	0	1	1	0	0	51%
	5	1	1	0	0	1	1	0	0	66%
	6	1	1	1	0	1	0	0	0	71%
	7	1	1	0	0	1	0	0	0	86%
	8	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 090 UNITS

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	1	0	0	0	0	0	17%
	2	1	1	0	0	0	0	0	0	33%
	3	1	0	0	0	0	0	0	0	50%
	4	1	0	0	0	1	1	1	0	67%
	5	1	0	0	0	1	1	0	0	83%
	6	1	0	0	0	1	0	0	0	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	1	0	17%
	2	0	0	0	0	1	1	0	0	33%
	3	0	0	0	0	1	0	0	0	50%
	4	1	1	1	0	1	0	0	0	67%
	5	1	1	0	0	1	0	0	0	83%
	6	1	0	0	0	1	0	0	0	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

STAGING SEQUENCE — SIZE 105 UNITS

CIRCUIT A	STAGE	COMPRESSOR OR UNLOADER								PERCENT
		a1	u1	u2	a2	b1	u3	u4	b2	
Lead	0	0	0	0	0	0	0	0	0	0%
	1	1	1	0	0	0	0	0	0	20%
	2	1	0	0	0	0	0	0	0	30%
	3	1	1	0	1	0	0	0	0	40%
	4	1	0	0	1	0	0	0	0	50%
	5	1	1	0	1	1	1	0	0	60%
	6	1	0	0	1	1	1	0	0	70%
	7	1	0	0	1	1	0	0	0	80%
	8	1	0	0	1	1	1	0	1	90%
	9	1	0	0	1	1	0	0	1	100%
Lag	0	0	0	0	0	0	0	0	0	0%
	1	0	0	0	0	1	1	0	0	20%
	2	0	0	0	0	1	0	0	0	30%
	3	0	0	0	0	1	1	0	1	40%
	4	0	0	0	0	1	0	0	1	50%
	5	1	1	0	0	1	1	0	1	60%
	6	1	1	0	0	1	0	0	1	70%
	7	1	0	0	0	1	0	0	1	80%
	8	1	1	0	1	1	0	0	1	90%
	9	1	0	0	1	1	0	0	1	100%

LEGEND

0 — Off **a,b** — Compressor Circuit Designation
1 — On **u** — Unloader

APPENDIX D — VFD INFORMATION

On variable air volume units with optional VFD, the supply fan speed is controlled by a 3-phase VFD. The VFD is located in the supply fan section (030-050 units) or mixing box section (055-105 units) behind an access door. The VFD speed is controlled directly by the *Comfort*Link™ controls through a 4 to 20 mA signal based on a supply duct pressure sensor. The VFD has a display, which can be used for service diagnostics, but setup of the building pressure and control loop factors should be done through the scrolling marquee display. The VFD is powered during normal operation to prevent condensation from forming on the boards during the off mode and is stopped by driving the speed to 0 (by sending a 4 mA signal to the VFD).

The Z Series units use ABB VFDs. The interface wiring for the VFDs is shown in Fig. A. The VFD connects through an isolation board to the 4 to 20 mA RCB board. Terminal designations are shown in Table A. Configurations are shown in Table B.

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 (COMMON)	Factory-supplied jumper
X1-10 (24 VDC) X1-13 (DI-1)	Run (factory-supplied jumper)
X1-10 (24 VDC) X1-16 (DI-4)	Start Enable 1 (Factory-supplied jumper). When opened the drive goes to emergency stop.
X1-2 (AI-1) X1-3 (AGND)	Factory wired for 4 to 20 mA remote input

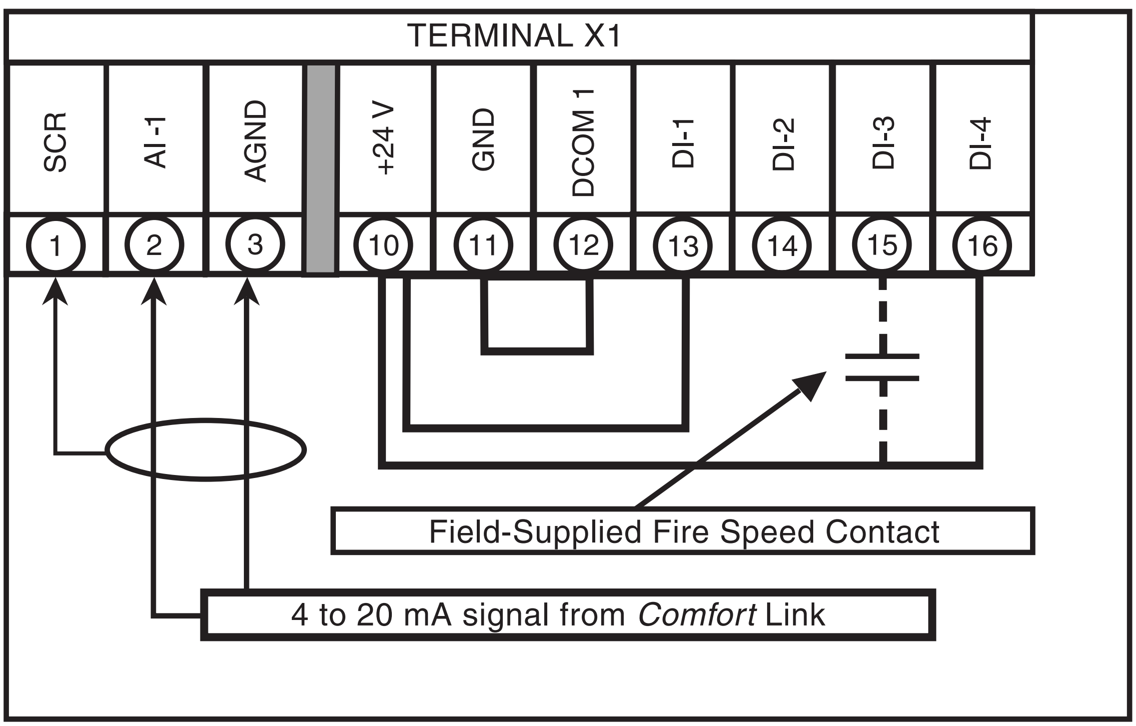


Fig. A — VFD Wiring

Table B — VFD Configurations

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	CARRIER DEFAULT
Start-Up Data	LANGUAGE	9901	ENGLISH
	APPLIC MACRO	9902	USER 1
	MOTOR CTRL MODE	9904	SCALAR: FREQ
	MOTOR NOM VOLT	9905	460v
	MOTOR NOM CURR	9906	*TBD*
	MOTOR NOM FREQ	9907	60 Hz
	MOTOR NOM SPEED	9908	1750 rpm
Start/Stop/Dir	EXT1 COMMANDS	1001	DI-1
	DIRECTION	1003	REVERSE
Analog Inputs	MINIMUM AI1	1301	20.0 %
	MAXIMUM AI1	1302	100.0 %
Relay Outputs	RELAY OUTPUT 1	1401	STARTED
	RELAY OUTPUT 2	1402	RUN
	RELAY OUTPUT 3	1403	FAULT (-1)
System Controls	RUN ENABLE	1601	NOT SELECTED
	START ENABLE 1	1608	DI-4
OVER RIDE	OVERRIDE SEL	1701	DI-3
	OVERRIDE FREQ	1702	60 Hz
	OVERRIDE SPEED	1703	1750 rpm
	OVER PASS CODE	1704	ENTERED
	OVERRIDE	1705	ON
	STOP FUNCTION	2102	RAMP
Accel/Decel	ACCELER TIME 1	2202	30.0s
	DECELER TIME 1	2203	30.0s
MOTOR	SWITCHING FREQ	2606	8 kHz

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.

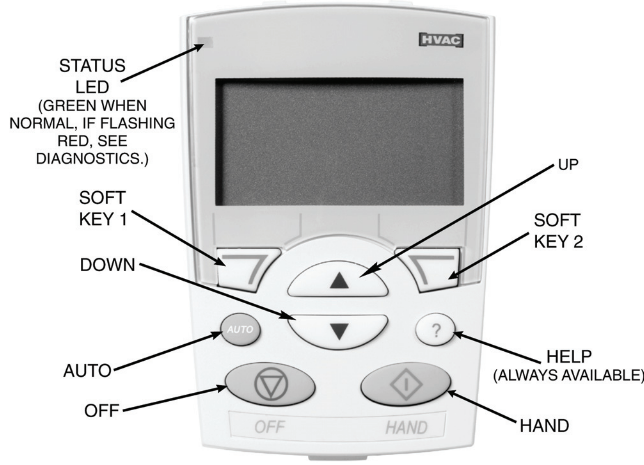


Fig. B — VFD Keypad

START UP WITH ASSISTANT — Initial start-up has been performed at the factory. To start up the VFD with the Start-Up Assistant or reset the VFD with the Carrier defaults, 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 Carrier Assistant and press SEL (SOFT KEY 2).
4. The Carrier Assistant will ask questions to determine the correct parameters for the VFD. Select the desired values and press SAVE (SOFT KEY 2) after every change. The process will continue until all the parameters are set.
   a. The Carrier Assistant will ask "Is this an Air Handler or Rooftop?" Select "Rooftop."
   b. The Carrier Assistant will ask "Is this a High E or Premium E motor?" Select the correct efficiency type.
   c. If the VFD can be used with two different size (HP) motors, then the Carrier Assistant will ask the user to choose the proper HP. Select the correct motor horsepower.

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.

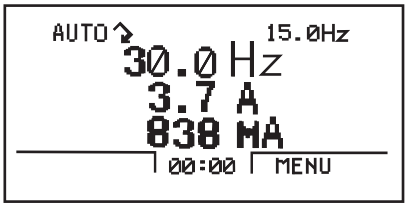


Fig. C — Standard Display Example

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 C. 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.

Table C — 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.

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), follow these steps:

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 D below to find and address the root cause of the problem.

Table D — 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).

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 E lists the routine maintenance intervals recommended by Carrier.

Table E — 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

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.

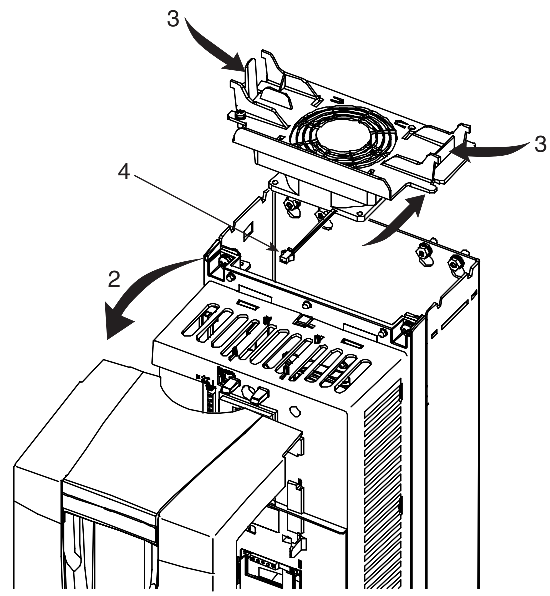


Fig. D — Main Fan Replacement (Frame Sizes R1-R4)

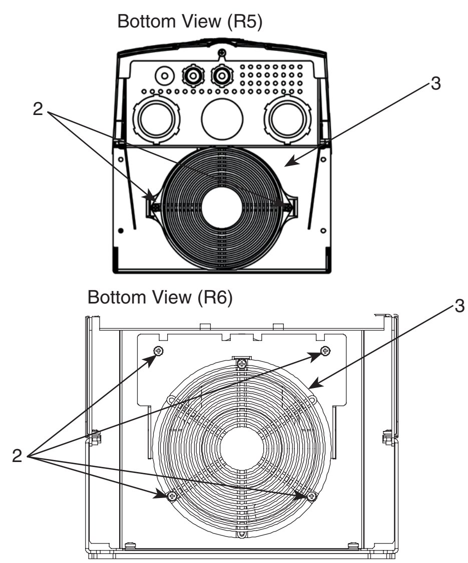


Fig. E — Main Fan Replacement (Frame Sizes R5 and R6)

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.

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.

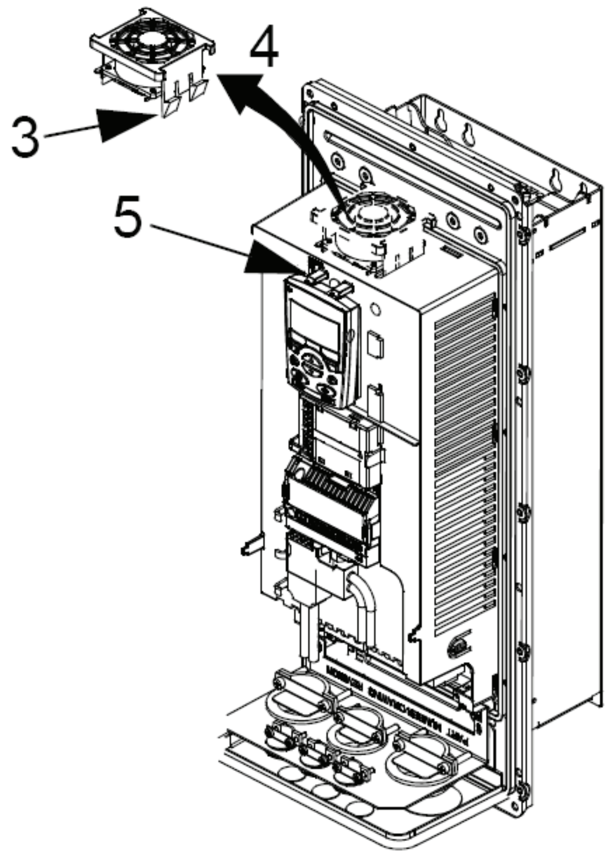


Fig. F — Internal Enclosure Fan Replacement

APPENDIX E — MODE SELECTION PROCESS

The following section is to be used in conjunction with Fig. 4 on page 43. 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.

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 ")

INDEX

CONTROLS SET POINT AND CONFIGURATION LOG

MODEL NUMBER:	______	**Software Version**	
SERIAL NUMBER:	______	**MBB**	CESR131292--
DATE:	______	**RCB**	CESR131249--
TECHNICIAN:	______	**ECB**	CESR131249--
		NAVI	CESR131227--
		SCB	CESR131226--
		CEM	CESR131174--
		MARQ	CESR131171--

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
UNIT	UNIT CONFIGURATION			
→**C.TYP**	Machine Control Type	1 - 6 (multi-text strings)	4	
→**CV.FN**	Fan Mode (0=Auto, 1=Cont)	0 - 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	
→**SIZE**	Unit Size (30-105)	30 - 105	30	
→**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			
→**Z.GN**	Capacity Threshold Adjst	-10 - 10	1	
→**MC.LO**	Compressor Lockout Temp	-25 - 55 dF	40	
→**L.L.EN**	Lead/Lag Operation ?	Yes/No	No	
→**M.M.**	Motor Master Control ?	Yes/No	No	
→**HPSP**	Head Pressure Setpoint	80 - 150 dF	113	
→**A1.EN**	Enable Compressor A1	Enable/Disable	Enable	
→**A2.EN**	Enable Compressor A2	Enable/Disable	Enable	
→**B1.EN**	Enable Compressor B1	Enable/Disable	Enable	
→**B2.EN**	Enable Compressor B2	Enable/Disable	Enable	
→**CS.A1**	CSB A1 Feedback Alarm	Enable/Disable	Enable	
→**CS.A2**	CSB A2 Feedback Alarm	Enable/Disable	Enable	
→**CS.B1**	CSB B1 Feedback Alarm	Enable/Disable	Enable	
→**CS.B2**	CSB B2 Feedback Alarm	Enable/Disable	Enable	
→**HPS.A**	CMPA1 Hi.Pr.Sw. Trip	365 - 415 PSIG	415	
→**HPS.B**	CMPB1 Hi.Pr.Sw. Trip	365 - 415 PSIG	415	
→**H.SST**	Hi SST Alert Delay Time	5 - 30 min	10	
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	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
HEAT	HEATING CONFIGURATION			
→**HT.CF**	Heating Control Type	0 - 4	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 GAS CONFIGS			
→**SG.CF**→**HT.ST**	Staged Gas Heat Type	0 - 4	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	110 - 180 dF	170	
→**SG.CF**→**SW.L.T**	Limit Switch Low Temp	100 - 170 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 - 255	0	
→**HH.CF**→**ACTC**→**SN.2**	Hydronic Ht.Serial Num.2	0 - 255	0	
→**HH.CF**→**ACTC**→**SN.3**	Hydronic Ht.Serial Num.3	0 - 255	0	
→**HH.CF**→**ACTC**→**SN.4**	Hydronic Ht.Serial Num.4	0 - 255	0	
→**HH.CF**→**ACTC**→**SN.5**	Hydronic Ht.Serial Num.5	0 - 255	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	0-2 (multi-text strings)	0	
→**SP.S**	Static Pressure Sensor	Enable/Disable	Disable	
→**SP.LO**	Static Press. Low Range	-10 - 0	0	
→**SP.HI**	Static Press. High Range	0 - 10	5	
→**SP.SP**	Static Pressure Setpoint	0 - 5	1.5	
→**SP.MN**	VFD-IGV Minimum Speed	0 - 100	20	
→**SP.MX**	VFD-IGV Maximum Speed	0 - 100	100	
→**SP.FS**	VFD-IGV 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	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	
→**ACT.C**	IGV ACTUATOR CONFIGS			
→**ACTC**→**SN.1**	IGV Serial Number 1	0 - 255	0	
→**ACTC**→**SN.2**	IGV Serial Number 2	0 - 255	0	
→**ACTC**→**SN.3**	IGV Serial Number 3	0 - 255	0	
→**ACTC**→**SN.4**	IGV Serial Number 4	0 - 255	0	
→**ACTC**→**SN.5**	IGV Serial Number 5	0 - 255	0	
→**ACTC**→**C.A.LM**	IGV Cntrl Angle Lo Limit	0-90	25	

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 - 255	0	
→ACTC→SN.1.2	Econ Serial Number 2	0 - 255	0	
→ACTC→SN.1.3	Econ Serial Number 3	0 - 255	0	
→ACTC→SN.1.4	Econ Serial Number 4	0 - 255	0	
→ACTC→SN.1.5	Econ Serial Number 5	0 - 255	0	
→ACTC→C.A.L1	Econ Ctrl Angle Lo Limit	0 - 90	85	
→ACTC→SN.2.1	Econ 2 Serial Number 1	0 - 255	0	
→ACTC→SN.2.2	Econ 2 Serial Number 2	0 - 255	0	
→ACTC→SN.2.3	Econ 2 Serial Number 3	0 - 255	0	
→ACTC→SN.2.4	Econ 2 Serial Number 4	0 - 255	0	
→ACTC→SN.2.5	Econ 2 Serial Number 5	0 - 255	0	
→ACTC→C.A.L2	Econ 2 Ctrl Angle Lo Limit	0 - 90	85	
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	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
BP (cont)				
→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 - 255	0	
→ACT.C→BP.1→SN.2	BP 1 Serial Number 2	0 - 255	0	
→ACT.C→BP.1→SN.3	BP 1 Serial Number 3	0 - 255	0	
→ACT.C→BP.1→SN.4	BP 1 Serial Number 4	0 - 255	0	
→ACT.C→BP.1→SN.5	BP 1 Serial Number 5	0 - 255	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 - 255	0	
→ACT.C→BP.2→SN.2	BP 2 Serial Number 2	0 - 255	0	
→ACT.C→BP.2→SN.3	BP 2 Serial Number 3	0 - 255	0	
→ACT.C→BP.2→SN.4	BP 2 Serial Number 4	0 - 255	0	
→ACT.C→BP.2→SN.5	BP 2 Serial Number 5	0 - 255	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	
→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	

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CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
IAQ (cont)				
→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 - 255	0	
→ACTC→SN.2	Humd Serial Number 2	0 - 255	0	
→ACTC→SN.3	Humd Serial Number 3	0 - 255	0	
→ACTC→SN.4	Humd Serial Number 4	0 - 255	0	
→ACTC→SN.5	Humd Serial Number 5	0 - 255	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	
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	
→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

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UNIT START-UP CHECKLIST

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 (48Z 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 (48Z ONLY)

ELECTRIC HEAT SUPPLY AIR __________ F (50Z ONLY, IF EQUIPPED)

PRESSURES

GAS INLET PRESSURE __________ IN. WG (48Z ONLY)

GAS MANIFOLD PRESSURE STAGE NO. 1 __________ IN. WG STAGE NO. 2 __________IN. WG (48Z ONLY)

REFRIGERANT SUCTION CIRCUIT NO. 1 __________PSIG CIRCUIT NO. 2__________ PSIG

REFRIGERANT DISCHARGE CIRCUIT NO. 2 __________ PSIG CIRCUIT NO. 2__________ PSIG

☐ ______________________ VERIFY REFRIGERANT CHARGE.

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