WeatherExpert®
48/50N2,N3,N4,N5,N6,N7,N8,N9
Packaged Rooftop Cooling Units with Gas Heat,
Optional Electric Heat, or Hydronic Heat and
*Comfort*Link Controls Version 10.x

Controls, Start-Up, Operation, Service and Troubleshooting

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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

ELECTRICAL SHOCK HAZARD

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

UNIT DAMAGE HAZARD

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.

⚠ DANGER

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

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

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
d. Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to the system.
e. Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

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

⚠ CAUTION

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

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

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

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

⚠ AVERTISSEMENT

RISQUE D´INCENDIE OU D´EXPLOSION

Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels.

Ne pas entreposer ni utiliser d´essence ni autres vapeurs ou liquides inflammables à proximité de cet appareil ou de tout autre appareil.

QUE FAIRE SI UNE ODEUR DE GAZ EST DÉTECTÉE

- Ne mettre en marche aucun appareil.
- Ne toucher aucun interrupteur électrique; ne pas utiliser de téléphone dans le bâtiment.
- Quitter le bâtiment immédiatement.
- Appeler immédiatement le fournisseur de gaz en utilisant le téléphone d´un voisin. Suivre les instructions du fournisseur de gaz.
- Si le fournisseur de gaz n´est pas accessible, appeler le service d´incendie.

L´installation et l´entretien doivent être effectués par un installateur ou une entreprise d´entretien qualifié, ou le fournisseur de gaz.

GENERAL

This book contains Start-Up, Controls, Operation, Troubleshooting, and Service information for the 48/50N Series rooftop units. See Table 1. These units are equipped with *Comfort*Link controls version 10.0 or higher. Use this guide in conjunction with the separate installation instructions packaged with the unit.

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

Table 1 — N Series Product Line

UNIT	SIZE	APPLICATION
48N2	All	Vertical Supply/Return, CV/SAV *Comfort*Link Controls
48N3	All	Vertical Supply/Return, VAV *Comfort*Link Controls
48N4	All	Horizontal Supply/Return, CV/SAV *Comfort*Link Controls
48N5	All	Horizontal Supply/Return, VAV *Comfort*Link Controls
48N6	All	Vertical Supply/Horizontal Return, CV/SAV *Comfort*Link Controls
48N7	All	Vertical Supply/Horizontal Return, VAV *Comfort*Link Controls
48N8	All	Horizontal Supply/Vertical Return, CV/SAV *Comfort*Link Controls
48N9	All	Horizontal Supply/Vertical Return, VAV *Comfort*Link Controls
50N2	All	Vertical Supply/Return, CV/SAV *Comfort*Link Controls
50N3	All	Vertical Supply/Return, VAV *Comfort*Link Controls
50N4	All	Horizontal Supply/Return, CV/SAV *Comfort*Link Controls
50N5	All	Horizontal Supply/Return, VAV *Comfort*Link Controls
50N6	All	Vertical Supply/Horizontal Return, CV/SAV *Comfort*Link Controls
50N7	All	Vertical Supply/Horizontal Return, VAV *Comfort*Link Controls
50N8	All	Horizontal Supply/Vertical Return, CV/SAV *Comfort*Link Controls
50N9	All	Horizontal Supply/Vertical Return, VAV *Comfort*Link Controls

LEGEND

CV — Constant Volume
SAV — Staged Air Volume
VAV — Variable Air Volume

The 48/50N 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(s) 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 via local display using the supplied Navigator™ device or through the Carrier Comfort Network® (CCN) using ComfortVIEW™ software, Network Service Tool, or other CCN device.

The *Comfort*Link system controls all aspects of the rooftop. It controls the supply-fan motor, compressors, and economizer to maintain the proper temperature conditions. The controls also cycle condenser fans to maintain suitable head pressure. All units are equipped with a supply fan VFD (variable frequency drive). The VAV units utilize the VFD 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 the building pressure using an optional VFD controlled power exhaust or return fan controlled from a building pressure sensor. The control safeties are continuously monitored to prevent the unit from operating under abnormal conditions. Sensors include pressure transducers and thermistors. For units on CV applications, the *Comfort*Link controls will direct the VFD to drive the supply fan at low speed for low cool or heat demand and high speed on high cool or heat demand.

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

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

Conventions Used in This Manual

This manual will use the following conventions for discussing configuration points for the local display (Navigator™).

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

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

When a value is included as part of the path name, it will be shown at the end of the path name after an equals sign. If the value represents a configuration setting, an explanation will be shown in parentheses after the value. As an example, ***Configuration→ IAQ→AQ.CF→IQ.AC*** = 1 (IAQ Analog Input).

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

The CCN (Carrier Comfort Network®) point names are also cross-referenced in the local display tables (Appendix A) for user interface with the unit via CCN instead of the local display. The CCN tables are located in Appendix B of this manual.

BASIC CONTROL USAGE

*Comfort*Link Controls

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

The controls are flexible, providing constant volume and variable air volume cooling control sequences, and heating control sequences for 2-stage electric and gas systems, modulating gas heating, SCR (silicon control rectifier) electric heat, and hydronic heat in both Occupied and Unoccupied schedule modes. This control also manages:

- VAV duct pressure (VAV units only) with configurable static pressure reset
- Building pressure through 4 different power exhaust schemes
- Return fan applications using fan tracking
- Condenser fan head pressure control
- Dehumidification (with optional reheat) and humidifier sequences
- Space ventilation control, in Occupied and Unoccupied periods, using CO_2 sensors or external signals, with ventilation defined by damper position or ventilation airflow measurement
- Smoke control functions
- Occupancy schedules
- Occupancy or start/stop sequences based on third-party signals
- Alarm status and history and run time data
- Management of a complete unit service test sequence
- Economizer operation and Fault Diagnosis and Detection (FDD) per California Energy Commission Title 24-2013.

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

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

The *Comfort*Link controller is also capable of communicating with a BACnet network by going through a UPC Open controller. This permits third-party building management systems to provide remote monitoring and control of 48/50N units. See Appendix F for additional information.

The *Comfort*Link control system is easy to access through the use of a Navigator™ display. A computer is not needed to perform unit start-up. The Navigator module provides detailed explanations of control information.

For service flexibility, a factory-supplied Navigator™ module 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 menu structure, control access and display data for the unit.

Navigator™ Display

The hand-held Navigator display is used with the 48/50N Series units. See Fig. 1. The Navigator display is plugged into the RJ-14 jack in the main control box on the COMM board. The Navigator display can also be plugged into the RJ-14 jack located on the unit corner post located at the economizer end of the unit.

Fig. 1 — Accessory Navigator Display

Operation

All units are shipped from the factory with the Navigator display, which is located in the main control box. See Fig. 1. The Navigator display provides the user with an interface to the *Comfort*Link control system. The display has arrow keys, an ESC key, and an ENTER key. These keys are used to navigate through the different levels of the display structure. The Navigator has 4 lines of display. See Table 2 for the menu structure.

The 4 keys are used to navigate through the display structure, which is organized in a tiered mode structure. See Table 2 for the first 2 levels of the mode structure. If the buttons have not been used for a period, the display will default to the AUTO VIEW display category as shown under the RUN STATUS category. To show the top-level display, press the ESC key until a blank display is shown. Then use the ▲ and ▼ keys to scroll through the top level categories.These are listed in Appendix A and will be indicated on the Navigator 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 ▲ and ▼ keys and the ENTER key until the desired display item is found. At any time, the user can move back a mode level by pressing the ESC key.

Items in the Configuration and Service Test modes are password protected. The display will prompt for a PASSWORD. Use the ENTER and arrow keys to enter the 4 digits of the password. The default password is 1111.

Pressing the ESC and ENTER keys simultaneously will display an expanded text description for each display point.

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

If the user needs to force a variable, follow the same process as when editing a configuration parameter. When using the Navigator display, a forced variable will be displayed with a blinking "f" following its value. For example, if supply fan requested (***FAN.F***) is forced, the display shows "YESf", where the "f" is blinking to signify a force on the point. Remove the force by selecting the point that is forced with the ENTER key and then pressing both 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 Carrier 3V™ system and can serve as a CCN user-interface and configuration tool.

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. 2 for System Pilot interface details.

CCN Tables and Display

In addition to the Navigator display, the user can also access the same information through the CCN tables by using the System Pilot, Service Tool, or other CCN programs. Details on the CCN tables are summarized in Appendix B. The point names displayed in the CCN tables and the corresponding local display acronyms available via the Navigator display may be different and more items are displayed in the CCN tables. As a reference, the CCN point names are included in the local display menus shown in Appendix A.

GENERIC STATUS DISPLAY TABLE

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

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

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

> 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), a complete new upload is performed. **This requires that any previous table database be completely removed first.** Failure to do this will not allow the user to display the new points that have been created and the software will have a different table database than the unit control.

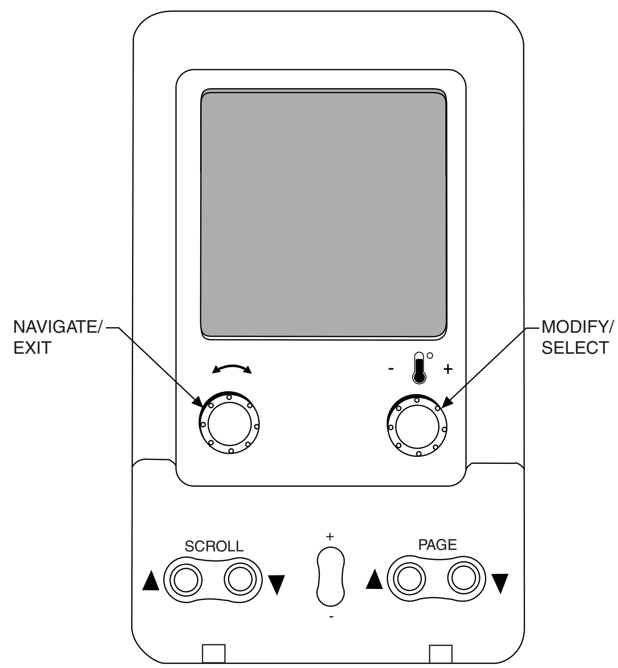


Fig. 2 — System Pilot User Interface

Table 2 — Navigator 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)	Local Machine Disable (STOP)	Refrigerant Temperatures (REF.T)	Refrigerant Pressures (REF.P)	Occupied Cool Setpoint (OCSP)	Compressor Feedback (FD.BK)	Cooling (COOL)	Cooling Configuration (COOL)	Month, Date, Day and Year (DATE)	HVAC Mode (HVAC)	Reset All Current Alarms (R.CUR)
Cooling Information (COOL)	Soft Stop Request (S.STP)			Unoccupied Heat Setpoint (UHSP)	Thermostat Inputs (STAT)	Heating (HEAT)	Evap/Discharge Temp. Reset (EDT.R)	Local Time Schedule (SCH.L)	Control Type (CTRL)	Alarm History (HIST)
VFD Information (VFDS)	Supply Fan Request (FAN.F)			Unoccupied Cool Setpoint (UCSP)	Fire-Smoke Modes (FIRE)	Actuators (ACTU)	Heating Configuration (HEAT)	Local Holiday Schedules (HOL.L)	Mode Controlling Unit (MODE)	
Mode Trip Helper (TRIP)	Test Independent Outputs (INDP)			Heat - Cool Setpoint (GAP)	Relative Humidity (REL.H)	General Outputs (GEN.O)	Supply Static Press. Config. (SP)	Daylight Savings Time (DAY.S)		
Ctl Temp RAT,SAT, or ZONE (TEMP)	Test Fans (FANS)			VAV Occ Cool On (V.C.ON)	Air Quality Sensors (AIR.Q)		Economizer Configuration (ECON)			
CCN Linkage (LINK)	Calibrate Test Actuators (ACT.C)			VAV Occ Cool Off (V.C.OF)	CFM Sensors (CFM)		Building Press. Configs (BP)			
Compressor Run Hours (HRS)	Test Humidimizer (HMZR)			Supply Air Setpoint (SASP)	Reset Inputs (RSET)		Cool/Heat Setpoint Offsets (D.LV.T)			
Compressor Starts (STRT)	Test Circuit EXVS (EXVS)			Supply Air Setpoint Hi (SA.HI)	4-20 Milliamp Inputs (4-20)		Demand Limit Config. (DMD.L)			
Software Version Numbers (VERS)	Test Cooling (COOL)			Supply Air Setpoint Lo (SA.LO)			Indoor Air Quality Config. (IAQ)			
	Test Heating (HEAT)			Heating Supply Air Setpoint (SA.HT)			Humidity Configuration (HUMD)			
	Auto Component Diag. Test (AC.DT)			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: NO/NC (SW.LG)			
							Display Configuration (DISP)			
							Supply Fan FVD Config. (S.VFD)			
							Exhaust Fan FVD Config. (E.VFD)			
							Filter Configuration (FLTC)			
							Prognostics Config. (PROG)			
							Evap Cond Configuration (EVP.C)			

START-UP

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

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

Unit Preparation

Check that unit has been installed in accordance with the installation instructions and applicable codes. Make sure that the economizer hoods have 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 modulating gas or SCR electric heat, make sure that the LAT (leaving air temperature) sensors have been routed to the supply ducts as required.

Accessory Installation

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

Crankcase Heaters

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

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

Evaporator Fan

Fan belts and fixed pulleys are factory-installed. See Tables 3-22 for fan performance. Be sure that fans rotate in the proper direction. Component pressure drop data is shown in Tables 19 and 20. See Tables 21 and 22 for motor limitations.

FIELD-SUPPLIED FAN DRIVES

Supply fan and power exhaust fan drives are fixed-pitch, non-adjustable selections for maximum reliability and long belt life. If the factory drive sets must be changed to obtain other fan speeds, consult the nearest Browning Manufacturing Co. sales office with the required new wheel speed and the data from Physical Data and Supply Fan Drive Data tables (center distances, motor and fan shaft diameters, motor horsepower) in Installation Instructions for a modified drive set selection. For minor speed changes, the VFD can be used to provide speed control. See page 169 for belt installation procedure.

Controls

Use the following steps for the controls:

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

1. Set any control configurations that are required (field-installed accessories, etc.). The unit is factory configured for all appropriate factory-installed options.
2. Enter unit set points. The unit is shipped with the set point default values. If a different set point is required, use the Navigator™ display or CCN interface to change the configuration values.
3. If the internal time schedules are going to be used, configure the Occupancy schedule.
4. Verify that the control time periods programmed meet current requirements.
5. Use Auto Commisioning 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 and R to W2 in the control box to initiate high fire heat.
6. After the unit has run with high fire energized for several minutes, verify that incoming pressure is 5.0 in. wg or greater and that the manifold pressure is 3.1 in. wg. If manifold pressure must be adjusted, refer to Gas Valve Adjustment section on page 184.
7. Use the Service Test procedure to verify all heat stages of operation.

Table 3 — Fan Performance — 48/50N 75-90 Nominal Ton Units Standard Supply Fan Data

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
15,000	734	3.74	764	4.22	794	4.71	823	5.22	851	5.73
18,000	846	5.75	873	6.30	898	6.87	924	7.45	948	8.04
20,000	923	7.45	947	8.06	971	8.68	994	9.31	1017	9.95
22,000	1001	9.48	1023	10.14	1045	10.82	1066	11.50	1088	12.20
24,000	1080	11.87	1100	12.59	1120	13.32	1140	14.05	1160	14.80
26,000	1159	14.65	1178	15.43	1197	16.21	1215	17.00	1234	17.80
28,000	1238	17.86	1256	18.69	1274	19.52	1291	20.37	1308	21.22
30,000	1318	21.52	1335	22.41	1352	23.30	1368	24.20	1384	25.10
32,000	1399	25.68	1414	26.61	1430	27.56	1446	28.51	1461	29.47
34,000	1479	30.35	1494	31.33	1509	32.34	1524	33.34	1538	34.36
36,000	1560	35.56	1574	36.61	1588	37.66	1602	38.72	1616	39.78
38,000	1641	41.36	1655	42.46	1668	43.57	1681	44.68	1694	45.80
40,000	1722	47.77	1735	48.92	1748	50.09	1760	51.25	1773	52.43
42,000	—	—	—	—	—	—	—	—	—	—
45,000	—	—	—	—	—	—	—	—	—	—

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
15,000	878	6.25	905	6.79	931	7.33	957	7.88	982	8.44
18,000	973	8.64	996	9.25	1020	9.87	1043	10.50	1065	11.13
20,000	1039	10.61	1061	11.26	1083	11.94	1104	12.61	1125	13.29
22,000	1108	12.90	1129	13.61	1149	14.33	1169	15.06	1189	15.79
24,000	1179	15.56	1199	16.32	1218	17.09	1236	17.87	1255	18.66
26,000	1252	18.61	1270	19.42	1288	20.24	1305	21.08	1323	21.91
28,000	1326	22.09	1343	22.95	1359	23.83	1376	24.71	1392	25.60
30,000	1400	26.02	1416	26.94	1432	27.86	1448	28.79	1464	29.73
32,000	1476	30.44	1491	31.41	1506	32.39	1521	33.37	1536	34.37
34,000	1553	35.37	1567	36.39	1581	37.43	1595	38.47	1609	39.51
36,000	1630	40.86	1643	41.94	1657	43.03	1670	44.11	1684	45.21
38,000	1707	46.93	1720	48.06	1733	49.20	1746	50.35	1759	51.49
40,000	1785	53.61	1798	54.80	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
45,000	—	—	—	—	—	—	—	—	—	—

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
15,000	1006	9.01	1030	9.58	1054	10.16	1077	10.75	1100	11.34
18,000	1087	11.77	1109	12.42	1131	13.08	1152	13.74	1173	14.41
20,000	1146	13.99	1167	14.69	1187	15.39	1207	16.11	1227	16.83
22,000	1209	16.54	1228	17.29	1247	18.05	1266	18.81	1284	19.58
24,000	1273	19.45	1291	20.25	1309	21.06	1327	21.87	1345	22.69
26,000	1340	22.76	1357	23.61	1374	24.47	1391	25.33	1408	26.20
28,000	1409	26.49	1425	27.39	1441	28.30	1457	29.22	1473	30.14
30,000	1479	30.68	1494	31.64	1510	32.60	1525	33.56	1540	34.54
32,000	1551	35.37	1565	36.37	1580	37.39	1594	38.40	1608	39.43
34,000	1623	40.57	1637	41.63	1651	42.69	1665	43.76	1678	44.83
36,000	1697	46.32	1710	47.43	1723	48.55	1737	49.67	1750	50.79
38,000	1772	52.66	1784	53.81	1797	54.98	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
45,000	—	—	—	—	—	—	—	—	—	—

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
15,000	1122	11.94	1145	12.55	1166	13.16	1188	13.78	1209	14.40
18,000	1193	15.09	1214	15.77	1234	16.46	1253	17.16	1273	17.86
20,000	1246	17.55	1265	18.29	1284	19.03	1303	19.77	1322	20.53
22,000	1303	20.36	1321	21.14	1339	21.93	1357	22.72	1374	23.52
24,000	1362	23.52	1379	24.35	1396	25.19	1413	26.04	1430	26.89
26,000	1424	27.08	1440	27.96	1457	28.86	1473	29.75	1489	30.65
28,000	1488	31.07	1504	32.01	1519	32.94	1535	33.89	1550	34.84
30,000	1555	35.52	1570	36.50	1584	37.50	1599	38.49	1613	39.49
32,000	1623	40.46	1637	41.49	1651	42.53	1665	43.58	1679	44.64
34,000	1692	45.92	1705	47.01	1719	48.09	1732	49.20	1745	50.30
36,000	1762	51.92	1775	53.06	1788	54.21	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
45,000	—	—	—	—	—	—	—	—	—	—

LEGEND
Bhp — Brake Horsepower

Table 4 — Fan Performance — 48/50N 75-90 Nominal Ton Units High-Static Supply Fan Data

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
15,000	315	2.56	354	3.34	390	4.19	425	5.09	459	6.04
18,000	364	3.68	397	4.50	428	5.38	459	6.30	489	7.27
20,000	397	4.59	427	5.45	456	6.34	484	7.29	512	8.26
22,000	431	5.64	458	6.53	485	7.45	511	8.41	537	9.40
24,000	465	6.85	490	7.76	515	8.70	539	9.68	563	10.70
26,000	499	8.20	523	9.14	546	10.12	569	11.12	591	12.15
28,000	534	9.72	556	10.69	578	11.68	599	12.71	620	13.76
30,000	569	11.40	590	12.40	610	13.42	630	14.47	650	15.54
32,000	605	13.26	624	14.29	643	15.33	662	16.40	681	17.50
34,000	640	15.30	658	16.35	676	17.42	694	18.52	712	19.63
36,000	676	17.51	693	18.59	710	19.69	727	20.81	744	21.95
38,000	711	19.92	728	21.03	744	22.15	760	23.29	776	24.46
40,000	747	22.53	763	23.66	778	24.80	793	25.97	809	27.15
42,000	783	25.33	798	26.49	812	27.66	827	28.85	842	30.06
45,000	837	29.92	851	31.12	864	32.33	878	33.55	892	34.79

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
15,000	491	7.05	522	8.09	552	9.18	580	10.30	608	11.47
18,000	517	8.27	545	9.32	572	10.40	598	11.52	624	12.66
20,000	538	9.28	564	10.33	590	11.41	614	12.53	638	13.67
22,000	562	10.43	586	11.49	610	12.58	633	13.70	656	14.86
24,000	587	11.74	609	12.82	632	13.91	654	15.04	675	16.20
26,000	613	13.21	635	14.30	656	15.41	676	16.55	697	17.71
28,000	641	14.84	661	15.94	681	17.07	701	18.22	720	19.39
30,000	670	16.64	689	17.76	708	18.90	726	20.07	745	21.25
32,000	699	18.62	717	19.75	735	20.92	753	22.09	770	23.29
34,000	729	20.77	747	21.92	764	23.10	781	24.30	797	25.51
36,000	760	23.11	777	24.29	793	25.48	809	26.69	825	27.92
38,000	792	25.63	808	26.83	823	28.04	838	29.27	854	30.52
40,000	824	28.36	839	29.57	854	30.80	868	32.05	883	33.31
42,000	856	31.28	870	32.51	885	33.76	899	35.03	913	36.31
45,000	905	36.04	919	37.31	932	38.58	945	39.88	959	41.18

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
15,000	636	12.66	662	13.90	688	15.16	713	16.46	738	17.78
18,000	649	13.85	674	15.06	697	16.30	721	17.57	744	18.87
20,000	662	14.86	685	16.06	708	17.29	730	18.55	752	19.84
22,000	678	16.03	700	17.24	722	18.47	743	19.72	764	21.00
24,000	697	17.38	717	18.58	738	19.82	758	21.07	778	22.34
26,000	717	18.90	737	20.11	756	21.34	776	22.60	795	23.87
28,000	739	20.59	758	21.81	777	23.05	795	24.31	813	25.58
30,000	763	22.46	781	23.69	799	24.93	816	26.20	833	27.48
32,000	788	24.51	805	25.75	822	27.00	839	28.28	855	29.57
34,000	814	26.74	830	27.99	846	29.26	863	30.55	878	31.84
36,000	841	29.17	857	30.43	872	31.71	887	33.00	903	34.32
38,000	869	31.78	884	33.06	899	34.35	913	35.66	928	36.98
40,000	897	34.59	912	35.88	926	37.18	940	38.51	954	39.85
42,000	927	37.60	941	38.91	954	40.24	968	41.57	981	42.92
45,000	972	42.51	985	43.84	998	45.17	1011	46.54	1023	47.91

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
15,000	762	19.13	785	20.51	808	21.91	831	23.34	853	24.80
18,000	766	20.19	788	21.54	810	22.91	831	24.31	852	25.73
20,000	774	21.15	795	22.49	816	23.84	836	25.22	856	26.62
22,000	784	22.30	805	23.62	825	24.97	844	26.34	864	27.73
24,000	798	23.64	817	24.96	836	26.30	855	27.67	874	29.04
26,000	813	25.17	832	26.49	850	27.82	868	29.18	886	30.56
28,000	831	26.89	849	28.21	866	29.54	884	30.90	901	32.27
30,000	851	28.79	868	30.11	884	31.45	901	32.81	917	34.18
32,000	872	30.88	888	32.21	904	33.55	920	34.91	936	36.29
34,000	894	33.17	910	34.50	925	35.85	941	37.22	956	38.59
36,000	918	35.65	933	36.98	948	38.34	962	39.71	977	41.10
38,000	943	38.32	957	39.67	971	41.04	985	42.42	1000	43.82
40,000	968	41.20	982	42.56	996	43.94	1010	45.33	1023	46.73
42,000	995	44.27	1008	45.66	1021	47.04	1035	48.44	1048	49.86
45,000	1036	49.29	1049	50.68	1061	52.09	1074	53.51	1086	54.94

LEGEND

Bhp — Brake Horsepower

Table 5 — Fan Performance — 48/50N 105 Nominal Ton Units Standard Supply Fan Data

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
21,000	974	8.74	996	9.38	1019	10.03	1041	10.70	1063	11.37
25,000	1132	13.69	1151	14.44	1171	15.20	1190	15.97	1209	16.75
27,000	1213	16.82	1231	17.62	1249	18.44	1267	19.26	1284	20.09
29,000	1294	20.43	1312	21.30	1328	22.17	1345	23.05	1362	23.93
31,000	1377	24.60	1393	25.51	1409	26.44	1425	27.37	1441	28.31
33,000	1461	29.35	1476	30.33	1491	31.31	1506	32.30	1521	33.29
35,000	1546	34.75	1560	35.78	1575	36.82	1589	37.87	1603	38.92
37,000	1632	40.86	1645	41.94	1659	43.04	1672	44.14	1686	45.25
39,000	1719	47.72	1732	48.87	1744	50.03	1757	51.19	1770	52.35
41,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
44,000	—	—	—	—	—	—	—	—	—	—
46,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

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
21,000	1084	12.05	1105	12.74	1126	13.44	1147	14.14	1167	14.86
25,000	1227	17.54	1246	18.33	1264	19.13	1282	19.94	1300	20.76
27,000	1302	20.93	1319	21.78	1336	22.63	1353	23.50	1370	24.37
29,000	1378	24.82	1395	25.73	1411	26.63	1427	27.55	1443	28.47
31,000	1456	29.26	1472	30.22	1487	31.18	1502	32.14	1517	33.12
33,000	1536	34.29	1550	35.30	1565	36.32	1579	37.34	1593	38.37
35,000	1617	39.98	1630	41.04	1644	42.12	1658	43.19	1671	44.27
37,000	1699	46.36	1712	47.49	1725	48.61	1738	49.74	1751	50.88
39,000	1782	53.52	1795	54.70	—	—	—	—	—	—
41,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
44,000	—	—	—	—	—	—	—	—	—	—
46,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

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
21,000	1187	15.58	1207	16.31	1226	17.04	1245	17.78	1264	18.53
25,000	1318	21.58	1335	22.41	1353	23.25	1370	24.09	1387	24.94
27,000	1387	25.24	1404	26.12	1420	27.01	1436	27.90	1452	28.81
29,000	1459	29.40	1474	30.33	1490	31.27	1505	32.22	1520	33.17
31,000	1532	34.10	1547	35.09	1562	36.08	1576	37.08	1591	38.09
33,000	1608	39.40	1622	40.44	1636	41.49	1650	42.54	1663	43.61
35,000	1685	45.36	1698	46.46	1712	47.55	1725	48.66	1738	49.78
37,000	1764	52.03	1777	53.18	1789	54.33	—	—	—	—
39,000	—	—	—	—	—	—	—	—	—	—
41,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
44,000	—	—	—	—	—	—	—	—	—	—
46,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

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
21,000	1283	19.29	1302	20.05	1320	20.82	1338	21.59	1356	22.37
25,000	1404	25.80	1420	26.67	1437	27.53	1453	28.41	1470	29.29
27,000	1468	29.71	1484	30.63	1500	31.55	1515	32.47	1531	33.41
29,000	1536	34.13	1551	35.10	1566	36.07	1580	37.05	1595	38.03
31,000	1605	39.10	1620	40.11	1634	41.14	1648	42.16	1662	43.20
33,000	1677	44.67	1691	45.74	1704	46.81	1718	47.89	1731	48.98
35,000	1751	50.89	1764	52.01	1777	53.14	1790	54.28	—	—
37,000	—	—	—	—	—	—	—	—	—	—
39,000	—	—	—	—	—	—	—	—	—	—
41,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
44,000	—	—	—	—	—	—	—	—	—	—
46,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Table 6 — Fan Performance — 48/50N 105 Nominal Ton Units High-Static Supply Fan Data

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
21,000	441	4.97	466	5.77	491	6.61	516	7.49	540	8.41
25,000	497	6.95	519	7.83	541	8.75	563	9.69	584	10.67
27,000	534	8.54	555	9.47	576	10.43	596	11.42	616	12.44
29,000	572	10.35	592	11.33	611	12.34	630	13.38	649	14.44
31,000	610	12.41	629	13.44	647	14.50	664	15.58	682	16.69
33,000	649	14.72	666	15.80	683	16.91	699	18.03	716	19.18
35,000	687	17.30	703	18.43	719	19.58	735	20.75	751	21.95
37,000	726	20.16	741	21.34	756	22.53	771	23.75	786	25.00
39,000	764	23.31	779	24.54	793	25.79	807	27.06	822	28.34
41,000	803	26.78	817	28.05	831	29.35	844	30.65	858	31.99
42,000	842	30.56	855	31.89	868	33.22	881	34.59	894	35.96
44,000	881	34.68	893	36.06	906	37.44	918	38.84	930	40.26
46,000	920	39.14	932	40.56	944	41.99	956	43.45	967	44.91
48,000	959	43.97	970	45.43	982	46.91	993	48.41	1004	49.92
52,500	1047	56.20	1057	57.78	1068	59.35	1078	60.95	1088	62.57

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
21,000	563	9.35	587	10.33	609	11.34	632	12.38	654	13.44
25,000	606	11.67	627	12.71	647	13.77	667	14.86	688	15.97
27,000	636	13.49	655	14.56	675	15.66	694	16.78	713	17.93
29,000	667	15.53	685	16.64	704	17.78	722	18.94	739	20.12
31,000	699	17.81	717	18.97	734	20.15	751	21.34	768	22.57
33,000	732	20.35	749	21.55	765	22.77	781	24.01	797	25.27
35,000	766	23.16	782	24.41	797	25.66	812	26.94	827	28.24
37,000	801	26.25	815	27.54	830	28.84	844	30.16	859	31.49
39,000	836	29.65	850	30.97	863	32.31	877	33.67	891	35.05
41,000	871	33.34	884	34.71	897	36.09	911	37.49	924	38.91
42,000	907	37.35	919	38.76	932	40.19	945	41.64	957	43.09
44,000	943	41.70	955	43.15	967	44.62	979	46.11	991	47.61
46,000	979	46.40	991	47.89	1002	49.41	1014	50.92	1025	52.48
48,000	1016	51.44	1027	52.99	1038	54.54	1049	56.12	1060	57.69
52,500	1099	64.19	1109	65.82	1119	67.48	1129	69.14	1140	70.82

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
21,000	676	14.53	697	15.65	719	16.79	739	17.96	760	19.16
25,000	707	17.11	727	18.27	746	19.46	765	20.67	784	21.90
27,000	731	19.11	750	20.30	768	21.52	786	22.76	804	24.02
29,000	757	21.34	774	22.56	792	23.82	809	25.09	826	26.38
31,000	784	23.81	801	25.07	817	26.36	833	27.66	849	29.00
33,000	813	26.55	828	27.85	844	29.17	859	30.51	875	31.87
35,000	842	29.56	857	30.90	872	32.26	887	33.63	901	35.02
37,000	873	32.85	887	34.22	901	35.62	915	37.03	929	38.46
39,000	905	36.44	918	37.86	932	39.28	945	40.73	958	42.21
41,000	937	40.34	950	41.80	963	43.27	975	44.75	988	46.26
42,000	970	44.57	982	46.06	994	47.56	1007	49.09	1019	50.63
44,000	1003	49.13	1015	50.66	1027	52.20	1039	53.76	1050	55.34
46,000	1037	54.03	1048	55.60	1060	57.19	1071	58.78	1082	60.40
48,000	1071	59.29	1082	60.91	1093	62.54	1104	64.17	1115	65.83
52,500	1150	72.51	1160	74.21	1170	75.93	1180	77.66	1190	79.39

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
21,000	780	20.37	801	21.61	820	22.87	840	24.14	859	25.45
25,000	803	23.16	822	24.44	840	25.73	858	27.05	876	28.38
27,000	822	25.30	839	26.61	857	27.94	874	29.28	891	30.64
29,000	843	27.69	859	29.02	876	30.38	892	31.75	908	33.14
31,000	865	30.33	881	31.70	897	33.08	913	34.48	928	35.90
33,000	890	33.25	905	34.64	920	36.06	935	37.49	950	38.93
35,000	916	36.43	930	37.86	945	39.31	959	40.77	973	42.25
37,000	943	39.90	957	41.37	971	42.85	984	44.34	998	45.85
39,000	972	43.68	985	45.18	998	46.69	1011	48.20	1024	49.76
41,000	1001	47.76	1014	49.30	1026	50.84	1039	52.41	1051	53.99
42,000	1031	52.18	1043	53.76	1055	55.33	1067	56.93	1079	58.54
44,000	1062	56.93	1074	58.53	1085	60.15	1097	61.79	1108	63.44
46,000	1094	62.03	1105	63.67	1116	65.33	1127	67.00	1138	68.68
48,000	1126	67.49	1137	69.17	1147	70.87	1158	72.57	1169	74.29
52,500	1200	81.15	1210	82.92	1220	84.69	1230	86.47	1240	88.28

LEGEND
Bhp — Brake Horsepower

Table 7 — Fan Performance — 48/50N 120 Nominal Ton Units Standard Supply Fan Data

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
24,000	775	8.13	797	8.86	819	9.61	841	10.37	862	11.14
28,000	883	12.01	903	12.85	922	13.70	941	14.56	960	15.43
32,000	991	16.95	1008	17.89	1026	18.85	1043	19.81	1059	20.79
34,000	1045	19.86	1062	20.85	1078	21.86	1094	22.88	1110	23.91
36,000	1099	23.07	1115	24.12	1130	25.18	1145	26.25	1161	27.33
38,000	1153	26.61	1168	27.71	1183	28.83	1197	29.95	1212	31.08
40,000	1207	30.50	1221	31.65	1235	32.82	1249	33.99	1263	35.17
42,000	1261	34.74	1274	35.94	1288	37.16	1301	38.39	1315	39.63
44,000	1315	39.36	1328	40.62	1341	41.89	1354	43.16	1366	44.45
46,000	1369	44.36	1381	45.67	1394	47.00	1406	48.33	1418	49.67
48,000	1423	49.78	1435	51.14	1447	52.51	1458	53.89	1470	55.28
50,000	1477	55.61	1488	57.03	1500	58.45	1511	59.88	1522	61.33
52,000	1530	61.87	1542	63.35	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—

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
24,000	883	11.92	903	12.72	924	13.53	943	14.35	963	15.18
28,000	978	16.32	997	17.22	1015	18.13	1032	19.05	1050	19.98
32,000	1076	21.78	1092	22.78	1109	23.79	1125	24.81	1141	25.84
34,000	1126	24.94	1141	26.00	1157	27.06	1172	28.13	1188	29.21
36,000	1176	28.42	1191	29.52	1206	30.64	1220	31.75	1235	32.88
38,000	1226	32.22	1240	33.38	1255	34.54	1269	35.70	1283	36.89
40,000	1277	36.37	1291	37.57	1304	38.79	1318	40.00	1331	41.23
42,000	1328	40.87	1341	42.12	1354	43.38	1367	44.66	1380	45.93
44,000	1379	45.75	1392	47.05	1404	48.36	1417	49.69	1429	51.01
46,000	1430	51.02	1443	52.37	1455	53.74	1467	55.11	1479	56.49
48,000	1482	56.69	1494	58.10	1505	59.51	1517	60.93	1528	62.36
50,000	1534	62.77	1545	64.24	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—

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
24,000	982	16.02	1001	16.87	1020	17.73	1038	18.60	1056	19.48
28,000	1067	20.92	1084	21.87	1101	22.83	1118	23.80	1135	24.77
32,000	1157	26.88	1172	27.93	1188	28.98	1203	30.05	1218	31.13
34,000	1203	30.30	1218	31.39	1232	32.50	1247	33.61	1262	34.73
36,000	1249	34.02	1263	35.16	1278	36.32	1292	37.49	1306	38.66
38,000	1296	38.07	1310	39.27	1324	40.48	1337	41.69	1351	42.91
40,000	1344	42.47	1357	43.72	1371	44.97	1384	46.23	1396	47.50
42,000	1393	47.22	1405	48.52	1418	49.83	1430	51.14	1443	52.46
44,000	1441	52.35	1453	53.70	1466	55.06	1478	56.42	1490	57.79
46,000	1490	57.87	1502	59.27	1514	60.67	1526	62.09	1537	63.51
48,000	1540	63.80	—	—	—	—	—	—	—	—
50,000	—	—	—	—	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—

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
24,000	1074	20.37	1092	21.26	1109	22.17	1127	23.08	1144	24.00
28,000	1151	25.76	1167	26.75	1183	27.76	1199	28.76	1215	29.79
32,000	1233	32.21	1248	33.30	1263	34.40	1277	35.50	1292	36.62
34,000	1276	35.87	1290	37.01	1305	38.16	1319	39.32	1333	40.47
36,000	1320	39.84	1333	41.03	1347	42.23	1361	43.43	1374	44.65
38,000	1364	44.14	1377	45.38	1390	46.62	1404	47.88	1416	49.13
40,000	1409	48.79	1422	50.07	1435	51.36	1447	52.67	1460	53.98
42,000	1455	53.78	1467	55.12	1480	56.47	1492	57.81	1504	59.17
44,000	1502	59.16	1514	60.55	1525	61.94	1537	63.34	1549	64.75
46,000	1549	64.93	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
50,000	—	—	—	—	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Table 8 — Fan Performance — 48/50N 120 Nominal Ton Units High-Static Supply Fan Data

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
24,000	427	4.78	458	5.82	486	6.86	513	7.92	539	8.98
28,000	489	6.84	515	7.99	541	9.14	565	10.30	589	11.48
32,000	520	8.07	545	9.26	569	10.47	592	11.69	614	12.91
34,000	583	10.94	605	12.24	627	13.55	648	14.88	668	16.21
36,000	614	12.60	636	13.95	656	15.32	676	16.69	696	18.07
38,000	646	14.42	666	15.83	686	17.24	705	18.67	724	20.09
40,000	678	16.41	697	17.86	716	19.32	735	20.80	753	22.28
42,000	710	18.56	729	20.07	747	21.58	764	23.10	782	24.63
44,000	742	20.90	760	22.45	777	24.01	794	25.58	811	27.16
46,000	774	23.41	791	25.01	808	26.62	824	28.23	840	29.86
48,000	807	26.12	823	27.77	839	29.42	854	31.08	870	32.75
50,000	839	29.01	854	30.71	870	32.41	885	34.12	900	35.84
52,000	871	32.11	886	33.86	901	35.61	916	37.36	930	39.12
56,000	936	38.94	950	40.77	964	42.60	977	44.45	991	46.30
60,000	1001	46.62	1014	48.55	1027	50.48	1040	52.41	1052	54.35

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
24,000	564	10.05	588	11.12	611	12.20	633	13.28	655	14.37
28,000	611	12.66	633	13.85	655	15.04	675	16.23	695	17.43
32,000	636	14.15	657	15.39	678	16.64	698	17.88	717	19.13
34,000	688	17.54	708	18.89	727	20.24	745	21.59	763	22.95
36,000	715	19.46	734	20.85	752	22.25	770	23.65	787	25.06
38,000	742	21.53	760	22.97	778	24.42	795	25.87	812	27.33
40,000	770	23.76	788	25.26	804	26.75	821	28.25	837	29.76
42,000	798	26.16	815	27.70	831	29.24	848	30.79	863	32.35
44,000	827	28.73	843	30.32	859	31.92	874	33.51	890	35.11
46,000	856	31.49	871	33.12	887	34.76	902	36.40	917	38.06
48,000	885	34.43	900	36.11	915	37.79	929	39.48	944	41.18
50,000	915	37.56	929	39.29	943	41.02	958	42.75	971	44.49
52,000	944	40.88	958	42.66	972	44.43	986	46.21	999	48.01
56,000	1004	48.15	1017	50.02	1031	51.89	1043	53.76	1056	55.63
60,000	1065	56.29	1077	58.23	1090	60.18	1102	62.14	1114	64.11

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
24,000	676	15.46	696	16.55	716	17.65	736	18.74	754	19.84
28,000	715	18.63	734	19.84	753	21.05	771	22.25	789	23.47
32,000	736	20.39	755	21.65	773	22.92	790	24.18	808	25.45
34,000	781	24.30	798	25.67	815	27.04	832	28.41	848	29.79
36,000	804	26.48	821	27.89	838	29.31	854	30.73	870	32.16
38,000	829	28.79	845	30.26	861	31.73	877	33.20	892	34.68
40,000	854	31.27	869	32.78	885	34.30	900	35.83	915	37.35
42,000	879	33.91	894	35.47	909	37.04	924	38.61	939	40.18
44,000	905	36.72	920	38.33	934	39.94	949	41.56	963	43.18
46,000	931	39.71	946	41.36	960	43.02	974	44.69	988	46.35
48,000	958	42.88	972	44.58	986	46.28	1000	48.00	1013	49.72
50,000	985	46.24	999	47.99	1012	49.74	1026	51.49	1039	53.25
52,000	1013	49.79	1026	51.58	1039	53.38	1052	55.18	1065	56.99
56,000	1069	57.50	1081	59.38	1094	61.28	1106	63.17	1118	65.06
60,000	1126	66.08	1138	68.04	1149	70.01	1161	72.00	1173	73.97

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
24,000	773	20.94	791	22.05	809	23.15	826	24.25	843	25.36
28,000	807	24.69	824	25.91	841	27.13	857	28.35	873	29.57
32,000	825	26.72	842	28.00	858	29.27	874	30.55	890	31.83
34,000	865	31.17	881	32.55	896	33.93	912	35.32	927	36.70
36,000	886	33.59	901	35.02	916	36.46	931	37.89	946	39.33
38,000	908	36.15	923	37.64	937	39.12	952	40.62	967	42.10
40,000	930	38.88	945	40.42	959	41.94	974	43.49	988	45.02
42,000	953	41.76	968	43.34	982	44.93	996	46.51	1009	48.10
44,000	977	44.81	991	46.44	1005	48.06	1018	49.70	1032	51.34
46,000	1001	48.02	1015	49.71	1028	51.38	1042	53.07	1055	54.74
48,000	1026	51.43	1040	53.15	1053	54.87	1065	56.60	1078	58.33
50,000	1052	55.02	1064	56.78	1077	58.56	1090	60.32	1102	62.10
52,000	1077	58.79	1090	60.61	1102	62.43	1115	64.24	1127	66.06
56,000	1130	66.96	1142	68.86	1154	70.76	1165	72.67	1177	74.58
60,000	1184	75.95	1195	77.95	1207	79.93	1218	81.93	1229	83.92

Table 9 — Fan Performance — 48/50N 130, 150 Nominal Ton Units Standard Supply Fan Data

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
26,000	841	10.40	862	11.19	882	12.00	902	12.82	922	13.65
30,000	951	15.00	969	15.90	987	16.81	1005	17.73	1022	18.67
34,000	1060	20.74	1076	21.75	1092	22.77	1108	23.80	1124	24.83
36,000	1114	24.09	1130	25.14	1145	26.22	1160	27.29	1175	28.39
38,000	1168	27.76	1183	28.87	1198	29.99	1212	31.13	1227	32.27
40,000	1223	31.78	1237	32.95	1251	34.12	1265	35.31	1278	36.50
42,000	1277	36.17	1290	37.39	1304	38.62	1317	39.85	1330	41.10
44,000	1331	40.94	1344	42.22	1357	43.49	1370	44.78	1382	46.08
46,000	1385	46.11	1398	47.43	1410	48.76	1422	50.11	1434	51.45
48,000	1439	51.68	1451	53.05	1463	54.45	1475	55.84	1487	57.24
50,000	1493	57.68	1505	59.12	1516	60.55	1528	61.99	1539	63.44
52,000	1548	64.13	—	—	—	—	—	—	—	—
54,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—
60,000	—	—	—	—	—	—	—	—	—	—

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
26,000	941	14.49	961	15.35	980	16.21	998	17.09	1016	17.97
30,000	1040	19.61	1057	20.57	1074	21.54	1091	22.52	1107	23.50
34,000	1140	25.88	1155	26.94	1171	28.01	1186	29.08	1201	30.17
36,000	1190	29.48	1205	30.59	1220	31.71	1234	32.84	1249	33.98
38,000	1241	33.42	1255	34.58	1269	35.76	1283	36.93	1297	38.12
40,000	1292	37.70	1306	38.92	1319	40.14	1332	41.37	1346	42.61
42,000	1343	42.36	1356	43.62	1369	44.90	1382	46.17	1395	47.46
44,000	1395	47.39	1407	48.70	1420	50.02	1432	51.36	1444	52.70
46,000	1446	52.81	1459	54.18	1470	55.55	1482	56.93	1494	58.33
48,000	1498	58.66	1510	60.06	1521	61.50	1533	62.92	1544	64.37
50,000	—	—	—	—	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
54,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—
60,000	—	—	—	—	—	—	—	—	—	—

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
26,000	1034	18.87	1052	19.78	1070	20.69	1087	21.62	1105	22.55
30,000	1123	24.49	1140	25.50	1156	26.52	1172	27.54	1187	28.57
34,000	1216	31.27	1231	32.38	1245	33.49	1260	34.62	1274	35.74
36,000	1263	35.12	1277	36.28	1291	37.44	1305	38.62	1319	39.80
38,000	1311	39.32	1324	40.52	1338	41.73	1351	42.95	1365	44.19
40,000	1359	43.86	1372	45.12	1385	46.38	1398	47.65	1411	48.93
42,000	1408	48.76	1420	50.07	1433	51.38	1445	52.71	1457	54.03
44,000	1457	54.05	1469	55.40	1481	56.76	1493	58.13	1505	59.51
46,000	1506	59.72	1518	61.13	1529	62.55	1541	63.97	—	—
48,000	—	—	—	—	—	—	—	—	—	—
50,000	—	—	—	—	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
54,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—
60,000	—	—	—	—	—	—	—	—	—	—

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
26,000	1122	23.49	1138	24.44	1155	25.40	1172	26.36	1188	27.34
30,000	1203	29.61	1218	30.66	1234	31.72	1249	32.78	1264	33.85
34,000	1289	36.88	1303	38.03	1317	39.18	1331	40.35	1345	41.52
36,000	1333	40.98	1347	42.18	1360	43.38	1374	44.60	1387	45.82
38,000	1378	45.43	1391	46.67	1404	47.93	1417	49.19	1430	50.45
40,000	1423	50.21	1436	51.51	1449	52.81	1461	54.12	1474	55.44
42,000	1470	55.37	1482	56.71	1494	58.06	1506	59.42	1518	60.79
44,000	1517	60.90	1528	62.30	1540	63.70	—	—	—	—
46,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
50,000	—	—	—	—	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
54,000	—	—	—	—	—	—	—	—	—	—
56,000	—	—	—	—	—	—	—	—	—	—
60,000	—	—	—	—	—	—	—	—	—	—

Table 10 — Fan Performance — 48/50N 130, 150 Nominal Ton Units High-Static Supply Fan Data

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
26,000	470	6.23	499	7.34	525	8.46	551	9.60	575	10.73
30,000	534	8.75	559	9.98	583	11.22	606	12.46	629	13.71
34,000	567	10.24	590	11.53	613	12.82	635	14.11	656	15.42
36,000	599	11.89	621	13.23	643	14.57	664	15.93	684	17.28
38,000	632	13.71	653	15.10	674	16.50	694	17.90	713	19.31
40,000	665	15.70	685	17.14	704	18.59	724	20.05	742	21.51
42,000	698	17.87	717	19.37	735	20.86	754	22.37	772	23.89
44,000	730	20.22	749	21.77	767	23.32	784	24.88	802	26.44
46,000	764	22.78	781	24.37	798	25.98	815	27.59	832	29.19
48,000	797	25.53	813	27.17	830	28.83	846	30.48	862	32.15
50,000	830	28.49	846	30.19	862	31.88	878	33.59	893	35.30
52,000	863	31.66	879	33.40	894	35.15	909	36.90	924	38.67
54,000	896	35.05	911	36.84	926	38.64	941	40.44	955	42.24
56,000	963	42.51	977	44.40	991	46.29	1004	48.18	1018	50.07
60,000	1030	50.92	1043	52.90	1056	54.88	1069	56.86	1081	58.86

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
26,000	599	11.87	622	13.02	644	14.17	665	15.32	686	16.48
30,000	650	14.97	671	16.22	691	17.49	711	18.76	731	20.02
34,000	677	16.73	697	18.04	716	19.36	736	20.68	754	22.01
36,000	704	18.65	723	20.01	742	21.38	761	22.76	779	24.14
38,000	732	20.73	751	22.15	769	23.57	787	25.00	804	26.43
40,000	760	22.98	778	24.45	796	25.92	813	27.41	830	28.89
42,000	789	25.40	806	26.93	823	28.46	840	29.98	856	31.52
44,000	818	28.01	835	29.59	851	31.16	867	32.74	883	34.32
46,000	848	30.81	864	32.44	880	34.06	895	35.69	911	37.33
48,000	878	33.81	893	35.49	909	37.16	923	38.82	938	40.52
50,000	908	37.02	923	38.73	938	40.45	952	42.18	967	43.91
52,000	939	40.42	953	42.20	967	43.96	981	45.74	995	47.52
54,000	969	44.05	983	45.87	997	47.69	1011	49.50	1024	51.33
56,000	1031	51.98	1044	53.89	1057	55.80	1070	57.71	1083	59.63
60,000	1094	60.85	1106	62.86	1118	64.85	1131	66.86	1143	68.87

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
26,000	706	17.63	726	18.79	745	19.95	763	21.11	782	22.28
30,000	749	21.29	768	22.57	786	23.84	803	25.12	821	26.40
34,000	772	23.33	790	24.66	808	25.99	825	27.33	842	28.66
36,000	796	25.52	814	26.90	831	28.29	847	29.68	863	31.06
38,000	821	27.86	838	29.30	854	30.73	870	32.18	886	33.62
40,000	846	30.37	862	31.86	878	33.35	894	34.85	909	36.34
42,000	872	33.06	888	34.59	903	36.13	919	37.68	933	39.22
44,000	899	35.91	914	37.50	929	39.10	944	40.69	958	42.29
46,000	926	38.97	940	40.60	955	42.24	969	43.89	983	45.53
48,000	953	42.20	967	43.89	981	45.58	995	47.28	1009	48.97
50,000	981	45.65	995	47.38	1008	49.12	1022	50.86	1035	52.60
52,000	1009	49.30	1022	51.08	1036	52.87	1049	54.66	1062	56.45
54,000	1037	53.16	1051	54.98	1064	56.82	1076	58.66	1089	60.50
56,000	1095	61.55	1108	63.48	1120	65.41	1132	67.34	1144	69.26
60,000	1155	70.88	1166	72.89	1178	74.91	1190	76.93	1201	78.94

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
26,000	799	23.44	817	24.60	834	25.77	851	26.93	867	28.10
30,000	838	27.68	854	28.96	871	30.25	887	31.53	902	32.81
34,000	858	29.99	874	31.33	890	32.67	906	34.02	921	35.36
36,000	879	32.45	895	33.85	911	35.24	926	36.64	941	38.04
38,000	902	35.06	917	36.51	932	37.96	947	39.41	962	40.87
40,000	925	37.84	940	39.33	954	40.84	969	42.34	983	43.85
42,000	948	40.77	963	42.33	977	43.88	991	45.44	1005	46.98
44,000	972	43.88	987	45.48	1001	47.09	1014	48.69	1028	50.31
46,000	997	47.18	1011	48.83	1025	50.50	1038	52.14	1052	53.80
48,000	1023	50.67	1036	52.38	1049	54.07	1063	55.78	1076	57.49
50,000	1049	54.36	1062	56.10	1075	57.85	1088	59.61	1100	61.36
52,000	1075	58.24	1088	60.04	1100	61.83	1113	63.63	1125	65.44
54,000	1102	62.34	1114	64.18	1127	66.03	1139	67.88	1151	69.72
56,000	1156	71.20	1168	73.13	1180	75.08	1192	77.01	1203	78.95
60,000	1212	80.97	1224	83.00	1235	85.03	1246	87.06	—	—

Table 11 — Fan Performance — 48/50N 75-150 Nominal Ton Units Standard Return Fan Data

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
15,000	449	2.09	476	2.54	502	3.02	528	3.52	554	4.04
18,000	528	3.38	551	3.91	574	4.46	596	5.03	618	5.62
21,000	609	5.15	629	5.76	648	6.38	668	7.03	687	7.69
24,000	691	7.49	708	8.17	725	8.87	742	9.59	759	10.32
27,000	773	10.45	789	11.22	804	12.00	819	12.79	834	13.60
30,000	856	14.14	870	14.99	884	15.85	897	16.72	911	17.60
33,000	939	18.64	952	19.56	964	20.49	977	21.44	989	22.40
36,000	1022	24.00	1034	25.01	1045	26.02	1057	27.04	1068	28.09
39,000	1106	30.33	1116	31.41	1127	32.50	1137	33.61	1148	34.73
42,000	1189	37.69	1199	38.86	1209	40.04	1219	41.21	1228	42.42
45,000	1272	46.18	1282	47.42	1291	48.68	1300	49.94	1309	51.22
48,000	1356	55.86	1365	57.19	1373	58.52	1382	59.88	1391	61.23
51,000	1440	66.82	1448	68.24	1456	69.65	1464	71.07	1472	72.51
52,500	1482	72.81	1490	74.26	1497	75.71	1505	77.17	1513	78.65

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
15,000	579	4.59	604	5.15	629	5.73	653	6.32	677	6.94
18,000	639	6.23	661	6.86	682	7.50	703	8.16	723	8.84
21,000	705	8.36	724	9.06	743	9.77	761	10.50	779	11.24
24,000	776	11.07	792	11.84	809	12.62	825	13.41	842	14.22
27,000	849	14.42	864	15.26	879	16.11	894	16.97	908	17.85
30,000	924	18.49	938	19.40	951	20.33	965	21.26	978	22.21
33,000	1001	23.38	1014	24.36	1026	25.36	1038	26.37	1050	27.39
36,000	1079	29.13	1091	30.20	1102	31.27	1113	32.35	1125	33.44
39,000	1158	35.85	1169	37.00	1179	38.14	1190	39.30	1200	40.47
42,000	1238	43.62	1248	44.84	1258	46.06	1268	47.30	1277	48.54
45,000	1318	52.50	1328	53.79	1337	55.10	1346	56.41	1355	57.73
48,000	1399	62.59	1408	63.96	1416	65.35	1425	66.72	1434	68.13
51,000	1480	73.95	1489	75.40	1497	76.86	1505	78.32	1513	79.80
52,500	1521	80.13	1529	81.63	1537	83.12	1545	84.63	1553	86.14

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
15,000	700	7.56	723	8.21	746	8.86	768	9.53	791	10.21
18,000	744	9.53	764	10.24	784	10.96	804	11.69	824	12.44
21,000	797	11.99	815	12.77	833	13.55	851	14.35	868	15.16
24,000	858	15.04	874	15.88	890	16.72	906	17.59	921	18.46
27,000	923	18.74	937	19.64	952	20.56	966	21.48	980	22.43
30,000	991	23.17	1005	24.15	1018	25.13	1031	26.13	1044	27.13
33,000	1063	28.41	1075	29.46	1087	30.52	1099	31.58	1111	32.66
36,000	1136	34.55	1147	35.67	1158	36.79	1169	37.93	1180	39.08
39,000	1211	41.65	1221	42.84	1231	44.04	1242	45.24	1252	46.46
42,000	1287	49.80	1297	51.05	1306	52.33	1316	53.61	1325	54.90
45,000	1364	59.05	1373	60.40	1382	61.74	1391	63.09	1400	64.46
48,000	1442	69.53	1451	70.94	1459	72.37	1468	73.80	1476	75.23
51,000	1521	81.28	1529	82.78	1537	84.28	1545	85.78	1553	87.30
52,500	1560	87.66	1568	89.18	1576	90.72	1584	92.27	1592	93.83

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
15,000	813	10.90	834	11.60	856	12.31	877	13.02	898	13.75
18,000	843	13.19	862	13.96	881	14.74	900	15.53	919	16.34
21,000	886	15.98	903	16.81	920	17.66	937	18.51	954	19.38
24,000	937	19.35	952	20.25	968	21.15	983	22.08	999	23.01
27,000	994	23.38	1009	24.34	1023	25.32	1037	26.30	1050	27.30
30,000	1057	28.15	1070	29.18	1083	30.22	1095	31.27	1108	32.33
33,000	1123	33.74	1135	34.84	1146	35.94	1158	37.06	1170	38.19
36,000	1191	40.23	1202	41.39	1213	42.57	1224	43.76	1235	44.95
39,000	1262	47.68	1273	48.93	1283	50.18	1293	51.42	1303	52.69
42,000	1335	56.21	1344	57.51	1354	58.82	1364	60.16	1373	61.48
45,000	1409	65.83	1418	67.22	1427	68.61	1436	70.02	1445	71.42
48,000	1484	76.69	1493	78.13	1501	79.59	1510	81.07	1518	82.55
51,000	1561	88.80	1569	90.34	1577	91.89	1585	93.43	1593	94.97
52,500	1599	95.40	1607	96.95	1615	98.52	1623	100.12	1630	101.70

Table 12 — Fan Performance — 48/50N 75 Nominal Ton Units High-Static Return Fan Data

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
15,000	332	1.50	363	1.98	392	2.50	420	3.04	447	3.61
18,000	387	2.36	413	2.91	438	3.50	462	4.11	486	4.75
21,000	443	3.52	466	4.15	488	4.81	509	5.50	530	6.21
24,000	500	5.03	520	5.74	540	6.48	559	7.24	578	8.03
27,000	558	6.96	576	7.75	593	8.56	611	9.40	628	10.26
30,000	616	9.34	633	10.22	648	11.11	664	12.02	679	12.95
33,000	675	12.23	690	13.19	704	14.16	718	15.15	733	16.16
36,000	734	15.69	747	16.72	761	17.77	774	18.85	787	19.94
39,000	793	19.75	805	20.87	818	22.00	830	23.16	842	24.32
42,000	852	24.48	864	25.68	875	26.89	886	28.13	898	29.37
45,000	911	29.92	922	31.21	933	32.50	943	33.81	954	35.14
48,000	971	36.12	981	37.48	991	38.87	1001	40.25	1011	41.66
51,000	1030	43.14	1040	44.59	1049	46.06	1058	47.52	1068	49.00
52,500	1060	46.98	1069	48.46	1078	49.97	1087	51.48	1097	53.00

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
15,000	473	4.20	499	4.82	524	5.45	548	6.11	571	6.78
18,000	509	5.41	532	6.10	554	6.80	576	7.53	597	8.27
21,000	551	6.94	571	7.69	591	8.47	610	9.26	630	10.07
24,000	596	8.83	615	9.66	632	10.50	650	11.36	668	12.24
27,000	644	11.13	661	12.03	677	12.95	694	13.88	710	14.83
30,000	695	13.91	710	14.87	725	15.86	740	16.86	754	17.88
33,000	747	17.19	761	18.23	774	19.29	788	20.37	802	21.46
36,000	800	21.04	813	22.16	826	23.30	838	24.45	851	25.61
39,000	854	25.50	866	26.70	878	27.91	890	29.14	902	30.37
42,000	909	30.63	920	31.91	931	33.19	942	34.49	953	35.81
45,000	965	36.47	975	37.83	986	39.19	996	40.57	1006	41.96
48,000	1021	43.09	1031	44.52	1040	45.95	1050	47.41	1060	48.88
51,000	1077	50.50	1087	52.02	1096	53.54	1105	55.07	1114	56.62
52,500	1106	54.55	1115	56.09	1124	57.66	1133	59.23	1142	60.81

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
15,000	594	7.46	616	8.16	638	8.86	660	9.59	680	10.32
18,000	618	9.02	638	9.79	658	10.58	678	11.38	697	12.20
21,000	649	10.90	667	11.74	685	12.60	703	13.47	721	14.35
24,000	685	13.13	702	14.05	719	14.97	735	15.92	751	16.87
27,000	725	15.79	741	16.77	756	17.77	772	18.78	787	19.81
30,000	769	18.92	783	19.97	798	21.03	812	22.12	826	23.21
33,000	815	22.57	829	23.69	842	24.83	855	25.98	868	27.14
36,000	863	26.79	876	27.98	888	29.19	900	30.41	913	31.65
39,000	913	31.62	925	32.89	936	34.18	948	35.46	959	36.78
42,000	964	37.14	975	38.47	986	39.83	997	41.20	1008	42.58
45,000	1017	43.37	1027	44.78	1037	46.20	1047	47.65	1057	49.10
48,000	1070	50.36	1079	51.86	1089	53.35	1099	54.87	1108	56.41
51,000	1124	58.18	1133	59.74	1142	61.33	1151	62.91	1160	64.52
52,500	1151	62.42	1160	64.02	1169	65.64	1177	67.26	1186	68.90

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
15,000	701	11.06	721	11.82	741	12.58	760	13.35	779	14.13
18,000	716	13.02	734	13.86	753	14.70	771	15.56	789	16.43
21,000	739	15.25	756	16.16	773	17.09	790	18.02	806	18.97
24,000	768	17.84	784	18.82	799	19.82	815	20.83	830	21.84
27,000	802	20.84	816	21.89	831	22.96	846	24.04	860	25.12
30,000	840	24.32	853	25.44	867	26.58	881	27.72	894	28.88
33,000	881	28.32	894	29.51	906	30.70	919	31.93	932	33.15
36,000	925	32.90	937	34.15	949	35.42	961	36.71	972	38.00
39,000	971	38.09	982	39.43	993	40.77	1004	42.12	1015	43.49
42,000	1018	43.96	1029	45.36	1039	46.78	1050	48.21	1060	49.64
45,000	1067	50.56	1077	52.05	1087	53.52	1097	55.02	1107	56.53
48,000	1118	57.94	1127	59.48	1137	61.05	1146	62.62	1155	64.19
51,000	1169	66.13	1178	67.75	1187	69.40	1196	71.04	1205	72.70
52,500	1195	70.55	1204	72.22	1213	73.88	1221	75.56	1230	77.26

Table 13 — Fan Performance — 48/50N 90 Nominal Ton Units High-Static Return Fan Data

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
15,000	266	1.19	298	1.69	328	2.23	358	2.80	386	3.41
18,000	307	1.82	334	2.38	360	2.99	386	3.63	411	4.31
21,000	349	2.65	373	3.30	396	3.97	418	4.69	440	5.43
24,000	392	3.75	413	4.47	434	5.21	454	6.00	474	6.81
27,000	436	5.13	455	5.92	474	6.74	492	7.60	510	8.48
30,000	481	6.83	498	7.70	515	8.60	531	9.53	547	10.48
33,000	526	8.90	541	9.85	556	10.82	572	11.82	587	12.85
36,000	571	11.34	585	12.39	599	13.44	613	14.51	627	15.62
39,000	616	14.24	629	15.35	642	16.48	655	17.64	668	18.81
42,000	661	17.60	674	18.79	686	20.00	698	21.23	710	22.49
45,000	707	21.46	718	22.73	730	24.01	741	25.34	752	26.66
48,000	753	25.86	763	27.21	774	28.58	785	29.97	795	31.38
51,000	798	30.83	808	32.26	818	33.72	828	35.18	838	36.67
52,500	821	33.55	831	35.02	841	36.51	850	38.01	860	39.53

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
15,000	413	4.05	439	4.71	465	5.39	489	6.09	513	6.81
18,000	435	5.01	458	5.75	481	6.50	503	7.28	525	8.07
21,000	462	6.20	483	7.00	504	7.82	524	8.67	544	9.54
24,000	493	7.65	512	8.51	531	9.40	549	10.31	568	11.25
27,000	527	9.39	545	10.32	562	11.28	579	12.26	595	13.26
30,000	563	11.46	579	12.47	595	13.49	611	14.54	626	15.61
33,000	601	13.90	616	14.97	631	16.07	645	17.19	659	18.32
36,000	641	16.74	654	17.89	668	19.05	681	20.23	694	21.44
39,000	681	20.02	693	21.23	706	22.47	718	23.72	731	25.00
42,000	722	23.76	734	25.05	745	26.36	757	27.68	769	29.03
45,000	763	28.01	775	29.38	786	30.76	797	32.16	807	33.58
48,000	806	32.80	816	34.25	827	35.71	837	37.16	847	38.67
51,000	848	38.17	858	39.69	868	41.22	878	42.77	888	44.35
52,500	870	41.08	879	42.63	889	44.21	899	45.79	908	47.40

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
15,000	537	7.54	560	8.29	582	9.05	604	9.82	625	10.60
18,000	547	8.89	568	9.72	588	10.56	608	11.43	628	12.30
21,000	563	10.42	583	11.32	601	12.25	620	13.18	638	14.14
24,000	586	12.20	603	13.18	621	14.17	638	15.18	655	16.21
27,000	612	14.28	628	15.32	644	16.38	660	17.46	676	18.56
30,000	641	16.69	656	17.80	671	18.93	686	20.08	701	21.24
33,000	673	19.47	687	20.65	701	21.85	715	23.06	728	24.29
36,000	707	22.67	720	23.91	733	25.17	746	26.45	759	27.74
39,000	743	26.29	755	27.61	767	28.93	779	30.29	791	31.65
42,000	780	30.40	792	31.78	803	33.18	814	34.59	826	36.03
45,000	818	35.02	829	36.46	840	37.94	851	39.43	861	40.93
48,000	857	40.18	868	41.71	878	43.24	888	44.80	898	46.38
51,000	897	45.93	907	47.52	917	49.13	926	50.76	936	52.40
52,500	918	49.03	927	50.66	936	52.30	946	53.98	955	55.66

Table 14 — Fan Performance — 48/50N 105-150 Nominal Ton Units High-Static Return Fan Data

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
24,000	260	2.40	284	3.15	308	3.96	330	4.82	352	5.73
28,000	296	3.51	317	4.36	337	5.25	357	6.21	377	7.20
30,000	315	4.19	334	5.08	353	6.03	372	7.02	390	8.06
32,000	333	4.95	351	5.90	369	6.89	387	7.93	404	9.01
34,000	351	5.81	369	6.81	386	7.85	403	8.94	419	10.06
36,000	370	6.78	387	7.82	403	8.92	419	10.04	434	11.21
38,000	389	7.84	405	8.94	420	10.08	435	11.25	450	12.47
40,000	408	9.03	423	10.18	437	11.37	452	12.59	466	13.86
42,000	427	10.33	441	11.53	455	12.76	469	14.04	482	15.35
44,000	446	11.76	459	13.01	473	14.30	486	15.62	499	16.99
46,000	465	13.31	478	14.61	491	15.95	503	17.33	516	18.74
48,000	484	15.01	496	16.36	509	17.75	521	19.17	533	20.64
50,000	503	16.84	515	18.25	527	19.69	539	21.16	550	22.67
52,000	522	18.83	534	20.28	545	21.78	556	23.31	568	24.85
60,000	599	28.36	609	30.04	619	31.75	629	33.47	639	35.21

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
24,000	472	11.98	490	13.12	508	14.30	526	15.49	543	16.71
28,000	485	13.96	502	15.19	518	16.46	535	17.75	551	19.05
30,000	493	15.07	510	16.35	525	17.65	541	18.98	557	20.34
32,000	503	16.28	518	17.60	534	18.95	549	20.32	564	21.72
34,000	513	17.58	528	18.94	543	20.33	557	21.75	572	23.20
36,000	524	18.99	539	20.39	553	21.82	567	23.29	581	24.77
38,000	536	20.51	550	21.96	564	23.43	577	24.94	590	26.46
40,000	549	22.15	562	23.64	575	25.16	588	26.70	601	28.27
42,000	562	23.91	575	25.45	587	27.00	600	28.59	612	30.20
44,000	575	25.81	588	27.38	600	28.98	612	30.61	624	32.26
46,000	589	27.83	601	29.45	613	31.10	625	32.76	636	34.46
48,000	604	30.00	615	31.66	627	33.35	638	35.07	649	36.81
50,000	619	32.31	630	34.02	641	35.75	652	37.50	662	39.29
52,000	634	34.78	644	36.54	655	38.31	666	40.11	676	41.93
60,000	697	46.29	706	48.22	716	50.17	725	52.15	734	54.14

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
24,000	561	17.94	577	19.20	594	20.47	610	21.77	626	23.07
28,000	567	20.39	582	21.75	598	23.13	613	24.52	628	25.94
30,000	572	21.73	587	23.13	602	24.56	616	26.00	631	27.47
32,000	578	23.15	593	24.60	607	26.06	621	27.55	635	29.06
34,000	586	24.66	600	26.15	614	27.66	627	29.20	641	30.76
36,000	594	26.29	608	27.82	621	29.37	634	30.95	647	32.55
38,000	604	28.02	617	29.59	629	31.19	642	32.82	655	34.45
40,000	614	29.86	626	31.48	639	33.12	651	34.78	663	36.47
42,000	624	31.84	637	33.50	649	35.17	661	36.88	672	38.60
44,000	636	33.94	648	35.64	659	37.36	671	39.11	682	40.88
46,000	648	36.18	659	37.93	670	39.69	682	41.48	693	43.28
48,000	660	38.56	671	40.34	682	42.16	693	43.98	704	45.83
50,000	673	41.08	684	42.91	695	44.78	705	46.64	716	48.54
52,000	687	43.77	697	45.64	707	47.54	718	49.46	728	51.38
60,000	744	56.17	753	58.20	762	60.27	771	62.37	780	64.48

Table 15 — Fan Performance — 48/50N 75 Nominal Ton Units Standard Power Exhaust Fan Data

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
5,000	294	0.39	375	0.58	438	0.77	491	0.96	538	1.14
8,000	361	1.03	436	1.39	496	1.72	548	2.04	594	2.35
10,000	409	1.72	480	2.21	538	2.66	589	3.08	634	3.49
12,000	459	2.70	526	3.32	582	3.89	631	4.42	676	4.94
14,000	511	4.00	575	4.76	628	5.46	676	6.12	719	6.75
16,000	565	5.68	624	6.59	676	7.42	722	8.21	763	8.97
18,000	620	7.80	676	8.85	725	9.83	769	10.76	809	11.64
20,000	676	10.41	728	11.61	775	12.73	817	13.79	857	14.82

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
5,000	581	1.33	621	1.52	657	1.71	692	1.90	725	2.09
8,000	636	2.66	675	2.96	711	3.26	746	3.56	778	3.85
10,000	675	3.89	714	4.28	749	4.66	783	5.05	815	5.43
12,000	716	5.44	754	5.93	789	6.41	822	6.89	854	7.36
14,000	758	7.37	795	7.96	830	8.55	863	9.12	894	9.69
16,000	802	9.70	838	10.41	872	11.11	904	11.79	935	12.46
18,000	847	12.50	882	13.33	915	14.14	947	14.93	977	15.72
20,000	893	15.80	927	16.76	960	17.69	991	18.61	1021	19.50

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
5,000	756	2.28	786	2.48	814	2.67	842	2.87	868	3.07
8,000	809	4.15	838	4.45	867	4.75	894	5.04	920	5.34
10,000	846	5.80	875	6.18	903	6.55	930	6.92	957	7.30
12,000	884	7.82	913	8.28	941	8.74	968	9.19	994	9.65
14,000	924	10.25	952	10.80	980	11.35	1006	11.89	1032	12.43
16,000	964	13.12	993	13.77	1020	14.42	1046	15.06	1072	15.69
18,000	1006	16.49	1034	17.24	1061	18.00	1087	18.74	1112	19.47
20,000	1049	20.39	1077	21.26	1103	22.12	1129	22.97	1153	23.81

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
5,000	894	3.28	919	3.48	943	3.69	967	3.90	990	4.11
8,000	946	5.64	971	5.94	995	6.24	1018	6.54	1041	6.84
10,000	982	7.67	1007	8.04	1030	8.41	1054	8.78	1076	9.15
12,000	1019	10.10	1043	10.55	1067	11.00	1090	11.45	1113	11.89
14,000	1057	12.97	1081	13.51	1105	14.04	1128	14.57	1150	15.10
16,000	1096	16.32	1120	16.95	1144	17.57	1166	18.19	1189	18.81
18,000	1136	20.20	1160	20.93	1183	21.64	1206	22.36	1228	23.07
20,000	1178	24.64	1201	25.47	1224	26.29	1246	27.10	1268	27.91

Table 16 — Fan Performance — 48/50N 90-150 Nominal Ton Units Standard Power Exhaust Fan Data

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
5,000	238	0.34	307	0.55	363	0.76	410	0.98	453	1.21
7,000	272	0.66	335	0.95	388	1.24	433	1.53	474	1.83
9,000	311	1.17	368	1.54	417	1.91	461	2.28	500	2.65
11,000	354	1.90	406	2.36	451	2.82	492	3.27	529	3.72
13,000	399	2.91	446	3.47	488	4.01	526	4.55	561	5.08
15,000	446	4.26	488	4.90	527	5.54	563	6.16	596	6.78
16,000	469	5.07	510	5.76	547	6.44	582	7.11	615	7.78
18,000	518	7.01	555	7.80	590	8.57	622	9.33	653	10.08
20,000	567	9.41	602	10.29	634	11.15	664	12.01	693	12.85
22,000	617	12.32	649	13.29	679	14.25	708	15.19	735	16.13
24,000	667	15.79	697	16.85	725	17.90	752	18.93	778	19.97
25,000	693	17.75	721	18.86	749	19.96	775	21.04	800	22.11
26,000	718	19.87	746	21.03	772	22.17	798	23.30	822	24.42
27,000	744	22.16	770	23.36	796	24.55	821	25.72	845	26.89
28,000	769	24.62	795	25.87	820	27.10	844	28.32	867	29.54

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
5,000	492	1.45	528	1.70	561	1.95	593	2.21	623	2.48
7,000	512	2.13	547	2.44	580	2.75	611	3.07	640	3.40
9,000	536	3.02	570	3.40	602	3.78	632	4.16	661	4.55
11,000	564	4.17	596	4.62	627	5.07	656	5.53	684	5.99
13,000	594	5.61	626	6.14	655	6.67	684	7.21	711	7.74
15,000	628	7.40	658	8.01	686	8.63	713	9.24	740	9.85
16,000	645	8.44	675	9.09	703	9.75	729	10.40	755	11.06
18,000	682	10.83	710	11.57	737	12.32	762	13.05	787	13.79
20,000	721	13.69	747	14.52	773	15.35	798	16.17	822	16.99
22,000	761	17.06	787	17.98	811	18.90	835	19.81	858	20.72
24,000	803	20.99	827	21.99	850	23.01	873	24.01	895	25.01
25,000	824	23.18	848	24.24	871	25.29	893	26.34	915	27.38
26,000	846	25.53	869	26.64	891	27.73	913	28.83	934	29.92
27,000	868	28.05	890	29.20	912	30.35	933	31.48	954	32.62
28,000	890	30.74	912	31.94	933	33.13	954	34.31	974	35.49

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
5,000	651	2.76	678	3.04	704	3.32	730	3.62	754	3.92
7,000	668	3.73	695	4.06	721	4.41	746	4.76	770	5.11
9,000	688	4.95	714	5.35	740	5.75	764	6.16	788	6.57
11,000	711	6.45	737	6.92	762	7.39	786	7.86	809	8.34
13,000	737	8.28	762	8.82	786	9.36	809	9.90	832	10.45
15,000	765	10.47	789	11.08	813	11.70	836	12.32	858	12.94
16,000	780	11.71	804	12.36	827	13.02	850	13.68	871	14.33
18,000	811	14.52	834	15.26	857	16.00	879	16.73	900	17.47
20,000	845	17.81	867	18.63	889	19.45	910	20.27	931	21.08
22,000	880	21.62	902	22.53	923	23.43	943	24.33	963	25.23
24,000	917	26.00	938	27.00	958	27.98	978	28.97	998	29.96
25,000	936	28.42	956	29.45	976	30.49	996	31.52	1015	32.55
26,000	955	31.00	975	32.08	995	33.16	1014	34.23	1033	35.30
27,000	974	33.74	994	34.87	1014	35.99	1033	37.11	1051	38.22
28,000	994	36.66	1014	37.83	1033	39.00	1052	40.16	1070	41.32

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
5,000	778	4.22	800	4.54	823	4.85	844	5.18	865	5.50
7,000	793	5.47	816	5.83	838	6.20	859	6.58	880	6.96
9,000	811	6.99	833	7.42	855	7.84	876	8.28	897	8.71
11,000	831	8.82	853	9.31	875	9.80	896	10.29	916	10.79
13,000	854	11.00	876	11.55	897	12.11	917	12.67	937	13.23
15,000	879	13.56	901	14.18	921	14.81	941	15.44	961	16.07
16,000	893	14.99	914	15.66	934	16.32	954	16.98	973	17.65
18,000	921	18.20	941	18.94	961	19.68	981	20.42	1000	21.16
20,000	951	21.90	971	22.72	990	23.54	1009	24.35	1028	25.17
22,000	983	26.13	1002	27.03	1021	27.93	1040	28.82	1058	29.73
24,000	1017	30.94	1035	31.92	1054	32.90	1072	33.88	1089	34.86
25,000	1034	33.57	1052	34.60	1071	35.62	1088	36.65	1106	37.66
26,000	1052	36.37	1070	37.44	1088	38.50	1105	39.57	1122	40.63
27,000	1070	39.34	1088	40.45	1105	41.56	1122	42.67	1139	43.77
28,000	1088	42.48	1106	43.64	1123	44.78	1140	45.94	1157	47.09

Table 17 — Fan Performance — 48/50N 75-105 Nominal Ton Units High-Static Power Exhaust Fan Data

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
15,000	185	1.91	240	3.01	285	4.17	324	5.43	358	6.75
18,000	198	2.74	250	4.03	293	5.36	331	6.75	365	8.22
21,000	212	3.82	261	5.30	303	6.82	339	8.38	372	9.99
24,000	227	5.19	274	6.88	313	8.58	349	10.32	381	12.10
27,000	243	6.87	287	8.78	325	10.69	359	12.61	391	14.57
30,000	260	8.93	301	11.06	338	13.17	371	15.29	401	17.43
33,000	277	11.38	316	13.73	351	16.06	383	18.39	412	20.73
36,000	295	14.28	332	16.86	366	19.41	396	21.94	425	24.48
39,000	313	17.67	348	20.47	380	23.24	410	25.99	437	28.74
42,000	332	21.58	365	24.61	396	27.60	424	30.57	451	33.53
45,000	351	26.04	382	29.31	412	32.53	439	35.71	465	38.89
48,000	370	31.12	400	34.62	428	38.07	454	41.48	479	44.87
51,000	389	36.84	418	40.57	445	44.25	470	47.88	—	—
52,500	399	39.97	427	43.81	453	47.60	—	—	—	—

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
15,000	390	8.15	419	9.63	446	11.17	472	12.77	496	14.45
18,000	396	9.75	424	11.34	451	13.00	477	14.71	501	16.49
21,000	403	11.66	431	13.39	457	15.18	482	17.02	506	18.91
24,000	411	13.93	438	15.80	464	17.73	489	19.70	512	21.73
27,000	419	16.56	447	18.60	472	20.68	496	22.80	519	24.97
30,000	429	19.61	456	21.81	481	24.06	504	26.34	527	28.65
33,000	440	23.08	466	25.47	490	27.88	513	30.33	536	32.81
36,000	451	27.03	476	29.60	500	32.20	523	34.82	545	37.47
39,000	463	31.49	488	34.25	511	37.04	534	39.84	555	42.67
42,000	476	36.48	500	39.46	523	42.43	545	45.42	566	48.43
45,000	489	42.06	512	45.23	535	48.41	—	—	—	—
48,000	503	48.25	—	—	—	—	—	—	—	—
51,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

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
15,000	519	16.17	542	17.97	563	19.81	584	21.71	603	23.66
18,000	524	18.32	546	20.21	567	22.16	587	24.15	607	26.20
21,000	529	20.86	551	22.86	572	24.91	592	27.01	611	29.15
24,000	535	23.81	556	25.92	577	28.09	597	30.30	617	32.57
27,000	542	27.18	563	29.44	583	31.73	603	34.07	622	36.46
30,000	549	31.01	570	33.41	590	35.84	610	38.33	629	40.85
33,000	557	35.32	578	37.88	598	40.47	617	43.09	636	45.75
36,000	566	40.15	587	42.87	606	45.61	625	48.39	—	—
39,000	576	45.53	596	48.41	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
45,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
51,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

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
15,000	623	25.67	641	27.73	660	29.83	677	31.98	694	34.18
18,000	626	28.29	645	30.44	663	32.62	680	34.85	698	37.14
21,000	630	31.35	649	33.60	667	35.89	684	38.21	701	40.60
24,000	635	34.87	654	37.23	671	39.62	689	42.06	706	44.53
27,000	641	38.90	659	41.36	677	43.87	694	46.42	711	49.00
30,000	647	43.40	665	45.99	683	48.64	—	—	—	—
33,000	654	48.44	—	—	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—
39,000	—	—	—	—	—	—	—	—	—	—
42,000	—	—	—	—	—	—	—	—	—	—
45,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
51,000	—	—	—	—	—	—	—	—	—	—
52,500	—	—	—	—	—	—	—	—	—	—

Table 18 — Fan Performance — 48/50N 120-150 Nominal Ton Units High-Static Power Exhaust Fan Data

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
24,000	195	3.13	239	5.10	274	6.96	303	8.78	329	10.57
28,000	209	4.07	254	6.47	288	8.71	317	10.87	343	13.00
30,000	216	4.60	261	7.22	295	9.65	324	12.01	350	14.31
32,000	224	5.17	268	8.02	302	10.66	331	13.19	357	15.68
34,000	231	5.79	275	8.87	310	11.72	339	14.45	364	17.12
36,000	238	6.44	283	9.77	317	12.84	346	15.77	371	18.62
38,000	246	7.15	290	10.72	324	14.01	353	17.14	379	20.19
40,000	253	7.89	297	11.73	331	15.24	360	18.58	386	21.82
42,000	261	8.69	305	12.79	339	16.53	368	20.10	393	23.53
44,000	268	9.54	312	13.90	346	17.89	375	21.66	400	25.32
46,000	276	10.43	319	15.09	353	19.29	382	23.30	408	27.17
48,000	283	11.38	327	16.32	361	20.79	389	25.02	415	29.09
50,000	291	12.39	334	17.62	368	22.34	397	26.79	422	31.08
52,000	298	13.45	341	18.98	375	23.95	404	28.65	429	33.17
60,000	328	18.30	371	25.08	405	31.15	433	36.84	458	42.27

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
24,000	352	12.35	373	14.11	393	15.87	412	17.63	429	19.39
28,000	366	15.10	387	17.19	407	19.25	426	21.32	444	23.37
30,000	373	16.58	394	18.83	414	21.05	433	23.28	451	25.48
32,000	380	18.12	402	20.54	421	22.93	440	25.31	458	27.69
34,000	388	19.74	409	22.32	429	24.89	447	27.42	465	29.96
36,000	395	21.42	416	24.18	436	26.91	454	29.63	472	32.32
38,000	402	23.18	423	26.12	443	29.02	461	31.90	479	34.76
40,000	409	25.01	430	28.12	450	31.20	469	34.27	486	37.29
42,000	416	26.89	437	30.21	457	33.47	476	36.70	493	39.90
44,000	423	28.87	445	32.38	464	35.83	483	39.24	501	42.62
46,000	431	30.92	452	34.62	472	38.25	490	41.84	508	45.40
48,000	438	33.05	459	36.93	479	40.77	497	44.55	515	48.30
50,000	445	35.26	466	39.34	486	43.37	505	47.35	522	51.28
52,000	452	37.56	473	41.86	493	46.07	512	50.24	529	54.34
60,000	481	47.54	502	52.71	522	57.76	—	—	—	—

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
24,000	446	21.15	462	22.91	478	24.67	492	26.43	507	28.20
28,000	460	25.43	476	27.49	492	29.54	507	31.59	521	33.64
30,000	467	27.69	484	29.90	499	32.10	514	34.30	528	36.50
32,000	475	30.04	491	32.40	506	34.76	521	37.10	535	39.45
34,000	482	32.49	498	34.99	513	37.50	528	40.00	542	42.50
36,000	489	35.00	505	37.67	520	40.33	535	42.99	549	45.64
38,000	496	37.60	512	40.43	527	43.26	542	46.07	556	48.88
40,000	503	40.30	519	43.31	534	46.28	549	49.25	563	52.22
42,000	510	43.09	526	46.25	542	49.41	556	52.53	571	55.66
44,000	517	45.96	533	49.29	549	52.62	564	55.92	578	59.19
46,000	525	48.94	541	52.45	556	55.92	571	59.40	—	—
48,000	532	52.00	548	55.68	563	59.35	—	—	—	—
50,000	539	55.17	555	59.03	—	—	—	—	—	—
52,000	546	58.43	—	—	—	—	—	—	—	—
60,000	—	—	—	—	—	—	—	—	—	—

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
24,000	521	29.98	534	31.75	547	33.52	560	35.31	572	37.09
28,000	535	35.67	548	37.74	561	39.79	574	41.86	586	43.91
30,000	542	38.69	555	40.89	568	43.08	581	45.29	593	47.49
32,000	549	41.79	562	44.13	575	46.48	588	48.83	600	51.17
34,000	556	44.99	569	47.48	582	49.97	595	52.47	607	54.95
36,000	563	48.28	576	50.93	589	53.57	602	56.19	614	58.85
38,000	570	51.68	584	54.48	597	57.27	—	—	—	—
40,000	577	55.17	591	58.13	—	—	—	—	—	—
42,000	584	58.77	—	—	—	—	—	—	—	—
44,000	—	—	—	—	—	—	—	—	—	—
46,000	—	—	—	—	—	—	—	—	—	—
48,000	—	—	—	—	—	—	—	—	—	—
50,000	—	—	—	—	—	—	—	—	—	—
52,000	—	—	—	—	—	—	—	—	—	—
60,000	—	—	—	—	—	—	—	—	—	—

Table 19 — Component Pressure Drops (in. wg) Sizes N, P, Q (75-105 Ton Nominal Capacity)

COMPONENT	AIRFLOW (cfm)									
	15,000	19,000	23,000	27,000	31,000	35,000	39,000	43,000	47,000	52,000
High-Capacity Evaporator Coil (75-90)	0.05	0.10	0.14	0.18	0.22	0.26	0.29	0.32	0.34	0.37
High-Capacity Evaporator Coil (105)	0.04	0.09	0.14	0.19	0.24	0.28	0.32	0.36	0.40	0.44
Humidi-MiZer® System (75-105)	0.02	0.03	0.05	0.09	0.17	0.25	0.39	0.54	0.70	0.91
Hydronic Coil (75-105)	0.13	0.20	0.28	0.37	0.46	0.57	0.68	0.80	0.93	1.10
Steam Coil (75-105)	0.14	0.22	0.31	0.41	0.51	0.63	0.75	0.88	1.02	1.21
Low Gas Heat (75-105)	0.15	0.20	0.26	0.33	0.41	0.49	0.58	0.68	0.78	0.92
Medium Gas Heat (75-105)	0.18	0.25	0.33	0.42	0.51	0.62	0.73	0.85	0.98	1.15
High Gas Heat (75-105)	0.26	0.35	0.45	0.56	0.67	0.80	0.94	1.09	1.24	1.45
Electric Heat (108 kW)	0.05	0.08	0.12	0.16	0.21	0.27	0.34	0.42	0.50	0.62
Electric Heat (108 kW, High-Static Supply Fan)	0.08	0.12	0.17	0.24	0.32	0.41	0.51	0.63	0.75	0.93
Electric Heat (144 kW)	0.06	0.09	0.13	0.18	0.23	0.30	0.38	0.46	0.55	0.68
Electric Heat (144 kW, High-Static Supply Fan)	0.08	0.13	0.19	0.27	0.35	0.45	0.56	0.69	0.83	1.02
Electric Heat (190 kW)	0.06	0.10	0.14	0.19	0.26	0.33	0.41	0.51	0.61	0.75
Electric Heat (190 kW, High-Static Supply Fan)	0.09	0.14	0.21	0.29	0.39	0.50	0.62	0.76	0.91	1.12
Electric Heat (265 kW)	0.07	0.11	0.15	0.21	0.28	0.36	0.46	0.56	0.67	0.82
Electric Heat (265 kW, High-Static Supply Fan)	0.10	0.16	0.23	0.32	0.43	0.55	0.68	0.84	1.00	1.24
FILTERS										
Mixed Air Filters										
4-in. MERV 8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-in. MERV 14	0.21	0.27	0.33	0.39	0.44	0.50	0.56	0.61	0.67	0.74
Cartridge Filter with 2-in. Pre-Filter	0.38	0.48	0.58	0.68	0.78	0.88	0.98	1.08	1.18	1.30
Cartridge Filter with 4-in. Pre-Filter	0.30	0.38	0.46	0.54	0.62	0.70	0.78	0.86	0.94	1.04
MERV 14 Bag with 2-in. Pre-Filter	0.30	0.38	0.46	0.54	0.62	0.70	0.78	0.86	0.94	1.04
MERV 14 Bag with 4-in. Pre-Filter	0.23	0.29	0.35	0.41	0.47	0.53	0.59	0.65	0.71	0.78
MERV 15 Bag with 2-in. Pre-Filter	0.30	0.38	0.46	0.54	0.62	0.70	0.78	0.86	0.94	1.04
MERV 15 Bag with 4-in. Pre-Filter	0.23	0.29	0.35	0.41	0.47	0.53	0.59	0.65	0.71	0.78
Final Filters										
Cartridge Filter with 2-in. Pre-Filter	0.39	0.50	0.61	0.71	0.82	0.92	1.03	1.13	1.24	1.37
Cartridge Filter with 4-in. Pre-Filter	0.32	0.40	0.48	0.57	0.65	0.74	0.82	0.91	0.99	1.09
MERV 15 Bag with 2-in. Pre-Filter	0.32	0.40	0.48	0.57	0.65	0.74	0.82	0.91	0.99	1.09
MERV 15 Bag with 4-in. Pre-Filter	0.24	0.30	0.36	0.43	0.49	0.55	0.62	0.68	0.74	0.82
HEPA with 2-in. Pre-Filter	0.47	0.60	0.73	0.85	0.98	1.11	1.23	1.36	1.48	1.64
HEPA with 4-in. Pre-Filter	0.39	0.50	0.61	0.71	0.82	0.92	1.03	1.13	1.24	1.37
Economizer Pressure Drop	0.07	0.09	0.11	0.15	0.19	0.24	0.29	0.35	0.41	0.50
High-Static PE Fan (off)	0.02	0.05	0.09	0.12	0.15	0.19	0.24	0.30	0.35	0.44
Standard PE Fan (90-105) (off)	0.00	0.05	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.44
Standard PE Fan (75) (off)	0.06	0.08	0.10	0.13	0.15	0.20	0.25	0.29	0.36	0.43
Outdoor Airflow Station	0.00	0.03	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.28

LEGEND

PE — Power Exhaust

Table 20 — Component Pressure Drops (in. wg) Sizes R, S, T (120-150 Ton Nominal Capacity)

COMPONENT	AIRFLOW (cfm)									
	24,000	28,000	32,000	36,000	40,000	44,000	48,000	52,000	56,000	60,000
High-Capacity Evaporator Coil (120)	0.10	0.13	0.16	0.19	0.22	0.25	0.28	0.31	0.33	0.36
High-Capacity Evaporator Coil (130-150)	0.11	0.14	0.17	0.20	0.23	0.26	0.29	0.33	0.36	0.39
Humidi-MiZer® System (120-150)	0.06	0.11	0.19	0.29	0.42	0.56	0.73	0.92	1.14	1.38
Hydronic Coil (120-150)	0.18	0.23	0.28	0.34	0.41	0.48	0.55	0.63	0.71	0.80
Steam Coil (120-150)	0.21	0.27	0.34	0.41	0.49	0.57	0.66	0.76	0.86	0.96
Low Gas Heat (120-150)	0.28	0.35	0.43	0.51	0.61	0.71	0.81	0.93	1.04	1.17
Medium Gas Heat (120-150)	0.35	0.44	0.54	0.64	0.76	0.88	1.02	1.16	1.31	1.46
High Gas Heat (120-150)	0.47	0.58	0.70	0.83	0.97	1.11	1.26	1.42	1.59	1.76
Electric Heat (144 kW)	0.13	0.18	0.24	0.30	0.38	0.46	0.55	0.65	0.76	0.87
Electric Heat (144 kW, High-Static Supply Fan)	0.20	0.27	0.36	0.46	0.57	0.69	0.83	0.98	1.14	1.31
Electric Heat (265 kW)	0.15	0.20	0.26	0.34	0.42	0.51	0.61	0.72	0.83	0.96
Electric Heat (300 kW)	0.22	0.30	0.39	0.50	0.62	0.76	0.91	1.07	1.25	1.44
Electric Heat (300 kW)	0.29	0.39	0.51	0.65	0.81	0.99	1.18	1.39	1.63	1.87
FILTERS										
Mixed Air Filters										
4-in. MERV 8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4-in. MERV 14	0.34	0.40	0.46	0.51	0.57	0.63	0.69	0.74	0.80	0.86
Cartridge Filter with 2-in. Pre-Filter	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
Cartridge Filter with 4-in. Pre-Filter	0.48	0.56	0.64	0.72	0.80	0.88	0.96	1.04	1.12	1.20
MERV 14 Bag with 2-in. Pre-Filter	0.48	0.56	0.64	0.72	0.80	0.88	0.96	1.04	1.12	1.20
MERV 14 Bag with 4-in. Pre-Filter	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90
MERV 15 Bag with 2-in. Pre-Filter	0.48	0.56	0.64	0.72	0.80	0.88	0.96	1.04	1.12	1.20
MERV 15 Bag with 4-in. Pre-Filter	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90
Final Filters										
Cartridge Filter with 2-in. Pre-Filter	0.63	0.74	0.84	0.95	1.05	1.16	1.26	1.37	1.47	1.58
Cartridge Filter with 4-in. Pre-Filter	0.51	0.59	0.67	0.76	0.84	0.93	1.01	1.09	1.18	1.26
MERV 15 Bag with 2-in. Pre-Filter	0.51	0.59	0.67	0.76	0.84	0.93	1.01	1.09	1.18	1.26
MERV 15 Bag with 4-in. Pre-Filter	0.38	0.44	0.51	0.57	0.63	0.69	0.76	0.82	0.88	0.95
HEPA with 2-in. Pre-Filter	0.76	0.88	1.01	1.14	1.26	1.39	1.52	1.64	1.77	1.89
HEPA with 4-in. Pre-Filter	0.63	0.74	0.84	0.95	1.05	1.16	1.26	1.37	1.47	1.58
Economizer Pressure Drop	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.53	0.62	0.71
High-Static PE Fan (off)	0.08	0.11	0.14	0.19	0.24	0.26	0.28	0.33	0.40	0.42
Standard PE Fan (off)	0.10	0.15	0.17	0.23	0.28	0.33	0.37	0.44	0.48	0.58
Outdoor Airflow Station	0.08	0.11	0.13	0.16	0.20	0.24	0.28	0.33	0.38	0.43

LEGEND

PE — Power Exhaust

Table 21 — Supply Fan Motor Limitations

ENCLOSURE TYPE	NOMINAL		MAXIMUM		MAXIMUM AMPS		RATED EFFICIENCY
	Bhp	BkW	Bhp	BkW	460 V	575 V	
ODP	15	11.2	17.3	12.9	21.7	17.4	93.0
TEFC	15	11.2	17.2	12.9	20.5	16.6	92.4
ODP	20	14.9	22.9	17.1	28.2	22.5	93.6
TEFC	20	14.9	23.0	17.1	27.3	21.9	93.0
ODP	25	18.7	28.7	21.4	35.1	28.2	93.6
TEFC	25	18.7	28.7	21.4	34.3	27.4	93.6
ODP	30	22.4	34.5	25.7	42.1	32.8	94.1
TEFC	30	22.4	34.5	25.7	41.3	33.0	93.6
ODP	40	29.8	43.7	32.6	55.8	44.6	94.1
TEFC	40	29.8	46.0	34.3	53.5	42.8	94.1
ODP	50	37.3	53.9	40.2	69.6	55.2	94.5
TEFC	50	37.3	57.5	42.9	66.6	53.2	94.5
ODP	60	44.8	68.1	50.8	81.7	65.6	95.0
TEFC	60	44.8	69.0	51.5	81.9	67.5	95.0
ODP	75	56.0	84.2	62.8	101.2	80.5	95.0
TEFC	75	56.0	86.0	64.2	100.7	82.6	95.4
ODP	100	74.6	112.2	83.7	132.3	105.8	95.4
TEFC	100	74.6	114.8	85.6	140.3	110.7	95.4

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts
ODP — Open Drip Proof
TEFC — Total Enclosed Fan Cooled

NOTES:

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

Table 22 — Power Exhaust and Return Fan Motor Limitations

ENCLOSURE TYPE	NOMINAL		MAXIMUM		MAXIMUM AMPS		RATED EFFICIENCY
	Bhp	BkW	Bhp	BkW	460 V	575 V	
ODP	7.5	5.60	8.58	6.40	11.2	8.6	91.7
TEFC	7.5	5.60	8.62	6.43	10.5	8.4	91.7
ODP	10	7.46	11.48	8.56	14.5	11.6	91.7
TEFC	10	7.46	11.49	8.57	14.0	11.3	91.7
ODP	15	11.2	17.3	12.9	21.7	17.4	93.0
TEFC	15	11.2	17.2	12.9	20.5	16.6	92.4
ODP	20	14.9	22.9	17.1	28.2	22.5	93.6
TEFC	20	14.9	23.0	17.1	27.3	21.9	93.0
ODP	25	18.7	28.7	21.4	35.1	28.2	93.6
TEFC	25	18.7	28.7	21.4	34.3	27.4	93.6
ODP	30	22.4	34.5	25.7	42.1	32.8	94.1
TEFC	30	22.4	34.5	25.7	41.3	33.0	93.6
ODP	40	29.8	43.7	32.6	55.8	44.6	94.1
TEFC	40	29.8	46.0	34.3	53.5	42.8	94.1
ODP	50	37.3	53.9	40.2	69.6	55.2	94.5
TEFC	50	37.3	57.5	42.9	66.6	53.2	94.5
ODP	60	44.8	68.1	50.8	81.7	65.6	95.0
TEFC	60	44.8	69.0	51.5	81.9	67.5	95.0

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts
ODP — Open Drip Proof
TEFC — Total Enclosed Fan Cooled

NOTES:

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

CONTROLS QUICK START

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

VAV Units Using Return Air Sensor or Space Temperature Sensor

To configure the unit, perform the following:

1. The type of control is configured under ***Configuration →UNIT→C.TYP.*** Set ***C.TYP*** to 1 (VAV-RAT) for return air sensor. Set ***C.TYP*** to 2 (VAV-SPT) for space temperature sensor.
   NOTE: For VAV with a space sensor (VAV-SPT), under ***Configuration→UNIT→SENS→SPT.S***, enable the space sensor by setting ***SPT.S*** to ENBL.

NOTE: Refer to the section on static pressure control for information on how to set up the unit for the type of supply fan control desired.

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

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

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

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

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

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

   This applies to both TSTAT MULTI and SENSOR MULTI modes.

NOTE: Configure either ***RTIO*** and ***LIMT*** or ***RES.S***. All 3 are not used.

7. See the Economizer Configurations section for additional economizer option configurations.
8. See the Exhaust Configurations section for addition exhaust option configurations.

Multi-Stage CV and SAV Units with Mechanical Thermostat

To configure the unit, perform the following:

1. Under ***Configuration→UNIT→C.TYP***, set ***C.TYP*** to 3 (TSTAT MULTI). See the Economizer Configurations section for additional economizer option configurations.
2. Under the ***Setpoints*** menu, the following configurations should be set:

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

   See the Exhaust Configurations section for additional exhaust option configurations.

Multi-Stage CV and SAV Units with Space Sensor

To configure the unit, perform the following:

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

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

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

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

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

Economizer Configurations

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

EC.EN Economizer Enabled?
EC.MN Economizer Min.Position
EC.MX Economizer Max. 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
CFM.C Outdoor Air CFM Control
E.CFG Economizer Operation Config
UEFC Unoccupied Economizer Free Cooling
ACT.C Economizer Actuator Config

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

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

If equipped with an outdoor airflow station, make sure ***Configuration→ECON→CFM.C→OCF.S*** is enabled (set to 1 or 2). If an outdoor airflow station is used, then the economizer will control to cfm, not a position, as long as the sensor is valid. Therefore, ***Configuration→ECON→CFM.C→ O.C.MX*** supersedes ***Configuration→ECON→EC.MN***. Without cfm or enthalpy control, the outdoor-air dampers will open to minimum position when the supply fan is running. Outdoor-air dampers will spring-return closed upon loss of power or shutdown of the supply fan.

Indoor Air Quality Configurations

DEMAND CONTROLLED VENTILATION

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

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

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

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

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

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

Exhaust Configurations

The following exhaust options should be configured.

Configuration→BP→BF.CF=1

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

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

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

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

Configuration→BP→BP.CF=2 (Return Fan Tracking Control)

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

BP.SP	Building Pressure Setpoint (see note below)

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

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

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

FT.CF	Fan Track Learn Enable (see note below)
FT.TM	Fan Track Learn Rate (see note below, not used when Fan Track Learning is disabled)
FT.ST	Fan Track Initial DCFM
FT.MX	Fan Track Max Clamp (see note below, not used when Fan Track Learning is disabled)
FT.AD	Fan Track Max Correction (see note below, not used when Fan Track Learning is disabled)
FT.OF	Fan Track Internal 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)

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

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

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

If equipped with an outdoor airflow station, make sure ***Configuration→ECON→CFM.C→OCF.S*** is enabled (set to 1 or 2). If an outdoor airflow station is used, then the economizer will control to cfm, not a position, as long as the sensor is valid. Therefore, ***Configuration→ECON→CFM.C→ O.C.MX*** supersedes ***Configuration→ECON→EC.MN***. Without cfm or enthalpy control, the outdoor-air dampers will open to minimum position when the supply fan is running. Outdoor-air dampers will spring-return closed upon loss of power or shutdown of the supply fan.

Set Clock on VFD

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 230 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 display.
2. Use the UP or DOWN keys to highlight TIME AND DATE 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 8 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→IAQ→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. The default password is 1111. ***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 2 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; the 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 2 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; the 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 Navigator 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 default 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. Staged air volume (SAV) modulates from high to low based on the software's algorithms. To remove the force, press ENTER, and then press the UP and DOWN arrows simultaneously.

The remaining categories: ***INDP***, ***FANS***, ***AC.T.C***, ***HMZR***, ***EX-VS***, ***COOL***, ***HEAT***, and ***AC.DT*** are submenus with separate items and functions. See Table 23.

Service Test Mode Logic

Operation in the Service Test mode is submenu specific except for the ***INDP*** submenu. Leaving the submenu while a test is being performed and attempting to start a different test in the new submenu 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*** submenu, any attempt to turn on heating stages within the ***HEAT*** submenu 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*** submenu 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*** submenu and will remain on if compressor stages were requested in the ***COOL*** submenu.

Fans

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

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

Table 23 — Service Test

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
TEST	Service Test Mode	Off/On		MAN_CTRL	
STOP	Local Machine Disable	No/Yes		UNITSTOP	
S.STP	Soft Stop Request	No/Yes		SOFTSTOP	
FAN.F	Supply Fan Request	No/Yes		SFANFORC	
INDP	TEST INDEPENDENT OUTPUTS				
HUM.R	Humidifier Relay	Off/On		HUMR_TST	
ALRM	Remote Alarm/Aux Relay	Off/On		ALRM_TST	
FANS	TEST FANS				
F.MOD	Fan Test Automatic?	No/Yes		FANAUTO	
E.POS	Econ 1 Out Act. Cmd. Pos.	0-100		ECONFANS	
SF.BY	Supply Fan Bypass Relay	Off/On		SFAN_TST	
S.VFD	Supply Fan Commanded %	0-100	%	SFVFDTST	
PE.BY	Power Exhaust Bypass Relay	Off/On		PEBY_TST	
E.VFD	Exhaust Fan Commanded %	0-100	%	EFVFDTST	
A.VFD	MtrMaster A Commanded %	0-100	%	OAVFDTST	
B.VFD	MtrMaster B Commanded %	0-100	%	OBVFDTST	
CDF.1	Condenser Fan Output 1	Off/On		CDF1_TST	
CDF.2	Condenser Fan Output 2	Off/On		CDF2_TST	
CDF.3	Condenser Fan Output 3	Off/On		CDF3_TST	
CDF.4	Condenser Fan Output 4	Off/On		CDF4_TST	
CDF.5	Condenser Fan Output 5	Off/On		CDF5_TST	
AC.T.C	CALIBRATE TEST-ACTUATORS				
EC1.C	Econ 1 Out Act.Cmd.Pos.	0-100	%	ECON1TST	
E1.CL	Economizer Calibrate Cmd	No/Yes		ECONOCAL	
E1C.A	Econ 1 Out Act Ctl Angle	0-100		CONCANG	
EC2.C	Econ 2 Ret Act.Cmd.Pos.	0-100	%	ECON2TST	
E2.CL	Economzr 2 Calibrate Cmd	No/Yes		ECON2CAL	
E2C.A	Econ 2 Ret Act Ctl Angle	0-100		ECN2CANG	
EC3.C	Econ 3 Out Act. Cmd.Pos.	0-100	%	ECON2TST	
E3.CL	Economzr 3 Calibrate Cmd	No/Yes		ECON3 CAL	
E3C.A	Humidifier Act. Ctrl. Ang.	0-100		HUMDCANG	
HTC.C	Ht.Coil Command Position	0-100	%	HTCLACTC	
HT.CL	Heating Coil Act. Cal.Cmd	No/Yes		HCOILCAL	
HTC.A	Heat Coil Act.Ctl.Angle	0-100		HTCLCANG	
HMD.C	Humidifier Command Pos.	0-100	%	HUMD_TST	
HM.CL	Humidifier Act. Cal.Cmd	No/Yes		HUMIDCAL	
HMD.A	Humidifier Act.Ctrl.Ang.	0-100		HUMDCANG	
HTC.3	Ht.Coil Command Position	0-100		HTC3ACTS	
HC.3L	Heat Coil Act 3 Cal Cmd	No/Yes		HTC3_CAL	
HC3.A	Heat Coil Act 3 Cal Cmd	0-100		HTC3CANG	
HTC.4	Ht.Coil Command Position	0-100		HTC4ACTS	
HC.4L	Heat Coil Act 4 Cal Cmd	No/Yes		HTC4_CAL	
HC4.A	HTC4 Control Angle	0-100		HTC4CANG	
SRCH	SEARCH FOR SERIAL NUMBER				
ACTV	Belimo Serial Num Search	No/Yes		BELSERCH	
ECN.1	Economizer 1 Search	No/Yes		EC1SERCH	
ECN.2	Economizer 2 Search	No/Yes		EC2SERCH	
ECN.3	Economizer 3 Search	No/Yes		EC3SERCH	
HT.CL	Heat Coil Valve Search	No/Yes		HTCSERCH	
HUMD	Humidifier Valve Search	No/Yes		UMSERCH	
HT.C3	Heat Coil 3 Valve Search	No/Yes		HTC3SRCH	
HT.C4	Heat Coil 4 Valve Search	No/Yes		HTC4SRCH	
HMZR	TEST HUMIDIMIZER				
RHV	Humidimizer 3-Way Valve	Off/On		RHVH_TST	
C.EXV	Condenser EXV Position	0-100	%	CEXVHTST	
B.EXV	Bypass EXV Position	0-100	%	BEXVHTST	
C.CAL	Condenser EXV Calibrate	Off/On		CEXV_CAL	
B.CAL	Bypass EXV Calibrate	Off/On		BEXV_CAL	
EXVS	TEST CIRCUIT EXVS				
A1.EX	Circuit A EXV 1 Position	0-100	%	A_X1_TST	
A2.EX	Circuit A EXV 2 Position	0-100	%	A_X2_TST	
B1.EX	Circuit B EXV 1 Position	0-100	%	B_X1_TST	

Table 23 — Service Test (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
EXVS (cont)	TEST CIRCUIT EXVS				
B2.EX	Circuit B EXV 2 Position	0-100	%	B_X2_TST	
A1.CL	Cir A EXV 1 Calibrate	Off/On		A_X1_CAL	
A2.CL	Cir A EXV 2 Calibrate	Off/On		A_X2_CAL	
B1.CL	Cir B EXV 1 Calibrate	Off/On		B_X1_CAL	
B2.CL	Cir B EXV 2 Calibrate	Off/On		B_X2_CAL	
COOL	TEST COOLING				
E.POS	Econ 1 Out Act.Cmd.Pos.	0-100	%	ECONCOOL	
SP.SP	Static Pressure Setpoint	0-5	"H2O	SPSPCTST	
CL.ST	Requested Cool Stage	0-8		CLST_TST	
MLV	Minimum Load Valve Relay	Off/On		MLV_TST	
A1	Compressor A1 Relay	Off/On		CMPA1TST	
A1.CP	Compressor A1 Capacity	20-100		A1CAPTST	
A1.B1	Two Circuit Start A1,B1	Off/On		CMPABTST	
A2	Compressor A2 Relay	Off/On		CMPA2TST	
A3	Compressor A3 Relay	Off/On		CMPA3TST	
A4	Compressor A4 Relay	Off/On		CMPA4TST	
B1	Compressor B1 Relay	Off/On		CMPB1TST	
B2	Compressor B2 Relay	Off/On		CMPB2TST	
B3	Compressor B3 Relay	Off/On		CMPB3TST	
B4	Compressor B4 Relay	Off/On		CMPB4TST	
RHV	Humidimizer 3-Way Valve	Off/On		RHVH_TST	
C.EXV	Condenser EXV Position	0-100	%	CEXVHTST	
B.EXV	Bypass EXV Position	0-100	%	BEXVHTST	
HEAT	TEST HEATING				
HT.ST	Requested Heat Stage	0-15		HTST_TST	
HT.1	Heat Relay 1	Off/On		HS1_TST	
H1.CP	Modulating Heat Capacity	0-100	%	MGAS_TST	
HT.2	Heat Relay 2	Off/On		HS2_TST	
HT.3	Relay 3 W1 Gas Valve 2	Off/On		HS3_TST	
HT.4	Relay 4 W2 Gas Valve 2	Off/On		HS4_TST	
HT.5	Relay 5 W1 Gas Valve 3	Off/On		HS5_TST	
HT.6	Relay 6 W2 Gas Valve 3	Off/On		HS6_TST	
HT.7	Relay 7 W1 Gas Valve 4	Off/On		HS7_TST	
HT.8	Relay 8 W2 Gas Valve 4	Off/On		HS8_TST	
HT.9	Relay 9 W1 Gas Valve 5	Off/On		HS9_TST	
HT.10	Relay 10 W2 Gas Valve 5	Off/On		HS10_TST	
HIR	Heat Interlock Relay	Off/On		HIR_TST	
HTC.C	Ht.Coil Command Position	0-100	%	HTCLHEAT	
AC.DT	AUTO-COMPONENT DIAG TEST				
CP.TS	COMPRESSOR AUTO-TEST				
CP.TR	Run Compressor Auto-Test	No/Yes		AC_CT	
CT.ST	Test Status & Timer	0-1		DD_TEXT	
SP.A	Cir A Suction Pressure	–14-750	psig	SP_A	
SP.B	Cir B Suction Pressure	–14-750	psig	SP_B	
RSLT	COMPS. AUTO-TEST RESULTS				
A1	Comp A1 Auto-Test Result	0-3		AC_CP_A1	
A2	Comp A2 Auto-Test Result	0-3		AC_CP_A2	
A3	Comp A3 Auto-Test Result	0-3		AC_CP_A3	
A4	Comp A4 Auto-Test Result	0-3		AC_CP_A4	
B1	Comp B1 Auto-Test Result	0-3		AC_CP_B1	
B2	Comp B2 Auto-Test Result	0-3		AC_CP_B2	
B3	Comp B3 Auto-Test Result	0-3		AC_CP_B3	
B4	Comp B4 Auto-Test Result	0-3		AC_CP_B4	
DS.TS	DIG SCROLL AUTO-TEST				
DS.TR	Run Dig Scroll Auto-Test	No/Yes		AC_DS	
DS.DT	Test Status & Timer	0-1		DD_TEXT	
A1.CP	Compressor A1 Capacity	0-100	%	CMPA1CAP	
SP.A	Cir A Suction Pressure	–14-750	psig	SP_A	
SP.AV	Avg Suction Pressure A	–100-1000	psig	SP_A_AVG	
DS.RS	Dig Scroll AutoTest Stat	0-3		AC_DSST	

Table 23 — Service Test (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
EX.TS	EXVS AUTO-COMPONENT TEST				
EX.TR	Run EXVs Auto-Test	No/Yes		AC_EX	
XT.ST	Test Status & Timer	0-1		DD_TEXT	
SH.SP	EXV Superheat Ctrl SP	5-40		SH_SP_CT	
SH.A1	Cir A EXV1 Superheat Tmp	–100-200	^F	SH_A1	
SH.A2	Cir A EXV2 Superheat Tmp	–100-200	^F	SH_A2	
SH.B1	Cir B EXV1 Superheat Tmp	–100-200	^F	SH_B1	
SH.B2	Cir B EXV2 Superheat Tmp	–100-200	^F	SH_B2	
XA1S	EXV A1 Auto-Test Status	0-3		AC_XA1ST	
XA2S	EXV A2 Auto-Test Status	0-3		AC_XA2ST	
XB1S	EXV B1 Auto-Test Status	0-3		AC_XB1ST	
XB2S	EXV B2 Auto-Test Status	0-3		AC_XB2ST	
CD.TS	CHARGE TST W/O LQD SENS.				
CD.TR	Run Chrg Tst w/o Lqd Sen	No/Yes		AC_CDTR	
CD.ET	Test Status & Timer	0-1		DD_TEXT	
SCT.A	Cir A Sat.Condensing Tmp	–40-240	dF	SCTA	
SST.A	Cir A Sat.Suction Temp.	–40-240	dF	SSTA	
OAT	Outside Air Temperature	–40-240	dF	OAT	
SCT.B	Cir A Sat.Condensing Tmp	–40-240	dF	SCTA	
SST.B	Cir A Sat.Suction Temp.	–40-240	dF	SSTA	
ML.TS	MLV/HGBP AUTO-TEST				
ML.TR	Run MLV/HGBP Auto-Test	No/Yes		AC_MLV	
ML.TD	Test Status & Timer	0-1		DD_TEXT	
MLV	Minimum Load Valve Relay	Off/On		MLV_TST	
DP.A	Cir A Discharge Pressure	–14-750	psig	DP_A	
ML.ST	MLV/HGBP AutoTest Result	0-3		AC_MLVST	
SF.TS	SUPPLY FAN AUTO-TEST				
SF.TR	Run Supply Fan Auto-Test	No/Yes		AC_SF	
SF.DT	Test Status & Timer	0-1		DD_TEXT	
S.VFD	VFD1 Actual Speed %	0-100	%	VFD1_SPD	
S.PWR	VFD1 Actual Motor Power	–150-150	kW	VFD1PWR	
SP	Static Pressure	–20-20	"H2O	SP	
SF.ST	SF Auto-Test Result	0-3		AC_SF_ST	
EC.TS	ECONOMIZER AUTO-TEST				
EC.TR	Run Economizer Auto-Test	No/Yes		AC_EC	
EC.DT	Test Status & Timer			DD_TEXT	
S.VFD	VFD1 Actual Speed %	0-100	%	VFD1_SPD	
TORQ	VFD1 Torque Moving Avg			VFD1TMAV	
ECN.P	Econ 1 Out Act.Curr.Pos.			ECONOPOS	
EC2.P	Econ 2 Ret Act.Curr.Pos.			ECON2POS	
EC3.P	Econ 3 Out Act.Curr.Pos.			ECON3POS	
EC.ST	Econ Auto-Test Result	0-3		AC_EC_ST	

Actuators

In the ***AC.T.C*** submenu, 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 submenu, the user may calibrate and control the 3 economizer actuators (2 outdoor air and 1 return air), hydronic/steam or humidifier actuators.

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

Humidi-MiZer® System

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

This submenu also allows manual manipulation of RHV (reheat 3-way valve), the bypass valve, and condenser valve. With the compressors and outdoor fans off, the user should hear a light ratcheting sound during movement of the 2 modulating valves. The sound can serve as proof of valve operation.

Service Test→HMZR→RHV (Humidi-MiZer 3-Way Valve)

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

Service Test→HMZR→C.EXV (HMV-1: Condenser EXV Position)

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

Service Test→HMZR→B.EXV (HMV-2: Bypass EXV Position)

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

Service Test→HMZR→C.CAL (Condenser EXV Calibrate)

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

Service Test→HMZR→B.CAL (Bypass EXV Calibrate)

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

Cooling

The cooling submenu 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 Set Point). Upon entering the cooling submenu, the static pressure control item will default to the unit's static pressure set point. Thereafter, as mechanical cooling commences and the fan starts, the static pressure can be manually adjusted during the cool mode without affecting the configured set point for normal runtime operation. By adjusting the static pressure set point, the user can increase or decrease the supply airflow. Do not use a static pressure that will exceed the system limits.
- ***Service Test→COOL→CL.ST*** (Requested Cool Stage). If this item is set to a non-zero value, the current assigned compression stage for this unit will be selected and enacted. Thereafter, the individual compressor will be "read-only" and reflect the current staging state. In addition, this item will automatically clamp the cooling stages to its pre-configured maximum.
- Manual relay control of individual compressors. If the cooling stage pattern request is set to zero, the user will have the ability to manually control compressors. If the user energizes mechanical cooling, the supply fan and the outdoor fans will be started automatically. During mechanical cooling, the unit will protect itself. Compressor diagnostics are active, monitoring for high discharge pressure, low suction pressure, etc. The user can also turn the minimum load valve on and off and set the digital scroll capacity (on units equipped with this device).

- ***Service Test→COOL→RHV*** (Humidi-MiZer 3-Way Valve). On Humidi-MiZer equipped units, this item allows the user to switch the reheat valve from ON to OFF and vice versa. When ***RHV*** is switched to the ON position, a 3-way valve will be energized, allowing refrigerant flow to enter the reheat coil as if in a dehumidification mode or reheat mode. When ***RHV*** is switched to the OFF position, the 3-way valve will be deenergized and the unit will revert back to normal cooling. Note that this function only allows manipulation of ***RHV*** if a compressor on Circuit B has already been turned ON. To manually exercise this valve without an active Circuit B compressor, see the section titled ***Service Test→HMZR→RHV***. To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→COOL→RHV)***.
- ***Service Test→COOL→C.EXV*** (HMV-1: Condenser EXV Position). On Humidi-MiZer® equipped units, this item allows the user to exercise the valve that controls refrigerant flow to the Circuit B condenser. To exercise the valve, ***RHV*** must first be switched to ON ***(Service Test→COOL→RHV)*** and a Circuit B compressor must be commanded ON. The valve default position is 100% (completely open). The user will be able to adjust the valve from 0 to 100% through this function. The only constraint on the valve position is that the percentage sum of the bypass valve ***(Service Test→COOL→ B.EXV)*** and condenser valve must equal 100%. For example, if the condenser modulating valve is only 80% open, then the gas bypass modulating valve must remain at least 20% open. The effect of closing the condenser valve will be to increase the supply-air temperature (additional reheat capacity). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→COOL→C.EXV).***
- ***Service Test→COOL→B.EXV*** (HMV-2: Bypass EXV Position). On Humidi-MiZer equipped units, this item allows the user to exercise the valve that controls discharge gas bypass around the Circuit B condenser. To exercise the valve, ***RHV*** must first be switched to ON ***(Service Test→COOL→RHV)*** and a Circuit B compressor must be commanded ON. The valve default position is 0% (completely closed). The user will be able to adjust the valve from 0 to 100% through this function. The only constraint on the valve position is that the percentage sum of the bypass valve and condenser valve (***Service Test→COOL→C.EXV)*** must equal 100%. For example, if the condenser modulating valve is only 80% open, then the gas bypass modulating valve must remain at 20% open. The effect of opening the bypass valve will be to increase the supply air temperature (additional reheat capacity). To view the actual valve position at any time, the user can use the Outputs menu (***Outputs→ COOL→B.EXV).***

Heating

The Heat Test Mode submenu will offer automatic fan start-up if not a gas-fired heat unit. On gas heat units, the IGC (integrated gas controller) feedback from the gas control units will bring the fan on as required.

Within this submenu, 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.1-10, Service Test→ HEAT→HIR*** (Manual Heat Relay Control). If the "Heat Stage Request" item is set to zero, it will be possible to individually control the heat relays, including the heat interlock relay.
- ***Service Test→HEAT→H1.CP*** (Modulating Heat Capacity). If configured for modulating gas or SCR electric heat, the user will be able to manually control the capacity of the modulating heat section (0 to 100%). The requested heat stage must be greater than or equal to 1 or heat relay 1 must be on before the control will accept a modulating heat capacity request. If neither case is true, the control will overwrite the modulating heat request back to 0%.
- ***Service Test→HEAT→HTC.C*** (Ht Coil Command Position). If configured for hydronic heat type, the user will be able to manually control the positioning of the actuator, which controls hot water (0 to 100%).

SERVICE COMPONENT TESTS

Auto-component testing is the automated testing procedure of a component or a group of components. Auto-component testing can be used during commissioning of a unit to verify that components are functioning properly. It can also be used as a diagnostics routine for troubleshooting.

Control Description (Overview)

The 40/50N Series large rooftop unit is capable of performing auto-component tests. The auto-component tests appear in Navigator under the Service Test menu (***Service Test→AC.DT***):

CP.TS	Compressor Auto-Test
DS.TS	Dig Scroll Auto-Test
EX.TS	EXVS Auto-Component Test
CD.TS	Charge Tst without Lqd Sens.
ML.TS	MLV/HGBP Auto-Test
SF.TS	Supply Fan Auto-Test
RSLT	Comps Auto-Test Results

The unit must be in Service Test mode to perform the auto-component tests (***Service Test→TEST→ON***).

Starting another test before a currently running test has completed will cancel the running test and reset all outputs before starting the newly requested test.

Setting Service Test mode to "OFF" while running an auto-component test will cancel the running test and reset all outputs.

For a complete description of notices, alerts, and alarms referenced, see the Alarms and Alerts section.

Auto-component tests will have a status indicated by:

1. Not Run
2. Running
3. Pass
4. Fail

The results of all auto-component tests will default to "NOT RUN."

After power cycling the MBB, the results of all auto-component tests will default to "NOT RUN."

If the required conditions for the test are not met, the test will not be allowed to run. Note that there may be no indication for the possible reasons why a test might not run.

For each auto-component test, if the verification criteria is met, test status will display "PASS" and if the verification criteria is not met, test status will display "FAIL."

For each auto-component test, the following information is grouped in one screen: test status, component status, and values of response parameters.

Auto-Component Test Control Descriptions

The compressor auto-component test requires the following conditions:

1. Unit is not shut down due to failure (A152).

2. No compressors are on or requested on.
3. All compressors are available for staging.

The testing screen will display the following:

CP.TS	ON	Run Compressor Auto-Test
CT.ST	Staging 1/8	Test Status and Timer
SP.A	188.5 psig	Cir A Suction Pressure
SP.B	207.3 psig	Cir B Suction Pressure
RSLT		Comps Auto-Test Results

The compressor auto-component test functions by staging all compressors ON and verifying a corresponding change in the compressor CSB (compressor status board), and that circuit suction pressure (***SP.A/SP.B***) decreases at least ***AC_SP_DR. AC_SP_DR*** (Auto-Component Suction Pressure Drop) is the expected suction pressure drop when starting a compressor. It is used during the compressor auto component test. When a compressor is staged, the control verifies the suction pressure drops by ***AC_SP_DR***. The default value is 3, with a range of 0 to 10 psig.

Setting ***CP.TS***=ON will perform the following automatically:

1. Turn supply fan and required condenser fans ON.
2. After 25 seconds, stage up one compressor.
3. Verify CSB changes state properly.
4. Verify circuit SP decreases by ***AC_SP_DR*** within 30 seconds.
5. Wait 30 seconds.
6. Repeat Steps 1-5 for next compressor until all compressors are staged ON.
7. Stage all compressors down and verify CSB changes state properly.
8. End test.

If a compressor is commanded ON and the corresponding CSB indicates OFF, a "Compressor Failure" alert will be logged:

T051	Circuit A, Compressor 1 Failure
T052	Circuit A, Compressor 2 Failure
T053	Circuit A, Compressor 3 Failure
T059	Circuit A, Compressor 4 Failure
T054	Circuit B, Compressor 1 Failure
T055	Circuit B, Compressor 2 Failure
T056	Circuit B, Compressor 3 Failure
T060	Circuit B, Compressor 4 Failure

If a compressor is commanded ON and the corresponding CSB indicates ON while a decrease in suction pressure is not detected, the "Suction Pressure Alert" will be logged:

T062	Circuit A, Suction Pressure Alert
T063	Circuit B, Suction Pressure Alert

If a compressor is commanded OFF and the corresponding CSB indicates ON, a "Compressor Stuck" alarm will be logged:

A051	Circuit A, Compressor 1 Stuck On Failure
A052	Circuit A, Compressor 2 Stuck On Failure
A053	Circuit A, Compressor 3 Stuck On Failure
A059	Circuit A, Compressor 4 Stuck On Failure
A054	Circuit B, Compressor 1 Stuck On Failure
A055	Circuit B, Compressor 2 Stuck On Failure
A056	Circuit B, Compressor 3 Stuck On Failure
A061	Circuit B, Compressor 4 Stuck On Failure

Selecting "RSLT" from the compressor auto-test screen will display the compressor auto-test result screen. The following display is an example where the A2 compressor failed the test:

A1	Passed	Comp A1 Auto-Test Result
A2	Failed	Comp A2 Auto-Test Result
A3	Passed	Comp A3 Auto-Test Result
A4	Passed	Comp A4 Auto-Test Result
B1	Passed	Comp B1 Auto-Test Result
B2	Passed	Comp B2 Auto-Test Result
B3	Passed	Comp B3 Auto-Test Result
B4	Passed	Comp B4 Auto-Test Result

Digital Scroll Compressor (A1) Auto-Component Test

The digital scroll auto-component test requires the following conditions:

1. Unit is not shut down due to failure (A152).
2. ***DG.A1***=YES (digital scroll compressor installed on A1 and enabled).
3. OAT<DSMAXOAT (digital scroll maximum OAT).
4. No compressors are on or requested on.
5. Compressor A1 is available to start.

The testing screen will display the following:

DS.TR	ON	Run Dig Scroll Auto-Test
DS.DT	Running 1/1	Test Status and Timer
A1.CP	50%	Compressor A1 Capacity
SP.A	188.5 psig	Cir A Suction Pressure
SP.AV	185.5 psig	Avg Suction Pressure A
DS.RS	Running	Dig Scroll AutoTest Stat

The digital scroll auto-component test functions by running the scroll compressor (***A1.CP***) at 50% and 100% while verifying a change in average circuit suction pressure (***SP.AV***) of ***AC_DS_SP***.

The digital scroll auto-component suction pressure drop (***AC_DS_SP***) will default to 2.5 psig with a range of 0 to 10 psig.

Setting ***DS.TR***=ON will perform the following:

1. Turn supply fan and condenser fans ON.
2. Wait for 25 seconds.
3. Set digital scroll capacity to 50%.
4. Verify circuit ***SP.AV*** decreases by ***AC_DS_SP*** within 30 seconds.
5. Wait 2 minutes.
6. Set digital scroll capacity to 100%.
7. Verify circuit ***SP.AV*** decreases ***AC_DS_SP*** within 30 seconds.
8. End test.

If ***SP.AV*** is verified to change properly at 50% and 100% capacity, then ***DS.RS***= PASS, otherwise ***DS.RS***=FAIL.

EXV Auto-Component Test

The EXV auto-component test requires the following conditions:

1. Unit is not shut down due to failure (A152).
2. OAT>70°F.
3. No compressors are on or requested on.
4. A1, B1, B2 are available on a 75-ton unit; A1, A2, B1, B2 are available on 90, 105, 120, 130, and 150-ton units.

The testing screen will display the following:

EX.TR	ON	Run EXVs Auto-Test
XT.ST	Running CMPS	Test Status and Timer
SH.SP	12.0 dF	EXV Superheat Ctrl SP
SH.A1	11.7 dF	Cir A EXV1 Superheat Temp
SH.A2	12.4 dF	Cir A EXV2 Superheat Temp
SH.B1	12.4 dF	Cir B EXV1 Superheat Temp
SH.B2	12.1 dF	Cir B EXV2 Superheat Temp

XA1S	Running	EXV A1 Auto-Test Status
XA2S	Running	EXV A2 Auto-Test Status
XB1S	Running	EXV B1 Auto-Test Status
XB2S	Running	EXV B2 Auto-Test Status

The EXV auto-component test functions by staging compressor A1, B1, and B2 for a 75-ton unit and A1, A2, B1, B2 for other units, and verifying the superheat is within ± ***AC_SH_DB*** (auto-component test superheat deadband) of the superheat set point (***SH.SP***).

The auto-component test superheat deadband (***AC_SH_DB***) will default to 2°F with a range of 0°F to 10°F.

Setting ***EX.TR***=ON will perform the following:

1. Stage compressors A1/B1/B2 for 75-ton unit, A1/A2/B1/B2 for other units.
2. Allow compressors to run for 5 minutes.
3. Verify that ***SH.A1***, ***SH.A2***, ***SH.B1***, and ***SH.B2*** have stabilized to ***SH.SP*** ± ***AC_SH_DB***. If all 4 superheats are ***SH.SP*** ± ***AC_SH_DB*** then set PASS status and end test.
4. If any superheat is outside ***SH.SP*** ± ***AC_SH_DB***, allow compressors to run for 5 more minutes.
5. Set PASS/FAIL status according to whether each superheat has stabilized to ***SH.SP*** ± ***AC_SH_DB*** and end test.

If ***SH.SP*** ± ***AC_SH_DB*** then ***XA1S, XA2S, XB1S,*** and ***XB2S***=PASS, otherwise ***XA1S, XA2S, XB1S,*** and ***XB2S***=FAIL.

If the EXV superheat is not within ***SH.SP*** ± ***SH.DB***, the superheat alert will be logged:

T064	EXV A1 Superheat Outside Range
T065	EXV A2 Superheat Outside Range
T066	EXV B1 Superheat Outside Range
T067	EXV B2 Superheat Outside Range

Refrigerant Charge Auto-Test (without Liquid Sensors)

The refrigerant charge auto test without liquid sensors requires the following conditions:

1. Unit is not shut down due to failure (A152).
2. OAT>70°F.
3. No compressors are on or requested on.
4. All compressors are available for staging.

The test screen will display the following:

CD.TR	ON	Run Chrg Test without Lqd Sen
CD.ET	Running	Test Status and Timer
SCT.A	105.3 F	Cir A Sat. Condensing Temp
SST.A	50.4 F	Cir A Sat. Suction Temp
OAT	66.3 F	Outside Air Temp
SCT.B	106.5 F	Cir A Sat. Condensing Temp
SST.B	49.8 F	Cir A Sat. Suction Temp

When no liquid sensors are installed, all compressors and outdoor fans of both Circuit A and B are commanded to be ON. The operator will read ***OAT***, ***SCT.A***, and ***SST.A*** in order to then compare the values to the A charging chart to determine if refrigerant in Circuit A is properly charged. The operator reads ***OAT***, ***SCT.B***, and ***SST.B***, in order to then compare the values to the B charging chart to determine if refrigerant in Circuit B is properly charged. Thus this is a semi-auto test because operator intervention is required to determine the test results. No test results are displayed.

Setting ***CD.TR***=ON will perform the following:

1. Command supply fan ON.
2. Command all A and B Circuit outdoor fans ON.
3. Stage all A and B Circuit compressors ON.
4. Let compressors run 5 minutes.
5. Prompt user to read charging charts.
6. Let compressors run 5 minutes.
7. End test.

Minimum Load Valve Auto-Component Test

Minimum load valve (MLV) is also referred to as hot gas bypass valve (HGBV).

The hot gas bypass auto-component test requires the following conditions:

1. Unit is not shut down due to failure (A152).
2. ***MLV***=ENBL.
3. No compressors are on or requested on.
4. Compressor A1 is available to start.

The test screen will display the following:

ML.TR	No	Run MLV/HGBV Auto-Test
ML.TD	Running 1/1	Test Status and Timer
MLV	Off	Minimum Load Valve Relay
DP.A	331.3 psig	Cir A Discharge Pressure
ML.ST	Running	MLV/HGBP AutoTest Result

The MLV auto-component test functions by comparing the discharge pressure when MLV is closed to that when MLV is open, and verifying ***DP.A*** decreases by at least ***AC_MLVDR***.

The auto-component MLV deadband (***AC_MLVDR***) will default to 5 psig with a range of 0 to 10 psig.

Setting ***ML.TR***=ON will perform the following:

1. Command A1 ON and ***MLV*** OFF.
2. Let circuit stabilize for 5 minutes and save ***DP.A*** (recorded).
3. Command ***MLV*** ON.
4. Let circuit stabilize for 5 minutes and record ***DP.A*** (current).
5. Verify ***DP.A*** (recorded) - ***DP.A*** (current) > ***AC_MLVDR***.
6. End test.

If ***DP.A*** (recorded) – ***DP.A*** (current) > ***AC_MLVDR*** then ***ML.ST***=PASS, otherwise ***ML.ST***=FAIL.

Supply Fan Auto-Component Test

The supply fan auto-component test requires the following conditions:

1. Unit is not shut down due to failure (A152).
2. Supply fan VFD not in bypass mode.
3. Power exhaust or return fan (if enabled) not in bypass mode.
4. Supply fan not on.

The test screen will display this:

SF.TR	ON	Run Supply Fan Auto-Test
SF.DT	Running	Test Status and Timer
S.VFD	0%	VFD1 Actual Speed %
S.PWR	0.00 kW	VFD1 Actual Motor Power
SP	0.00″ H20	Static Pressure
SF.ST	Pass	SF Auto-Test Result

The supply fan auto-component test functions by commanding the supply fan to minimum speed (***STATPMIN***), and verifying that VFD power (***S.PWR***) and duct static pressure (***SP***) is increasing.

Setting ***SF.TR***=ON will perform the following:

1. Record ***S.PWR*** and ***SP***.
2. Command ***S.VFD*** to ***STATPMIN***, and let run 5 minutes.
3. Verify ***S.PWR*** increases.
4. If ***SP.CF***=ENBL and ***SP.S***=ENBL, verify ***SP*** increases.
5. End test.

After letting the supply fan run and stabilize for 5 minutes, the control will verify ***S.PWR*** has increased and ***SP*** (if enabled) has increased.

If both ***S.PWR*** and ***SP*** (if enabled) have increased, ***SF.ST***=PASS, otherwise ***SF.ST***=FAIL.

THIRD PARTY CONTROL

Thermostat

The method of control would be through the thermostat inputs:

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

Alarm Output

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

Remote Switch

The remote switch may be configured for 3 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→IAQ→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 to 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

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

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

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

See Appendix D and the VFD literature supplied with the unit for further information on 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 (4-20 SA RSET - external 4 to 20 mA supply air reset control). The 4 to 20 mA input to the control system (TB202-9 and TB202-8) will be linearized and range from 0°F to 20°F. For example, 4 mA = 0°F reset, 12 mA = 10°F reset, and 20 mA = 20°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 2 means:

Two discrete inputs tied to demand limit set point percentages.

OR

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

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

DEMAND LIMIT DISCRETE INPUTS

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

Economizer/Outdoor Air Damper Control

There are multiple methods for externally controlling the economizer damper.

IAQ DISCRETE INPUT CONFIGURATION

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

Before configuring the switch functionality, first determine how the switch will be read. A closed switch can indicate either a low IAQ condition or a high IAQ condition. This is set at ***Configuration→IAQ→SW.LG→IAQ.L***. The user can set what a low reading would mean based on the type of switch being used. Setting

IAQ.L to OPEN means that when the switch is open, the input will read LOW. When the switch is closed, the input will read HIGH. Setting ***IAQ.L*** to CLSE (closed) means that when the switch is closed, the input will read LOW, and therefore, when the switch is open, the switch will read HIGH.

There are 2 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→IAQ→ 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→IAQ→ 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 3 configurations for ***IQ.I.F.*** Select the configuration that will be used for fan operation. This configuration allows the user to decide whether the IAQ discrete switch will start the fan (if the supply fan is not already running), and in which state of occupancy the fan will start.

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

IAQ ANALOG INPUT CONFIGURATION

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

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

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

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

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 3 configurations for ***IQ.A.F***, and they follow the same logic as for the discrete input. This configuration allows the user to decide (if the supply fan is not already running) if the IAQ Analog Minimum Position Override input will start the fan and in which state of occupancy the fan will start.

IQ.A.F = 0	IAQ analog sensor input cannot start the supply fan
IQ.A.F = 1	IAQ analog sensor input can start the supply fan in occupied mode only
IQ.A.F = 2	IAQ analog sensor input can start the supply fan in both occupied and unoccupied modes

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

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

The 4 to 20 mA signal from the sensor wired to TB201-8 and TB201-7 is scaled to an equivalent indoor CO_2 (IAQ) by the parameters ***IQ.R.L*** and ***IQ.R.H*** located under the ***Configuration→IAQ→AQ.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.O.P*** 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 TB201-8 and TB201-7. The input is processed as 4 mA = 0% and 20 mA = 100%, thereby giving complete range control of the effective minimum position.

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

To disable the standard enthalpy control input function, unplug the enthalpy switch and provide a jumper from TB201-6 to TB201-5 (see wiring diagrams in Major System Components section on page 134).

IQ.A.C = 4 (10,000 ohm Potentiometer Damper Control)

This configuration will provide input for a 10,000-ohm linear potentiometer that acts as a remotely controlled analog input for economizer minimum damper position. The input is processed as 0 ohms = 0% and 10,000 ohms = 100%, thereby giving complete range control of the effective minimum position.

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

CONTROLS OPERATION

Modes

The *Comfort*Link controls operate under a hierarchy of command structure as defined by 3 essential elements: the System mode, the HVAC mode, and the Control mode. The System mode is the top level mode that defines 3 essential states for the control system: OFF, RUN, and TEST.

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

The Control mode is essentially the control type of the unit (***Configuration→UNIT→C.TYP***). This defines from where the control looks to establish a cooling or heating mode.

Furthermore, there are a number of modes which operate concurrently when the unit is running. The operating modes of the control are located at the local displays under ***Operating Modes***. See Table 24.

Table 24 — 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	Off/On	MODEOCCP
T.OVR	Timed Override in Effect	Off/On	MODETOVR
DCV	DCV Resetting Min Pos	Off/On	MODEADCV
SA.R	Supply Air Reset	Off/On	MODESARS
DMD.L	Demand Limit in Effect	Off/On	MODEDMLT
T.C.ST	Temp.Compensated Start	Off/On	MODETCST
IAQ.P	IAQ Pre-Occ Purge Active	Off/On	MODEIQPG
LINK	Linkage Active — CCN	Off/On	MODELINK
LOCK	Mech.Cooling Locked Out	Off/On	MODELOCK
H.NUM	HVAC Mode Numerical Form	number	MODEHVAC

MODES CONTROLLING UNIT

Currently Occupied (OCC)

This variable displays the current occupancy 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 due to demand controlled ventilation.

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 a third party.

Temperature Compensated Start (T.C.ST)

This variable displays if Heating or Cooling has been initiated before occupancy 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 pre-ventilate 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 out 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 (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 (Navigator™ display). The System Test modes are Factory Test Enabled and Service Test Enabled. See the Service Test section on page 29 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 2 possible text displays for this mode; one is normal run mode and the other occurs if one of the following fire-smoke modes is present: smoke purge, pressurization, or evacuation.

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

HVAC MODES ***(OPERATING MODE→HVAC)***

The HVAC mode is dependent on the system mode to allow it to further determine the operational state of the rooftop unit. The actual determination of an HVAC mode is based on a hierarchal decision-making process whereby certain overrides may interfere with normal temperature/humidity control. The decision-making process that determines the HVAC mode is shown in Fig. 3 and Appendix E.

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

HVAC Mode — STARTING UP (0)

The unit is transitioning from the OFF mode to a different mode.

HVAC Mode — DISABLED (1)

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

HVAC Mode — SHUTTING DOWN (2)

The unit is transitioning from a mode to the OFF mode.

HVAC Mode — SOFTSTOP REQUEST (3)

The unit is off due to a soft stop request from the control.

HVAC Mode — REM SW.DISABLE (4)

The unit is off due to the remote switch.

HVAC Mode — FAN STATUS FAIL (5)

The unit is off due to a supply fan status failure.

HVAC Mode — STATIC PRESSURE FAIL (6)

The unit is off due to failure of the static pressure sensor.

HVAC Mode — COMP.STUCK ON (7)

The unit is shut down because there is an indication that a compressor is running even though it has been commanded off.

HVAC Mode — OFF (8)

The unit is off and no operating modes are active.

HVAC Mode — TEST (9)

The unit is in the self-test mode, which is entered through the Service Test menu.

HVAC Mode — TEMPERING VENT (10)

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

HVAC Mode — TEMPERING LOCOOL (11)

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

HVAC Mode — TEMPERING HICOOL (12)

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

HVAC Mode — VENT (13)

This is a normal operation mode where no heating or cooling is required and outside air is being delivered to the space to control IAQ levels.

HVAC Mode — LOW COOL (14)

A normal cooling mode where a low cooling demand is present.

HVAC Mode — HIGH COOL (15)

A normal cooling mode where a high cooling demand is present.

HVAC Mode — LOW HEAT (16)

The unit will be in low heating demand mode using either gas, electric, or hydronic heat.

HVAC Mode — HIGH HEAT (17)

The unit will be in high heating demand mode using gas, electric, or hydronic heat.

HVAC Mode — UNOCC. FREE COOL (18)

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

HVAC Mode — FIRE SHUT DOWN (19)

The unit has been stopped due to a fire shutdown input (FSD) from 2 or more of the fire control modes: purge, evacuation, or pressurization.

HVAC Mode — PRESSURIZATION (20)

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

HVAC Mode — EVACUATION (21)

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

HVAC Mode — SMOKE PURGE (22)

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

HVAC Mode — COOLING DEHUM (23)

The unit is operating in Cool mode and dehumidification is in effect.

HVAC Mode — VENTING DEHUM (24)

The unit is operating in Vent mode and dehumidification is in effect.

HVAC Mode — FREEZESTAT TRIP (25)

If the freezestat trips, the unit enters the Freezestat Trip HVAC mode. The supply fan will run, the hydronic heat valve will be wide open, and the economizer damper will be closed.

HVAC Mode — PLEN.PRESS.FAIL (26)

The unit is off due to a failure of the plenum pressure switch.

HVAC Mode — RCB COMM FAILURE (27)

The unit is off due to a Rooftop Control Board (RCB) communication failure.

HVAC Mode — SUPPLY VFD FAULT (28)

The unit is off due to a supply fan VFD fault or supply fan VFD communications loss.

HVAC Mode — AIR PRESSURE SWITCH FAIL (29)

If there is an air pressure safety switch error, the unit enters Air pressure switch failure mode.

HVAC Mode — THREE PHASE POWER FAIL (30)

If the unit is configured for power monitoring and there is a power error, the unit enters Power failure mode.

HVAC Mode — HEATING DEHUM (31)

Unit is operating in Heat mode and dehumidification is in effect.

HVAC Mode — DUCT STATIC PRESSURE FAIL (32)

If the unit is a VAV unit with a supply duct pressure sensor and measured supply duct static pressure is above the configurable SP Low Alert Limit, the unit enters this mode.

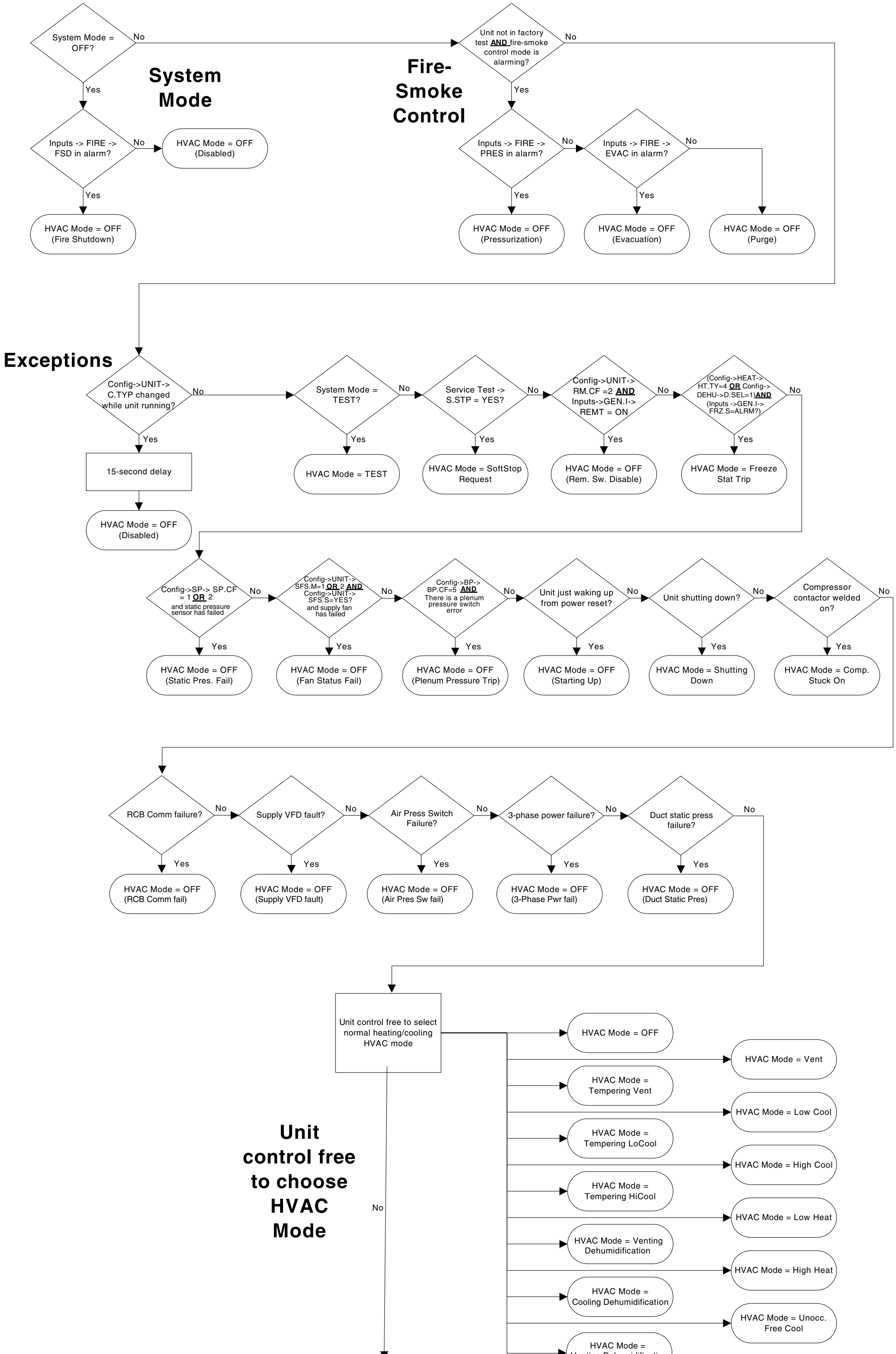


Fig. 3 — Mode Selection

Unit Configuration

There is a submenu under the Configuration mode of the local display entitled ***UNIT***. This submenu contains an assortment of items that most of which are relative to other particular subsections of this control manual. This section will define all of these configurations here for easy reference. The submenu which contains these configurations is located at the local display under ***Configuration→UNIT***. See Table 25.

Machine Control Type (C.TYP)

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 types possible will now be defined:

- ***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 10 minutes before the return-air temperature is allowed to call out any mode.

- ***C.TYP*** = 3 (TSTAT – MULTI)

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

- ***C.TYP = 4*** (SPT – MULTI)

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

Unit Size (75-150) (SIZE)

There are several available tonnages for the N Series control. Make sure this configuration matches the size called out by the model number of the unit. This is important, as the cooling stage tables are directly determined based on the SIZE configuration.

Fan Mode (FN.MD) (0= Auto, 1= Cont)

This Fan Mode configuration can be used for machine control types (***Configuration→UNIT→C.TYP***) 3 and 4.

The Fan Mode variable establishes the operating sequence for the supply fan during occupied periods. When set to 1 = Continuous, the fan will operate continuously during occupied periods. When set to 0 = Automatic, the fan will run only during a heating or cooling mode.

Remote Switch Configuration (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 on page 100 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 configs, 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→SP→SP.RS = 1 (Static Pressure Reset using 4-20 mA sensor)

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

Configuration→UNIT→SENS→MRH.S = Enable (Mixed Air Relative Humidity Sensor Enable)

Configuration→SP→SP.RS = 4 (Static Pressure Reset using VFD Control)

Configuration→ECON→CFM.C→OCF.S = Enable (set to 1 or 2) (Outdoor Air CFM Sensor Enable)

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

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

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

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

Configuration→BP→DMD.L→DM.L.S = 2 (4-20MA CTRL) (Demand Limiting using a 4-20 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) (4-20 mA sensor, no DAQ)

Configuration→IAQ→FLTC→MFL.S = 1,3,4,5 (Main Filter Status is not disabled or schedule)

Configuration→IAQ→FLTC→PFL.S = 1,3,4,5 (Post Filter Status is not disabled or schedule)

Liquid Sensors Installed (LQ.SN)

This configuration instructs the control to read the liquid temperature thermistors and pressure transducers on A and B refrigeration circuits.

Power Monitor Installed (PW.MN)

This configuration instructs the control to monitor the power status input.

VFD Bypass Enable (VFD.B)

This configuration instructs the control to enable the EXB in order to use the supply fan relay (***SFBYRLY***) and ret/exh bypass relay (***PEBRLY***) outputs. To make the equipment operate with optional bypasses for the fans, first disable all static pressure fan control types (***SP.CF***, ***SP.SV*** and ***SP.S***), then set ***VFD.B*** to enable.

Enable Smart Menu (SM.MN)

When enabled this configuration causes the control to only display the points associated with the particular unit configuration. For example, if the unit does not have heat, the heating points will not be displayed.

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 Heating 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.

Table 25 — Unit Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION				
C.TYP	Machine Control Type	1 to 4		CTRLTYPE	3
SIZE	Unit Size (75-150)	75 to 150		UNITSIZE	75
FN.MD	Fan Mode (0=Auto, 1=Cont)	0 to 1		FAN_MODE	1
RM.CF	Remote Switch Config	0 to 3		RMTINCFG	0
CEM	CEM Module Installed	No/Yes		CEM_BRD	No
LQ.SN	Liquid Sensors Installed	No/Yes		LQ_SENS	No
PW.MN	Power Monitor Installed	No/Yes		PWR_MON	No
VFD.B	VFD Bypass Enable?	No/Yes		VFD_BYEN	No
SM.MN	Enable Smart Menus?	Disable/Enable		SMART_MN	Enable
TCS.C	Temp.Cmp.Strt.Cool Factr	0 to 60	Minutes	TCSTCOOL	0
TCS.H	Temp.Cmp.Strt.Heat Factr	0 to 60	Minutes	TCSTHEAT	0
SFS.S	Fan Fail Shuts Down Unit	No/Yes		SFS_SHUT	No
SFS.M	Fan Stat Monitoring Type	0 to 2		SFS_MON	0
VAV.S	VAV Unocc.Fan Retry Time	0 to 720	Minutes	SAMPMINS	50
MAT.S	MAT Calc Config	0 to 2		MAT_SEL	1
MAT.R	Reset MAT Table Entries?	No/Yes		MATRESET	No
MAT.D	MAT Outside Air Default	0 to 100	%	MATOADOS	20
ALTI	Altitude……..in feet:	–1000 to 60000		ALTITUDE	0
DLAY	Startup Delay Time	0 to 900	Seconds	DELAY	0
AUX.R	Auxiliary Relay Config	0 to 3		AUXRELAY	0
SENS	INPUT SENSOR CONFIG				
SPT.S	Space Temp Sensor	Disable/Enable		SPTSENS	Disable
SP.O.S	Space Temp Offset Sensor	Disable/Enable		SPTOSENS	Disable
SP.O.R	Space Temp Offset Range	1 to 10	dF	SPTO_RNG	5
SRH.S	Space Air RH Sensor	Disable/Enable		SPRHSENS	Disable
RRH.S	Return Air RH Sensor	Disable/Enable		RARHSENS	Disable
MRH.S	Mixed Air RH Sensor	Disable/Enable		MARHSENS	Disable
FACT	FACTORY CONFIGURATION				
MD.MN	Model Number				
F. RST	Perform Factory Restore?	No/Yes			No

Fan Fail Shuts Down Unit (SFS.S)

This configuration will allow whether the unit should shut down on a supply fan status fail or simply alert the condition and continue to run.

YES – Shut down the unit if supply fan status monitoring fails, and send out an alarm.

NO – Do not shut down the unit if supply fan status monitoring fails, but send out an alert.

Fan Status 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

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.

MAT Calc Config (MAT.S)

This configuration gives the user 3 options in the processing of the mixed-air temperature (MAT) calculation:

- ***MAT.S*** = 0 CALC ONLY
  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 CALC N LEARN
  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 the user can more closely zoom in on the true MAT value.
- ***MAT.S*** = 2 NO MAT CALC
  The control will stop learning and use whatever the control has already learned. This would infer that the control spent a part of its life at ***MAT.S*** = 1. This might be useful to a commissioner of a system who first sets ***MAT.S*** = 1, then might go into the service test mode, turn on the fan and open the economizer to a static position for a little more than 5 minutes and then move to several positions to repeat the same (20%,40%,60%,80%). The only stipulation to this “commissioning” is that 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 “learned” forever.

Reset MAT Table Entries? (MAT.R)

This configuration allows the user to reset the internally stored MAT “learned” configuration entities back to their 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 Default (MAT.D)

This is the default temperature used for the mixed air temperature in the unit’s cooling algorithm.

Altitude.......in feet: (ALTI)

As the control does not include a barometric pressure sensor to thoroughly define the calculation of enthalpy and cfm, the control does include an altitude parameter, which will serve to set up a "mean" barometric pressure for use to calculate with. The effect of barometric pressure in these calculations is not great, but could have an effect, depending on the installed elevation of the unit. Basically, if the rooftop is installed at a particularly high altitude and enthalpy or cfm are being calculated, set this configuration to the current elevation of the installed rooftop.

Start Up Delay Time (DLAY)

This option inhibits the unit from operating after a power reset. The configuration may be adjusted from 0 to 900 seconds of delay.

Auxiliary Relay Output Configuration (AUX.R)

This configuration allows the user to configure the function of the auxiliary relay output. The output is 1.4 vac, 5 va maximum. The configuration can be set from 0 to 3. If ***AUX.R*** is set to 0, the auxiliary relay contact will be energized during an alarm. The output can be used to turn on an indicator light or sound an alarm in a mechanical room. If ***AUX.R*** is set to 1, the auxiliary relay will energize when the controls determine dehumidification/reheat is needed. The relay is wired to a third-party dehumidification/reheat device and energizes 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 "sweep" 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.

Mixed RH Sensor (MRH.S)

If a mixed air relative humidity sensor is installed, enable this configuration.

Model Number (MD.MN)

The 18-digit model number of the unit.

Factory Reset (F.RST)

Performing a factory reset will reset all configurable parameters back to the original settings as when the unit left the factory. To perform factory reset, set ***F.RST*** to "YES." When reset is complete, ***F.RST*** will change back to "NO."

Cooling Control

The N Series *Comfort*Link controls offer 2 basic control approaches to mechanical cooling: multi-stage cooling (CV) and multiple stages of cooling (VAV). In addition, the *Comfort*Link controls offer the ability to run multiple stages of cooling for either a space temperature sensor or thermostat by controlling the unit to either a low or high cool supply air set point.

SETTING UP THE SYSTEM

The control type (***Configuration→ UNIT→C.TYP***) determines the selection of the type of cooling control, as well as the technique for selecting a cooling mode. Unit staging tables are shown in Appendix C.

NOTE: Whether a unit has a VFD or a supply fan installed for static pressure control has no effect on configuration of the machine control type (***C.TYP***). No matter what the control type, it is possible to run the unit in either CV or VAV mode provided there are enough stages to accommodate lower air volumes for VAV operation. Refer to the section on static pressure control on page 69 for information on how to set up the unit for the type of supply fan control desired.

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 to 4	CTRLTYPE	*

*This default is model-number-dependent.

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

- ***C.TYP*** = 1 (VAV-RAT) and ***C.TYP*** = 2 (VAV-SPT)
  Both of these configurations refer to standard VAV operation. If the control is occupied, the supply fan is run continuously and return-air temperature will be used for both in the determination of the selection of a cooling mode. VAV-SPT differs from VAV-RAT only in that during the unoccupied period, space temperature will be used instead of return-air temperature to start the fan for 10 minutes before the return-air temperature is allowed to call out any mode.
- ***C.TYP*** = 3 (TSTAT – MULTI)
  This configuration will force the control to monitor the thermostat inputs to make a determination of mode. Unlike traditional 2-stage thermostat control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point.
- ***C.TYP* = 4** (SPT – MULTI)
  This configuration will force the control to monitor a space temperature sensor to make a determination of mode. Unlike traditional 2-stage space temperature control, the unit is allowed to use multiple stages of cooling control and perform VAV style operation. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point.

MACHINE DEPENDENT CONFIGURATIONS

Some configurations are linked to the physical unit and must not be changed. The configurations are provided in case a field replacement of a board occurs and the settings are not preserved by the download process of the new software. The following configurations apply to all machine control types (***C.TYP***). These configurations are located at the local display under ***Configuration→UNIT***. See Table 26.

Table 26 — Machine Dependent Configurations

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULTS
UNIT	UNIT CONFIGURATION			
SIZE	Unit Size (75-150)	75-150	UNITSIZE	*

*Dependent on unit.

Unit Size (SIZE)

There are 6 unit sizes (tons) for the N Series control. Make sure this configuration matches the size called out by the model number of the unit. This is important, as the cooling stage tables are directly determined based on the ***SIZE*** configuration.

EDT Reset Configuration (RS.CF)

This configuration applies to several machine control types (***Configuration→UNIT→C.TYP*** = 1,2,3, and 4). See Table 27.

- 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 0ºF reset. An input of 20 mA would correspond to 20ºF 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 28.

Enable Compressor A1 (A1.EN)

This configuration is used to disable the A1 compressor in case of failure for size 75 to 150-ton units.

Enable Compressor A2 (A2.EN)

This configuration is used to disable the A2 compressor in case of failure for size 75 to 150-ton units.

Enable Compressor A3 (A3.EN)

This configuration is used to disable the A3 compressor in case of failure for size 90 and 100-ton units. It is always disabled for size 75-ton units.

Enable Compressor A4 (A4.EN)

This configuration is used to disable the A4 compressor in case of failure for size 120 to 150-ton units. It is always disabled for size 75 to 105-ton units.

Enable Compressor B1 (B1.EN)

This configuration is used to disable the B1 compressor in case of failure for size 75 to 150-ton units.

Enable Compressor B2 (B2.EN)

This configuration is used to disable the B2 compressor in case of failure for size 75 to 150-ton units.

Enable Compressor B3 (B3.EN)

This configuration is used to disable the B3 compressor in case of failure for size 75 to 150-ton units.

Enable Compressor B4 (B4.EN)

This configuration is used to disable the B4 compressor in case of failure for size 120 to 150-ton units. It is always disabled for size 75 to 105-ton units.

CSB A1 Feedback Alarm (CS.A1)

This configuration is used to enable or disable compressor A1 feedback alarm. This configuration must be enabled whenever ***A1.EN*** is enabled.

CSB A2 Feedback Alarm (CS.A2)

This configuration is used to enable or disable compressor A2 feedback alarm. This configuration must be enabled whenever ***A2.EN*** is enabled.

CSB A3 Feedback Alarm (CS.A3)

This configuration is used to enable or disable compressor A3 feedback alarm. This configuration must be enabled whenever ***A3.EN*** is enabled.

CSB A4 Feedback Alarm (CS.A4)

This configuration is used to enable or disable compressor A4 feedback alarm. This configuration must be enabled whenever ***A4.EN*** is enabled.

CSB B1 Feedback Alarm (CS.B1)

This configuration is used to enable or disable compressor B1 feedback alarm. This configuration must be enabled whenever ***B1.EN*** is enabled.

CSB B2 Feedback Alarm (CS.B2)

This configuration is used to enable or disable compressor B2 feedback alarm. This configuration must be enabled whenever ***B2.EN*** is enabled.

CSB B3 Feedback Alarm (CS.B3)

This configuration is used to enable or disable the compressor B3 feedback alarm. This configuration must be enabled whenever ***B3.EN*** is enabled.

CSB B4 Feedback Alarm (CS.B4)

This configuration is used to enable or disable the compressor B4 feedback alarm. This configuration must be enabled whenever ***B4.EN*** is enabled.

SUMZ EDT Derivative Gain (DT.GN)

This is the derivative gain for the SUMZ EDT PID control loop.

Capacity Threshold Adjust (Z.GN)

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

Normally this configuration should not require any tuning or adjustment. If there is an application where the unit may be significantly oversized and there are indications of high compressor cycles, then the Capacity Threshold Adjust (***Z.GN***) can be used to adjust the overall logic gain. Normally this is set to 1.0, but it can be adjusted from 0.1 to 10. As the value of ***Z.GN*** is increased, the cycling of cooling stages will be slowed.

Compressor Lockout Temperature (MC.LO)

This configuration defines the outdoor air temperature below which mechanical cooling is locked out.

Table 27 — Supply Air Reset Configuration

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

Lead/Lag Operation? (LLAG)

This configuration selects the type of lead/lag compressor operation for the unit. There are 3 choices: automatic, Circuit A, and Circuit B.

0 = AUTOMATIC

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

1 = CIRCUIT A

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

2 = CIRCUIT B

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

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

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

High Capacity Evaporator (HC.EV)

This configuration is selects the type of evaporator coil installed at the factory on the unit. Yes = High capacity. No = Standard capacity. This configuration is set at the factory and should never need to be changed in the field.

High Efficiency Outdoor Fans (H.ODF)

This configuration selects the type of condenser coil and outdoor fans installed at the factory on the unit. Yes = High efficiency. No = Standard efficiency. This configuration is set at the factory and should never need to be changed in the field.

MotorMaster Control? (M.M.)

The condenser fan staging control for the unit is managed directly by the *Comfort*Link controls. There is no physical Motormaster device in the standard unit. If the unit was ordered from the factory with low ambient control (Motormaster) option, nothing further needs to be done. This configuration must be set to YES if an accessory low ambient operation Motormaster® V control is installed on the unit. Setting this configuration to YES alters the condenser fan staging sequence to accommodate the Motormaster V control. See Head Pressure Control section, page 55, for more information.

MotorMaster Setpoint Offset (MM.OF)

This configuration is the offset from Maximum Condensing Temperature (***SCT.H***) and determines the MotorMaster head pressure control point. MotorMaster Setpoint (***MM.SP***) = ***SCT.H*** + ***MM.OF***. The MotorMaster Setpoint is not directly settable and can only be set via the MotorMaster Setpoint Offset.

MotorMaster PID Configuration (M.PID)

The configurations in this subset are the PID control parameters for the MotorMaster control. These configurations should not be adjusted in the field.

Maximum Condenser Temp (SCT.H)

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

Minimum Condenser Temp (SCT.L)

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

A1 is Digital Scroll (DG.A1)

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

A1 Min Digital Capacity (MC.A1)

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

Dig Scroll Adjust Delta (DS.AP)

This configuration defines the maximum capacity the digital scroll will be allowed to change per request by the SUMZ Cooling Algorithm.

Dig Scroll Adjust Delay (DS.AD)

This configuration defines the time delay in seconds between digital scroll capacity adjustments.

Dig Scroll Reduce Delta (DS.RP)

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

Dig Scroll Reduce Delay (DS.RD)

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

Dig Scroll Reduction OAT (DS.RO)

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

Dig Scroll Max Only OAT (DS.MO)

This configuration defines the outdoor-air temperature above which the digital scroll will not be allowed to modulate. The digital scroll will be locked at 100% above this outdoor-air temperature.

Min Load Valve Enable (MLV)

This configuration instructs the control as to whether a minimum load (hot gas bypass) valve has been installed and will be controlled by the compressor staging routine.

High SST Alert Delay Time (H.SST)

This option allows the low saturated suction temperature alert timing delay to be adjusted.

Reverse Rotation Verified? (RR.VF)

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

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

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

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

The rate of suction pressure change from 5 seconds prior to compressor start to compressor start (rate prior) is compared to the rate of suction pressure change from compressor start to 5 seconds after compressor start (rate after). If (rate after) is less than (rate prior minus 1.25), alarm A140 is generated. This alarm will disable mechanical cooling and will require a manual reset. It is important to note that in Service Test mode, reverse rotation is checked on every compressor start.

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

Use CSBs for HPS detect? (CS.HP)

On units with multiple compressors running on a circuit, the Current Sensor Boards are used to help detect a High Pressure Switch trip. Setting this configuration to NO disables this additional High Pressure switch trip detection.

The parameters in the next 3 subsets, EXV Circuit Configs (***EXV.C***). EXV PID Configs (***E.PID***) and DP Override Configs (***DP.OC***) all deal with the EXC control parameters. These configurations should not be adjusted in the field. Adjustment could cause unstable EXV control resulting in head pressure trips, and /or compressor flooding.

Enab Cir Shtdwn w/ flood (EN.SC)

This configuration enables circuit shutdown when flooding is detected.

Comp. Cir. Exv. Min Pos% (EX.MN)

This configuration sets the allowable commanded EXV minimum position. Factory default is 20%. Normal adjustment range is 10 to 20%. Adjustment below this range could cause excessive head pressure alerts/alarms. Adjustment above this range could cause excessive flooding alerts and circuit shutdowns. See Troubleshooting section for more information.

NOTE: The actual value for EXV MIN POS% used during runtime is ***C.XMP***. In most cases ***C.XMP*** = ***EX.MN***. If OAT < LOWOAT, ***C.XMP*** = ***EX.MN***/2. This allows the EXV to close more at lower outdoor temperatures.

Flooding Detect Time (FL.TM)

This configuration sets the amount of time that the superheat must be below the flooding control set point (***C.FLS***), while the EXV is within 1% of the minimum position (***EX.MN***) before a flooding alert is logged and the circuit is restarted if ***EN.SC***=YES. Flooding shall be detected as follows:

1. If the EXV is being commanded by the PID.
2. Superheat is less than ***C.FLS*** for ***FL.TM*** consecutive seconds.
3. EXV position is within 1% of the minimum position (***EX.MN***).

The control shall monitor the superheat of each EXV and log an alert if flooding is detected.

If ***EN.SC***=NO, after logging the flooding alert, the circuit shall continue to run. The alert shall be automatically cleared when:

1. The EXV is being commanded by the PID.
2. Superheat is greater than ***C.FLS*** for ***FL.TM*** consecutive seconds.

If ***EN.SC***=YES, after logging the flooding alert, the circuit shall be marked as failed, forcing a circuit shutdown and recalibration of the shutdown circuit EXVs. The alert shall be automatically cleared ***FL.TM*** after being set. After clearing the alert, the circuit shall be immediately marked as usable.

Shutdown due to a flooding alert will not shut down both circuits at the same time. A second circuit waits for the alert to automatically clear on the first circuit before shutting down.

The unit will not automatically restart the compressors after the detection of flooding with a circuit reset, while in Service Test mode the operator has to manually restart any compressors.

COOL MODE SELECTION PROCESS

The N Series *Comfort*Link controls offer 3 distinct methods by which they may select a cooling mode.

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

This section is devoted to the process of cooling mode determination for the 3 types outlined above. See Tables 28 and 29.

Table 28 — Cooling Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
COOL	COOLING CONFIGURATION				
A1.EN	Enable Compressor A1	Disable/Enable		CMPA1ENA	Enable
A2.EN	Enable Compressor A2	Disable/Enable		CMPA2ENA	Enable
A3.EN	Enable Compressor A3	Disable/Enable		CMPA3ENA	Enable
A4.EN	Enable Compressor A4	Disable/Enable		CMPA4ENA	Enable
B1.EN	Enable Compressor B1	Disable/Enable		CMPB1ENA	Enable
B2.EN	Enable Compressor B2	Disable/Enable		CMPB2ENA	Enable
B3.EN	Enable Compressor B3	Disable/Enable		CMPB3ENA	Enable
B4.EN	Enable Compressor B4	Disable/Enable		CMPB4ENA	Enable
CS.A1	CSB A1 Feedback Alarm	Disable/Enable		CSB_A1EN	Enable
CS.A2	CSB A2 Feedback Alarm	Disable/Enable		CSB_A2EN	Enable
CS.A3	CSB A3 Feedback Alarm	Disable/Enable		CSB_A3EN	Enable
CS.A4	CSB A4 Feedback Alarm	Disable/Enable		CSB_A4EN	Enable
CS.B1	CSB B1 Feedback Alarm	Disable/Enable		CSB_B1EN	Enable
CS.B2	CSB B2 Feedback Alarm	Disable/Enable		CSB_B2EN	Enable
CS.B3	CSB B3 Feedback Alarm	Disable/Enable		CSB_B3EN	Enable
CS.B4	CSB B4 Feedback Alarm	Disable/Enable		CSB_B4EN	Enable
Z.GN	Capacity Threshold Adjust	0.1 to 10		Z_GAIN	1.0
DT.GN	SUMZ EDT Derivative Gain	0.1 to 3		DTGAIN	1.5
MC.LO	Compressor Lockout Temp	–25 to 55	dF	OATLCOMP	53
LLAG	Lead/Lag Operation ?	0 to 2		LLENABLE	0
HC.EV	High Capacity Evaporator	No/Yes		HCAPEVAP	No
H.ODF	High Efficiency OD Fans?	No/Yes		HIGH_EFF	No
M.M.	Motor Master Control ?	No/Yes		MOTRMAST	No
MM.OF	MM Setpoint Offset	–20 to 20	dF	MMSPOFST	-10.0
M.PID	MOTORMAST PID CONFIGS				
MM.RR	Motor Master PI Run Rate	5 to120		MM_RATE	5
MM.PG	Motor Master Prop Gain	0 to 5	sec	MINCAPA1	50
MM.PD	Motor Master Deriv. Gain	0 to 5		MM_DG	0.3
MM.TI	Motor Master Integ. Time	0.5 to 50		MM_TI	30.0
SCT.H	Maximum Condenser Temp	100 to 150	dF	SCT_MAX	115
SCT.L	Minimum Condenser Temp	40 to 90	dF	SCT_MIN	80
DG.A1	A1 is Digital Scroll	No/Yes		DIGCMPA1	No
MC.A1	A1 Min Digital Capacity	30 to 100	%	MINCAPA1	50
DS.AP	Dig Scroll Adjust Delta	0 to 100	%	DSADJPCT	100
DS.AD	Dig Scroll Adjust Delay	15 to 60	sec	DSADJDLY	20
DS.RP	Dig Scroll Reduce Delta	0 to 100	%	DSREDPCT	6
DS.RD	Dig Scroll Reduce Delay	15 to 60	sec	DSREDDLY	30
DS.RO	Dig Scroll Reduction OAT	70 to 120	dF	DSREDOAT	95
DS.MO	Dig Scroll Max Only OAT	70 to 120	dF	DSMAXOAT	105
MLV	Min Load Valve Enable	Disable/Enable		MLV_ENAB	Disable
H.SST	Hi SST Alert Delay Time	5 to 30	min	HSSTTIME	10
RR.VF	Rev Rotation Verified?	No/Yes		REVR_VER	No
CS.HP	Use CSBs for HPS Detect?	No/Yes		CSBHPDET	Yes
EXV.C	EXV CIRCUIT CONFIGS				
EX.SA	Cir. EXV Start Algorithm	0 to 1		EXV_STAL	0
SH.SP	EXV Superheat Setpoint	5 to 40	dF	SH_SP	12.0
SH.DB	EXV Superheat Deadband	0 to 2	dF	SH_DB	0.5
MOP.S	Max Oper. Pressure SP	40 to 120	dF	MOP_SP	70
CS.DE	EXV Cir Start Delay Secs	10 to 240	sec	EXVCSDLY	240
CS.PD	EXV Cir PreMove Dly Secs	0 to 30	sec	EXVCPDLY	30
EX.MN	Comp. Cir. Exv. Min Pos%	0 to 100	%	CC_XMPOS	20.0
EX.MC	Comp Cir EXV Mn Strt Pos	0 to 100	%	EXV_CSMP	30
EN.SC	Enab Cir Shtdwn w/ flood	No/Yes		FL_ENCSD	Yes
FL.TM	Flooding Detect Time	15 to 900		FL_DETTM	120
E.PID	EXV PID CONFIGS				
EX.RR	EXV PID Run Rate	5 to 120	sec	EXV_RATE	5
EX.PG	EXV PID Prop. Gain	0 to 5		EXV_PG	0.5
EX.TI	EXV Integration Time	0.5 to 60		EXV_TI	50
EX.HO	High OAT Lim (EXV Gain)	50 to 95	dF	HIGHOAT	70
EX.LO	Low OAT Lim (EXVGain)	40 to 80	dF	LOWOAT	60
EX.FG	%EXV Move on Cir. Stg Up	0 to 100	%	EXV_FF_G	10
EX.FD	%EXV Move on Cir. Stg Dw	0 to 100	%	EXV_FF_D	15.0
EX.CF	EXV Pre-Move Config	0 to 3	sec	EXVPMCFG	1
EX.PM	EXV Pre-Move Delay Secs	0 to 30	sec	EXVPMDLY	10
FL.SP	EXV SH Flooding Setpoint	0 to 10	dF	FL_SP	6.0
FL.OC	Flood Ovrde Press Cutoff	0 to 1000	psig	FL_ODPC	600.0
FL.OD	Flooding Override Delay	0 to 255	sec	FL_OD	0

Table 28 — Cooling Configuration (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
EX.SL	EXV Init Pos Slope	–100 to 100		EXV_SLP	–0.4
EX.IN	EXV Init Pos Intercept	–200 to 200		EXV_INT	66
EX.SM	EXV Smoothing Algorithm	0 to 1		EXV_SMAL	0
EX.EP	SH Error Exponent	1 to 1.5		ERR_POW	1.3
DP.OC	DP OVERRIDE CONFIGS				
DP.RS	DP Rate of Change Set	2 to 15	°psig	DP_RC_ST	10
DP.RC	DP Rate of Change Clr	0 to 5	°psig	DP_RC_CL	1
DP.L1	DP Override Limit 1	400 to 450	psig	DP_OD_L1	400
DP.L2	DP Override Limit 2	480 to 550	psig	DP_OD_L2	500
DP.TO	DP Override Timeout	6 to 150	sec	DP_OD_TO	90
DP.OR	DP Override Percent	0 to 15	%	DP_OD_PT	10

Table 29 — 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	^F	HCSP_GAP	5
V.C.ON	VAV Occ. Cool On Delta	0-25	^F	VAVOCON	3.5
V.C.OF	VAV Occ. Cool Off Delta	1-25	^F	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

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 2 offsets in the determination of an occupied VAV cooling mode (***Setpoints→V.C.ON*** and ***Setpoints→V.C.OF***), applying them to the low-heat off trip point and comparing the resulting temperature to the controlling return temperature (***R.TMP***).

The ***Setpoints→V.C.ON*** (VAV cool mode on offset) and ***Setpoints→V.C.OF*** (VAV cool mode off offset) offsets are used in conjunction with the low heat mode off trip point to determine when to bring cooling on and off and in enforcing a true "vent" mode between heating and cooling. See Fig. 4. The occupied cooling set point is not used in the determination of the cool mode. The occupied cooling set point is used for supply air reset only.

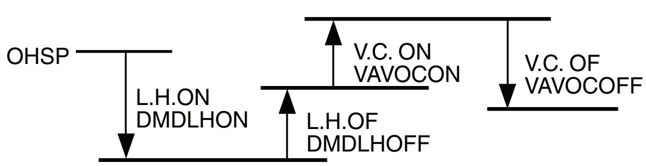


Fig. 4 — VAV Occupied Period Trip Logic

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

VAV Occupied Cool Mode Evaluation Configuration

There are VAV occupied cooling offsets under ***Setpoints***.

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

NOTE: There is a submenu 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 51 for more information.

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

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

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

Supply Air Set Point Control and the Staging of Compressors

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

Refer to the SumZ Cooling Algorithm section on page 51 for a discussion of how the N 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=4)

The machine control types that utilize this technique of mode selection are:

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

These particular control types operate differently than the VAV types in the occupied mode in that there is both a LOW COOL and a HIGH COOL mode. For both of these modes, the control offers 2 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→BP→D.LV.T***. See Table 30.

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

ITEM	EXPANSION	RANGE	CCN POINT
MODE	MODES CONTROLLING UNIT		
OCC	Currently Occupied	Off/On	MODEOCCP
T.C.ST	Temp.Compensated Start	Off/On	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. 5.

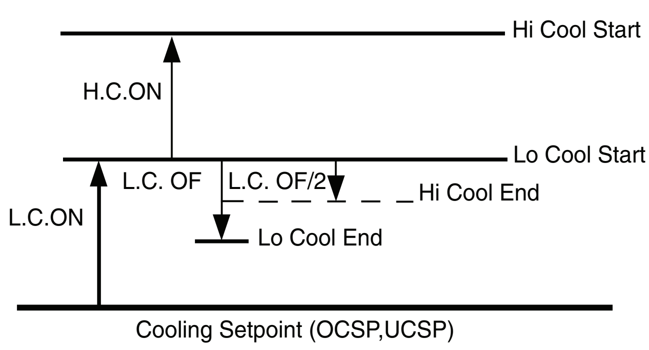


Fig. 5 — Cool Mode Evaluation

Demand Level Low Cool On Offset (***L.C.ON***)

This is the cooling set point offset added to the cooling set point at which point a Low Cool mode starts.

Demand Level High Cool On Offset (***H.C.ON***)

This is the cooling set point offset added to the “cooling set point plus ***L.C.ON***” at which point a High Cool mode begins.

Demand Level Low Cool Off Offset (***L.C.OF***)

This is the cooling set point offset subtracted from “cooling set point plus ***L.C.ON***” at which point a Low Cool mode ends.

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

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

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

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

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

Comfort Trending

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

Cool Trend Demand Level (***C.T.LV***)

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

Cool Trend Time (***C.T.TM***)

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

Timeguards

In addition to the set points and offsets that determine the trip points for bringing on and bringing off cool modes, there is a timeguard that 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 N Series *Comfort*Link controls manage supply-air temperature and the staging of compressors for these control types.

Table 30 — 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	0 to 2	^F	DMDLHON	1.5
H.H.ON	Dmd Level(+) Hi Heat On	0.5 to 20.0	^F	DMDHHON	0.5
L.H.OF	Dmd Level(-) Lo Heat Off	0.5 to 2.0	^F	DMDLHOFF	1
L.C.ON	Dmd Level Lo Cool On	0 to 2	^F	DMDLCON	1.5
H.C.ON	Dmd Level(+) Hi Cool On	0.5 to 20.0	^F	DMDHCON	0.5
L.C.OF	Dmd Level(-) Lo Cool Off	0.5 to 2	^F	DMDLCOFF	1
C.T.LV	Cool Trend Demand Level	0.1 to 5	^F	CTRENDLV	0.1
H.T.LV	Heat Trend Demand Level	0.1 to 5	^F	HTRENDLV	0.1
C.T.TM	Cool Trend Time	30 to 600	sec	CTRENDTM	120
H.T.TM	Heat Trend Time	30 to 600	sec	HTRENDTM	120

C.TYP = 3 (Thermostat Cool Mode Selection)

When a thermostat type is selected, the decision making process involved in determining the mode is straightforward. Upon energizing the Y1 input only, the unit HVAC mode will be LOW COOL. Upon the energizing of both Y1 and Y2 inputs, the unit HVAC mode will be HIGH COOL. If just input G is energized, the unit HVAC mode will be VENT and the supply fan will run.

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

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

COOL MODE DIAGNOSTIC HELP

To quickly determine the current trip points for the cooling modes, the Run Status submenu at the local display allows viewing of the calculated start and stop points for both the cooling and heating trip points. The following submenu can be found at the local display under ***Run Status→TRIP***. See Table 31.

Table 31 — Run Status Mode Trip Helper

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

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

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

SUMZ COOLING ALGORITHM

The SumZ cooling algorithm is an adaptive PID (proportional, integral, derivative) that is used by the control whenever more than 2 stages of cooling are present (***C.TYP*** = 1,2,3, and 4). This section will describe its operation and define the pertinent parameters. It is generally not necessary to modify parameters in this section. The information is presented 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 28.

Capacity Threshold Adjust (Z.GN)

This configuration affects the cycling rate of the cooling stages by raising or lowering the threshold that capacity must build to in order to add or subtract a stage of cooling.

The cooling algorithm's run-time variables are located at the local display under ***Run Status→COOL***. See Table 32.

Current Running Capacity (C.CAP)

This variable represents the amount of capacity currently running in percent.

Current Cool Stage (CUR.S)

This variable represents the cool stage currently running.

Requested Cool Stage (REQ.S)

This variable represents the requested cool stage. Cooling relay timeguards in place may prevent the requested cool stage from matching the current cool stage.

Maximum Cool Stages (MAX.S)

This variable is the maximum number of cooling stages the control is configured for and capable of controlling.

Active Demand Limit (DEM.L)

If demand limit is active, this variable will represent the amount of capacity that the control is currently limited to.

Capacity Load Factor (SMZ)

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

Next Stage EDT Decrease (ADD.R)

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

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

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

Table 32 — Run Status Cool Display

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
COOL	COOLING INFORMATION				
C.CAP	Current Running Capacity	0-100	%	CAPTOTAL	
CUR.S	Current Cool Stage	0-20		COOL_STG	
REQ.S	Requested Cool Stage	0-20		CL_STAGE	
MAX.S	Maximum Cool Stages	0-20		CLMAXSTG	
DEM.L	Active Demand Limit	0-100	%	DEM_LIM	forcible
SUMZ	COOL CAP. STAGE CONTROL				
SMZ	Capacity Load Factor	-400 – 400		SMZ	
ADD.R	Next Stage EDT Decrease	0-30		ADDRISE	
SUB.R	Next Stage EDT Increase	0-30		SUBRISE	
R.PCT	Rise Per Percent Capacity	0-10		RISE_PCT	
Y.MIN	Cap Deadband Subtracting	–40-0		Y_MINUS	
Y.PLU	Cap Deadband Adding	0-40		Y_PLUS	
Z.MIN	Cap Threshold Subtracting	–99-0		Z_MINUS	
Z.PLU	Cap Threshold Adding	0-99		Z_PLUS	
H.TMP	High Temp Cap Override	No/Yes		HI_TEMP	
L.TMP	Low Temp Cap Override	No/Yes		LOW_TEMP	
PULL	Pull Down Cap Override	No/Yes		PULLDOWN	
SLOW	Slow Change Cap Override	No/Yes		SLO_CHNG	
HMZR	HUMIDIMIZER				
CAPC	Humidimizer Capacity	0-100	%	HMZRCAPC	
C.EXV	Condenser EXV Position	0-100	%	COND_EXV	
B.EXV	Bypass EXV Position	0-100	%	BYP_EXV	
RHV	Humidimizer 3-Way Valve	No/Yes		HUM3WVAL	
C.CPT	Cooling Control Point	–20-140	dF	COOLCPNT	
EDT	Evaporator Discharge Tmp	–40-240	dF	EDT	
H.CPT	Heating Control Point	–20-140	dF	HEATCPNT	
LAT	Leaving Air Temperature	–40-240	dF	LAT	
EXVS	EXVS INFORMATION				
A1.EX	Circuit A EXV 1 Position	0-100	%	XV1APOSP	
A2.EX	Circuit A EXV 2 Position	0-100	%	XV2APOSP	
B1.EX	Circuit B EXV 1 Position	0-100	%	XV1BPOSP	
B2.EX	Circuit B EXV 2 Position	0-100	%	XV2BPOSP	
SH.A1	Cir A EXV1 Superheat Tmp	–100-200	^F	SH_A1	
SH.A2	Cir A EXV2 Superheat Tmp	–100-200	^F	SH_A2	
SH.B1	Cir B EXV1 Superheat Tmp	–100-200	^F	SH_B1	
SH.B2	Cir B EXV2 Superheat Tmp	–100-200	^F	SH_B2	
CTRL	EXVS CONTROL INFORMATION				
C.SHS	EXV Superheat Ctrl SP	5-40	^F	SH_SP_CT	forcible
C.FLS	EXV SH Flooding Ctrl SP	0-10		FL_SP_CT	forcible
C.EXP	EXV PID Ctrl Prop. Gain	0-5	^F	EXV_PG_C	forcible
C.EXT	EXV Ctrl Integrat. Time	0.5-6		EXV_TI_C	forcible
C.EXM	Cir Strt EXV Mn Ctrl Pos	0-100	%	EXCSMP_C	forcible

Next Stage EDT Increase (SUB.R)

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

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

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

Rise Per Percent Capacity (R.PCT)

This is a real time calculation that represents the number of degrees of drop/rise across the evaporator coil versus percent of current running capacity.

R.PCT = (*MAT* – *EDT*)/ ***C.CAP***

Cap Deadband Subtracting (Y.MIN)

This is a control variable used for Low Temp Override (***L.TMP***) and Slow Change Override (***SLOW***).

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

Cap Deadband Adding (Y.PLU)

This is a control variable used for High Temp Override (***H.TMP***) and Slow Change Override (***SLOW***).

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

Cap Threshold Subtracting (Z.MIN)

This parameter is used in the calculation of ***SMZ*** and is calculated as follows:

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

Cap Threshold Adding (Z.PLU)

This parameter is used in the calculation of ***SMZ*** and is calculated as follows:

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

High Temp Cap Override (H.TMP)

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

Low Temp Cap Override (L.TMP)

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

Pull Down Cap Override (PULL)

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

Slow Change Cap Override (SLOW)

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

Humidi-MiZer® Capacity (CAPC)

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

Condenser EXV Position (C.EXV)

This variable represents the position of the condenser EXV (percent open).

Bypass EXV Position (B.EXV)

This variable represents the position of the bypass EXV (percent open).

Humidi-MiZer 3-Way Valve (RHV)

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

Cooling Control Point (C.CPT)

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

Evaporator Discharge Temperature (EDT)

Displays the temperature measured between the evaporator coils and the Humidi-MiZer dehumidification/reheat coil. Units configured with Humidi-MiZer system have a thermistor grid installed between these 2 coils to provide the measurement. This temperature can also be read at ***Temperatures→AIR.T→CCT.***

Heating Control Point (H.CPT)

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

Leaving Air Temperature (LAT)

Displays the leaving air temperature after the Humidi-MiZer reheat/dehumidification coil.

SumZ Operation

The SumZ algorithm is an adaptive PID style of control. The PID (proportional, integral, derivative) is programmed within the control and the relative speed of staging can only be influenced by the user through the adjustment of the ***Z.GN*** configuration. 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 leaving-air temperature of the evaporator coil, and based upon the difference between the 2 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*** submenu.

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 2 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*** that 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 2 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 to 2	MAT_SEL	1
MAT.R	Reset MAT Table Entries?	No/Yes	MATRESET	No

MAT Calc Config (***MAT.S***) — This configuration gives the user 3 options in the processing of the mixed-air temperature (MAT) calculation:

- ***MAT.S*** = 0
  There will be no MAT calculation.
- ***MAT.S*** = 1
  The control will attempt to learn MAT over time. Any time the system is in a vent mode and the economizer stays at a particular position for long enough, MAT = EDT. Using this, the control has an internal table whereby it can more closely determine the true MAT value.
- ***MAT.S*** = 2
  The control will stop learning and use whatever the control has already learned. Using this setting infers that the control has spent some time set to ***MAT.S*** = 1.

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

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

SumZ Overrides

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

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

Economizer Trim Override

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

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

Mechanical Cooling Lockout (Configuration→COOL→ MC.LO)

This configuration allows a configurable outside-air temperature set point below which mechanical cooling will be completely locked out.

DEMAND LIMIT CONTROL

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

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

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

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

To use Demand Limiting, select the type of demand limiting to use. This is done with the Demand Limit Select configuration (***Configuration→BP→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→BP→DMD.L***. See Table 33.

Demand Limit Select (DM.L.S)

This configuration determines the type of demand limiting.

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

Two-Switch Demand Limiting (***DM.L.S** = 1*)

This type of demand limiting utilizes 2 discrete inputs:

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

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

Inputs→GEN.I→DL.S1

Inputs→GEN.I→DL.S2

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

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

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

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

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

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

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

The relevant configurations for this type of demand limiting are:

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

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

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

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

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

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

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

HEAD PRESSURE CONTROL

Condenser head pressure for the 48/50N Series is managed directly by the *Comfort*Link controls. The controls are able to cycle up to 9 stages of outdoor fans to maintain acceptable head pressure. Fan stages will be turned on or off in reaction to discharge pressure sensors with the pressure converted to the corresponding saturated condensing temperature.

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

There are 5 configurations provided for head pressure control that can be found at the local display:

Configuration→COOL→M.M (Motormaster enable)

Configuration→M.PID→SCT.H **(**Maximum Condensing Temp)

Configuration→M.PID→SCT.L **(**Minimum Condensing Temp)

There are up to 5 outputs provided to control head pressure:

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

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

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

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

Outputs→FANS→CDF.5 — Condenser Fan Output 5

The specific staging sequence for a unit depends on 3 factors: the unit size (tonnage), which refrigeration circuits are currently operating, and whether or not Motormaster control is enabled. See Fig. 6-8 for fan staging sequencing.

The condenser fan output controls outdoor fan contactors and outdoor fans for each unit tonnage as shown in Fig. 6. Each stage of fans is also shown. The *Comfort*Link controller adds or subtracts stages of fans based on ***SCT.H*** and ***SCT.L***. When the SCT rises above ***SCT.H***, a fan stage will be added. The *Comfort*Link controller will continue to add a fan stage every 10 seconds thereafter if the SCT remains above ***SCT.H***. If SCT rises above 130°F, the controller will turn on the maximum fan stages for the unit. When the SCT drops below the ***SCT.L***, a fan stage will be subtracted. The *Comfort*Link controller will continue to drop a fan stage every 2 minutes thereafter if the SCT remains below ***SCT.L***.

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

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

On the initial start-up of a circuit, the condenser fans will start 5 seconds prior to the compressor starting in order to ensure proper head pressure of the compressor immediately at start-up. After the compressor starts, the normal head pressure routine will begin 30 seconds after the condenser fan pre-start. What stage fans starts depends on the outdoor ambient temperature. The 3 situations are:

OAT ≤ 50°F

50 F < OAT < 70°F

OAT ≥ 70°F

See Fig. 6-8 for what stage of fans starts for each scenario.

Table 33 — Demand Limit Configuration

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

ECONOMIZER INTEGRATION WITH MECHANICAL COOLING

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

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

Multi-Stage Cooling Economizer Mechanical Cooling Delay

This type of mechanical cooling delay is relevant to the following machine control types:

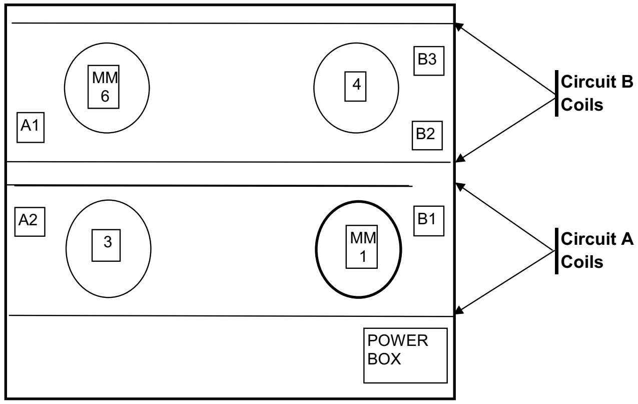
C.TYP = 1 VAV-RAT

C.TYP = 2 VAV-SPT

C.TYP = 3 TSTAT-MULTI

C.TYP = 4 SPT-MULTI

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



Applicable Units	
Tonnage	**Efficiency**
75	Standard

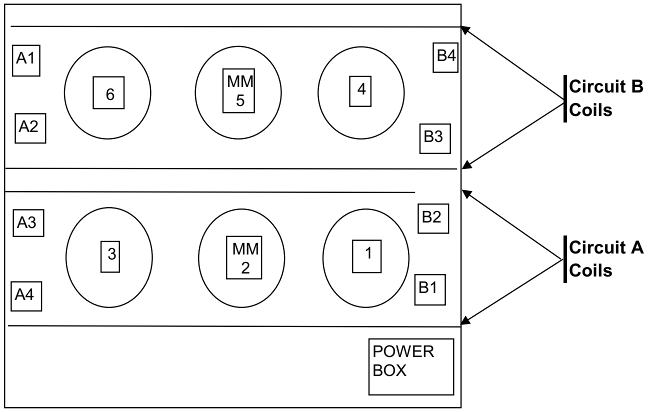
Circuit	Controlling Output		Contactor	OFM(s)	Logic
	Software	Board	Conrolled	Controlled	
A	CONDFAN1	MBB Rly 6	OFC1	OFM 1	See Table
A	CONDFAN2	MBB Rly 5	OFC2	OFM 3	See Table
B	CONDFAN3	RCB Rly 1	OFC3	OFM 6	See Table
B	CONDFAN4	RCB Rly 2	OFC4	OFM 4	See Table

Common, M.M.=YES or NO	Contactor	Software Pts	# of Fans ON	Fans ON	Ckt A # Fans ON	Ckt B # Fans ON	Staging Logic	Stage Up Logic	Stage Down Logic
Stage 1A	OFC1	CONDFAN1	1	OFM1	1	0	Ckt A on. Stage up by individual circuit when SCTA > SCT_MAX	Stage up to Stage 2A when SCTA>SCT_MAX	Stage down, OFC1 off, when Ckt A goes off.
Stage 1B	OFC3	CONDFAN3	1	OFM6	0	1	Ckt Bon. Stage up by individual circuit when SCTB > SCT_MAX	Stage up to Stage 2B when SCTB>SCT_MAX	Stage down, OFC3 off, when Ckt B goes off.
Stage 2A	OFC 1,2	CONDFAN1,2	2	OFM1,3	2	0	Stage up by individual circuit when SCTA/B > SCT_MAX		Stage down to Stage 1A when SCTA< SCT_MIN
Stage 2B	OFC 3,4	CONDFAN3,4	2	OFM4,6	0	2	Stage down by individual circuit when SCTA/B < SCT_MIN		Stage down to Stage 1B when SCTB < SCT_MIN

LEGEND

MM — Motormaster® Control
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor

Fig. 6 — 75-Ton Standard Efficiency Unit Condenser Fan Staging Sequence



Applicable Units	
Tonnage	**Efficiency**
75	High
90	Standard
105	Standard
120	Standard

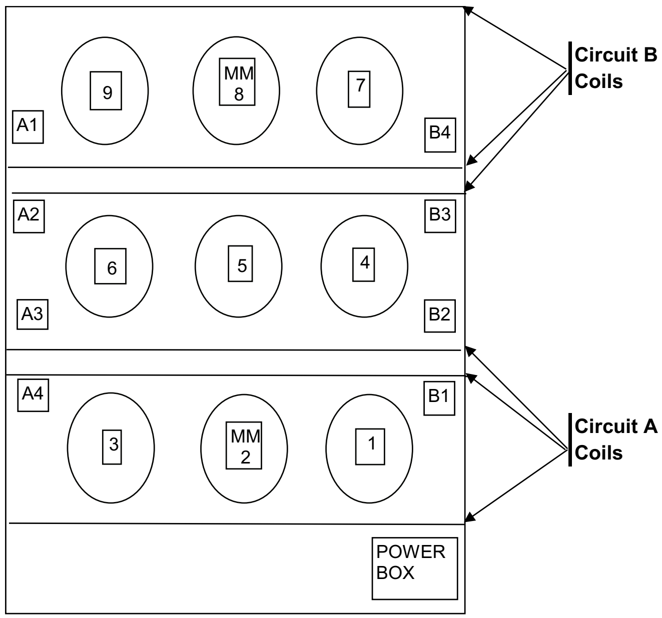
Circuit	Controlling Output Software	Controlling Output Board	Contactor Conrolled	OFM(s) Controlled	Logic
A	CONDFAN1	MBB Rly 6	OFC1	OFM2	See Table
A	CONDFAN2	MBB Rly 5	OFC2	OFM 1,3	See Table
B	CONDFAN3	RCB Rly 1	OFC3	OFM5	See Table
B	CONDFAN4	RCB Rly 2	OFC4	OFM 4,6	See Table

Common, M.M.=YES or NO	Contactor	Software Pts	# of Fans ON	Fans ON	Ckt A # Fans ON	Ckt B # Fans ON	Staging Logic	Stage Up Logic	Stage Down Logic
Stage 1A	OFC1	CONDFAN1	1	OFM2	1	0	Ckt A on. Stage up by individual circuit when SCTA > SCT_MAX	Stage up to Stage 2A when SCTA>SCT_MAX	Stage down, OFC1 off, when Ckt A goes off.
Stage 1B	OFC3	CONDFAN3	1	OFM5	0	1	Ckt Bon. Stage up by individual circuit when SCTB > SCT_MAX	Stage up to Stage 2B when SCTB>SCT_MAX	Stage down, OFC3 off, when Ckt B goes off.
Stage 2A	OFC2	CONDFAN2	2	OFM1,3	2	0	Stage up by individual circuit when SCTA/B > SCT_MAX	Stage up to Stage 3A when SCTA>SCT_MAX	Stage down to Stage 1A when SCTA< SCT_MIN
Stage 2B	OFC4	CONDFAN4	2	OFM4,6	0	2	Stage down by individual circuit when SCTA/B < SCT_MIN	Stage up to Stage 3B when SCTB>SCT_MAX	Stage down to Stage 1B when SCTB < SCT_MIN
Stage 3A	OFC1,2	CONDFAN1,2	3	OFM1,2,3	3	0	Stage up & down by individual circuit		Stage down to Stage 2A when SCTA<SCT_MIN
Stage 3B	OFC3,4	CONDFAN3,4	3	OFM4,5,6	0	3	Up if SCTA/B > SCT_MAX, Down if SCTA/B<SCT_MIN		Stage down to Stage 2B when SCTB<SCT_MIN

LEGEND

MM — Motormaster® Control
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor

Fig. 7 — 75-Ton High Efficiency and 90 to 120-Ton Standard Efficiency Unit Condenser Fan Staging Sequence



Applicable Units	
Tonnage	**Efficiency**
90	High
105	High
120	High
130	Standard
130	High
150	Standard

	Controlling Output		Contactor	OFM(s)	Logic
Circuit	**Software**	**Board**	**Conrolled**	**Controlled**	
A	CONDFAN1	MBB Rly 6	OFC1	OFM2	See Table
Common	CONDFAN2	MBB Rly 5	OFC2	OFM 4,5,6	See Table
B	CONDFAN3	RCB Rly 1	OFC3	OFM8	See Table
A	CONDFAN4	RCB Rly 2	OFC4	OFM 1,3	See Table
B	CONDFAN5	RCB Rly 3	OFC5	OFM 7,9	See Table

Common, M.M.=YES or NO	Contactor	Software Pts	# of Fans ON	Fans ON	Ckt A # Fans ON	Ckt B # Fans ON	Staging Logic	Stage Up Logic	Stage Down Logic
Stage 1A	OFC1	CONDFAN1	1	OFM2	1	0	Ckt A on. Stage up when either circuit is > SCT_MAX	Stage up to Stage 2A AND Stage 2B when either circuit SCT>SCT_MAX	Stage down, OFC1 off, when Ckt A is off.
Stage 1B	OFC3	CONDFAN3	1	OFM8	0	1	Ckt B on. Stage up when either circuit is > SCT_MAX	Stage up to Stage 2A AND Stage 2B when either circuit SCT>SCT_MAX	Stage down, OFC3 off, when Ckt B is off.
Stage 2A	OFC2	CONDFAN2	3	OFM4,5,6	1.5	1.5	Stage up by individual circuit when SCT > SCT_MAX	Stage up to Stage 3A when SCTA>SCT_MAX	Stage down to Stage 1A when SCTA AND SCTB < SCT_MIN
Stage 2B	OFC2	CONDFAN2	3	OFM4,5,6	1.5	1.5	Stage down when both circuits SCT < SCT_MIN	Stage up to Stage 3B when SCTB>SCT_MAX	Stage down to Stage 1B when SCTA AND SCTB < SCT_MIN
Stage 3A	OFC1,2	CONDFAN1,2	4	OFM4,5,6,2	2.5	1.5	Stage up & down by individual circuit	Stage up to Stage 4A when SCTA>SCT_MAX	Stage down to Stage 2A when SCTA<SCT_MIN
Stage 3B	OFC2,3	CONDFAN2,3	4	OFM4,5,6,8	1.5	2.5	Up if SCT > SCT_MAX, Down if SCT<SCT_MIN	Stage up to Stage 4B when SCTB>SCT_MAX	Stage down to Stage 2B when SCTB<SCT_MIN
Stage 4A	OFC2,4	CONDFAN2,4	5	OFM4,5,6,1,3	3.5	1.5	Stage up & down by individual circuit	Stage up to Stage 5A when SCTA>SCT_MAX	Stage down to Stage 3A when SCTA<SCT_MIN
Stage 4B	OFC2,5	CONDFAN2,5	5	OFM4,5,6,7,9	1.5	3.5	Up if SCT > SCT_MAX, Down if SCT<SCT_MIN	Stage up to Stage 5B when SCTB>SCT_MAX	Stage down to Stage 3B when SCTB<SCT_MIN
Stage 5A	OFC2,1,4	CONDFAN1,2,4	6	OFM4,5,6,1,2,3	4.5	1.5	Stage down by individual circuit		Stage down to Stage 4A when SCTA<SCT_MIN
Stage 5B	OFC2,5,3	CONDFAN2,3,5	6	OFM4,5,6,7,9,8	1.5	4.5	Down if SCT<SCT_MIN		Stage down to Stage 4B when SCTB<SCT_MIN

LEGEND

MM — Motormaster® Control
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor

Fig. 8 — 90 to 130-Ton High Efficiency and 130 and 150-Ton Standard Efficiency Unit Condenser Fan Staging Sequence

Heating Control

The N Series *Comfort*Link controls offers control for 6 different types of heating systems to satisfy general space heating requirements: 2-stage gas heat, 2-stage electric heat, SCR (modulating) electric heat, steam heat, modulating gas heat, and hydronic heat. Heating control also provides tempering and reheat functions. These functions are discussed in separate sections. Reheat is discussed under Dehumidification and Reheat section on page 89.

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

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

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

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

POST FILTER APPLICATION

Gas heat controls also use an airflow switch when post filter option is installed in unit. Lack of airflow will prevent gas heat from operating.

Electric heat controls add filter temperature switches at the post filters. The filter temperature switches will prevent electric heat from operating when high temperatures are experienced.

SETTING UP THE SYSTEM

The essential heating configurations located at the local display under ***Configuration→ HEAT***. See Table 34.

Table 34 — Heating Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HEAT	HEATING CONFIGURATION				
HT.CF	Heating Control Type	0 to 5		HEATTYPE	0*
HT.SP	Heating Supply Air Setpt	65 to 120	dF	SASPHEAT	85
OC.EN	Occupied Heating Enabled	No/Yes		HTOCCENA	No
LAT.M	MBB Sensor Heat Relocate	No/Yes		HTLATMON	No
SG.CF	STAGED HEAT CONFIGS				
HT.ST	Staged Heat Type	0 to 3		HTSTGTYP	0*
CAP.M	Max Cap Change per Cycle	5 to 45		HTCAPMAX	45*
M.R.DB	St.Ht DB min.dF/PID Rate	0 to 5		HT_MR_DB	0.5
S.G.DB	St.Heat Temp. Dead Band	0 to 5	^F	HT_SG_DB	2
RISE	Heat Rise dF/sec Clamp	0.05 to 0.2		HTSGRISE	0.06
LAT.L	LAT Limit Config	0 to 20	^F	HTLATLIM	10
LIM.M	Limit Switch Monitoring?	No/Yes		HTLIMMON	Yes
SW.H.T	Limit Switch High Temp	80 to 210	dF	HT_LIMHI	170*
SW.L.T	Limit Switch Low Temp	80 to 210	dF	HT_LIMLO	160*
HT.P	Heat Control Prop. Gain	0 to 1.5		HT_PGAIN	1
HT.D	Heat Control Derv. Gain	0 to 1.5		HT_DGAIN	1
HT.TM	Heat PID Rate Config	30 to 300	sec	HTSGPIDR	90*
HH.CF	HYDRONIC HEAT CONFIGS				
HW.P	Hydronic Ctl.Prop. Gain	0 to 1.5		HW_PGAIN	1
HW.I	Hydronic Ctl.Integ. Gain	0 to 1.5		HW_IGAIN	1
HW.D	Hydronic Ctl.Derv. Gain	0 to 1.5		HW_DGAIN	1
HW.TM	Hydronic PID Rate Config	15 to 300	sec	HOTWPIDR	90
ACT.C	HYDR.HEAT ACTUATOR CFGS.				
SN.1.1	Hydronic Ht.Serial Num.1	0 to 9999		HTC1_SN1	0
SN.1.2	Hydronic Ht.Serial Num.2	0 to 6		HTC1_SN2	0
SN.1.3	Hydronic Ht.Serial Num.3	0 to 9999		HTC1_SN3	0
SN.1.4	Hydronic Ht.Serial Num.4	0 to 254		HTC1_SN4	0
C.A.L1	Hydr.Ht.Ctl.Ang Lo Limit	0 to 90		HTC1CALM	0
SN.2.1	Humd/HTC2 Ser Num 1	0 to 9999		HTC2_SN1	0
SN.2.2	Humd/HTC2 Ser Num 2	0 to 6		HTC2_SN2	0
SN.2.3	Humd/HTC2 Ser Num 3	0 to 9999		HTC2_SN3	0
SN.2.4	Humd/HTC2 Ser Num 4	0 to 254		HTC2_SN4	0
C.A.L2	Humd/HTC2 Ctl Ang Lo Lim	0 to 90		HTC2CALM	0
SN.3.1	HTC3 Serial Number 1	0 to 9999		HTC3_SN1	0
SN.3.2	HTC3 Serial Number 2	0 to 6		HTC3_SN2	0
SN.3.3	HTC3 Serial Number 3	0 to 9999		HTC3_SN3	0
SN.3.4	HTC3 Serial Number 4	0 to 254		HTC3_SN4	0
C.A.L3	HTC3 Ctrl Angle Lo Limit	0 to 90		HTC3CALM	0
SN.4.1	HTC4 Serial Number 1	0 to 9999		HTC4_SN1	0
SN.4.2	HTC4 Serial Number 2	0 to 6		HTC4_SN2	0
SN.4.3	HTC4 Serial Number 3	0 to 9999		HTC4_SN3	0
SN.4.4	HTC4 Serial Number 4	0 to 254		HTC4_SN4	0
C.A.L4	HTC4 Ctrl Angle Lo Limit	0 to 90		HTC4CALM	0

*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 = 2 Stage Electric Heat

2 = 2 Stage Gas Heat

3 = Staged Gas Heat or Modulating Gas Heat

4 = Hydronic Heat (Hot Water or Steam)

5 = SCR Electric Heat

Heating Supply Air Set Point (HT.SP)

In a low heat mode for either modulating gas, SCR electric, or hydronic heat, this is the supply air set point for heating.

Occupied Heating Enable (OC.EN)

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

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

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 2-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 2 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 warm-up cycle (***Configuration→HEAT→OC.EN***). See descriptions above in the Setting Up the System section for more information.

Morning Warm-up

The morning warm-up is a VAV RTU Linkage/*Comfort*Link mode. This is initiated in the air system (VAV zone controllers) and communicated through Linkage, when a set of conditions occur. Those conditions are below:

- The RTU's schedule is initially in the unoccupied time period and transitions to an occupied time period
- A call for heating initiated by the zone controllers and/or their system.

The unoccupied set points are changed to the occupied set points. This morning warm-up mode remains through to the scheduled occupied time period and continues as long as a call for heating is still valid. Morning warm-up will terminate when a call for cooling is initiated.

Tstat-Multi-Stage (C.TYP = 3)

With thermostat control the W1 and W2 inputs determine whether the HVAC Mode is LOW or HIGH HEAT.

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

W2 = ON, W2 = ON: HVAC MODE = HIGH HEAT

NOTE: 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 121.

SPT Multi-Stage (C.TYP = 4)

The unit is free to select a heating mode based on space temperature (SPT).

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

TEMPERATURE-DRIVEN HEAT MODE EVALUATION

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

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

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

Then, the heat/cool set point offsets under ***Configuration→BP→ D.LV.T*** should be set. See Table 35.

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

ITEM	EXPANSION	RANGE	CCN POINT
MODE	MODES CONTROLLING UNIT		
OCC	Currently Occupied	Off/On	MODEOCCP
T.C.ST	Temp.Compensated Start	Off/On	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 set point (***UHSP***) is used.

Table 35 — 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	0 to 2	^F	DMDLHON	1.5
H.H.ON	Dmd Level(+) Hi Heat On	0.5 to 20	^F	DMDHHON	0.5
L.H.OF	Dmd Level(-) Lo Heat Off	0.5 to 2	^F	DMDLHOFF	1
L.C.ON	Dmd Level Lo Cool On	0 to 2	^F	DMDLCON	1.5
H.C.ON	Dmd Level(+) Hi Cool On	0.5 to 20	^F	DMDHCON	0.5
L.C.OF	Dmd Level(-) Lo Cool Off	0.5 to 2	^F	DMDLCOFF	1
C.T.LV	Cool Trend Demand Level	0.1 to 5	^F	CTRENDLV	0.1
H.T.LV	Heat Trend Demand Level	0.1 to 5	^F	HTRENDLV	0.1
C.T.TM	Cool Trend Time	30 to 600	sec	CTRENDTM	120
H.T.TM	Heat Trend Time	30 to 600	sec	HTRENDTM	120

The control will call out a low or high heat mode by comparing the controlling temperature to the heating set point and the heating set point offset. The set point offsets are used as additional help in customizing and tweaking comfort into the building space. See Fig. 9 for an example of offsets.

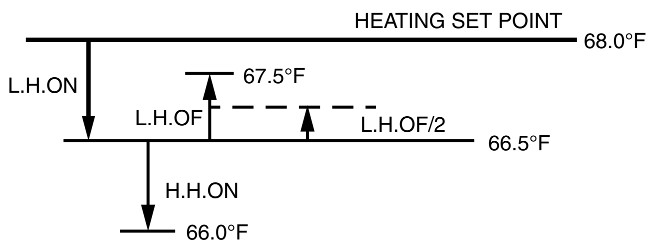


Fig. 9 — Heating Offsets

Demand Level Low Heat on Offset (L.H.ON)

This is the heating set point offset below the heating set point at which point Low Heat starts.

Demand Level High Heat on Offset (H.H.ON)

This is the heating set point offset below [the heating set point minus ***L.H.ON***] at which point high heat starts.

Demand Level Low Heat Off Offset (L.H.OF)

This is the heating set point offset above [the heating set point minus ***L.H.ON***] at which point the Low Heat mode ends.

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

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

To get out of a LOW HEAT mode, the controlling temperature must rise above [the heating set point minus ***L.H.ON*** plus ***L.H.OF***].

To get out of a HIGH HEAT mode, the controlling temperature must rise above [the heating set point minus ***L.H.ON*** plus ***L.H.OF***/2].

The Run Status table in the local display allows the user to see the exact trip points for both the heating and cooling modes without doing the calculations.

Heat Trend Demand Level (H.T.LV)

This is the change in demand that must be seen within the time period specified by ***H.T.TM*** in order to hold off a HIGH HEAT mode regardless of demand. This is not applicable to VAV control types (***C.TYP***=1 and 2) in the occupied period. This technique has been referred to as "Comfort Trending." As long as a LOW HEAT mode is making progress in warming the space, the control will hold off on a HIGH HEAT mode. This is relevant for the space sensor machine control types (***C.TYP*** = 4) because the unit may transition into the occupied mode and see an immediate and large heating demand when the set points change.

Heat Trend Time (H.T.TM)

This is the time period upon which the heat trend demand level (***H.T.LV***) operates and may work to hold off staging or a HIGH HEAT mode. This is not applicable to VAV control types (***C.TYP***=1 and 2) in the occupied period. See "Heat Trend Demand Level" section for more details.

HEAT MODE DIAGNOSTIC HELP

To quickly determine the current trip points for the low and high heat modes, there is a menu in the local display which lets the user quickly view the state of the system. This menu also contains the cool trip points as well. See Table 31 at the local display under ***Run Status→TRIP***.

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

TWO-STAGE GAS AND ELECTRIC HEAT CONTROL (***HT.CF* = 1,2**)

If the HVAC mode is LOW HEAT:

- If electric heat is configured, then the control will request the supply fan ON
- If gas heat is configured, then the IGC and IFO (IGC fan output) controls the supply fan request
- The control will turn on Heat Relay 1 (***HS1***)
- If evaporator discharge temperature is less than 50°F, then the control will turn on Heat Relay 2 (***HS2***)

NOTE: The logic for this "low heat" override is that one stage of heating will not be able to raise the temperature of the supply airstream sufficient to heat the space.

If the HVAC mode is HIGH HEAT:

- If electric heat is configured, then the control will request the supply fan ON
- If gas heat is configured, then the IGC and IFO output controls the supply fan request
- The control will turn on Heat Relay 1 (***HS1***)
- The control will turn on Heat Relay 2 (***HS2***)

HYDRONIC HEATING CONTROL (***HT.CF* = 4**)

Hydronic heating in N Series units refers to a hot water or steam coil controlled by an actuator. These actuators are communicating actuators and may be field supplied. When ***Configuration →HEAT→HT.CF***=4, there is a thermistor array called ***Temperatures→AIR.T→CCT*** that is connected to the RXB, which 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 36.

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 or steam 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 not be modified without approval from Carrier service personnel.

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.

Table 36 — Hydronic Heat Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HH.CF	HYDRONIC HEAT CONFIGS				
HW.P	Hydronic Ctl.Prop. Gain	0 to 1.5		HW_PGAIN	1
HW.I	Hydronic Ctl.Integ. Gain	0 to 1.5		HW_IGAIN	1
HW.D	Hydronic Ctl.Derv. Gain	0 to 1.5		HW_DGAIN	1
HW.TM	Hydronic PID Rate Config	15 to 300	sec	HOTWPIDR	90
ACT.C	HYDR.HEAT ACTUATOR CFGS.				
SN.1.1	Hydronic Ht.Serial Num.1	0 to 9999		HTC1_SN1	0
SN.1.2	Hydronic Ht.Serial Num.2	0 to 6		HTC1_SN2	0
SN.1.3	Hydronic Ht.Serial Num.3	0 to 9999		HTC1_SN3	0
SN.1.4	Hydronic Ht.Serial Num.4	0 to 254		HTC1_SN4	0
C.A.L1	Hydr.Ht.Ctl.Ang Lo Limit	0 to 90		HTC1CALM	0
SN.2.1	Humd/HTC2 Ser Num 1	0 to 9999		HTC2_SN1	0
SN.2.2	Humd/HTC2 Ser Num 2	0 to 6		HTC2_SN2	0
SN.2.3	Humd/HTC2 Ser Num 3	0 to 9999		HTC2_SN3	0
SN.2.4	Humd/HTC2 Ser Num 4	0 to 254		HTC2_SN4	0
C.A.L2	Humd/HTC2 Ctl Ang Lo Lim	0 to 90		HTC2CALM	0
SN.3.1	HTC3 Serial Number 1	0 to 9999		HTC3_SN1	0
SN.3.2	HTC3 Serial Number 2	0 to 6		HTC3_SN2	0
SN.3.3	HTC3 Serial Number 3	0 to 9999		HTC3_SN3	0
SN.3.4	HTC3 Serial Number 4	0 to 254		HTC3_SN4	0
C.A.L3	HTC3 Ctrl Angle Lo Limit	0 to 90		HTC3CALM	0
SN.4.1	HTC4 Serial Number 1	0 to 9999		HTC4_SN1	0
SN.4.2	HTC4 Serial Number 2	0 to 6		HTC4_SN2	0
SN.4.3	HTC4 Serial Number 3	0 to 9999		HTC4_SN3	0
SN.4.4	HTC4 Serial Number 4	0 to 254		HTC4_SN4	0
C.A.L4	HTC4 Ctrl Angle Lo Limit	0 to 90		HTC4CALM	0

Configuring Hydronic Heat to Communicate Via Actuator Serial Number

Every actuator used in the N Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator, with the exception of hydronic and steam heat actuators. 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. For the hydronic or steam heat actuators, these need to be field programmed, as the actuators are field-installed accessories. The hydronic or steam option uses either 2 or 4 actuators, depending on the type of heat, unit tonnage, heat capacity, and valves selected. Hydronic heat always has 2 actuators. Steam heat always has 4 actuators, except on certain valve selections on the 75-ton unit. Four individual numbers make up this serial number and these can be programmed to match the serial number of the actuator in its Hydronic Heating Actuator Configs group, ***ACT.C*** (***SN.1.1, SN.1.2, SN.1.3, SN.1.4, SN.2.1, etc.***). See Fig. 10.

NOTE: The serial numbers for all actuators can be found inside the control doors of the unit, as well as on the actuator itself. If an actuator is replaced in the field, it is a good idea to remove the additional peel-off serial number sticker on the actuator and cover up the old one inside the control doors.

MODULATING GAS HEAT CONTROL (***HT.CF*** = 3 AND ***HT.ST*** = 0, 1, 2, OR 3)

As an option, the units with gas heat can be equipped with modulating gas heat controls that will provide infinite stages of heat capacity. This is intended for tempering mode and tempering economizer air when in a cooling mode and the dampers are at minimum vent position. Tempering can also be used during a pre-occupancy purge to prevent low-temperature air from being delivered to the space. Tempering for staged gas, modulating gas, and hydronic heat will be discussed in its own section. This section will focus on heat mode control, which ultimately is relevant to tempering, minus the consideration of the supply air heating control point.

The modulating gas and SCR electric heat configurations are located at the local display under ***Configuration →HEAT→SG.CF***. See Table 37.

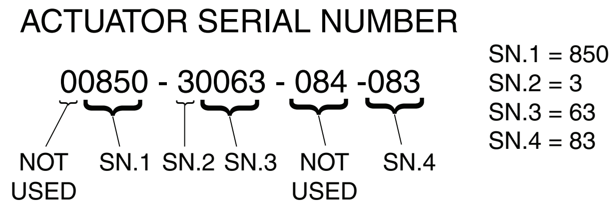


Fig. 10 — Actuator Serial Number Configuration

SCR ELECTRIC HEAT CONTROL (***HT.CF*** = 5, NO REQ. SET ***HT.ST***)

As an option, the units with electric heat can be equipped with modulating SCR electric heater controls that will provide infinite stages of heat capacity. This is intended for tempering mode and tempering economizer air when in a cooling mode and the dampers are at minimum vent position. Tempering can also be used during a pre-occupancy purge to prevent low temperature air from being delivered to the space. Tempering for modulating gas, hydronic, and SCR electric heat will be discussed in its own section. This section will focus on heat mode control, which ultimately is relevant to tempering, minus the consideration of the supply air heating control point.

Staged Heat Type (HT.ST)

This configuration instructs the control as to how many stages and in what order they are staged. Setting ***HT.ST = 0, 1, 2, or 3*** configures the unit for Modulating Gas Heat.

Max Cap Change per Cycle (CAP.M)

This configuration limits the maximum change in capacity per PID run time cycle.

St.Ht DB Min.dF/PID Rate (M.R.DB)

This configuration is a deadband minimum temperature per second rate. See capacity calculation logic on this page for more details.

St.Heat Temp.Dead Band (S.G.DB)

This configuration is a deadband delta temperature. See capacity calculation logic on this page for more details.

Heat Rise in dF/Sec Clamp (RISE)

This configuration clamps heat staging up when the leaving-air temperature is rising too fast.

Table 37 — Staged Heat Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SG.CF	STAGED HEAT CONFIGS				
HT.ST	Staged Heat Type	0 to 3		HTSTGTYP	0*
CAP.M	Max Cap Change per Cycle	5 to 45		HTCAPMAX	45*
M.R.DB	St.Ht DB min.dF/PID Rate	0 to 5		HT_MR_DB	0.5
S.G.DB	St.Heat Temp. Dead Band	0 to 5	^F	HT_SG_DB	2
RISE	Heat Rise dF/sec Clamp	0.05 to 0.2		HTSGRISE	0.06
LAT.L	LAT Limit Config	0 to 20	^F	HTLATLIM	10
LIM.M	Limit Switch Monitoring?	No/Yes		HTLIMMON	Yes
SW.H.T	Limit Switch High Temp	80 to 210	dF	HT_LIMHI	170*
SW.L.T	Limit Switch Low Temp	80 to 210	dF	HT_LIMLO	160*
HT.P	Heat Control Prop. Gain	0 to 1.5		HT_PGAIN	1
HT.D	Heat Control Derv. Gain	0 to 1.5		HT_DGAIN	1
HT.TM	Heat PID Rate Config	30 to 300	sec	HTSGPIDR	90*

*Some configurations are model number dependent.

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.

Heat Control Prop. Gain (HT.P)

This configuration is the proportional term for the PID, which runs in the HVAC mode LOW HEAT.

Heat Control Derv. Gain (HT.D)

This configuration is the derivative term for the PID, which runs in the HVAC mode LOW HEAT.

Heat PID Rate Config (HT.TM)

This configuration is the PID run time rate.

Staged Heating Logic

If the HVAC mode is HIGH HEAT:

- On 48N units, the supply fan for staged heating is controlled by the integrated gas control (IGC) boards and, unless the supply fan is on for a different reason, will be controlled by the IFO. On 50N units, the fan is ON whenever the heat is ON.
- Command all stages of heat ON.

If the HVAC mode is LOW HEAT:

- On 48N units, the supply fan for modulating gas heating is controlled by the integrated gas control (IGC) boards and, unless the supply fan is on for a different reason, will be controlled by the IGC IFO input. On 50N units, the fan is ON whenever the heat is ON.
- The unit will control stages of heat to the heating control point (***Run Status→VIEW→HT.C.P***). The heating control point in a LOW HEAT HVAC mode for staged heat is the heating supply air set point (***Setpoints→SA.HT***).

Staged Heating PID Logic

The heat control loop is a PID design with exceptions, overrides, and clamps. Capacity rises and falls based on set point and supply-air temperature. When the *Comfort*Link control is in Low Heat or Tempering Mode (HVAC mode), the algorithm calculates the desired heat capacity. The basic factors that govern the controlling technique are:

- how frequently the algorithm is run.
- the amount of proportional and derivative gain applied.
- the maximum allowed capacity change each time this algorithm is run.
- deadband hold-off range when rate is low.

This routine is run once every "***HT.TM***" seconds. Every time the routine is run, the calculated sum is added to the control output value. In this manner, integral effect is achieved. Every time this algorithm is run, the following calculation is performed:

Error = ***HT.C.P – LAT***

Error_last = error calculated previous time

P = ***HT.P****(Error)

D = ***HT.D****(Error – Error_last)

The P and D terms are overridden to zero if:

Error < ***S.G.DB*** AND Error > ***– S.G.DB*** AND D < ***M.R.DB*** AND D > ***– M.R.DB.***

"P + D" are then clamped based on ***CAP.M.*** This sum can be no larger or no smaller than +***CAP.M*** or –***CAP.M***.

Finally, the desired capacity is calculated:

Staged Heat Capacity Calculation = "P + D" + old Staged Heat Capacity Calculation.

NOTE: The PID values should not be modified without approval from Carrier service personnel.

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 impair or negatively affect the Carrier product warranty.

Modulating Gas Heat Staging

Different unit sizes will control heat stages differently based on the amount of heating capacity included. These staging patterns are selected based on the unit model number. The selection of a set of staging patterns is controlled via the heat stage type configuration parameter ***Configuration→HEAT→SG.CF→HT.ST***. Setting ***HT.ST*** to 0, 1, 2, or 3 configures the unit for Modulating Gas Heat. The selection of ***HT.ST = 0, 1, 2, or 3*** is based on the unit size and heat size. See Table 38.

Table 38 — Modulating Gas Heat

NUMBER OF STAGES	HT.ST CONFIG.	NO. OF HEAT EXCHANGER SECTIONS	UNIT SIZE 48N	HEAT SIZE
3	0	2	75, 90, 105	Low
4	1	3	75	High
			90, 105	Med
			120,130,150	Low
5	2	4	90-105	High
			120,130,150	Med
7	3	5	120,130,150	High

As the heating capacity rises and falls based on demand, the modulating gas control logic will stage the heat relay patterns up and down respectively (***Run Status→VIEW→HT.ST***) and set the capacity of the Modulating Gas section (***Outputs →HEAT→H1.CP***). The Heat Stage Type configuration selects one of the staging patterns that the modulating gas control will use. In addition to the staging patterns, the capacity for each stage is also determined by the modulating gas heating PID algorithm. Therefore, choosing the heat relay outputs and setting the modulating gas section capacity is a function of the capacity desired, the available heat staging patterns configured with heat stage type (***HT.ST***), and the capacity range presented by each staging pattern.

As the modulating gas control desired capacity rises, it is continually checked against the capacity ranges of the next higher staging patterns. Since each stage has a range of capacities, and the capacities of some stages overlap, the control selects the highest stage with sufficient minimum capacity.

Similarly, as the modulating gas control desired capacity drops, it is continually checked against the capacity ranges of the next lower stages. The control selects the lowest stage with sufficient maximum capacity.

The first 2 modulating gas heat outputs are located on the MBB. Outputs 3, 4, 5, 6, and the analog output that sets the modulating gas section capacity are located on the SCB outputs 7 and 8 are located on the CXB. The heat stage selected (***Run Status→VIEW→HT.ST***) is clamped between 0 and the maximum number of stages possible (***Run Status →VIEW→H.MAX***). See Tables 39-42.

SCR Electric Heat Staging

For all SCR electric heat units there is only 1 heat stage. Whenever the heat is energized, all heaters are active and modulated through the SCR control.

Table 39 — Modulating Gas Heat Control Steps (*HT.ST* = 0)

STAGE	RELAY OUTPUT				CAPACITY %	
	Heat 1	Heat 2	Heat 3	Heat 4		
	MBB-RLY8	TR1-CR	SCB-RLY1	SCB-RLY2		
	IGC1	MGV1	IGC2	MGV2	MIN	MAX
0	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	15	50
2	ON	OFF/ON*	ON	OFF	52	88
3	ON	OFF/ON*	ON	ON	65	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

Table 40 — Modulating 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	TR1-CR	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4		
	IGC1	MGV1	IGC2	MGV2	IGC3	MGV3	MIN	MAX
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	OFF	OFF	10	33
2	ON	OFF/ON*	ON	OFF	OFF	OFF	35	58
3	ON	OFF/ON*	ON	OFF	ON	OFF	60	83
4	ON	OFF/ON*	ON	ON	ON	ON	76	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

Table 41 — Modulating Gas Heat Control Steps (*HT.ST* = 2)

STAGE	RELAY OUTPUT								CAPACITY %	
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6	Heat 7	Heat 8		
	MBB-RLY8	TR1-CR	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4	MBB-RLY9	MBB-RLY10		
	IGC1	MGV1	IGC2	MGV2	IGC3	MGV3	IGC4	MGV4	MIN	MAX
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	OFF	OFF	OFF	OFF	7	25
2	ON	OFF/ON*	ON	OFF	OFF	OFF	OFF	OFF	26	44
3	ON	OFF/ON*	ON	OFF	ON	OFF	OFF	OFF	45	63
4	ON	OFF/ON*	ON	OFF	ON	OFF	ON	OFF	64	81
5	ON	OFF/ON*	ON	ON	ON	ON	ON	ON	82	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

Table 42 — Modulating Gas Heat Control Steps (*HT.ST* = 3)

STAGE	RELAY OUTPUT										CAPACITY %	
	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5	Heat 6	Heat 7	Heat 8	Heat 9	Heat 10		
	MBB-RLY8	TR1-CR	SCB-RLY1	SCB-RLY2	SCB-RLY3	SCB-RLY4	MBB-RLY9	MBB-RLY10	CXB-RLY1	CXB-RLY2		
	IGC1	MGV1	IGC2	MGV2	IGC3	MGV3	IGC4	MGV4	IGC5	MGV5	MIN	MAX
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF/ON*	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	6	20
2	ON	OFF/ON*	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	21	35
3	ON	OFF/ON*	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	36	50
4	ON	OFF/ON*	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	51	65
5	ON	OFF/ON*	ON	OFF	ON	OFF	ON	OFF	ON	OFF	66	80
6	ON	OFF/ON*	ON	ON	ON	ON	ON	OFF	ON	OFF	76	90
7	ON	OFF/ON*	ON	ON	ON	ON	ON	ON	ON	ON	86	100

* ON when ***Outputs→HEAT→H1.CP*** > 54%, OFF when ***Outputs→HEAT→H1.CP*** < 46%.

The electric heat outputs are located on the MBB. The analog output that sets the SCR electric heat section capacity is located on the SCB.

Limit Switch Temperature Monitoring (LIM.M)

Variable air volume applications in the low heat or tempering mode can experience low airflow and as a result it is possible for nuisance trips of the gas heat limit switch, thereby shutting off all gas stages. In order to achieve consistent heating in a tempering mode, a thermistor (***Temperatures→AIR.T→S.G.LS***) is placed next to the limit switch and monitored for overheating. In order to control a tempering application where the limit switch temperature has risen above either the upper or lower configuration parameters (***SW.L.T, SW.H.T***), the staged gas control will respond by clamping or dropping gas stages. See Table 43.

Table 43 — SCR Electric Heat Control Steps

STAGE	RELAY OUTPUT		CAPACITY (%)	
	Heat1	Heat2	Min.	Max.
0	OFF	OFF	0	0
1	ON	ON	0	100

If the Limit Switch Monitoring configuration parameter (***LIM.M***) is set to YES, all the modes will be monitored. If set to NO, then only LAT Cutoff mode and Capacity Clamp mode for ***RISE*** will be monitored.

If ***S.G.LS*** rises above ***SW.L.T*** or if (LAT – LAT last time through the capacity calculation) is greater than (***RISE***) degrees F per second, the control will not allow the capacity routine to add stages and will turn on the Capacity Clamp mode.

If ***S.G.LS*** rises above ***SW.H.T***, the control will run the capacity routine immediately and drop all heat stages and will turn on the Limiting mode.

If ***S.G.LS*** falls below ***SW.L.T***, the control will turn off both Capacity Clamp mode and Limiting mode with one exception. If (LAT – LAT last time through the capacity calculation) is greater than "***RISE***" degrees F per second, the control will stay in the Capacity Clamp mode.

If control is in the Limiting mode and then ***S.G.LS*** falls below ***SW.L.T***, and LAT is not rising quickly, the control will run the capacity calculation routine immediately and allow a full stage to come back on if desired this first time through upon recovery. This will effectively override the "max capacity stage" clamp.

In addition to the above checks, it is also possible at low cfm for the supply-air temperature to rise and fall radically between capacity calculations, thereby impacting the limit switch temperature. In the case where supply-air temperature (LAT) rises above the control point (***HT.C.P***) + the cutoff point (***LAT.L***), the control will run the capacity calculation routine immediately and drop a stage of heat. Thereafter, every time the capacity calculation routine runs, provided the control is still in the LAT cutoff mode condition, a stage will drop each time through. Falling back below the cutoff point will turn off the LAT cutoff mode.

CONTROL BOARD INFORMATION

Integrated Gas Control (IGC)

One IGC is provided with each bank of gas heat exchangers; 2, 3, 4, or 5 IGCs are used depending on unit size and heat capacity. The IGC controls the direct spark ignition system and monitors the rollout switch, limit switches, and induced-draft motor Hall Effect switch. For units equipped with Modulating Gas heat, the IGC in the Modulating Gas section uses a Pressure Switch in place of the Hall Effect sensor. The IGC is equipped with an LED (light-emitting diode) for diagnostics. See Table 44.

Table 44 — IGC LED Indicators

ERROR CODE	LED INDICATION
Normal Operation	On
Hardware Failure	Off
Fan Off/On 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.

Integrated Gas Control Board Logic

This board provides control for the ignition system for the gas heat sections.

When a call for gas heat is initiated, power is sent to W on the IGC boards. For standard 2-stage heat, all boards are wired in parallel. For modulating gas heat, each board is controlled separately. When energized, an LED on the IGC board will be turned on. See Table 44 for LED explanations.

Each board will ensure that the rollout switch and limit switch are closed. The induced-draft motor is then energized. For units equipped with 2-stage gas heat the speed of the motor is proven with a Hall Effect sensor on the motor. For units equipped with modulating gas heat the motor function is proven with a pressure switch. When the motor speed or function is proven, the ignition activation period begins. The burners ignite within 5 seconds. If the burners do not light, there is a 22-second delay before another 5-second attempt is made. If the burners still do not light, this sequence is repeated for 15 minutes. After 15 minutes have elapsed and the burners have not ignited, then heating is locked out. The control will reset when the request for W (heat) is temporarily removed.

When ignition occurs, the IGC board will continue to monitor the condition of the rollout switch, limit switches, Hall Effect sensor or pressure switch, and the flame sensor. Forty-five seconds after ignition has occurred, the IGC will request that the indoor fan be turned on.

The IGC fan output (IFO) is connected to the indoor fan input on the MBB, which will indicate to the controls that the indoor fan should be turned on (if not already on). If, for some reason, the overtemperature limit switch trips prior to the start of the indoor fan blower, on the next attempt the 45-second delay will be shortened by 5 seconds. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan delay will not change back to 45 seconds unless power is reset to the control.

The IGC boards only control the first stage of gas heat on each gas valve. The second stages are controlled directly from the MBB board for staged gas. For units equipped with modulating gas heat, the second stage is controlled from the timer relay board (TR1). The IGC board has a minimum on-time of 1 minute.

In modes such as Service Test where long minimum on times are not enforced, the 1-minute timer on the IGC will still be followed and the gas will remain on for a minimum of 1 minute.

Staged Gas Heat Board (SCB)

When optional modulating gas heat is used, the SCB board is installed and controls additional stages of gas heat. The SCB also provides additional sensors for monitoring of the supply-air and limit switch temperatures. For units equipped with modulating gas heat, the SCB provides the 4 to 20 mA signal to the SC30 board that sets the modulating gas section capacity. This board is located in the main unit control box.

Timer Relay Control Board (TR1)

The TR1 is used on modulating gas-heat-equipped units only. It is located in the gas heat section and is used in combination with the SC30 to provide control of the modulating gas heat section. The TR1 receives an input from the IGC, initiates a start-up sequence, powers the SC30, sets the induced-draft motor speed, and provides the main gas valve high fire input. When the start-up sequence is complete, the TR1 checks the input from the SC30 to determine which state to command the induced-draft motor and main gas valve. See Table 45.

Signal Conditioner Control Board (SC30)

The SC30 is used on modulating gas-heat-equipped units only. It is located in the gas heat section and is used in combination with the TR1 to provide control of the modulating gas heat section. The SC30 is powered by an output from the TR1. It receives a capacity input from the SCB, provides a capacity output to the modulating gas valve, and provides an output to the TR1 to determine which state to command the induced-draft motor and main gas valve. See Table 45.

Table 45 — TR1 Board LED Indicators

LED DESIGNATION	RESULT/ACTION
ON	24 VAC Supplied to TR1
SR	Input received from IGC2, starts timer no. 1
MR	Modulating Gas Valve modulated except during fixed output delay time
FR	IDM2 operates at high speed
CR	Modulating Gas Valve operates in high pressure stage

Modulating Gas Control Boards (SC30 and TR1) Logic

All gas modulating units are equipped with one timer relay board (TR1) and one signal conditioner board (SC30), regardless of unit size. The boards provide control for variable heating output for the gas heat section.

Similar with staged gas heat option, each IGC board is controlled separately. The IGC functions are not affected by the modulating gas control logic. When a call for gas heat is initiated, W on the IGC board and the timer relay board (TR1) are energized. The LED on TR1 board will be turned on. See Table 45 for LED explanation.

When TR1 received an input from the IGC board, the relay board starts Timer no. 1 or start-up sequence: sets the gas valve stage and the inducer motor speed, and enables the signal conditioner board SC30. During Timer no. 1, the SC30 board keeps a fixed heating output. When Timer no. 1 expires, the modulating gas control boards start Timer no. 2. Throughout the duration of Timer no. 2, the boards determine which state to adjust the capacity output to satisfy the heat demand. When Timer no. 2 expires, the boards receive a capacity input from the SCB board and continuously modulate the heat output until the mode selection sensor is satisfied.

The IGC boards only control the first stage of gas heat on each gas valve. The second stages are controlled directly from the MBB board. The IGC board has a minimum on-time of 1 minute.

In modes such as Service Test where long minimum on times are not enforced, the 1-minute timer on the IGC will still be followed and the gas will remain on for a minimum of 1 minute.

RELOCATE SAT FOR HEATING-LINKAGE APPLICATIONS

If ***Configuration→HEAT→LAT.M*** is set to YES, the supply air temperature thermistor (***Temperatures→AIR.T → SAT***) must be relocated downstream of the installed heating device. This only applies to 2-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 2-wire conductor cable from the control box through the low voltage conduit into the space inside the building and route the cable to the new sensor location.

Installing a New Sensor

Procure a duct-mount temperature sensor (Carrier P/N 33ZCSENPAT or equivalent 10,000 ohm at 25°C 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 Offset	5-75	^F	TEMPCOOL	5
T.V.OC	Tempering Vent Occ SASP	–20-80	dF	TEMPVOCC	65
T.V.UN	Tempering Vent Unocc. SASP	–20-80	dF	TEMPVUNC	50

Operation

First, the unit must be in a vent mode, a low cool, or a high cool HVAC mode to be considered for a tempering mode. Secondly, the tempering mode is only allowed when the rooftop is configured for modulating gas, SCR electric heat, or hydronic heating (***Configuration→HEAT →HT.CF***=3 or 4). Also, if OAT is above the chosen tempering set point, tempering will not be allowed. Additionally, tempering mode is locked out if any stages of mechanical cooling are present.

If the control is configured for staged gas, modulating gas, SCR electric heat, or hydronic heating and the control is in a vent, low cool, or high cool HVAC mode, and the rooftop control is in a situation where the economizer must maintain a minimum position/minimum cfm, then the evaporator discharge temperature (EDT) will be monitored. If the EDT falls below a particular trip point then tempering mode may be called out:

HVAC mode = "Tempering Vent"

HVAC mode = "Tempering LoCool"

HVAC mode = "Tempering HiCool"

The decision making/selection process for the tempering trip set point is as follows:

If an HVAC cool mode is in effect, then the tempering cool point is ***SASP – T.CL***.

If not in effect and unit is in a pre-occupied purge mode (***Operating Modes→MODE→IAQ.P***=ON), then the trip point is ***T.PRG***.

If not in effect and unit is in an occupied mode (***Operating Modes→MODE→IAQ.P***=ON), then the trip point is TEMPVOCC.

For all other cases, the trip point is TEMPVUNC.

NOTE: The unoccupied economizer free cooling does not qualify as an HVAC cool mode, as it is an energy saving feature and has its own OAT lockout already. The unoccupied free cooling mode (HVAC mode = Unocc. Free Cool) will override any unoccupied vent mode from triggering a tempering mode.

A minimum amount of time must pass before calling out any tempering mode. In effect, the EDT must fall below the trip point value –1°F continuously for a minimum of 2 minutes. Also, at the end of a mechanical cooling cycle, a 10-minute delay will be enforced before considering a tempering during vent mode in order to allow any residual cooling to dissipate from the evaporator coil.

If the above conditions are met, the algorithm is free to select the tempering mode (MODETEMP).

If a tempering mode becomes active, the modulating heat source (staged gas, modulating gas, SCR electric heat, or hot water) will attempt to maintain leaving-air temperature (LAT) at the tempering set point used to trigger the tempering mode. The technique for modulation of set point for staged gas, modulating gas, SCR electric heat, and hydronic heat is the same as in a heat mode. More information regarding the operation of heating can be referenced in the Heating Control section.

Recovery from a tempering mode (MODETEMP) will occur when the EDT rises above the trip point. On any change in HVACMODE, the tempering routine will re-assess the tempering set point, which may cause the control to continue or exit tempering mode.

Static Pressure Control

Variable air volume (VAV) air-conditioning systems must provide varying amounts of air to the conditioned space. As air terminals downstream of the unit modulate their flows, the unit must simply maintain control over duct static pressure in order to accommodate the needs of the terminals, and therefore to meet the varying combined airflow requirement. The unit design includes an 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 a variable frequency drive (VFD) for the supply fan. The speed of the fan can be controlled directly by the *Comfort*Link controls. A duct static pressure transducer is located in the auxiliary control box. The signal from the pressure sensor is received by the RCB board and is then used in a PID control routine that outputs a fan speed to the VFD.

The PID routine periodically calculates the static pressure error from set point. This error at any point in time is simply the duct static pressure set point minus the measured duct static. It is 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 calculated value is then used to create an output signal used to adjust the VFD to maintain the static pressure set point.

SETTING UP THE SYSTEM

Here are the options under the Local Display Mode ***Configuration→SP***. See Table 46.

Table 46 — Static Pressure Control Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SP	SUPPLY STATIC PRESS.CFG.				
SP.CF	Static Pressure Config	Disable/Enable		STATICFG	Disable
SP.SV	Staged Air Volume Ctrl	Disable/Enable		STATICFG	Disable
SP.S	Static Pressure Sensor	Disable/Enable		SPSENS	Disable
SP.LO	Static Press. Low Range	–10 to 0	in. wg	SP_LOW	0
SP.HI	Static Press. High Range	0 to 10	in. wg	SP_HIGH	5
SP.SP	Static Pressure Setpoint	0 to 5	in. wg	SPSP	1.5
SP.MN	VFD Minimum Speed	10 to 100	%	STATPMIN	20
SP.MX	VFD Maximum Speed	0 to 100	%	STATPMAX	100
SP.FS	VFD Fire Speed Over.	0 to 100	%	STATPFSO	100
SP.RS	Stat. Pres. Reset Config	0 to 4		SPRSTCFG	0
SP.RT	SP Reset Ratio	0 to 2.00	in. wg	SPRRATIO	0.2
SP.LM	SP Reset Limit	0 to 2.00	in. wg	SPRLIMIT	0.75
SP.EC	SP Reset Econo.Position	0 to 100	%	ECONOSPR	5
S.PID	STAT.PRESS.PID CONFIGS				
SP.TM	Static Press. PID Run Rate	5 to 120	sec	SPIDRATE	7
SP.P	Static Press. Prop. Gain	0 to 5		STATP_PG	0.5
SP.I	Static Pressure Intg. Gain	0 to 2		STATP_IG	0.5
SP.D	Static Pressure Derv. Gain	0 to 5		STATP_DG	0.3

Static Pressure Configuration (SP.CF)

This variable is used to configure the use of *Comfort*Link for static pressure control. It has the following options:

- 0 (DISABLED) - No static pressure control by *ComfortLink* controls. This would be used for a constant volume (CV) application when static pressure control is not required or for a VAV application if there will be third-party control of the VFD. In this latter case, a suitable means of control must be field-installed.
- 1 (ENABLED) - This will enable the use of *Comfort*Link controls

Staged Air Volume Control (SP.SV)

This variable enabled the use of a CV unit with VFD for staged air volume control.

Static Pressure Sensor (SP.S)

This variable enables the use of a supply duct static pressure sensor. This must be enabled to use *Comfort*Link controls for static pressure control. If using a third-party control for the VFD, then 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. *Comfort*Link controls will map this value to a 4 mA sensor output.

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 output when the signal is 20 mA.

Static Pressure Set Point (SP.SP)

This is the static pressure control point. It is the point against which *Comfort*Link controls compares the actual measured supply duct pressure for determination of the error that is used for PID control. Adjust ***SP.SP*** to the minimum value necessary for proper operation of air terminals in the conditioned space at full load and part load. Too high 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.

VFD Minimum Speed (SP.MN)

This is the minimum speed for the supply fan VFD. Typically the value is chosen to maintain a minimum level of ventilation.

NOTE: Most VFDs have a built-in minimum speed adjustment that should be configured for 0% when using *Comfort*Link controls for static pressure control.

VFD Maximum Speed (SP.MX)

This is the maximum speed for the supply fan VFD. This is usually set to 100%.

VFD Fire Speed Override (SP.FS)

This is the speed that the supply fan VFD will use during the fire modes: pressurization, evacuation, and purge. This is usually set to 100%.

Static Pressure Reset Configuration (SP.RS)

This option is used to configure the static pressure reset function. When ***SP.RS*** = 0, there is no static pressure reset via an analog input. When ***SP.RS*** = 1, there is static pressure reset based on the CEM 4 to 20 mA 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 4 mA = 0% speed and 20 mA = 100% (***SP.MN*** and ***SP.MX*** will override).

Static Pressure Reset Ratio (SP.RT)

This option defines the reset ratio in terms of static pressure versus temperature. The reset ratio determines how much the static pressure is reduced for every degree below set point for RAT or SPT.

Static Pressure Reset Limit (SP.LM)

This option defines the maximum amount of static pressure reset that is allowed. This is sometimes called a "clamp."

NOTE: Resetting static pressure via RAT and SPT is primarily a constant volume application that utilizes a VFD. The reasoning is that there are 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 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 service personnel 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.

RELATED POINTS

These points represent static pressure control and static pressure reset inputs and outputs. See Table 47.

Table 47 — Static Pressure Reset Related Points

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
Inputs					
→ 4-20 → SP.M	Static Pressure mA	4 to 20	mA	SP_MA	
→ 4-20 → SP.M.T	Static Pressure mA Trim	–2.0 → +2.0	mA	SPMATRIM	
→ RSET →SP.RS	Static Pressure Reset	0.0 to 3.0	in. wg	SPRESET	0.0
→ 4-20 →SP.M	Static Pressure Reset mA	4 to 20	mA	SP_MA	0.0
Outputs					
→ FANS → S.VFD	Supply Fan VFD Speed	0 to 100	%	SFAN_VFD	

Static Pressure mA (SP.M)

This variable reflects the value of the static pressure sensor signal received by *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 20mA static pressure transducer signal, and can be used to calibrate a transducer.

Static Pressure Reset (SP.RS)

This variable reflects the value of the static pressure reset signal applied from a CCN system.

Static Pressure Reset mA (SP.M)

This input reflects the value of the static pressure transducer reset signal applied from a CCN system.

Static Pressure Reset Sensor (SP.RS)

This variable can be configured to allow static pressure reset from a CCN system. See relevant CCN documentation for additional details.

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.

STATIC PRESSURE RESET

CCN Linkage

The *Comfort*Link controls supports the use of static pressure reset. For static pressure reset to occur, the unit must be part of a CCN system with access to CCN reset variable and the Linkage Master Terminal System Logic. The Linkage Master terminal monitors the primary air damper position of all the terminals in the system (done through LINKAGE with the new *Comfort*ID™ air terminals).

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 2 minutes whenever the system is operating. The calculation ensures that the supply static pressure is always enough to supply the required airflow at the worst case terminal but never more than necessary, so that the primary air dampers do not have to operate with an excessive pressure drop (more 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 the value is reduced. Because the reset value is subtracted from the controlling set point at the equipment, the pressure set point increases and the primary air dampers close a little (to less than 90%). If the most open damper closes to less than 60%, the system recalculates the pressure reduction variable and the value is increased. This results in a decrease in the controlling set point at the equipment, which causes the primary air dampers to open a little more (to greater than 60%).

The rooftop unit has the design static pressure set point programmed into the CCN control. This is the maximum set point that could ever be achieved under any condition. To simplify the installation and commissioning process for the field, this system control is designed so that the installer only needs to enter a maximum duct design pressure or maximum equipment pressure, whichever is less. There is no longer a need to calculate the worst case pressure drop at design conditions and then hope that some intermediate condition does not require a higher supply static pressure to meet the load conditions. For example, a system design requirement may be 1.2 in. wg, the equipment may be capable of providing 3.0 in. wg, and the supply duct is designed for 5.0 in. wg. In this case, the installer could enter 3.0 in. wg as the supply static pressure set point and allow the air terminal system to dynamically adjust the supply duct static pressure set point as required.

The system will determine the actual set point required delivering the required airflow at every terminal under the current load conditions. It will always be the lowest value under the given conditions, and as the conditions and airflow set point at each terminal change throughout the operating period, so will the equipment static pressure set point.

The CCN system must have access to a CCN variable (SPRESET which is part of the equipment controller). In the algorithm for static pressure control, the SPRESET value is always subtracted from the configured static pressure set point by the equipment controller. The SPRESET variable is always checked to be a positive value or zero only (negative values are clamped to zero). The result of the subtraction of the SPRESET variable from the configured set point is limited so that it cannot be less than zero.

The result is that the system will dynamically determine the required duct static pressure based on the actual load conditions currently in the space. It eliminates the need to calculate the design supply static pressure set point (although some may still want to do it anyway). It also saves the energy that is the difference between the design static pressure set point and the required static pressure (multiplied by the airflow). Normally, the VAV system operates at the design static pressure set point all the time; however, a typical VAV system operates at design conditions less than 2% of the time. A significant saving in fan horsepower can be achieved utilizing static pressure reset.

Third Party 4 to 20 mA Input

It is also possible to perform static pressure reset via an external 4 to 20 mA signal connected to the CEM board where 4 mA corresponds to 0 in. reset and 20 mA corresponds to 3 in. of reset. The only caveat to this is that the static pressure 4 to 20 mA input shares the same input as the analog OAQ sensor. Therefore, obviously both sensors cannot be used at the same time. To enable the static pressure reset 4 to 20 mA sensor: Set ***Configuration→UNIT→SENS→SP.RS*** to "Enabled."

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 that sensor's location on the CEM board to monitor or perform static pressure reset via an external 4 to 20 mA input. Enabling this sensor will give the user the ability to reset from 0 in. to 3 in. of static, the supply static pressure set point (***Configuration→SP→SP.SP***), where 4 mA= 0 in. and 20 mA = 3 inches.

As an example: If the static pressure reset input is measuring 6 mA, then the input is resetting 2 mA of its 16 mA (4-20) "control range." This is essentially $^2/_{16}$ of 3 in. or 0.375 in. of reset. If the static pressure set point (***SP.SP***) = 1.5 in., then the static pressure control point for the system will be 1.5 – 0.375 = 1.125 inches.

Fan Status Monitoring

GENERAL

The N 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. But for any unit with an installed duct static pressure sensor, it is possible to measure duct pressure rise directly, which removes the need for a differential switch.

SETTING UP THE SYSTEM

There are 2 configurations of concern located in ***Configuration→UNIT***. See Table 48.

Table 48 — Fan Status Monitoring Configuration

ITEM	EXPANSION	RANGE	CCN POINT
SFS.S	Fan Fail Shuts Down Unit	No/Yes	SFS_SHUT
SFS.M	Fan Stat Monitoring Type	0 to 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 allow whether the unit should shut down on a supply fan status fail or simply alert the condition and continue to run.

YES — Shut down the unit if supply fan status monitoring fails, and send out an alarm.

NO — Do 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 which determines static pressure control is ***Configuration→SP→SP.CF***. If this configuration is set to 0 (none), a fan failure condition must wait 60 continuous seconds before taking action. If this configuration is 1 (VFD), a fan failure condition must wait 3 continuous minutes before taking action.

If the unit is configured to monitor a fan status switch (***SFS.M*** = 1), and if the supply fan commanded state does not match the supply fan status switch for 3 continuous minutes, then a fan status failure has occurred.

If the unit is configured for supply duct pressure monitoring (***SFS.M*** = 2), then

- If the supply fan is requested ON and the static pressure reading is not greater than 0.2 in. wg for the time clarified above, 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 the time clarified above, a fan failure has occurred.

Dirty Filter Switch

This unit is equipped with several filter stages. It is important to maintain clean filters to reduce the energy consumption of the system. This unit is designed to provide several ways to achieve this goal. Table 49 shows the 9 configurations for filter monitoring in this unit. If the configuration for either the main or final filter is set to 0-Disable then the input is set to read "Clean all the time." There are several controls which need to be used in conjunction with the filter configuration so that each corresponding setting will operate correctly.

The fault status timer is a parameter that sets the number of minutes the filter status must be in a fault state before the fault latch is closed. To set the fault time, use ***Configuration →FLTC→FS.FT***; the range is between 0 and 10 minutes. The default for this parameter is 2 minutes.

Filter types (***MF_TY, PF_TY***) and final resistance (***MF_FR, PF_FR***) are used for the Delta Pressure and Predictive Life configurations for the main and post filter. The final resistance will be automatically set when the filter type is selected. After selecting a filter type, it is possible to change the filter final resistance. Settings for filters based on Tables 49 and 50 for main and post filters.

Table 49 — Main Filter Types

MAIN FILTER TYPE (MF_TY)	DESCRIPTION	MAIN FILTER FINAL RESISTANCE (MF_FR)
0	Std 2 in. MERV	1
1	4-in. MERV 8	1
2	4-in. MERV 14	1.5
3	12-in. MERV 14 Bag with 2 in. pre-filter	2
4	12-in. MERV 14 Bag with 4 in. pre-filter	2
5	19-in. MERV 15 Bag with 2 in.pre-filter	2
6	19-in. MERV 15 Bag with 4 in. pre-filter	2
7	12-in. MERV 14 Cart with 2 in. pre-filter	2.5
8	12-in. MERV 14 Cart with 4 in. pre-filter	2.5
9	Strion Air	2

Table 50 — Post Filter Types

POST FILTER TYPE (PF_TY)	DESCRIPTION	POST FILTER FINAL RESISTANCE (PF_FR)
0	None	0
1	12-in. MERV 14 Cart with 2 in. pre-filter	2.5
2	12-in. MERV 14 Cart with 4 in. pre-filter	2.5
3	19-in. MERV 15 Bag with 2 in. pre-filter	2
4	19-in. MERV 15 Bag with 4 in. pre-filter	2
5	12-in. MERV 17 Bag with 2 in. pre-filter	3
6	12-in. MERV 17 Bag with 4 in. pre-filter	3

To change the filter type for the main filter, use ***Configuration→FLTC→MF.TY*** set between 0 and 9 according to the main filter type table. To change the filter type for the post filter, use ***Configuration→FLTC→PF.TY*** set between 0 and 6 according to the post filter type table. To adjust the final resistance for the main filter after a filter type has been selected, use ***Configuration→FLTC→MF.FR*** and set from 0 to 10. To adjust the final resistance for the post filter, use ***Configuration→FLTC→PF.FR*** and set between 0 and 10.

1 = Switch

If the Filter configuration for either the main or post filter is set to 1 (Switch), then a filter status switch should be installed. The monitoring of the filters is based on a clean/dirty switch input.

Monitoring of the main and post filter status switches 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 either the main or post filter status switch reads "dirty" for a user set continuous amount of time, 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.

2 = Schedule

Filter configuration for either main or post filter can be set to 2 (Schedule). In this mode the filter status is based on a schedule set by the user. The status is determined by the amount of time remaining in the filter life. The user sets the lifetime for the filter in months from 1 to 60 (5 years). The default for this parameter is 12 months. It is also possible to set a reminder and reset the schedule.

The main and post filters use "Birth points" and current date to calculate filter life and filter reminder. The birth date and current date are expressed as the number of days since 1/1/2000.

To change the main filter life, use ***Configuration→FLTC→MF.LT*** and set to required filter life from 1 to 60 months. To change the post filter life, use ***Configuration→FLTC→PF.LT*** and set to required filter life from 1 to 60 months.

To set main filter life reminder, use ***Configuration→FLTC→MF.RM*** and enter required filter reminder from 0 to 60 months. To set post filter life reminder, use ***Configuration→FLTC→PF.RM*** and enter required filter reminder from 0 to 60 months. Setting the reminder for either main or post filter to 0 will disable the reminder function for that filter.

To reset the main filter status schedule, use ***Configuration→FLTC→MF.RS***; when set to "yes", the birth date for the main filter will be converted to the current date in number of days since 1/1/2000. To reset the post filter status schedule, use ***Configuration→FLTC→PF.RS***; when set to "yes", the birth date for the post filter will be converted to the current date in number of days since 1/1/2000.

3 = Delta Pressure

Main and post filter status can be determined in relation to a maximum pressure differential across the corresponding filter. The pressure difference is provided by a transducer and sensors. The delta pressure configuration is disabled in Service Test mode and when the supply fan is not commanded on. If the fan is on, the unit is not in test mode, and the filter delta pressure is greater than or equal to the filter final resistance (***MF_FR, PF_FR***) for a period of time equal to the status fault timer (***FS.FT***), then an alarm will be generated. Recovery from this alert is possible by clearing all alarms or by replacing the dirty filter and the delta pressure is less than the new filter's final resistance for more than 30 seconds.

4 = Predictive Life (Calculate and Learn)

The filter status can be determined through a predicted life. When clean filters are first installed using this configuration they must be commissioned before use. This is done by setting the supply fan to a certain speed (in %) and measuring Supply Air CFM (SACFM) versus delta pressure (***MF.DP*** or ***PF.DP***) across the filter. There will need to be a maximum of 10 entries plus an entry for 0 SACFM and one for maximum SACFM. The data is collected and stored by the control.

The 10 entries are separated into bins based on maximum Supply Air CFM (SACFM). Maximum SACFM is based on unit size and supply fan SACFM configuration (SCFM_CFG). See Table 51.

It is possible to reset the main filter predictive life table and the post filter predictive life table separately. To reset the main filter predictive life table use ***Configuration→FLTC→MFT.R*** and select yes. To reset the post filter predictive life table, use ***Configuration→IAQ→FLTC→PFT.R***, and select yes.

5 = Predictive Life (Calculate only)

Once the control has learned the life of the filter it is possible to set the control to use the learned information to calculate the life of filters used in the future. This is only an option when the replacement filters used are the same type and final resistance as the filters used to learn the life.

During runtime the SACFM is used to interpolate the baseline pressure. The interpolation is then used to calculate the filter status. See Table 52.

Table 51 — Maximum SACFM

UNIT SIZE	SCFM_CFG	MAX_SACFM
75, 90, 105	LOW FAN	40,000
120, 130, 150	LOW FAN	50,000
75, 90, 105, 120, 130, 150	HIGH FAN	60,000

Table 52 — Dirty Filter Switch Points

ITEM	EXPANSION	RANGE	CCN POINT
Configuration→ FLTC→MFL.S	Main Filter Status Configuration	0 - Disable 1 - Switch 2 - Schedule 3 - Delta Pressure 4 - Calculate and Learn 5 - Calculate Only	FLTS_ENA
Configuration→ FLTC→PFL.S	Post Filter Status Configuration	0 - Disable 1 - Switch 2 - Schedule 3 - Delta Pressure 4 - Calculate and Learn 5 - Calculate Only	PFLS_ENA
Inputs→GEN.I →FLT.S	Filter Status Input	DRTY/CLN	FLTS
Inputs→GEN.I →PFL.S	Filter Status Input	DRTY/CLN	PFLTS

Economizer

The N Series economizer damper is controlled by communicating actuator motors over the local equipment network (LEN). The actuator is connected directly to linkage in the economizer section.

Economizers are used to provide ventilation air as well as free cooling based on several configuration options. This section shall be devoted to a description of the economizer and its ability to provide free cooling. Please see the section on Indoor Air Quality for more information on setting up and using the economizer to perform demand controlled ventilation (DCV) via the controlling of its minimum position. Also, please see the Third Party Control interface section for a description on how to take over the operation of the economizer through external control.

The N Series controls have the capability to not only control an economizer, but also to report its health and operation both to the local display and CCN network. Also, through either the local display or the CCN, the service technician has access to additional diagnostic tools to predict the state of the economizer.

ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) CONTROL

The Economizer Fault Detection and Diagnostics control can be divided into 2 tests: test for mechanically disconnected actuator and test for stuck/jammed actuator.

Mechanically Disconnected Actuator

The test for a mechanically disconnected actuator shall be performed by monitoring SAT as the actuator position changes and the damper blades modulate. As the damper opens, it is expected SAT will drop and approach OAT when the damper is at 100%. As the damper closes, it is expected SAT will rise and approach RAT when the damper is at 0%. The basic test shall be as follows:

1. With supply fan running, take a sample of SAT at current actuator position.
2. Modulate actuator to new position.
3. Allow time for SAT to stabilize at new position.
4. Take sample of SAT at new actuator position and determine:
   a. If damper has opened, SAT should have decreased.
   b. If damper has closed, SAT should have increased.
5. Use current SAT and actuator position as samples for next comparison after next actuator move.

The control shall test for a mechanically disconnected damper if all the following conditions are true:

1. An economizer is installed.
2. The supply fan is running.
3. Conditions are good for economizing.
4. The difference between RAT and OAT > T24RATDF. It is necessary for there to be a large enough difference between RAT and OAT in order to measure a change in SAT as the damper modulates.
5. The actuator has moved at least T24ECSTS %. A very small change in damper position may result in a very small (or non-measurable) change in SAT.
6. At least part of the economizer movement is within the range T24TSTMN % to T24TSTMX %. Because the mixing of outside air and return air is not linear over the entire range of damper position, near the ends of the range even a large change in damper position may result in a very small (or non-measurable) change in SAT.

Furthermore, the control shall test for a mechanically disconnected actuator after T24CHDLY minutes have expired when any of the following occur (this is to allow the heat/cool cycle to dissipate and not influence SAT):

1. The supply fans switches from OFF to ON.
2. Mechanical cooling switches from ON to OFF.
3. Reheat switches from ON to OFF.
4. The SAT sensor has been relocated downstream of the heating section and heat switches from ON to OFF.

The economizer shall be considered moving if the reported position has changed at least ± T24ECMDB %. A very small change in position shall not be considered movement.

The determination of whether the economizer is mechanically disconnected shall occur SAT_SEC/2 seconds after the economizer has stopped moving. The control shall log a “damper not modulating” alert if:

1. SAT has not decreased by T24SATMD degrees F SAT_SET/2 seconds after opening the economizer at least T24ECSTS %, taking into account whether the entire movement has occurred within the range 0-T24TSTMN %.
2. SAT has not increased by T24SATMD degrees F SAT_SET/2 seconds after closing the economizer at least T24ECSTS %, taking into account whether the entire movement has occurred within the range T24TSTMX to 100%.
3. Economizer reported position ≤5% and SAT is not approximately equal to RAT. SAT not approximately equal to RAT shall be determined as follows:
   a. SAT<RAT-(2*2(thermistor accuracy) + 2 (SAT increase due to fan)) or
   b. SAT>RAT+(2*2(thermistor accuracy) + 2 (SAT increase due to fan))
4. Economizer reported position ≥95% and SAT is not approximately equal to OAT. SAT not approximately equal to OAT shall be determined as follows:
   a. SAT<OAT-(2*2(thermistor accuracy) + 2 (SAT increase due to fan)) or
   b. SAT>OAT+(2*2(thermistor accuracy) + 2 (SAT increase due to fan))

Except when run as part of a self-test, the control shall not automatically clear “damper not modulating” alerts on units.

Test for stuck/jammed actuator

The control shall test for a jammed actuator as follows:

- If the actuator has stopped moving and the reported position (ECONxPOS, where x is 1,2) is not within ± EC_FLGAP% of the command position (ECONOCMD) after EC_FLTMR seconds, a “damper stuck or jammed” alert shall be logged, i.e., abs(ECONxPOS - ECONODMD) > EC_FLGAP for a continuous time period EC_FLTMR seconds.
- If the actuator jammed while opening (i.e., reported position < commanded position), a “not economizing when it should” alert shall be logged.
- If the actuator jammed while closing (i.e., reported position > command position), the “economizing when it should not” and “too much outside air” alerts shall be logged.

The control shall automatically clear the jammed actuator alerts as follows:

- If the actuator moves at least 1%, the alerts shall be cleared.

Alternate Excess Outdoor Air Test

For units configured with outdoor air measuring stations (OCFMSENS=YES):

Configuration→ECON→CFM.C→OCF.S=enabled (set to 1 or 2)

Under the following conditions:

1. Unit is not performing free cooling.
2. OACFM sensor is detected as good.
3. IAQ is not overriding CFM.
4. Purge is not overriding CFM.

If OACFM > (ECMINCFM + EX_ARCFM) for EX_ARTMR seconds, the “excess outside air” alert shall be logged.

DIFFERENTIAL DRY BULB CUTOFF CONTROL

Differential Dry Bulb Changeover

As both return air and outside air temperature sensors are installed as standard on these units, the user may select this option, ***E.SEL*** = 1, to perform a qualification of return and outside air in the enabling/disabling of free cooling. If this option is selected the outside-air temperature shall be compared to the return-air temperature to dis-allow free cooling as shown in Table 53:

Table 53 — Differential Dry Bulb Cutoff Control

E.SEL (ECON_SEL)	DDB.O (EC_DDBCO)	OAT/RAT Comparison	DDBC (DDBCSTAT)
NONE, OUTDR.ENTH, DIF.ENTHALPY	N/A	N/A	NO
DIFF.DRY BULB	0 degF	OAT>RAT	YES
		OAT<=RAT	NO
	–2 degF	OAT>RAT-2	YES
		OAT<=RAT-2	NO
	–4 degF	OAT>RAT-4	YES
		OAT<=RAT-4	NO
	–6 degF	OAT>RAT-6	YES
		OAT<=RAT-6	NO

The status of differential dry bulb cutoff shall be visible under ***Run Status→ECON→DISA→DDBC***.

There shall be hysteresis where OAT must fall 1°F lower than the comparison temperature when transitioning from DDBCSTAT=YES to DDBSTAT=NO.

ECONOMIZER SELF-TEST

It is possible for one actuator to become mechanically disconnected while the other(s) continue to work properly. The following self-test utilizes fan characteristics and motor power measurements to determine whether the dampers are properly modulating. A fan that is moving more air uses additional power than a fan that is moving a lesser quantity of air. In this test, each actuator/damper assembly is commanded independently while the fan and motor characteristics are monitored.

It shall be possible to manually start the self-test:

- In Navigator display, this test shall be located at ***Service Test→AC.DT→EC.TS***.
- Running the test shall require setting ***Service Test→TEST***=ON

The test shall also automatically run based on ***EC.DY*** (T24_-ECDY) and ***EC.TM*** (T24_ECTM):

- If conditions are acceptable to run the self-test (see below), the test shall be automatically started on the configured day ***EC.DY*** (T24_ECDY) at the configured time ***EC.TM*** (T24_ECTM).
- If conditions are not acceptable to run the self-test, it shall be re-scheduled for 24 hours later.

The economizer self-test shall only be allowed to run if all of the following conditions are valid:

1. The economizer is enabled
2. No actuators are detected as stuck
3. No actuators are detected as unavailable
4. RCB1 is properly communicating
5. The unit is not down due to failure (A152)
6. The supply fan VFD is not in bypass mode (if unit has this option)
7. If configured for building pressure, the unit has a return fan VFD and the fan is not in bypass mode

In addition to the above conditions, the economizer self-test shall not be automatically run if any of the following conditions are valid:

1. Unit not in OFF or VENT mode.

   The Test screen should be similiar to the following:

EC.TR	ON
EC.DT	WAITING
S.VFD	20.0 %
TORQ	17.5 %
ECN.P	20 %
EC2.P	0 %
EC3.P	0 %
EC.ST	RUNNING

   Setting ***EC.TS***=ON shall perform the following:
2. Command all actuators and dampers to the closed position.
3. Run the fan at T24SFSPD for T24ACMRT minutes and take a baseline torque (VFD1TMAV) measurement. With the dampers closed, there will be the least amount of airflow, and therefore the least amount of motor torque.
4. Modulate a single actuator/damper assembly open to T24ACOPN. This will increase the airflow.
5. Let the motor run for one minute. If the torque has increased by T24VFDPC % over the baseline measurement from Step 2, the current torque is set as the new baseline measurement; proceed to Step 5. If the torque has not increased by T24VFDPC %, continue to run the fan for a total of T24ACMRT minutes. If, after T24ACMRT minutes total, the torque has not increased by T24VFDPC % over the Step 2 baseline measurement, a fault is logged, and the test is ended.
6. Modulate the actuator/damper assembly closed.
7. Let the motor run for one minute. If the torque has decreased by T24VFDPC % over the baseline measurement from Step 4, the current torque is set as the new baseline measurement; proceed to Step 7. If the torque has not decreased by T24VFDPC %, continue to run the fan for a total of T24ACMRT minutes. If, after T24ACMRT minutes total, the torque has not decreased by T24VFDPC % below the Step 4 baseline measurement, a fault is logged, and the test is ended.
8. Repeat Steps 1-5 for additional actuator/damper assemblies.
9. Command actuators/dampers to "normal" positions.

If the torque increases and decreases properly, ***EC.ST***= "PASS," otherwise ***EC.ST***="FAIL."

If ***EC.ST*** is set to pass, any existing "damper not modulating" alert shall be automatically cleared.

If ***EC.ST*** is set to fail, the "damper not modulating" alert shall be logged.

If at any point in the test the fan does not reach the command speed or an actuator does not reach the command position within 5 minutes, the test shall be stopped and the status set to "NOT RUN."

FDD CONFIGURATIONS

Log Title 24 Faults (LOG.F)

Enables Title 24 detection and logging of mechanically disconnected actuator faults.

T24 Econ Move Detect (EC.MD)

Detects the amount of change required in the reported position before economizer is detected as moving.

T24 Econ Move SAT Test (EC.ST)

The minimum amount the economizer must move in order to trigger the test for a change in SAT. The economizer must move at least ***EC.ST*** % before the control will attempt to determine whether the actuator is mechanically disconnected.

T24 Econ Move SAT Change (S.CHG)

The minimum amount (in degrees F) SAT is expected to change based on economizer position change of ***EC.ST***.

T24 Econ RAT-OAT Diff (E.SOD)

The minimum amount (in degrees F) between RAT (if available) or SAT (with economizer closed and fan on) and OAT to perform mechanically disconnected actuator testing.

T24 Heat/Cool End Delay (E.CHD)

The amount of time (in minutes) to wait before mechanical cooling or heating has ended before testing for mechanically disconnected actuator. This is to allow SAT to stabilize at conclusion of mechanical cooling or heating.

T24 Test Minimum Position (ET.MN)

The minimum position below which tests for a mechanically disconnected actuator will not be performed. For example, if the actuator moves entirely within the range 0 to ***ET.MN***, a determination of whether the actuator is mechanically disconnected will not be made. This is due to the fact that at the extreme ends of the actuator movement, a change in position may not result in a detectable change in temperature. When the actuator stops in the range 0 to 2% (the actuator is considered to be closed), a test shall be performed where SAT is expected to be approximately equal to RAT. If SAT is not determined to be approximately equal to RAT, a "damper not modulating" alert shall be logged.

T24 Test Maximum Position (ET.MX)

The maximum position above which tests for a mechanically disconnected actuator will not be performed. For example, if the actuator moves entirely within the range ***ET.MX*** to 100 a determination of whether the actuator is mechanically disconnected will not be made. This is due to the fact that at the extreme ends of the actuator movement, a change in position may not result in a detectable change in temperature. When the actuator stops in the range 98 to 100% (the actuator is considered to be open), a test shall be performed where SAT is expected to be approximately equal to OAT. If SAT is not determined to be approximately equal to OAT, a "damper not modulating" alert shall be logged.

SAT Settling Time (SAT.T)

The amount of time (in seconds) the economizer reported position must remain unchanged (± ***EC.MD***) before the control will attempt to detect a mechanically disconnected actuator. This is to allow SAT to stabilize at the current economizer position. This configuration sets the settling time of the supply-air temperature (SAT). This typically tells the control how long to wait after a stage change before trusting the SAT reading and has been reused for Title 24 purposes.

Economizer Deadband Temp (AC.EC)

The allowed deadband between measured SAT and calculated SAT when performing economizer self-test. Range is 0 to 10, default is 4.

Econ Fault Detect Gap (E.GAP)

The discrepancy between actuator command and reported position in %. Used to detect actuator stuck/jammed. Range is 2 to 100, default is 5.

Econ Fault Detect Timer (E.TMR)

The timer for actuator fault detection in seconds. Used to detect actuator stuck/jammed. Range is 10 to 240, default is 20.

Excess Air CFM (X.CFM)

The max allowed excess air in CFM. Used to detect excess outside air. Range is 400 to 4000, default is 800.

Excess Air Detect Timer (X.TMR)

The timer for excess air detection with a range of 30 to 240. Default is 150.

T24 AutoTest SF Run Time (AC.MR)

Amount of time to run supply fan before sampling torque or making torque comparison. Range is 1 to 10, default is 2.

T24 Auto-Test VFD Speed (AC.SP)

Speed to run VFD during economizer auto-component test. Range is 10 to 50, default is 20.

T24 Auto-Test Econ % Open (AC.OP)

Amount to open each economizer during auto-component test. Range is 1 to 100. Default is 30.

T24 Auto-Test VFD % Change (VF.PC)

The expected change in torque when damper opens from 0 to ***AC.OP*** and then from ***AC.OP*** to 0. Range is 1 to 20, default is 10.

Econ Auto-Test Day (EC.DY)

The day on which to perform automatic economizer test. Range=NEVER, MON, TUE, WED, THR, FRI, SAT, SUN. Default is SAT.

Econ Auto=Test Time (EC.TM)

The time at which to perform automatic economizer test. The range is 0 to 23, default is 2.

SETTING UP THE SYSTEM

The economizer configuration options are under the Local Display Mode ***Configuration→ECON.*** See Table 54.

Table 54 — Economizer Configuration Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
EC.EN	Economizer Installed?	No/Yes		ECON_ENA	Yes
EC.MN	Economizer Min.Position	0 to 100	%	ECONOMIN	5
EC.MX	Economizer Max.Position	0 to 100	%	ECONOMAX	98
E.TRM	Economzr Trim For SumZ?	No/Yes		ECONTRIM	Yes
E.SEL	Econ ChangeOver Select	0 to 3		ECON_SEL	0
DDB.O	Diff Dry Bulb RAT Offset	0, -2, -4, -6	dF	EC_DDBCO	0
OA.E.C	OA Enthalpy ChgOvr Selct	1 to 5		OAEC_SEL	4
OA.EN	Outdr.Enth Compare Value	18 to 28		OAEN_CFG	24
OAT.L	High OAT Lockout Temp	–40 to 120	dF	OAT_LOCK	60
O.DEW	OA Dewpoint Temp Limit	50 to 62	dF	OADEWCFG	55
ORH.S	Outside Air RH Sensor	Disable/Enable		OARHSENS	Disable
CFM.C	OUTDOOR AIR CFM CONTROL				
OCF.S	Outdoor Air CFM Sensor	0 to 2		OCFMSENS	0
O.C.MX	Economizer Min.Flow	0 to 25000	CFM	OACFMMAX	2000
O.C.MN	IAQ Demand Vent Min.Flow	0 to 20000	CFM	OACFMMIN	0
O.C.DB	Econ.Min.Flow Deadband	200 to 1000	CFM	OACFM_DB	400
OA.RR	OACFM Econ Ctrl Run Rate	3 to 120	sec	OCFMECRT	20
OA.MP	OACFM Econ Ctrl Min Pos	0 to 10	%	OCFMECMN	0
EN.DO	Enable DCFM/OACFM Clamp	No/Yes		EN_DOCFM	Yes
E.SAC	Enable Single Act CFM	No/Yes		ENSACFMC	No
S.MX.C	Single Act. Max CFM	0 to 20000	CFM	SAMAXCFM	7500
S.M.DB	Single Act. Max CFM DB	0 to 5000	CFM	SAMAXCDB	2500
E.CFG	ECON.OPERATION CONFIGS				
E.P.GN	Economizer Prop.Gain	0.7 to 3.0		EC_PGAIN	1
E.RNG	Economizer Range Adjust	0.5 to 5	^F	EC_RANGE	2.5
E.SPD	Economizer Speed Adjust	0.1 to 10		EC_SPEED	0.75
E.DBD	Economizer Deadband	0.1 to 2	^F	EC_DBAND	0.5
UEFC	UNOCC.ECON.FREE COOLING				
FC.CF	Unoc Econ Free Cool Cfg	0 to 2		UEFC_CFG	0
FC.TM	Unoc Econ Free Cool Time	0 to 720	min	UEFCTIME	120
FC.L.O	Un.Ec.Free Cool OAT Lock	40 to 70	dF	UEFCNTLO	50
ACT.C	ECON.ACTUATOR CONFIGS				
SN.1.1	Econ 1 Out Ser Number 1	0-9999		ECN1_SN1	0
SN.1.2	Econ 1 Out Ser Number 2	0-6		ECN1_SN2	0
SN.1.3	Econ 1 Out Ser Number 3	0-9999		ECN1_SN3	0

Table 54 — Economizer Configuration Table (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SN.1.4	Econ 1 Out Ser Number 4	0-254		ECN1_SN4	0
C.A.L1	Ecn1 Out Ctl Angl Lo Lmt	0-90		ECONCALM	85
SN.2.1	Econ 2 Ret Ser Number 1	0-9999		ECN2_SN1	0
SN.2.2	Econ 2 Ret Ser Number 2	0-6		ECN2_SN2	0
SN.2.3	Econ 2 Ret Ser Number 3	0-9999		ECN2_SN3	0
SN.2.4	Econ 2 Ret Ser Number 4	0-254		ECN2_SN4	0
C.A.L2	Ecn2 Ret Ctl Angl Lo Lmt	0-90		ECN2CALM	85
SN.3.1	Econ 3 Out Ser Number 1	0-9999		ECN3_SN1	0
SN.3.2	Econ 3 Out Ser Number 2	0-6		ECN3_SN2	0
SN.3.3	Econ 3 Out Ser Number 3	0-9999		ECN3_SN3	0
SN.3.4	Econ 3 Out Ser Number 4	0-254		ECN3_SN4	0
C.A.L3	Ecn3 Out Ctl Angl Lo Lmt	0-90		ECN3CALM	85
T.24.C	TITLE 24 CONFIGS				
LOG.F	Log Title 24 Faults	No/Yes		T24LOGFL	No
EC.MD	T24 Econ Move Detect	1 to 10		T24ECMDB	1
EC.ST	T24 Econ Move SAT Test	10 to 20		T24ECSTS	10
S.CHG	T24 Econ Move SAT Change	0 to 5		T24SATMD	0.2
E.SOD	T24 Econ RAT-OAT Diff	5 to 20		T24RATDF	15
E.CHD	T24 Heat/Cool End Delay	0 to 60		T24CHDLY	25
ET.MN	T24 Test Minimum Pos.	0 to 50		T24TSTMN	15
ET.MX	T24 Test Maximum Pos.	50 to 100		T24TSTMX	85
SAT.T	SAT Settling Time	10 to 900		SAT_SET	240
AC.EC	Economizer Deadband Temp	0 to 10		AC_EC_DB	4
E.GAP	Econ Fault Detect Gap	2 to 100		EC_FLGAP	5
E.TMR	Econ Fault Detect Timer	10 to 240		EC_FLTMR	20
X.CFM	Excess Air CFM	400 to 4000		EX_ARCFM	800
X.TMR	Excess Air Detect Timer	30 to 240		EX_ARTMR	150
AC.MR	T24 AutoTest SF Run Time	1 to 10		T24ACMRT	2
AC.SP	T24 Auto-Test VFD Speed	10 to 50		T24ACSPD	20
AC.OP	T24 Auto-Test Econ % Opn	1 to 100		T24ACOPN	30
VF.PC	T24 Auto-Test VFD % Chng	1 to 20		T24VFDPC	10
EC.DY	T24 Econ Auto-Test Day	0=Never, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday		T24_ECDY	6=Saturday
EC.TM	T24 Econ Auto-Test Time	0 to 23		T24_ECTM	2

ECONOMIZER OPERATION

Is Economizer Enabled?

If an economizer is not being used or is to be completely disabled, the configuration option ***EC.EN*** may be set to NO. Otherwise the economizer enabled configuration must be set to YES. Without the economizer enabled, the outdoor-air dampers will open to minimum position when the supply fan is running. Outdoor-air dampers will spring-return closed upon loss of power or shutdown of the supply fan.

What is the Economizer Minimum Position?

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 even further to gain energy savings and to more carefully monitor “indoor IAQ problems.”

What is the Economizer Maximum Position?

The upper limit of the economizer may be clamped if so desired via configuration option ***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.

What is Economizer Trim for Sum Z?

A strange title, but a simple explanation. Sum Z stands for the adaptive cooling control algorithm used for multiple stages of compression. The configuration option ***E.TRM*** is typically set to Yes, and allows the economizer to modulate to the same control point “Sum Z” uses to control compressor staging. The advantage is lower compressor cycling coupled with tighter temperature control. Setting this option to “No” will cause the economizer, if it is indeed able to provide free cooling, to open to the Economizer Max. Position (***EC.MX***) during mechanical cooling.

ECONOMIZER CHANGEOVER SELECTION

There are 4 potential elements at play that may run concurrently, which determine whether the economizer is able to provide free cooling:

- Dry Bulb Changeover (outside air temperature qualification)
- The Enthalpy Switch (discrete switch input monitoring)
- Economizer Changeover Select (***E.SEL*** economizer changeover select configuration option)
- Outdoor Dewpoint Limit Check (needs an 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 ***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 N Series rooftops. When the switch reads HIGH, free cooling will be disallowed.

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→IAQ→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.

The enthalpy switch opens 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.

There are 2 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.

The enthalpy switch may also be field converted to a differential enthalpy switch by field installing an enthalpy sensor (33CSENTSEN or HL39ZZ003). The enthalpy switch/receiver remains installed in its factory location to sense outdoor air enthalpy. The additional enthalpy sensor is mounted in the return air stream to measure return air enthalpy. The enthalpy control jumper must be changed from M1 to M2 for differential enthalpy control. For the return air enthalpy sensor, a "two-wire" sensor, connect power to the Vin input and signal to the 4 to 20 mA loop input.

It should be noted that there is another way to accomplish differential enthalpy control when both an outdoor and return air relative humidity sensor are present. See section on Economizer Changeover Select for further information.

Economizer Changeover Select

The control is capable of performing any one of the following changeover types in addition to both the dry bulb lockout and the discrete switch 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. Unlike most control systems that use an enthalpy switch or enthalpy sensor, the N Series units can use the standard installed outdoor dry bulb sensor and an accessory relative humidity sensor to calculate the enthalpy of the air.

Setting ***E.SEL*** = 2 requires that the user configure ***OA.E.C***, the "Outdoor Enthalpy Changeover Select" configuration item, install an outdoor relative humidity sensor, and make sure a control expansion module board (CEM) is present. Once the sensor and board are installed, all the user need do is to enable ***ORH.S***, the outdoor relative humidity sensor configuration option. This, in turn, will enable the CEM board to be read, if it is not so already, automatically.

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.

Differential Enthalpy Changeover

This option compares the outdoor air enthalpy to the return air enthalpy and favors the airstream 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 configuration (***ORH.S***) and return air humidity sensor configuration (***Configuration→SENS→RRH.S***) must be enabled.

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.

Outdoor Dewpoint Limit Check

If an outdoor relative humidity sensor is installed, the control is able to calculate the outdoor air dew point temperature and will compare this temperature against the outside air dew point temperature limit configuration (***O.DEW***).

If the outdoor air dew point temperature is greater than ***O.DEW***, "free cooling" will not be allowed.

Custom Psychometric Curves

See Fig. 11 for an example of a custom curve constructed on a psychometric chart.

Configuring the Economizer to Communicate Via Actuator "Serial Number"

Every actuator used in the N 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. 6 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***. (***SN.1.1***, ***SN.1.2***, ***SN.1.3***, ***SN.1.4***, ***SN.1.5***, ***SN.2.1***, ***SN.2.2***, ***SN.2.3***, ***SN.2.4***, ***SN.2.5***, ***SN.3.1***, ***SN.3.2***, ***SN.3.3***, ***SN.3.4***, ***SN.3.5***).

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

The economizer actuator learns what its end stops are 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, internally it remembers what its "control angle" is. From that moment on, 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" or "large enough" 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 N Series control system has a configurable "control angle" alarm low limit in its "Economizer Actuator Configs" group, ***ACT.C***. (***C.A.L1***, ***C.A.L2***, ***C.A.L3***). If the control angle learned through calibration is less than ***C.A.L1***, ***C.A.L2***, or ***C.A.L3***, 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.

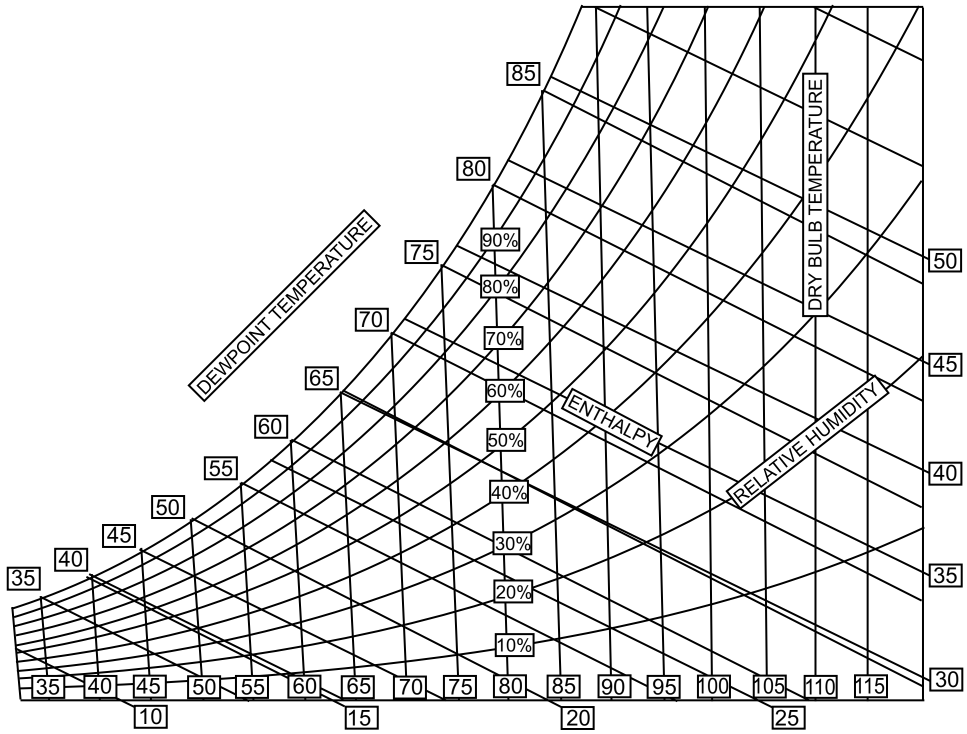


Fig. 11 — Custom Changeover Curve Example

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. Once the space has been sufficiently cooled during this cycle, the fan will be stopped.

In basic terms, the economizer will modulate in an unoccupied period and attempt to maintain space temperature to the "occupied" cooling set point. This necessitates the presence of a space temperature sensor.

Configuring the economizer for Unoccupied Economizer Free Cooling is done in the ***UEFC*** group, with 3 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 unoccupied economizer free cooling as available during the entire unoccupied period.

2 = perform unoccupied 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 Lockout Temperature (FC.LO)

This configuration option allows the user to select an outside air temperature, below which unoccupied free cooling is disallowed. This is further explained in the logic section.

Unoccupied Economizer Free Cooling Logic

Unoccupied free cooling can only operate with the qualifications:

- Unit configured for an economizer
- Unit in the unoccupied mode
- ***FC.CF*** set to 1 or ***FC.CF*** set to 2 and 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
- Space temperature sensor enabled and sensor reading healthy
- Outside air temperature sensor healthy
- The economizer would be allowed to cool if the fan were requested and in a cool mode.
- ***OAT*** > ***FC.LO*** (1.0 dF hysteresis applied)
- The rooftop is not in a fire smoke mode
- No fan failure when configured to shut the unit down on a fan failure

If all of the above conditions are satisfied:

Unoccupied Economizer Free Cooling shall start when both of the following conditions are true:

{SPT > (OCSP + 2)} AND {SPT > (OAT + 8)}

The Night Time Free Cooling Mode shall stop when either of the following conditions are true:

{SPT < OCSP} OR {SPT < (OAT + 3)}

…where SPT = Space Temperature and OCSP = Occupied Cooling Setpoint

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 on an N Series rooftop, 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***.

The following options are used to program outside air cfm control:

Outdoor Air CFM Sensor Enable (OCF.S)

This configuration enables the outdoor air cfm sensor and outside air cfm control. This configuration has the following settings:

0 = NONE - OACFM sensor and control is disabled (default).

1 = STD AIR FLOW - OACFM sensor and control is enabled using the factory standard airflow transducer having a range of approximately 2,300 to 22,600 cfm (75-105 ton) or 2,700 to 26,200 (120-150 ton) (effective with Version 3.0 or later software). Single actuator cfm, ***E.SAC***, must be enabled (set to YES) to reach the lowest cfms.

2 = EXT AIR FLOW - OACFM sensor and control is enabled using extended airflow (field-installed upgraded range) transducer having a range of approximately 6,000 to 60,000 cfm (75-150 ton) (standard with version 2.0 and earlier software; optional effective with version 3.0).

Economizer Minimum Flow Rate (O.C.MX)

This "cfm" configuration option replaces Economizer Minimum Position (***EC.MN***) when an outdoor air cfm sensor is enabled.

IAQ Demand Vent Minimum Flow Rate (O.C.MN)

This "cfm" configuration 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 "cfm" configuration option defines the deadband of the cfm control logic.

Economizer Control Run Rate (OA.RR)

This rate will specify how often the economizer position is updated based on ECMINCFM and OACFMAVG.

Economizer Control Minimum Position (OA.MP)

This is the minimum economizer position (% open) that will be allowed during the OACFM control. This is to prevent the economizer position from being calculated to 0% which results in OACFM=0 or a very low value.

Enable DCFM/OACFM Clamp (EN.DO)

If EN_DOCFM = YES and OACFM<DCFM_MAX, DCFM will be clamped at OACFM. If EN_DOCFM=NO, DCFM will be clamped at DCFM_MAX. This configuration is to prevent a very low OACFM value from causing the fan algorithm to lose control of building pressure.

Enable Single Act CFM (E.SAC)

The configuration enables single actuator OACFM control and has the following settings:

NO = Single actuator OACFM control is disabled (factory default). The control will use both outside air economizer dampers to meet ECMINCFM. This is the recommended setting when trying to control to greater than 7000 cfm outdoor air.

YES = Single actuator OACFM control is enabled. When ECMINCFM falls below ***S.MX.C*** (SAMAXCFM) one outside air economizer damper shall be closed and the remaining damper shall be modulated to meet ECMINCFM. This is the recommended setting when trying to control to less than 7000 cfm outdoor air.

Single Act. Max CFM (S.MX.C)

This configuration sets the single actuator maximum cfm. If the OACFM sensor is enabled and ***E.SAC*** = YES, when ECMINCFM falls below this configuration one outside air economizer damper shall be closed and the remaining damper shall be modulated to meet ECMINCFM. This configuration shall default to 7500 cfm for the standard flow station and 17500 for extended flow station.

Single Act Max CFM DB (S.M.DB)

This configuration sets the single actuator max cfm deadband. When ECMINCFM is greater than ***S.MX.C*** + ***S.M.DB*** the control shall revert back to dual actuator OACFM control. This configuration shall have a range of 0 to 5000 and a default of 2500.

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. Now, this configurable deadband helps keep the economizer from attempting to close until the outdoor air cfm rises to the current minimum cfm position PLUS the deadband value. 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.

EC.MN is the set point the *Comfort*Link software is attempting to meet for OACFM. It is determined using the following:

O.C.MX - Economizer Min.Flow [OACFMMAX]

O.C.MN - IAQ Demand Vent Min.Flow [OACFMMIN]

IQ.O.C - IAQ Override Flow [IAQOVCFM]

How single actuator control works:

- If ***E.SAC***=NO, the *Comfort*Link software will attempt to meet ECMINCFM using 2 actuators.
- If ***E.SAC***=YES:
- If ***EC.MN*** < ***S.MX.C***, the *Comfort*link software will activate single actuator OACFM control and attempt to meet ***EC.MN*** using a single actuator.
- If single actuator OACFM control is active and ***EC.MN*** > ***S.MCX.C*** + ***S.M.DB***, the *Comfort*Link software will revert back to dual actuator cfm control.
- Control would also return to dual actuator when:
- Free cooling active and OACFM is greater than ***S.MX.C*** + ***S.M.DB***
- Fire/smoke emergency
- Special allowances for service test:

If ***Run Status→ECON→SACA*** =NO both outside actuators shall be commanded from ***Service Test→FANS→E.POS*** and ***Service Test→COOL→E.POS***.

If ***Run Status→ECON→SACA***=YES only a single outside actuator shall be commanded from ***Service Test→FANS→E.POS*** and ***Service Test→COOL→E.POS***.

This will allow verification that the OACFM measurement is adjusted properly based on the number of dampers used. It also allows easy comparison of OACFM for various fan speeds.

BACKWARDS COMPATIBILITY NOTE: Units with version 3.0 software or later and OACFM option will have ***OCF.S*** set to "1," STD AIR FLOW. These units will have a control that enables the single outside air actuator feature, allowing accurate low OACFM measurement. When upgrading software on units built prior to January 2015, it will be necessary to manually set ***OCF.S*** to "2" unless the OACFM transducer was previously changed to a range of 0 to 0.10 in. wg.

ECONOMIZER OPERATION CONFIGURATIONS (WHICH AFFECT FREE COOLING ACTUATOR MODULATION)

There are configuration items in the ***E.CFG*** menu group that 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 configurations from their default settings without first consulting a service engineering representative.

In addition, it should be noted that the economizer cooling algorithm is designed to automatically slow down the economizer actuator's rate of travel as outside-air temperature decreases. See Table 55.

ECONOMIZER DIAGNOSTIC HELP

Because there are so many conditions which might disable the economizer from being able to provide free cooling, the control offers a handy place to identify these potentially disabling sources. All the user has to do is check ***ACTV***, the "Economizer Active" flag. If this flag is set to "Yes" there is no reason to explore the group under ***DISA***, the "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 easily discover exactly what is preventing the economizer from performing "free cooling."

In addition, the economizer's reported and commanded positions are viewable, as well as one convenient place to view outside-air temperature, relative humidity, enthalpy, and dew point temperature.

The following information can be found under the local display mode ***Run Status→ECON.***

Economizer Control Point Determination Logic

Once the economizer is allowed to provide free cooling, the economizer must determine exactly what set point it should try to maintain. The set point the economizer attempts to maintain when "free cooling" is located at ***Run Status→VIEW→EC.C.P***. This is the economizer control point.

The control selects set points differently, based on the control type of the unit. This control type can be found at ***Configuration→UNIT→C.TYP***.

There are 4 types of control.

C.TYP = 1 VAV-RAT

C.TYP = 2 VAV-SPT

C.TYP = 3 TSTAT Multi-Staging

C.TYP = 4 SPT Multi-Staging

If the economizer is not allowed to do free cooling, then ***EC.C.P*** = 0.

If the economizer is allowed to do free cooling and the Unoccupied Free Cooling Mode is ON, then ***EC.C.P = Setpoints→SASP + Inputs→RSET→SA.S.R***.

If the economizer is allowed to do free cooling and the Dehumidification mode is ON, then ***EC.C.P*** = the Cooling Control Point (***Run Status→VIEW→CL.C.P***).

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

If the ***C.TYP*** is either 1, 2, 3, or 4, and the unit is in a cool mode, then ***EC.C.P*** = the Cooling Control Point (***Run Status→ VIEW→CL.C.P***).

Single Act CFM Ctl Activ (SACA)

Indication whether single actuator CFM control is active.

NO = Single actuator cfm control is not currently active. The unit will use both outside air actuators for cfm control.

YES = Single actuator cfm control is currently active. The unit will use a single outside air actuator for cfm control, and the other outside air actuator shall be commanded closed.

The status indicator shall be forcible to allow the operator to force single actuator cfm control. The status shall be automatically cleared (set to NO) if:

1 = Fire/smoke emergence is active

2 = ***E.SAC***=NO

Table 55 — Economizer Run Status Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
EC1.P	Economizer 1 Out Act. Curr. Pos.	0-100	%	ECONOPOS	
EC2.P	Economizer 2 Ret. Act.Curr.Pos.	0-100	%	ECON2POS	
EC3.P	Economizer 3 Out Act.Curr.Pos.	0-100	%	ECON3POS	
ECN.C	Economizer Out Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
ACTV	Economizer Active ?	No/Yes		ECACTIVE	
SACA	Single Act CFM Ctl Activ	No/Yes		SACFMCTL	forcible
DISA	ECON DISABLING CONDITIONS				
UNV.1	Econ Out Act. Unavailable?	No/Yes		ECONUNAV	
UNV.2	Econ2 Ret Act. Unavailable?	No/Yes		ECN2UNAV	
UNV.3	Econ3 Out Act. Unavailable?	No/Yes		ECN3UNAV	
ENTH	Enth. Switch Read High ?	No/Yes		ENTH	
DBC	DBC - OAT Lockout?	No/Yes		DBC_STAT	
DEW	DEW - OA Dewpt.Lockout?	No/Yes		DEW_STAT	
DDBC	DDBD- OAT > RAT Lockout?	No/Yes		DDBCSTAT	
OAEC	OAEC- OA Enth Lockout?	No/Yes		OAECSTAT	
DEC	DEC - Diff.Enth.Lockout?	No/Yes		DEC_STAT	
EDT	EDT Sensor Bad?	No/Yes		EDT_STAT	
OAT	OAT Sensor Bad ?	No/Yes		OAT_STAT	
FORC	Economizer Forced?	No/Yes		ECONFORC	
SFON	Supply Fan Not On 30s?	No/Yes		SFONSTAT	
CLOF	Cool Mode Not In Effect?	No/Yes		COOL_OFF	
OAQL	OAQ Lockout in Effect?	No/Yes		OAQLOCKD	
HELD	Econ Recovery Hold Off?	No/Yes		ECONHELD	
DH.DS	Dehumid. Disabled Econ.?	No/Yes		DHDISABL	
O.AIR	OUTSIDE AIR INFORMATION				
OAT	Outside Air Temperature		dF	OAT	forcible
OA.RH	Outside Air Rel. Humidity		%	OARH	forcible
OA.E	Outside Air Enthalpy			OAE	
OA.D.T	Outside Air Dewpoint Temp		dF	OADEWTMP	

Building Pressure Control

The N Series *Comfort*Link controller supports several physical rooftop configurations used to control building pressure. This section will describe the various types used. See Table 56.

SETTING UP THE SYSTEM

The building pressure configs are found at the local display under ***Configuration→BP***.

Building Pressure Configuration (BP.CF)

This configuration selects the type of building pressure control in place.

- ***BP.CF*** = 0, No building pressure control
- ***BP.CF*** = 1, VFD controlling power exhaust to modulate building pressure control based on building pressure sensor
- ***BP.CF*** = 2, VFD controlling return fan (VFD fan tracking)

Building Pressure Sensor (BP.S)

This configuration allows the reading of a building pressure sensor when enabled. This sensor configuration is automatically enabled when BP.CF = 1 or 2.

Building Pressure (+/-) Range (BP.R)

This configuration establishes the range in H_2O that a 4 to 20 mA sensor will be scaled to. This configuration only allows sensors that measure both "positive and negative" pressure.

Building Pressure Setpoint (BP.SP)

This set point is the building pressure control set point. If configured for a type of modulating building pressure control, then this is the set point that the control will try to clamp or control to.

Building Pressure Setpoint Offset (BP.SO)

For building pressure configurations ***BP.CF***=1, this is the offset below the building pressure set point that the building pressure must fall below to turn off and disable power exhaust control.

VFD/ Actuator Fire Speed/Pos. (BP.FS)

For ***BP.CF*** = 1 and 2, this configuration is the fire speed override position when the control is in the purge and evacuation smoke control modes.

VFD/ Actuator Minimum Speed/Pos. (BP.MN)

For ***BP.CF*** = 1 and 2, this configuration is the minimum VFD speed/actuator position during building pressure operation below which the VFD/actuator may not control.

VFD Maximum Speed/Pos. (BP.MX)

For ***BP.CF*** = 1 and 2, this configuration is the maximum VFD speed during building pressure operation above which the VFD may not control.

Fan Track Learn Enable (FT.CF)

For ***BP.CF*** = 2, 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*** = 2, this return/exhaust control configuration is a timer whereby corrections to the delta cfm operation are made. 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.

Table 56 — Building Pressure Control Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
BP	BUILDING PRESSURE CONFIGURATIONS				
BP.CF	Building Pressure Configuration	0 to 2		BLDG_CFG	0*
BP.S	Building Pressure Sensor	Disable/Enable		BPSENS	Disable*
BP.R	Building Pressure (+/-) Range	0.10 to 0.25	H20	BP_Range	0.25
BP.SP	Building Pressure Setp.	–0.25 to 0.25	H20	BPSP	0.05
BP.SO	BP Setpoint Offset	0 to 0.5	H20	BPSO	0.05
B.V.A	VFD CONFIGURATION				
BP.FS	VFD/Act. Fire Speed/Pos.	0 to 100	%	BLDGPFSO	100
BP.MN	VFD/Act. Min. Speed/Pos.	0 to 100	%	BLDGPMIN	10
BP.MX	VFD Maximum Speed	0 to 100	%	BLDGPMAX	100
FAN.T	FAN TRACKING CONFIG				
FT.CF	Fan Track Learn Enable	No/Yes		DCFM_CFG	No
FT.TM	Fan Track Learn Rate	5 to 60	min	DCFMRATE	15
FT.ST	Fan Track Initial DCFM	–20,000 to 20,000	CFM	DCFMSTRT	2000
FT.MX	Fan Track Max Clamp	0 to 20,000	CFM	CDCFM_MAX	4000
FT.AD	Fan Track Max Correction	0 to 20,000	CFM	DCFM_ADJ	1,000
FT.OF	Fan Track Internal EEPROM	–20,000 to 20,000	CFM	DCFM_OFF	0
FT.RM	Fan Track Internal RAM	–20,000 to 20,000	CFM	DCFM_RAM	0
FT.RS	Fan Track Reset Internal	No/Yes		DCFMRSET	No
FAN.C	SUPPLY, RETURN FAN CFG				
SCF.C	Supply Air CFM Config	1 to 2		SCFM_CFG	2
REF.C	Return/Exhaust Air CFM Config.	1 to 2		RCFM_CFG	2
SCF.S	Supply Air CFM Sensor	Disable/Enable		SCFMSENS	Disable*
RCF.S	Return Air CFM Sensor	Disable/Enable		RCFMSENS	Disable*
ECF.S	Exhaust Air CFM Sensor	Disable/Enable		ECFMSENS	Disable*
B.PID	BLDG. PRESS. PID CONFIGURATIONS				
BP.TM	Bldg. Press. PID Run Rate	1 to 60	sec	BPIDRATE	10
BP.P	Bldg. Press. Prop. Gain	0 to 5		BLDGP_PG	0.5
BP.I	Bldg. Press. Integ. Gain	0 to 2		BLDGP_IG	0.5
BP.D	Bldg. Press. Deriv. Gain	0 to 5		BLDGP_DG	0.3

* Some configurations are model number dependent.

Fan Track Initial DCFM (FT.ST)

For ***BP.CF*** = 2, this return/exhaust control configuration is the start point upon which corrections (offset) are made over time when ***FT.CF*** = Yes and is the constant control point for delta cfm control when ***FT.CF*** = No.

Fan Track Max Clamp (FT.MX)

For ***BP.CF*** = 2, this return/exhaust control configuration is the maximum positive delta cfm control value allowed.

Fan Track Max Correction (FT.AD)

For ***BP.CF*** = 2, this return/exhaust control configuration is the max correction that is possible to be made 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*** = 2, 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 a 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 when ***FT.CF*** = Yes throughout the day. 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 right and the offsets are incorrect, this "learned" value can be reset.

Supply Air CFM Configuration (SCF.C)

This configuration is set at the factory depending on whether a high or low supply fan is installed. This information is then used by the control to determine the correct cfm tables to be used when measuring supply air cfm.

Return/Exhaust Air CFM Configuration (REF.C)

This configuration is set at the factory depending on whether a high or low return fan is installed. This information is then used by the control to determine the correct cfm tables to be used when measuring return or exhaust air cfm.

Supply Air CFM Sensor (SCF.S)

This configuration allows the reading of supply air cfm when enabled.

Return Air CFM Sensor (RCF.S)

This configuration allows the reading of return air cfm when enabled. This sensor and ***ECF.S*** share the same analog input so are mutually exclusive.

Exhaust Air CFM Sensor (ECF.S)

This configuration allows the reading of exhaust air cfm when enabled. This sensor and ***RCF.S*** share the same analog input so are mutually exclusive.

Building Pressure Run Rate (BP.TM)

For ***BP.CF*** = 1 and 2, this configuration is the PID run time rate.

Building Pressure Proportional Gain (BP.P)

For ***BP.CF*** = 1 and 2, this configuration is the PID Proportional Gain.

Building Pressure Integral Gain (BP.I)

For ***BP.CF*** = 1 and 2, this configuration is the PID Integral Gain.

Building Pressure Derivative Gain (BP.D)

For ***BP.CF*** = 1 and 2, this configuration is the PID Derivative Gain.

BUILDING PRESSURE CONTROL BASED ON ***BP.CF***

VFD Controlling Exhaust Fan Motors (BP.CF =1)

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 if the VFD is still commanded to a position > 0%. If the building pressure falls below the set point, the VFD will close 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 output (clamped between ***BP.MN*** and ***BP.MX***%) = P + I + D

If building pressure (***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. The 5-minute timer will continue to reload if the VFD is still commanded to a position > 0%. If the building pressure falls below the set point, the VFD will close automatically. Any time building pressure control becomes active, the exhaust fan relay turns on, which energizes the exhaust fan VFD.

Return/Exhaust Control (BP.CF =2)

The fan tracking algorithm controls the return fan VFD and the exhaust fan relay. Fan tracking is the method of control used on the plenum return fan option. The *Comfort*Link control uses a flow station to measure both the flow of both the supply and the return fans. The control will measure the airflow of both the supply fan and the return fan. The speed of the return fan is controlled by maintaining a delta cfm (usually with supply airflow being greater of the 2) between the 2 fans. The building pressure is controlled by maintaining this delta cfm between the 2 fans. The higher that supply airflow quantity increases above the return airflow, the higher the building pressure will be. Conversely, as the return airflow quantity increases above the supply airflow, the lower the building pressure will be. Whenever there is a request for the supply fan (or there is the presence of the IGC feedback on gas heat units), the return fan is started. The delta cfm is defined as ***S.CFM - R.CFM***. The return fan VFD is controlled by a PID on the error of delta cfm actual from delta cfm set point. If the error is positive, the drive will increase speed. If the error is negative, the drive will decrease speed.

NOTE: These configurations are used only if Fan Tracking Learning is enabled. When Fan Tracking Learning is enabled, the control will adjust the delta cfm (***FT.ST***) between the supply and return fan if the building pressure deviates from the Building Pressure Set Point (***BP.SP***). Periodically, at the rate set by the Fan Track Learn Rate (***FT.TM***), the delta cfm is adjusted upward or downward with a maximum adjustment at a given instance to be no greater than Fan Track Max Correction (***FT.AD***). The delta cfm cannot ever be adjusted greater than or less than the Fan Track Initial Delta Cfm (***FT.ST***) than by the Fan Track Max Clamp (***FT.MX***).

Smoke Control Modes

There are 4 smoke control modes that can be used to control smoke within areas serviced by the unit: Pressurization mode, Evacuation mode, Smoke Purge mode, and Fire Shutdown. Evacuation, Pressurization, and Smoke Purge modes require the controls expansion board (CEM). The Fire Shutdown input is located on the main base board (MBB) on terminals TB201-1 and 2. The unit may also be equipped with a factory-installed return air smoke detector that is wired to TB201-1,2 and will shut the unit down if a smoke condition is determined. Field-monitoring wiring can be connected to terminal TB201-1 and 2 to monitor the smoke detector. Inputs on the CEM board can be used to put the unit in the Pressurization, Evacuation, and Smoke Purge modes. These switches or inputs are connected to TB202: Pressurization — TB202-18 and 19, Evacuation — TB202-16 and 17, and Smoke Purge — TB202-14 and 15. Refer to page 134 for wiring diagrams.

Each mode must be energized individually on discrete inputs and the corresponding alarm is initiated when a mode is activated. The fire system provides a normally closed dry contact closure. Multiple smoke control inputs, sensed by the control, will force the unit into a Fire Shutdown mode.

FIRE SMOKE INPUTS

These discrete inputs can be found on the local display under ***Inputs→FIRE***.

ITEM	EXPANSION	RANGE	CCN POINT	WRITE STATUS
FIRE	FIRE-SMOKE INPUTS			
FSD	Fire Shutdown Input	ALRM/NORM	FSD	forcible
PRES	Pressurization Input	ALRM/NORM	PRES	forcible
EVAC	Evacuation Input	ALRM/NORM	EVAC	forcible
PURG	Smoke Purge Input	ALRM/NORM	PURG	forcible

Fire Shutdown Mode

This mode will cause an immediate and complete shutdown of the unit.

Pressurization Mode

This mode attempts to raise the pressure of a space to prevent smoke infiltration from an adjacent space. Opening the economizer (thereby closing the return air damper), shutting down power exhaust, and turning the indoor fan on will increase pressure in the space.

Evacuation Mode

This mode attempts to lower the pressure of the space to prevent infiltrating an adjacent space with its smoke. Closing the economizer (thereby opening the return-air damper), turning on the power exhaust, and shutting down the indoor fan decrease pressure in the space.

Smoke Purge Mode

This mode attempts to draw out smoke from the space after the emergency condition. Opening the economizer (thereby closing the return-air damper) and turning on both the power exhaust and indoor fan will evacuate smoke and bring in fresh air.

AIRFLOW CONTROL DURING THE FIRE/SMOKE MODES

All non-smoke related control outputs will get shut down in the fire/smoke modes. Those related to airflow will be controlled as explained below. The following matrix specifies all actions the control shall undertake when each mode occurs (outputs are forced internally with CCN priority number 1 - "Fire").

DEVICE	PRESSURIZATION	PURGE	EVACUATION	FIRE SD
Economizer	100%	100%	0%	0%
Indoor Fan — VFD	ON/FSO*	ON/FSO*	OFF	OFF
Power Exhaust VFD	OFF	ON/FSO*	ON/FSO*	OFF
Heat Interlock Relay	ON	ON	OFF	OFF

* "FSO" refers to the supply and exhaust VFD fire speed override configurable speed.

SMOKE CONTROL CONFIGURATION

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

The configurable fire speed override for supply fan VFD is in ***Configuration→SP→SP.FS***.

The supply fan relay's commanded output can be found in ***Outputs→FANS→S.FAN***.

The supply fan VFD's commanded speed can be found in ***Outputs→FANS→S.VFD***.

The configurable fire speed override for exhaust VFD/actuator is in ***Configuration→BP→B.V.A→BP.FS***.

The exhaust fan VFD's commanded speed can be found in ***Outputs→FANS→E.VFD***.

Indoor Air Quality Control

The indoor air quality (IAQ) function will admit fresh air into the space whenever space air quality sensors detect high levels of CO_2.

When a space or return air CO_2 sensor is connected to the unit control, the unit's IAQ routine allows a demand-based control for ventilation air quantity by providing a modulating outside air damper position that is proportional to CO_2 level. The ventilation damper position is varied between a minimum ventilation level (based on internal sources of contaminants and CO_2 levels other than from the effect of people) and the maximum design ventilation level (determined at maximum populated status in the building). Demand controlled ventilation (DCV) is also available when the *Comfort*Link unit is connected to a CCN system using ComfortID™ terminal controls.

This function also provides alternative control methods for controlling the amount of ventilation air being admitted, including fixed outdoor air ventilation rates (measured as cfm), external discrete sensor switch input, and externally generated proportional signal controls.

The IAQ function requires the installation of the factory-option economizer system. The DCV sequences also require the connection of accessory (or field-supplied) space or return air CO_2 sensors. Fixed cfm rate control requires the factory-installed outdoor air cfm option. External control of the ventilation position requires supplemental devices, including a 4 to 20 mA signal, a 10,000 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. The sensor connects to TB201 terminals 7 and 8. Be sure to leave the 182-ohm resistor in place on terminals 7 and 8.

OPERATION

The unit's indoor air quality algorithm modulates the position of the economizer dampers between 2 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 2 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. 12. 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. 12. 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.

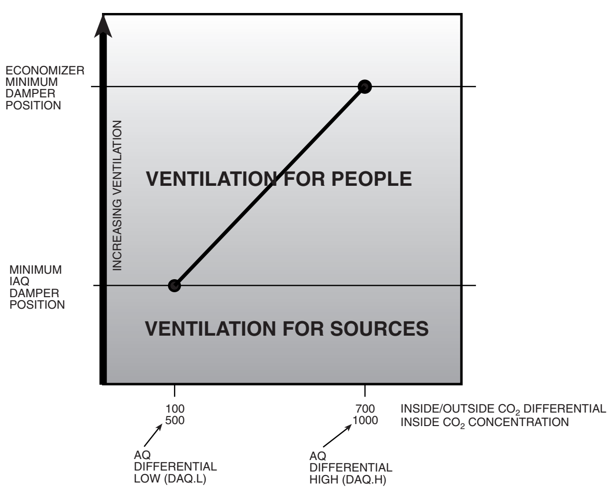


Fig. 12 — IAQ Control

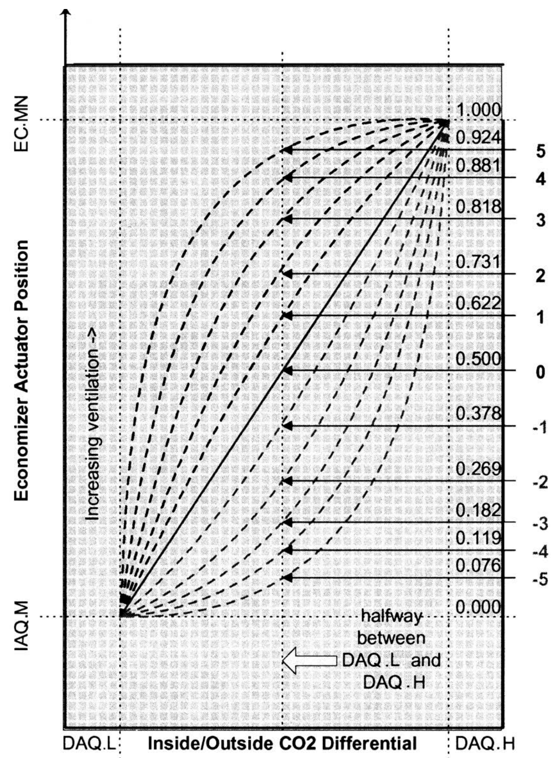
If the building is occupied and the indoor fan is running and the differential between IAQ and OAQ is less than ***DAQ.L***, the economizer will remain at ***IAQ.M***. The economizer will not close completely. The damper position will be 0 when the fan is not running or the building is unoccupied. The 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. 13.

SETTING UP THE SYSTEM

The IAQ configuration options are under the Local Display Mode ***Configuration→IAQ***. See Table 57.



NOTE: Calculating the IAQ.M and EC.MN damper position based on differential IAQ measurement.

Based on 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. 13 — IAQ Response Curve

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→DCV.C→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***).

Table 57 — Indoor Air Quality Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
DCV.C	DCV ECONOMIZER SETPOINTS				
EC.MN	Economizer Min.Position	0 to 100	%	ECONOMIN	5
IAQ.M	IAQ Demand Vent Min.Pos.	0 to 100	%	IAQMINP	0
O.C.MX	Economizer Min.Flow	0 to 20000	CFM	OACFMMAX	2000
O.C.MN	IAQ Demand Vent Min.Flow	0 to 20000	CFM	OACFMMIN	0
O.C.DB	Econ.Min.Flow Deadband	200 to 1000	CFM	OACFM_DB	400
AQ.CF	AIR QUALITY CONFIGS				
IQ.A.C	IAQ Analog Sensor Config	0 to 4		IAQANCFG	0
IQ.A.F	IAQ 4-20 ma Fan Config	0 to 2		IAQANFAN	0
IQ.I.C	IAQ Discrete Input Config	0 to 2		IAQINCFG	0
IQ.I.F	IAQ Disc.In. Fan Config	0 to 2		IAQINFAN	0
OQ.A.C	OAQ 4-20ma Sensor Config	0 to 2		OAQANCFG	0
AQ.SP	AIR QUALITY SETPOINTS				
IQ.O.P	IAQ Econo Override Pos.	0 to 100	%	IAQOVPOS	100
IQ.O.C	IAQ Override Flow	0 to 31000	CFM	IAQOVCFM	10000
DAQ.L	Diff.Air Quality LoLimit	0 to 1000		DAQ_LOW	100
DAQ.H	Diff. Air Quality HiLimit	100 to 2000		DAQ_HIGH	700
D.F.OF	DAQ PPM Fan Off Setpoint	0 to 2000		DAQFNOFF	200
D.F.ON	DAQ PPM Fan On Setpoint	0 to 2000		DAQFNON	400
IAQ.R	Diff. AQ Responsiveness	-5 to 5		IAQREACT	0
OAQ.L	OAQ Lockout Value	0 to 2000		OAQLOCK	0
OAQ.U	User Determined OAQ	0 to 5000		OAQ_USER	400
AQ.SR	AIR QUALITY SENSOR RANGE				
IQ.R.L	IAQ Low Reference	0 to 5000		IAQREFL	0
IQ.R.H	IAQ High Reference	0 to 5000		IAQREFH	2000
OQ.R.L	OAQ Low Reference	0 to 5000		OAQREFL	0
OQ.R.H	OAQ High Reference	0 to 5000		OAQREFH	2000
IAQ.P	IAQ PRE-OCCUPIED PURGE				
IQ.PG	IAQ Purge	No/Yes		IAQPURGE	No
IQ.P.T	IAQ Purge Duration	5 to 60	min	IAQPTIME	15
IQ.P.L	IAQ Purge LoTemp Min Pos	0 to 100	%	IAQPLTMP	10
IQ.P.H	IAQ Purge HiTemp Min Pos	0 to 100	%	IAQPHTMP	35
IQ.L.O	IAQ Purge OAT Lockout	35 to 70	dF	IAQPNTLO	50

- ***IQ.A.C*** = 3 (4 to 20 mA minimum position) — With a 4 to 20 mA signal connected to TB201 terminal 7 and 8, the economizer minimum position will be scaled linearly from 0% (4 mA) to ***EC.MN*** (20 mA).
- ***IQ.A.C*** = 4 (10K potentiometer minimum position) — With a 10K linear potentiometer connected to TB201 terminal 7 and 8, the economizer minimum position will be scaled linearly from 0% (0 ohms) to ***EC.MN*** (10,000 ohms).

IAQ Analog Fan Config (Configuration→IAQ→AQ.CF→IQ.A.F)

This is used to configure the control of the indoor fan. If this option is used, 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 turn off when DAQ is below the DAQ Fan Off Set Point (***Configuration→IAQ→AQ.SP→D.F.OF***). The control can be set up to respond to a discrete IAQ input. The discrete input is connected to TB202 terminal 12 and 13.

IAQ Discrete Input Config (Configuration→IAQ→AQ.CF→IQ.I.C)

This configuration is used to set the type of IAQ sensor. The following are the options:

- ***IQ.I.C*** = 0 (No Discrete Input) — This is used to indicate that no discrete input will be used and the standard IAQ sensor input will be used.
- ***IQ.I.C*** = 1 (IAQ Discrete Input) — This will indicate that the IAQ level (high or low) will be indicated by the discrete input. When the IAQ level is low, the economizer minimum position will be ***Configuration→IAQ→DCV.C→IAQ.M***.
- ***IQ.I.C*** = 2 (IAQ Discrete Input with Minimum Position Override) — This will indicate that the IAQ level (high or low) 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.

TOAQ 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 controlled 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 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. 13.

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 2 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 52,500 cfm for 75 to 105-ton units. The limit is 60,000 cfm for 120 to 150-ton units.

All configurations for the outdoor airflow station can be found in the ***Configuration→ECON→CFM.C*** submenu. For this algorithm to function, the Outdoor Air Cfm Sensor Configuration (***OCF.S.***) must be enabled (set to 1 or 2).

There are 3 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 2 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 N Series *Comfort*Link controls can control a field-supplied and field-installed humidifier device. The *Comfort*Link controls provide 2 types of humidification control: A discrete stage control (via a relay contact) and a proportional control type (communicating to a LEN actuator). The discrete stage control is used to control a single-stage humidifier (typically a spray pump). The proportional control type is typically used to control a proportional steam valve serving a steam grid humidifier.

The *Comfort*Link controls must be equipped with a controls expansion module and an accessory space or return air relative humidity sensor.

If a humidifier using a proportional steam valve is selected, the Carrier actuator (Carrier Part No. HF23BJ050) must be adapted to the humidifier manufacturer's steam valve. Contact Belimo Air controls for information on actuator linkage adapter packages required to mount the actuator on the specific brand and type of steam valve mounted by the humidifier manufacturer.

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

SETTING UP THE SYSTEM

These humidity configuration are located in the local displays under ***Configuration→ HUMD***. See Table 58. Related points are shown in Table 59.

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 58 — Humidity Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
HUMD	HUMIDITY CONFIGURATION				
HM.CF	Humidifier Control Cfg.	0 to 4		HUMD_CFG	0
HM.SP	Humidifier Setpoint	0 to 100	%	HUSP	40
H.PID	HUMIDIFIER PID CONFIGS				
HM.TM	Humidifier PID Run Rate	10 to 120	sec	HUMDRATE	30
HM.P	Humidifier Prop. Gain	0 to 5		HUMID_PG	1
HM.I	Humidifier Integral Gain	0 to 5		HUMID_IG	0.3
HM.D	Humidifier Deriv. Gain	0 to 5		HUMID_DG	0.3
ACT.C	HUMIDIFIER ACTUATOR CFGS				
SN.1	Humd Serial Number 1	0 to 9999		HUMD_SN1	0
SN.2	Humd Serial Number 2	0 to 6		HUMD_SN2	0
SN.3	Humd Serial Number 3	0 to 9999		HUMD_SN3	0
SN.4	Humd Serial Number 4	0 to 254		HUMD_SN4	0
C.A.LM	Humd Ctrl Angle Lo Limit	0-90		HUMDCALM	85

Table 59 — 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	
Config→UNIT→SENS→MRH.S	Mixed Air RH Sensor		MARHSENS	
Inputs→REL.H→RA.RH	Return Air Rel. Humidity	%	RARH	forcible
Inputs→REL.H→SP.RH	Space Relative Humidity	%	SPRH	forcible
Inputs→REL.H→MA.RH	Mixed Air Relative Humidity	%	MARH	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 N Series control system has its own unique serial number. The rooftop control uses this serial number to communicate with the actuator. The actuator serial number is located on a 2-part sticker affixed to the side of the actuator housing. Remove one of the actuator's serial number labels and paste it onto the actuator serial number records label located inside the left-hand access panel at the unit's control panel. Four individual numbers make up this serial number. Program the serial number of the actuator in its Humidifier Actuator Configurations group, ***ACT.C*** (***SN.1, SN.2, SN.3, SN.4***).

NOTE: The serial numbers for all actuators can be found inside the control doors of the unit as well as on the actuator itself. If an actuator is replaced in the field, it is a good idea to remove the additional peel-off serial number sticker on the actuator and cover up the old one inside the control doors.

Control Angle Alarm (Configuration→HUMD→ACTC→ C.A.LM)

The humidifier actuator learns what its end stops are 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 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 using a hot gas reheat coil (special order, factory-installed Humidi-MiZer).

Supplemental Reheat is possible with Staged/Modulating gas heat and hydronic heat if Humidi-MiZer is unable to provide sufficient heat.

Dehumidification and reheat control are allowed during Cooling and Vent modes in the occupied period.

On constant volume units using thermostat inputs (***C.TYP*** = 3), the discrete switch input must be used as the dehumidification control input. The commercial Thermidistat™ device is the recommended accessory device.

For an occupied unit with thermostat inputs (***C.TYP*** =3), a dehumidification demand can push the HVAC MODE from OFF to VENT and later VENTING DEHUM mode.

SETTING UP THE SYSTEM

The settings for dehumidification can be found at the local display at ***Configuration→ DEHU***.

Dehumidification Configuration (D.SEL)

The dehumidification configuration can be set for the following settings:

- ***D.SEL*** = 0 — No dehumidification and reheat.
- ***D.SEL*** = 1 — The control will perform both dehumidification and reheat with modulating valve (hydronic). The valid Heat source for this option is Hydronic Heat (***HT.CF*** = 4).
- ***D.SEL*** = 2 — The control will perform dehumidification and reheat with staged gas only. The valid heat source for this option is Staged Gas Heat or Modulating Gas Heat (***HT.CF*** = 3).
- ***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. The valid Heat sources for this option are ***HT.CF*** = 0, 1, 2 and 5.
- ***D.SEL*** = 4 — The control will use the Humidi-MiZer® adaptive dehumidification system.
- ***D.SEL*** = 5 — The control will perform both dehumidification and reheat with third party heat reclaim via the heat reclaim output. The heat reclaim output (***H.SEL***) must be configured before ***D.SEL***.

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.

Dehumidify RH Deadband (DH.DB)

This is the dehumidification relative humidity sensor's deadband.

Dehum Discrete Timeguard (DH.TG)

This is the dehumidification discrete switch's time guard.

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 5.

If the machine's control type is a TSTAT type (***Configuration→UNIT→C.TYP***=3) and the discrete input selection for the sensor is not configured (***D.SEN*** not equal to 3), dehumidification will be disabled.

If the machine's control type is a TSTAT type (***Configuration→UNIT→C.TYP***=3) and the economizer is able to provide cooling, a dehumidification mode may be called out, but the control will not request mechanical cooling.

NOTE: Configuring ***Configuration→DEHU→ D.SEN*** to 1, 2, or 3 will enable the CEM board along with the sensor selected for control.

NOTE: If ***Configuration→HEAT→HT.CF*** is inconsistent, ***Configuration→DEHU→D.SEL*** will automatically revert to 0.

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→IAQ→DEHU→D.SEL*** = 3), then no heating will be initiated and the alarm relay will be energized. If ***Configuration→IAQ→DEHU→D.SEL*** = 2 or1 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 falls below relative humidity sensor's dead band % (***Configuration→DEHU→DH.DB***) or below the set point (***Configuration→DEHU→D.RH.S),*** or the discrete input reads "LOW", and discrete switch time guard expires (***Configuration→DEHU→DH.TG***), the Humidi-MiZer mode will end.

Humidi-MiZer Adaptive Dehumidification System

Units with the factory-equipped Humidi-MiZer® option are capable of providing multiple modes of improved dehumidification as a variation of the normal cooling cycle. The design of the Humidi-MiZer system allows for 2 humidity control modes of operation of the rooftop unit, utilizing a common subcooling/reheat dehumidification coil located downstream of the standard evaporator coil. This allows the rooftop unit to operate in both a Dehumidification (Subcooling) mode and a hot gas Reheat Mode for maximum system flexibility. The Humidi-MiZer package is factory installed and will operate whenever there is a dehumidification requirement present. The Humidi-MiZer system is initiated based on input from a factory-installed return air humidity sensor to the large rooftop unit controller. Additionally, the unit controller may receive an input from a space humidity sensor, a discrete input from a mechanical humidistat, or third-party controller. Dehumidification and reheat control are allowed during Cooling and Vent modes in the occupied period.

SETTING UP THE SYSTEM

The settings for Humidi-MiZer system can be found at the local display at ***Configuration→DEHU***. See Table 60.

Dehumidification Configuration (D.SEL)

The dehumidification configuration for Humidi-MiZer option is ***D.SEL*** = 4 (DH – HUMDZR).

Dehumidification Sensor (D.SEN)

The sensor can be configured for the following settings:

- ***D.SEN*** = 1 — Initiated by return air relative humidity sensor.
- ***D.SEN*** = 2— Initiated by space relative humidity sensor.
- ***D.SEN*** = 3 — Initiated by discrete input.

The default sensor is the return air relative humidity sensor (***D.SEN*** = 1). Units ordered with the Humidi-MiZer option will have factory-installed return air relative humidity sensors.

Economizer Disable in Humidi-MiZer Mode (D.EC.D)

When ***D.SEL*** = 4 (DH – HUMDZR), this configuration is automatically set to ***D.EC.D*** = YES (Economizer disabled during dehumidification).

Vent Reheat Set Point Select (D.V.CF)

This configuration determines how the vent reheat set point is selected. This set point becomes the supply air set point when the Humidi-MiZer function is initiated and the unit enters a Reheat mode (relative humidity above set point with no cooling demand).

Table 60 — Dehumidification Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
DEHU	DEHUMIDIFICATION CONFIG.				
D.SEL	Dehumidification Config	0-5		DHSELECT	0
D.SEN	Dehumidification Sensor	1-3		DHSENSOR	1
D.EC.D	Econ disable in DH mode?	No/Yes		DHECDISA	Yes
D.V.CF	Vent Reheat Setpt Select	0-1		DHVHTCFG	0
D.V.RA	Vent Reheat RAT offset	0-8	^F	DHVRAOFF	0
D.V.HT	Vent Reheat Setpoint	55-75	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
DH.DB	Dehumidify RH Deadband	1-30	%	DHSENSDB	5
DH.TG	Dehum Discrete Timeguard	10-90	sec	DHDISCTG	30
HZ.RT	Humidi-MiZer Adjust Rate	5-120		HMZRRATE	30
HZ.PG	Humidi-MiZer Prop. Gain	0-10		HMZR_PG	0.8

D.V.CF = 0 — Reheat follows an offset subtracted from return air temperature (***D.V.RA***).

D.V.CF = 1 — Reheat follows a dehumidification heat set point (***D.V.HT***).

Vent Reheat RAT Offset (D.V.RA)

Set point offset used only when the Humidi-MiZer function is initiated and the unit enters a Reheat mode. This occurs when the relative humidity is above set point with no cooling demand. The air will be reheated to return-air temperature less this offset.

Vent Reheat Set Point (D.V.HT)

Set point used only when the Humidi-MiZer function is initiated and the unit enters a Reheat Mode. This occurs when the relative humidity is above set point with no cooling demand. When ***D.V.CF*** = 0, the supply air will be reheated to ***D.V.HT*** minus ***D.V.RA***. When ***D.V.CF*** = 1, the supply air will be reheated to ***D.V.HT***.

Dehumidify Cool Set Point (D.C.SP)

This is the Humidi-MiZer cooling set point used to determine the temperature the air will be cooled to prior to it being reheated to the desired supply-air temperature. This set point is used during the Humidi-MiZer Dehumidification and Reheat modes of operation.

Dehumidify RH Set Point (D.RH.S)

This is the Humidi-MiZer relative humidity trip point.

Dehumidify RH Deadband (DH.DB)

This is the dehumidification relative humidity sensor's deadband.

Dehum Discrete Timeguard (DH.TG)

This is the dehumidification discrete switch's timeguard.

Humidi-MiZer Adjust Rate (HZ.RT)

This is the rate (seconds) at which corrections are made in the position of the modulating valves (***C.EXV*** and ***B.EXV***) to maintain supply air set point.

Humidi-MiZer Proportional Gain (HZ.PG)

This is the proportional gain used in calculating the required valve position change for supply air temperature control. It is essentially the percentage of total reheat capacity adjustment that will be made per degree Fahrenheit of supply air temperature error.

OPERATION

Mode Qualifications

An HVAC: Off, Vent or Cool mode must be in effect to launch a Humidi-MiZer mode.

Sensor Failure

If an associated sensor responsible for controlling Humidi-MiZer fails, dehumidification will not be attempted (***SPRH***, ***RARH***).

Initiating a Humidi-MiZer Reheat or Dehumidification Mode

To call out a Reheat mode in the "Vent" or "Off" HVAC mode, or to call out a Dehumidification mode in a Cool HVAC mode, one of the following must be true:

- The space is occupied and the humidity is greater than the relative humidity trip point (***D.RH.S***).
- The space is occupied and the discrete humidity input is closed.

Ending a Humidi-MiZer Reheat or Dehumidification Mode

When either the humidity sensor falls below relative humidity sensor's dead band % (***Configuration→DEHU→DH.DB***) or below the set point (***Configuration→DEHU→D.RH.S),*** or the discrete input reads "LOW", and discrete switch time guard expires (***Configuration→DEHU→DH.TG***), the Humidi-MiZer mode will end.

Relevant Outputs

The Humidi-MiZer 3-way valve (reheat valve) commanded output can be found in ***Outputs→COOL→RHV***.

The Humidi-MiZer Condenser Modulating Valve (Condenser EXV) position output can be found in ***Outputs →COOL→C.EXV***. The condenser position will be provided as percent open.

HUMIDI-MIZER MODES

Dehumidification Mode (Subcooling)

This mode will be engaged to satisfy part-load type conditions when there is a space call for cooling and dehumidification. Although the temperature may have dropped and decreased the sensible load in the space, the outdoor and/or space humidity levels may have risen. A typical scenario might be when the outside air is 85°F and 70 to 80% relative humidity (RH). Desired SHR for equipment in this scenario is typically from 0.4 to 0.7. The Humidi-MiZer unit will initiate Dehumidification mode when the space temperature and humidity are both above the temperature and humidity set points, and attempt to meet both set point requirements. Once the humidity requirement is met, the unit can continue to operate in normal cooling mode to meet any remaining sensible capacity load. Alternatively, if the sensible load is met and humidity levels remain high, the unit can switch to Hot Gas Reheat mode to provide neutral, dehumidified air.

Reheat Mode

This mode is used when dehumidification is required without a need for cooling, such as when the outside air is at a neutral temperature, but high humidity exists. This situation requires the equipment to operate at a low SHR of 0.0 to 0.2. With no cooling requirement and a call for dehumidification, the N Series Humidi-MiZer adaptive dehumidification system will cycle on enough compressors to meet the latent load requirement, while simultaneously adjusting refrigerant flow to the Humidi-MiZer coil to reheat the air to the desired neutral air set point.

The N Series Humidi-MiZer system controls allow for the discharge air to be reheated to either the return air temperature minus a configurable offset or to a configurable Reheat set point (default 70°F). The hot gas reheat mode will be initiated when only the humidity is above the humidity set point, without a demand for cooling.

System Control

The essential difference between the De-humidification mode and the Reheat mode is in the supply air set point. In Dehumidification mode, the supply air set point is the temperature required to provide cooling to the space. This temperature is whatever the cooling control point would have been in a normal cooling mode. In Reheat mode, the supply air set point will be either an offset subtracted from return air temperature (***D.V.RA***) or the Vent Reheat Set Point (***D.V.HT***). Both values are configurable. For both Dehumidification mode and Reheat mode, the unit compressor staging will decrease the evaporator discharge temperature to the Dehumidify Cool Set Point (***D.C.SP COOL***) in order to meet the latent load and reheat the air to the required cooling or reheat set point. There is a thermistor array called ***Temperatures→AIR.T→CCT*** connected to the RCB. This thermistor array serves as the evaporator discharge temperature (EDT). See Fig. 14.

The N-Series Humidi-MiZer® system uses refrigerant flow modulation valves that provide accurate control of the leaving-air temperature as the evaporator discharge temperature is decreased to meet the latent load. As the refrigerant leaves the compressor, the modulating valves vary the amount of refrigerant that enters and/or bypasses the condenser coil. As the bypassed and hot refrigerant liquid, gas, or 2-phase mixture passes through the Humidi-MiZer coil, it is exposed to the cold supply airflow coming from the evaporator coil. The refrigerant is subcooled in this coil to a temperature approaching the evaporator leaving air temperature. The liquid refrigerant then enters an electronic expansion valve (EXV) where the refrigerant pressure is decreased. The refrigerant enters the EXV and evaporator coil at a temperature lower than in standard cooling operation. This lower temperature increases the latent capacity of the evaporator. The refrigerant passes through the evaporator and is turned into a superheated vapor. The air passing over the evaporator coil will become colder than during normal operation. However, as this same air passes over the Humidi-MiZer reheat coil, it will be warmed to meet the supply air set point temperature requirement. See Fig. 15.

During dehumidification with Humidi-MiZer (***Configuration→DEHU→D.SEL***=4), If dehum results in over-cooling (If Humidimizer capacity is not sufficient to heat it up enough), there will be a transition from dehum to heat mode for ***Configuration→HEAT→HT.CF***=1 or 2 or 5 (2-stage electric heat or 2-stage gas heat or SCR electric heat) and all compressors will turn OFF. This requirement on heating after cooling is that compressors must shut down and cannot be powered when electric heat powers up. This large power draw can result in blown fuses and a fire hazard.

During Heating Dehum mode with Humidi-MiZer (***Configuration→DEHU→D.SEL***=4), control enables Staged Gas or Hydronic heat sources (***Configuration→HEAT→HT.CF***=3 or 4) as Reheat sources along with Humidi-MiZer reheat. This is called supplemental reheat.

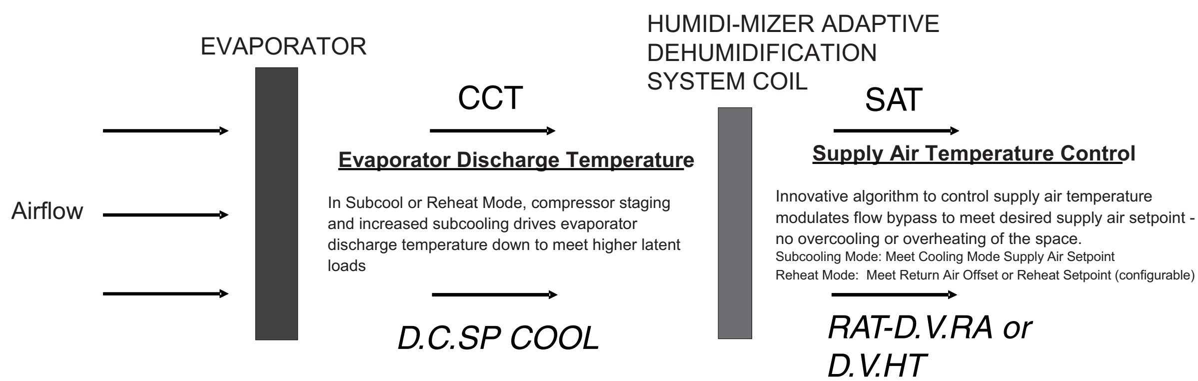


Fig. 14 — Humidi-MiZer® System Control

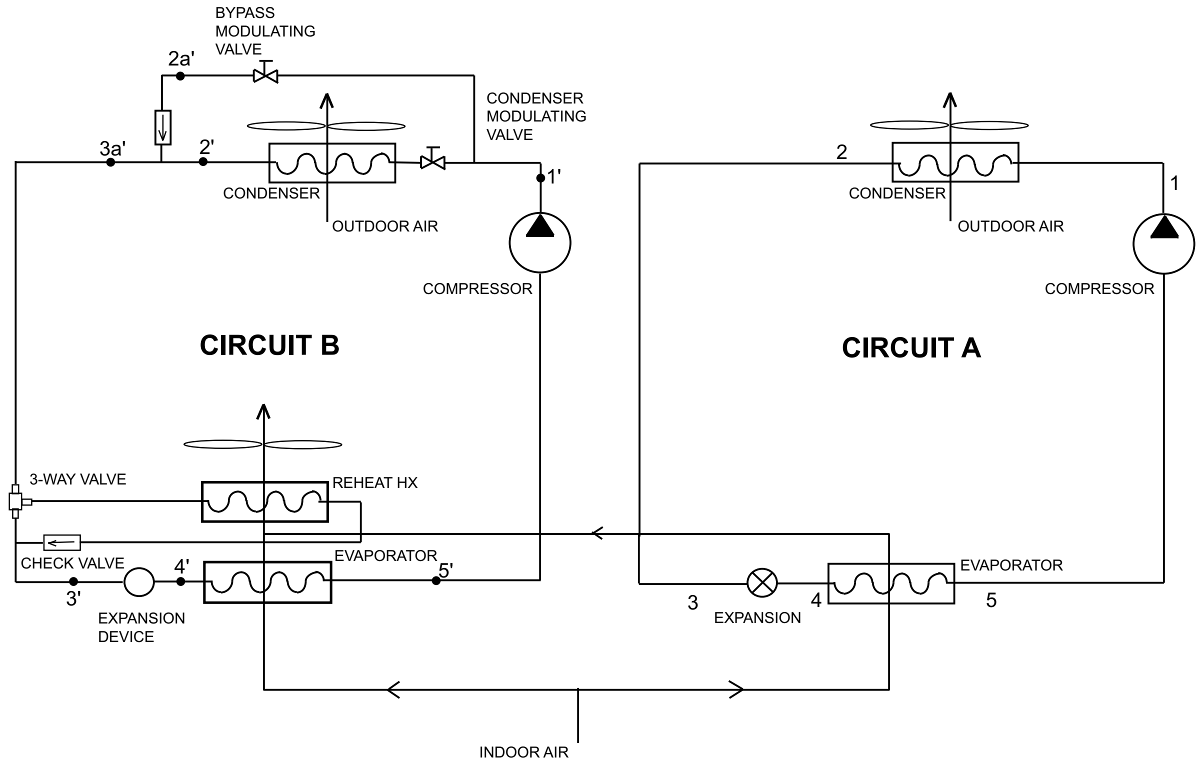


Fig. 15 — Humidi-MiZer System Diagram

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 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) 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 to 60	min	TCSTCOOL
TCS.H	Temp.Cmp.Strt.Heat Factr	0 to 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*** submenu in the ***Configuration*** mode.

The major configurations for CCN programming are located in the local displays at ***Configuration→IAQ→CCN***. See Table 61.

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 standalone, 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 and acknowledge. Only one device per bus can be configured for this option.

Schedule Number (SCH.N)

This configuration determines what schedule the control may follow.

SCH.N = 0 The control is always occupied.

SCH.N = 1 The control follows its internal time schedules. The user may enter any number between 1 and 64, but it will be overwritten to “1” by the control, as it only has one internal schedule.

SCH.N = 65-99 The control is either set up to receive to a broadcasted time schedule set to this number, or the control is set up to broadcast its internal time schedule (***G.S.B***) to the network, and this is the global schedule number it is broadcasting. If this is the case, then the control still follows its internal time schedules.

Accept Global Holidays? (HOL.T)

If a device is broadcasting the time on the bus, it is possible to accept the time, yet not accept the global holiday from the broadcast message.

Override Time Limit (O.T.L)

This configuration allows the user to decide how long an override occurs when it is initiated. The override may be configured from 1 to 4 hours. If the time is set to 0, the override function will become disabled.

Timed Override Hours (OV.EX)

This displays the current number of hours left in an override. It is possible to cancel an override in progress by writing “0” to this variable, thereby removing the override time left.

SPT Override Enabled? (SPT.O)

If a space sensor is present, then it is possible to override an unoccupied period by pushing the override button on the T55 or T56 sensor. This option allows the user to disable this function by setting this configuration to NO.

T58 Override Enabled? (T58.O)

The T58 sensor is a CCN device that allows cooling/heating set points to be adjusted, space temperature to be written to the rooftop unit, and the ability to initiate a timed override. This option allows the user to disable the override initiated from the T58 sensor by setting this option to NO.

Global Schedule Override? (GL.OV)

If the control is set to receive global schedules, then it is also possible for the global schedule broadcaster to call out an override condition, as well. This configuration allows the user to disable the global schedule broadcaster from overriding the control.

Alert Limit Configuration

The ALLM submenu is used to configure the alert limit set points. A list is shown in Table 62.

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.

Table 61 — CCN Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
CCN	CCN CONFIGURATION				
CCNA	CCN Address	1 to 239		CCNADD	1
CCNB	CCN Bus Number	0 to 239		CCNBUS	0
BAUD	CCN Baud Rate	1 to 5		CCNBAUDD	3
BROD	CCN BROADCST DEFINITIONS				
TM.DT	CCN Time/Date Broadcast	Off/On		CCNBC	On
OAT.B	CCN OAT Broadcast	Off/On		OATBC	Off
ORH.B	CCN OARH Broadcast	Off/On		OARHBC	Off
OAQ.B	CCN OAQ Broadcast	Off/On		OAQBC	Off
G.S.B	Global Schedule Broadcst	Off/On		GSBC	Off
B.ACK	CCN Broadcast Ack'er	Off/On		CCNBCACK	Off
SC.OV	CCN SCHEDULES-OVERRIDES				
SCH.N	Schedule Number	0 to 99		SCHEDNUM	1
HOL.T	Accept Global Holidays?	No/Yes		HOLIDAYT	No
O.T.L.	Override Time Limit	0 to 4	HRS	OTL	1
OV.EX	Timed Override Hours	0 to 4	HRS	OVR_EXT	0
SPT.O	SPT Override Enabled?	No/Yes		SPT_OVER	Yes
T58.O	T58 Override Enabled?	No/Yes		T58_OVER	Yes
GL.OV	Global Sched. Override?	No/Yes		GLBLOVER	No

EDT Low Alert Limit/Occc (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→RRH.S***), and the measured level is above the configurable RARH High Alert Limit (***R.RH.H***), then Alert 309 will occur. The unit will continue to run, and the alert will automatically reset.

OARH Low Alert Limit (O.RH.L)

If the unit is configured to use an outdoor air relative humidity sensor (***Configuration→ECON→ORH.S***) and the measured level is below the configurable OARH Low Alert Limit (***O.RH.L***), then economizer operation will be disabled. The unit will continue to run, and the alert will automatically reset.

OARH High Alert Limit (O.RH.H)

If the unit is configured to use a return air relative humidity sensor (***Configuration→ECON→ORH.S***) and the measured level is above the configurable OARH High Alert Limit (***O.RH.H***), then economizer operation will be disabled. The unit will continue to run, and the alert will automatically reset.

Supply Duct Pressure Low Alert Limit (SP.L)

If the unit is a VAV unit with a supply duct pressure sensor and the measured supply duct static pressure is below the configurable SP Low Alert Limit (***DP.L***), then Alert 310 will occur. The unit will continue to run, and the alert will automatically reset.

Supply Duct Pressure High Alert Limit (SP.H)

If the unit is a VAV unit with a supply duct pressure sensor and the measured supply duct static pressure is above the configurable SP High Alert Limit (***SP.H***), then Alert 311 will occur. The unit will continue to run, and the alert will automatically reset.

Table 62 — Alert Limit Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
SP.L.O	SPT lo alert limit/occ	-10-245	dF	SPLO	60
SP.H.O	SPT hi alert limit/occ	-10-245	dF	SPHO	85
SP.L.U	SPT lo alert limit/unocc	-10-245	dF	SPLU	45
SP.H.U	SPT hi alert limit/unocc	-10-245	dF	SPHU	100
SA.L.O	EDT lo alert limit/occ	-40-245	dF	SALO	40
SA.H.O	EDT hi alert limit/occ	-40-245	dF	SAHO	100
SA.L.U	EDT lo alert limit/unocc	-40-245	dF	SALU	40
SA.H.U	EDT hi alert limit/unocc	-40-245	dF	SAHU	100
RA.L.O	RAT lo alert limit/occ	-40-245	dF	RALO	60
RA.H.O	RAT hi alert limit/occ	-40-245	dF	RAHO	90
RA.L.U	RAT lo alert limit/unocc	-40-245	dF	RALU	40
RA.H.U	RAT hi alert limit/unocc	-40-245	dF	RAHU	100
OAT.L	OAT lo alert limit	-40-245	dF	OATL	-40
OAT.H	OAT hi alert limit	-40-245	dF	OATH	150
R.RH.L	RARH low alert limit	0-100	%	RRHL	0
R.RH.H	RARH high alert limit	0-100	%	RRHH	100
O.RH.L	OARH low alert limit	0-100	%	ORHL	0
O.RH.H	OARH high alert limit	0-100	%	ORHH	100
SP.L	SP low alert limit	0-5	"H2O	SPL	0
SP.H	SP high alert limit	0-5	"H2O	SPH	2
BP.L	BP lo alert limit	-0.25-0.25	"H2O	BPL	-0.25
BP.H	BP high alert limit	-0.25-0.25	"H2O	BPH	0.25
IAQ.H	IAQ high alert limit	0-5000		IAQH	1200

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 63.

> IMPORTANT: Sensor trim must not be used to extend unit operation past the allowable operating range. Doing so may impair or negatively affect the Carrier product warranty.

Air Temperature Leaving Supply Fan Sensor (SAT.T)

This variable is used to adjust the supply fan temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Return Air Temperature Sensor Trim (RAT.T)

This variable is used to adjust the return air temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Outdoor Air Temperature Sensor Trim (OAT.T) —

This variable is used to adjust the outdoor air temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Space Temperature Sensor Trim (SPT.T)

This variable is used to adjust the space temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Limit Switch Trim (L.SW.T)

This variable is used to adjust the limit switch temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

Air Temperature Leaving Evaporator Trim (CCT.T)

This variable is used to adjust the leaving evaporator temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

A1 Discharge Temperature (DTA.1)

This variable is used to adjust the A1 compressor discharge temperature sensor reading. The sensor reading can be adjusted ± 10°F to match the actual measured temperature.

NOTE: Due to the resolution of the control board analog input, temperature readings less than 50°F will become increasingly inaccurate as the temperature decreases.

Suction Pressure Circuit A Trim (SP.A.T)

This variable is used to adjust the suction pressure sensor reading for Circuit A. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Suction Pressure Circuit B Trim (SP.B.T)

This variable is used to adjust the suction pressure sensor reading for Circuit B. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Discharge Pressure Circuit A Trim (DP.A.T)

This variable is used to adjust the discharge pressure sensor reading for Circuit A. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Discharge Pressure Circuit B Trim (DP.B.T)

This variable is used to adjust the discharge pressure sensor reading for Circuit B. The sensor reading can be adjusted ±50 psig to match the actual measured pressure.

Liquid Pressure Circuit A Trim (LP.A.T)

This variable is used to adjust the liquid pressure sensor reading for Circuit A. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Liquid Pressure Circuit B Trim (LP.B.T)

This variable is used to adjust the liquid pressure sensor reading for Circuit B. The sensor reading can be adjusted ± 50 psig to match the actual measured pressure.

Table 63 — Sensor Trim Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
TRIM	SENSOR TRIM CONFIG.				
SAT.T	Air Temp Lvg SF Trim	-10 to 10	^F	SAT_TRIM	0
RAT.T	RAT Trim	-10 to 10	^F	RAT_TRIM	0
OAT.T	OAT Trim	-10 to 10	^F	OAT_TRIM	0
SPT.T	SPT Trim	-10 to 10	^F	SPT_TRIM	0
L.SW.T	Limit Switch Trim	-10 to 10	^F	LSW_TRIM	0
CCT.T	Air Temp Lvg Evap Trim	-10 to 10	^F	CCT_TRIM	0
DTA.1	A1 Discharge Temp Trim	-10 to 10	^F	DTA1TRIM	0
SP.A.T	Suct.Press.Circ.A Trim	-50 to 50	^F	SPA_TRIM	0
SP.B.T	Suct.Press.Circ.B Trim	-50 to 50	^F	SPB_TRIM	0
DP.A.T	Dis.Press.Circ.A Trim	-50 to 50	^F	DPA_TRIM	0
DP.B.T	Dis.Press.Circ.B Trim	-50 to 50	^F	DPB_TRIM	0
LP.A.T	Lqd.Press.Circ.A Trim	-50 to 50	^F	LPA_TRIM	0
LP.B.T	Lqd.Press.Circ.B Trim	-50 to 50	^F	LPB_TRIM	0

4 to 20 mA Inputs

There are a number of 4 to 20 mA inputs which may be calibrated. These inputs are located in ***Inputs→4-20***. They are:

- ***SP.M.T*** — static pressure milliamp trim
- ***BP.M.T*** — building pressure milliamp trim
- ***OA.M.T*** — outside air cfm milliamp trim
- ***RA.M.T*** — return air cfm milliamp trim
- ***SA.M.T*** — supply air cfm milliamp trim

Discrete Switch Logic Configuration

The ***SW.LG*** submenu is used to configure the normally open/normally closed settings of switches and inputs. This is used when field-supplied switches or input devices are used instead of Carrier devices. The normally open or normally closed setting may be different on a field-supplied device. These points are used to match the control logic to the field-supplied device.

The defaults for this switch logic section will not normally need changing. However, if a field-installed switch is used that is different from the Carrier switch, these settings may need adjustment.

> IMPORTANT: Many of the switch inputs to the control can be configured to operate as normally open or normally closed.

Settings for switch logic are found at the local displays under the ***Configuration→IAQ→SW.LG*** submenu. See Table 64.

Filter Status Input — Clean (MFT.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.

Post Filter Status Input — Clean (PFT.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.

SF Bypass Switch — Off (SFB.L)

The Supply Fan bypass switch is normally open when off. It allows operation of the supply fan through a bypass of the supply fan VFD.

PE Bypass Switch — Off (PEB.L)

The Power Exhaust bypass switch is normally open when off. It allows for operation of the exhaust fan through a bypass of the exhaust fan VFD.

Table 64 — Switch Logic Configuration

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULT
SW.LG	SWITCH LOGIC: NO / NC			
PWS.L	Power Fault Input - Good	Open/Close	PWRFLOGC	Close
MFT.L	Filter Status Input - Clean	Open/Close	FLTSLOGC	Open
PFT.L	Post Filter Stat. In-Clean	Open/Close	PFLTSLGC	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
SFB.L	SF Bypass Sw. - Off	Open/Close	SFBYLOGC	Open
PEB.L	PE Bypass Sw. - Off	Open/Close	PEBYLOGC	Open

Display Configuration

The ***DISP*** submenu is used to configure the local display settings. A list is shown in Table 65.

Test Display LEDs (TEST)

This is used to test the operation of the *Comfort*Link display.

Metric Display (METR)

This variable is used to change the display from English units to Metric units.

Language Selection (LANG)

This variable is used to change the language of the *Comfort*Link display. At this time, only English is available.

Password Enable (PAS.E)

This variable enables or disables the use of a password. The password is used to restrict use of the control to change configurations.

Service Password (PASS)

This variable is the 4-digit numeric password that is required if enabled.

VFD Configurations

There are 2 submenus under the Configuration menu, ***Configuration→IAQ→S.VFD*** and ***Configuration→IAQ→E.VFD***. These configurations are for the supply fan or optional exhaust fan variable frequency drives (VFDs). These submenus contain the configurations required for the supply fan and exhaust fan VFDs. This section defines the configurations in these submenus. See Tables 66 and 67. Further information on VFD configurations can be found in Appendix D.

SUPPLY FAN VFD CONFIGURATION

The submenu that contains these configurations is located at the local display under ***Configuration→IAQ→S.VFD***.

VFD1 Nominal Motor Volts (N.VLT)

This configuration defines the nominal motor voltage. This value must equal the value on the motor rating plate. This value sets the maximum drive output voltage supplied to the motor.

NOTE: The VFD cannot supply the motor with a greater voltage than the voltage supplied to the input of the VFD. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor Amps (N.AMP)

This configuration defines the nominal motor current. This value must equal the value defined in the Supply Fan Motor Limitations Table 21. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor Freq (N.FRQ)

This configuration defines the nominal motor frequency. This value must equal the value on the motor rating plate. This value sets the frequency at which the output voltage equals the Nominal Motor Volts (***N.VLT***). Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor RPM (N.RPM)

This configuration defines the nominal motor speed. This value must equal the value on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Nominal Motor HPwr (N.PWR)

This configuration defines the nominal motor power. This value must equal the value of the combined HP of both motors. Motor HP is found on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Motor Direction (M.DIR)

This configuration sets the direction of motor rotation. Motor direction change occurs immediately upon a change to this configuration. Power to the VFD need NOT be cycled for a change to this configuration to take effect.

VFD1 Acceleration Time (ACCL)

This configuration sets the acceleration time from zero to maximum output frequency. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Deceleration Time (DECL)

This configuration sets the deceleration time from maximum output frequency to zero. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD1 Switching Frequency (SW.FQ)

This configuration sets the switching frequency for the drive. Power to the VFD must be cycled in order for a change to this configuration to take effect.

Table 65 — Display Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
TEST	Test Display LEDs	Off/On		TEST	Off
METR	Metric Display	Off/On		DISPUNIT	Off
LANG	Language Selection	0-1(multi-text strings)		LANGUAGE	0
PAS.E	Password Enable	Disable/Enable		PASS_EBL	Enable
PASS	Service Password	0000-9999		PASSWORD	1111

Table 66 — Supply Fan VFD Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
S.VFD	SUPPLY FAN VFD CONFIG				
N.VLT	VFD1 Nominal Motor Volts	0 to 999	Volts	VFD1NVLT	460*
N.AMP	VFD1 Nominal Motor Amps	0 to 999	Amps	VFD1NAMP	55.0*
N.FRQ	VFD1 Nominal Motor Freq	10 to 500	Hz	VFD1NFRQ	60
N.RPM	VFD1 Nominal Motor RPM	50 to 30000	RPM	VFD1NRPM	1750
N.PWR	VFD1 Nominal Motor HPwr	0 to 500	HP	VFD1NPWR	40*
M.DIR	VFD1 Motor Direction	0=FWD, 1=REV		VFD1MDIR	0
ACCL	VFD1 Acceleration Time	0 to 1800	sec	VFD1ACCL	30
DECL	VFD1 Deceleration Time	0 to 1800	sec	VFD1DECL	30
SW.FQ	VFD1 Switching Frequency	0=1kHz, 1=4kHz, 2=8kHz, 3=12kHz		VFD1SWFQ	2

* This default is model number dependent.

Table 67 — Exhaust Fan VFD Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULTS
E.VFD	EXHAUST FAN VFD CONFIG				
N.VLT	VFD2 Nominal Motor Volts	0 to 999	Volts	VFD2NVLT	460*
N.AMP	VFD2 Nominal Motor Amps	0 to 999	Amps	VFD2NAMP	28.7*
N.FRQ	VFD2 Nominal Motor Freq	10 to 500	Hz	VFD2NFRQ	60
N.RPM	VFD2 Nominal Motor RPM	50 to 30000	RPM	VFD2NRPM	1750
N.PWR	VFD2 Nominal Motor HPwr	0 to 500	H.P.	VFD2NPWR	20*
M.DIR	VFD2 Motor Direction	0=FWD, 1=REV		VFD2MDIR	0
ACCL	VFD2 Acceleration Time	0 to 1800	sec	VFD2ACCL	30
DECL	VFD2 Deceleration Time	0 to 1800	sec	VFD2DECL	30
SW.FQ	VFD2 Switching Frequency	0=1kHz, 1=4kHz, 2=8kHz, 3=12kHz		VFD2SWFQ	2

* This default is model number dependent.

EXHAUST FAN VFD CONFIGURATION

The submenu that contains these configurations is located at the local display under ***Configuration→IAQ→E.VFD***.

VFD2 Nominal Motor Volts (N.VLT)

This configuration defines the nominal motor voltage. This value must equal the value on the motor rating plate. This value sets the maximum drive output voltage supplied to the motor.

NOTE: The VFD cannot supply the motor with a greater voltage than the voltage supplied to the input of the VFD. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor Amps (N.AMP)

This configuration defines the nominal motor current. This value must equal the value defined in:

- the High-Capacity Power Exhaust Systems Motor Limitations table (Table 22) if ***BP.CF***=4
- the Supply Fan Motor Limitations table (Table 21) if ***BP.CF***=5
- the Optional VFD Power Exhaust Motor Limitations table (Table 68) if ***BP.CF***=3

Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor Freq (N.FRQ)

This configuration defines the nominal motor frequency. This value must equal the value on the motor rating plate. This value sets the frequency at which the output voltage equals the Nominal Motor Volts (***N.VLT***). Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor RPM (N.RPM)

This configuration defines the nominal motor speed. This value must equal the value on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Nominal Motor HPwr (N.PWR)

This configuration defines the nominal motor power. This value must equal the value on the motor rating plate. Power to the VFD must be cycled in order for a change to this configuration to take effect.

Table 68 — Optional VFD Power Exhaust (PE) Motor Limitations (FLA)

POWER EXHAUST HP	UNIT VOLTAGE			
	208/230	**380**	**460**	**575**
High Efficiency PE				
6	20.4	10.0	9.6	7.6
10	30.6	18.2	12.8	10.2
15	44.8	24.4	19.4	15.6
20	58.6	32.4	26.8	20.6
Premium Efficiency PE				
6	16.0	—	8.0	—
10	29.4	—	13.6	—
15	43.0	—	19.4	—
20	56.0	—	25.2	—

VFD2 Motor Direction (M.DIR)

This configuration sets the direction of motor rotation. Motor direction change occurs immediately upon a change to this configuration. Power to the VFD need **NOT** be cycled for a change to this configuration to take effect.

VFD2 Acceleration Time (ACCL)

This configuration sets the acceleration time from zero to maximum output frequency. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Deceleration Time (DECL)

This configuration sets the deceleration time from maximum output frequency to zero. Power to the VFD must be cycled in order for a change to this configuration to take effect.

VFD2 Switching Frequency (SW.FQ)

This configuration sets the switching frequency for the drive. Power to the VFD must be cycled in order for a change to this configuration to take effect.

Remote Control Switch Input

The remote switch input is located on the RXB board and connected to TB201 terminals 3 and 4. The switch can be used for several remote control functions. See Table 69.

Remote Input State (Inputs→GEN.I→REMT)

This is the actual real time state of the remote input.

Table 69 — Remote Switch Configuration

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
REMT	Remote Input State	Off/On		RMTIN
RM.CF	Remote Switch Config	0 to 3		RMTINCFG
RMI.L	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG

Remote Switch Config (Configuration→UNIT→ RM.CF)

This is the configuration that allows the user to assign different types of functionality to the remote discrete input.

- 0 — NO REMOTE SW — The remote switch will not be used.
- 1 — OCC-UNOCC SW — The remote switch input will control the occupancy state. When the remote switch input is ON, the unit will be 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 70.

Hot Gas Bypass

The *Comfort*Link control system supports the use of an optional minimum load hot gas bypass valve (MLV) that is directly controlled by the *Comfort*Link control system. This provides an additional stage of capacity as well as low load coil freeze protection. Hot gas bypass is an active part of the N-Series *Comfort*Link capacity staging and minimum evaporator load protection functions. It is controlled though the Minimum Load Valve function. The hot gas bypass option consists of a solenoid valve with a fixed orifice sized to provide a nominal 3-ton evaporator load bypass. A hot gas refrigerant line routes the bypassed hot gas from the discharge line of Circuit A to the suction line of Circuit A. An additional thermistor in the suction line allows the unit control to monitor suction superheat. When the unit control calls for hot gas bypass, the hot gas bypasses the evaporator and adds refrigeration load to the compressor circuit to reduce the cooling effect from Circuit A.

The hot gas bypass system is a factory-installed option installed on Circuit A only. This function is enabled at ***Configuration→COOL→MLV***. When this function is enabled, an additional stage of cooling capacity is provided by the unit control staging sequences (see Appendix C).

Space Temperature Offset

Space Temperature Offset corresponds to a slider on a T56 sensor that allows the occupant to adjust the space temperature by a configured range during an occupied period. This sensor is only applicable to units that are configured as Multi-Stage SPT control (***Configuration→UNIT→C.TYP*** = 4).

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
SP.O.S	Space Temp Offset Sensor	Enable/Disable		SPTOSENS
SP.O.R	Space Temp Offset Range	1 to 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 70 — 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 menu is shown in Table 71.

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 weekday (Monday through Sunday).

Year (*YEAR*)

This variable is the current year (for example, 2020).

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 29 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.

Holiday Duration (HD.01 to HD.30→LEN)

This is the length in days of the holiday. The holiday can be 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 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.

Table 71 — Time Clock Menu

ITEM	EXPANSION	RANGE	CCN POINT	DEFAULT
TIME	**TIME OF DAY**			
HH.MM	Hour and Minute	00:00	TIME	
DATE	**MONTH,DATE,DAY AND YEAR**			
MNTH	Month of Year	multi-text strings	MOY	
DOM	Day of Month	0-31	DOM	
DAY	Day of Week	multi-text strings	DOWDISP	
YEAR	Year	e.g. 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	No/Yes	PER1MON	Yes
PER.1→DAYS→TUE	Tuesday in Period	No/Yes	PER1TUE	Yes
PER.1→DAYS→WED	Wednesday in Period	No/Yes	PER1WED	Yes
PER.1→DAYS→THU	Thursday in Period	No/Yes	PER1THU	Yes
PER.1→DAYS→FRI	Friday in Period	No/Yes	PER1FRI	Yes
PER.1→DAYS→SAT	Saturday in Period	No/Yes	PER1SAT	Yes
PER.1→DAYS→SUN	Sunday in Period	No/Yes	PER1SUN	Yes
PER.1→DAYS→HOL	Holiday in Period	No/Yes	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 to 12	STARTM	4
DS.ST→ST.WK	Week	1 to 5	STARTW	1
DS.ST→ST.DY	Day	1 to 7	STARTD	7
DS.ST→MIN.A	Minutes to Add	0 to 90	MINADD	60
DS.SP	**DAYLIGHTS SAVINGS STOP**			
DS.SP→SP.MN	Month	1 to 12	STOPM	10
DS.SP→SP.WK	Week	1 to 5	STOPW	5
DS.SP→SP.DY	Day	1 to 7	STOPD	7
DS.SP→MIN.S	Minutes to Subtract	0 to 90	MINSUB	60

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).

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 Navigator™ 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 121, 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 72-75 and Fig. 16.

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 a problem, the unit should be diagnosed in Service Test mode. The alarms must be reset before the circuit can operate in either Normal mode or Service Test mode.

Humidi-MiZer® Troubleshooting

Use the unit Navigator or a CCN device to view the status display and the diagnostic display for information concerning cooling operation with the Humidi-MiZer system. Check the Current Alarms and Alarm History for any unresolved alarm codes and correct. Verify Humidi-MiZer configuration settings are correct for the site requirements. If alarm conditions are corrected and cleared, then operation of the compressors, fans, and Humidi-MiZer valves may be verified by using the Service Test mode. See page 29. In addition to the Cooling Service Analysis (Table 72), see the Humidi-MiZer Service Analysis (Table 73) for more information.

Thermistor Troubleshooting

The OAT, RAT, EDT, LAT, T55, T56, and T58 temperature sensors use 10K thermistors. Resistances at various temperatures are listed in Tables 76 and 77. The DTA1, LT-A and LT-B use an 86K thermistor. See Table 78. The ST-A1, ST-A2, ST-B1, ST-B2 and RTA1 use a 5K thermistor. See Tables 79 and 80.

THERMISTOR/TEMPERATURE SENSOR CHECK

A high quality digital volt-ohmmeter is required to perform this check.

1. With the unit powered down, remove the terminal strip of the thermistor being diagnosed from the appropriate control board (MBB-J8 or RCB-J6). Connect the digital ohmmeter across the appropriate thermistor terminals in the terminal strip.
2. Using the resistance reading obtained, read the sensor temperature from the appropriate sensor table.
3. To check thermistor accuracy, measure the temperature at the thermistor location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. The temperature measured by the thermocouple and the temperature determined from the thermistor resistance reading should be within 5°F (3°C) if care was taken in applying thermocouple and taking readings.

If a more accurate check is required, unit must be powered down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) by measuring the resistance of the thermistor with the terminal strip removed from the control board. With the terminal strip plugged back into the control board and the unit powered up, compare the temperature determined from the resistance measurement with the value displayed by the control in the Temperatures menu using the Navigator display.

Transducer Troubleshooting

The electronic control uses 2 suction and 2 discharge pressure transducers to measure the suction pressure of Circuits A and B. The pressure/voltage characteristics of these transducers are in shown in Tables 81 and 82. The accuracy of these transducers can be verified by connecting an accurate pressure gage to the second refrigerant port in the suction line.

Forcing Inputs and Outputs

Many variables may be forced both from the CCN and directly at the local display. This can be useful during diagnostic testing and also during operation, typically as part of an advanced third party control scheme. See Appendix A and B.

NOTE: In the case of a power reset, any force levels in effect at the time of the power reset will be cleared.

CONTROL LEVEL FORCING

If any of the following points are forced with a priority level of 7 (consult CCN literature for a description of priority levels), the software clears the force from the point if it has not been written to or forced again within the timeout periods defined below:

Temperatures→AIR.T→OAT	Outside Air Temperature	30 minutes
Temperatures→AIR.T→RAT	Return Air Temperature	3 minutes
Temperatures→AIR.T→SPT	Space Temperature	3 minutes
Inputs→RSET→SP.RS	Static Pressure Reset	30 minutes
Inputs→REL.H→OA.RH	Outside Air Relative Humidity	30 minutes
Inputs→AIR.Q→OAQ	Outside Air Quality	30 minutes

Table 72 — Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and Fan Will Not Start	Power failure.	Check power source. Call power company.
	Fuse blown or circuit breaker tripped. Check fuses and circuit breakers in power and control panels.	Replace fuse or reset circuit breaker.
	Disconnect off.	Power disconnect.
	Compressor time guard to prevent short cycling.	Check using *Comfort*Link Navigator display.
	Thermostat or occupancy schedule set point not calling for Cooling.	Check using *Comfort*Link Navigator display.
	Outdoor temperature too low.	Check Compressor Lockout Temperature (***MC.LO***) using *Comfort*Link Navigator display.
	Active alarm.	Check active alarms using *Comfort*Link Navigator display.
Compressor Cycles (Other Than Normally Satisfying Thermostat)	Insufficient line voltage.	Determine cause and correct.
	Active alarm.	Check active alarms using *Comfort*Link Navigator display.
Compressor 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 EXV.	1. Check ST thermistor mounting and secure tightly to suction line and insulate. 2. Replace EXV (and filter drier) if stuck open or closed. 3. Run EXV auto-component test.
	EXV board malfunction.	Check alarm history for A169 (expansion valve control board comm. failure).
	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 EXV.	1. Check ST thermistor mounting and secure tightly to suction line and insulate. 2. Replace EXV (and filter drier) if stuck open or closed. 3. Run EXV auto-component test.
	EXV board malfunction.	Check alarm history for A169 (expansion valve control board comm. failure).
	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 EXV.	1. Check ST thermistor mounting and secure tightly to suction line and insulate. 2. Replace EXV (and filter drier) if stuck open or closed. 3. Run EXV auto-component test.
	EXV board malfunction.	Check alarm history for A169 (expansion valve control board comm. failure).
	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

EXV — Expansion Valve Control Board
ST — Suction Temperature

Table 73 — Humidi-MiZer® Service Analysis

PROBLEM	CAUSE	REMEDY
Subcooling Mode Will Not Activate	Circuit B compressors unavailable	Check alarm history for general cooling mode operation problems. See Table 72.
		Check for Circuit B compressors locked out.
	General Cooling Mode problem	See Table 72.
	Humidi-MiZer relative humidity sensor not functioning - RARH, SPRH, or field-installed RH sensor	Check that a relative humidity sensor is connected and that the appropriate sensor is configured in the unit software, (***Configuration→DEHU→D.SEN).*** See page 89.
		Check for 24VDC from CEM (RARH, SPRH).
		Check 4-20 mA signal from sensor.
	Humidi-MiZer temperature sensors not functioning - SAT, CCT	See “Thermistor Troubleshooting,” page 103.
	No Dehumidification demand	See “No Dehumidification Demand,” below.
	3-way valve malfunction	See “3-Way Valve Malfunction,” below.
	Unit control software is not configured for Humidi-MiZer system	Check that the unit is configured for Humidi-MiZer system ***(Configuration→DEHU→D.SEL)***.
Reheat Mode Will Not Activate	Circuit B compressors unavailable	Check alarm history for general cooling mode operation problems. See Table 72.
		Check for Circuit B compressors locked out.
	Humidi-MiZer relative humidity sensor not functioning - RARH, SPRH, or field-installed RH sensor	Check that a relative humidity sensor is connected and that the appropriate sensor is configured in the unit software, ***(Configuration→DEHU→D.SEN***). See page 89.
		Check for 24 VDC from CEM (RARH, SPRH).
		Check 4-20 mA signal from sensor.
	No Dehumidification demand	See “No Dehumidification Demand,” below.
	3-way valve malfunction	See “3-Way Valve Malfunction” below.
	Unit control software is not configured for Humidi-MiZer system	Check that the unit is configured for Humidi-MiZer system ***(Configuration →DEHU→D.SEL)***.
No Dehumidification Demand	Relative Humidity set point is too low - discrete input (Humidistat, Thermidistat, etc.)	Check/reduce setting on discrete humidity input device.
	Relative Humidity set point is too low - RH sensor	Check the dehumidification relative humidity trip point (***Configuration→DEHU→D.RH.S)***.
	Software configuration error for the type of relative humidity sensor being used	Check that the unit software is configured for the correct relative humidity sensor ***(Configuration→DEHU→D.SEN***). ***D.SEN =*** 1: RARH, 2:SPRH, 3: Discrete Input. See page 89.
	No humidity signal	Check wiring and sensor.
3-Way Valve Malfunction	No 24V signal to input terminals	Check using Service Test mode.
		Check wiring.
		Check transformer and circuit breakers.
		Check RCB relay output.
	Solenoid coil burnout	Check continuous over-voltage is less than 10%.
		Check continuous under-voltage is less than 15%.
		Check for missing coil assembly parts.
		Replace solenoid coil.
	Stuck valve	Replace valve. Replace filter drier.
Unit Initiates a Humidi-MiZer Reheat Mode, but Supply Air Temperature is Overheating/ Overcooling the Space	Humid-MiZer Vent Reheat Set Point is too low	Check the Vent Reheat Set Point Selection ***(Configuration →DEHU→D.V.CF)*** and Vent Reheat Setpoint ***(Configuration→DEHU→ D.V.HT).*** If used, check the Vent Reheat RAT Offset also ***(Configuration→DEHU→D.V.RA).*** See page 90 for Humid-MiZer controls set-up.
	Evaporator discharge temperature (CCT) or supply air temperature (SAT) thermistor is reading incorrectly.	See “Thermistor Troubleshooting,” page 103.
		Check if SAT thermistor is in a location that is measuring stratified air.
	Valve controlling gas bypass around the condenser is not functioning properly	See “Modulating Valves Not Functioning Properly.”
	Valve controlling refrigerant flow to the condenser is not functioning properly	See “Modulating Valves Not Functioning Properly.”
	Modulating valves are not calibrated properly	Run valve calibration through Service Test.
	Unit control software indicates a Humidi-MiZer Reheat Mode, but the 3-way valve is not functioning properly	See “3-Way Valve Malfunction.”
	Unit is not sized to meet the load at the current entering air and outdoor conditions	Check product data tables or ECAT for rated capacity at current entering air and outdoor conditions.

Table 73 — Humidi-MiZer® Service Analysis (cont)

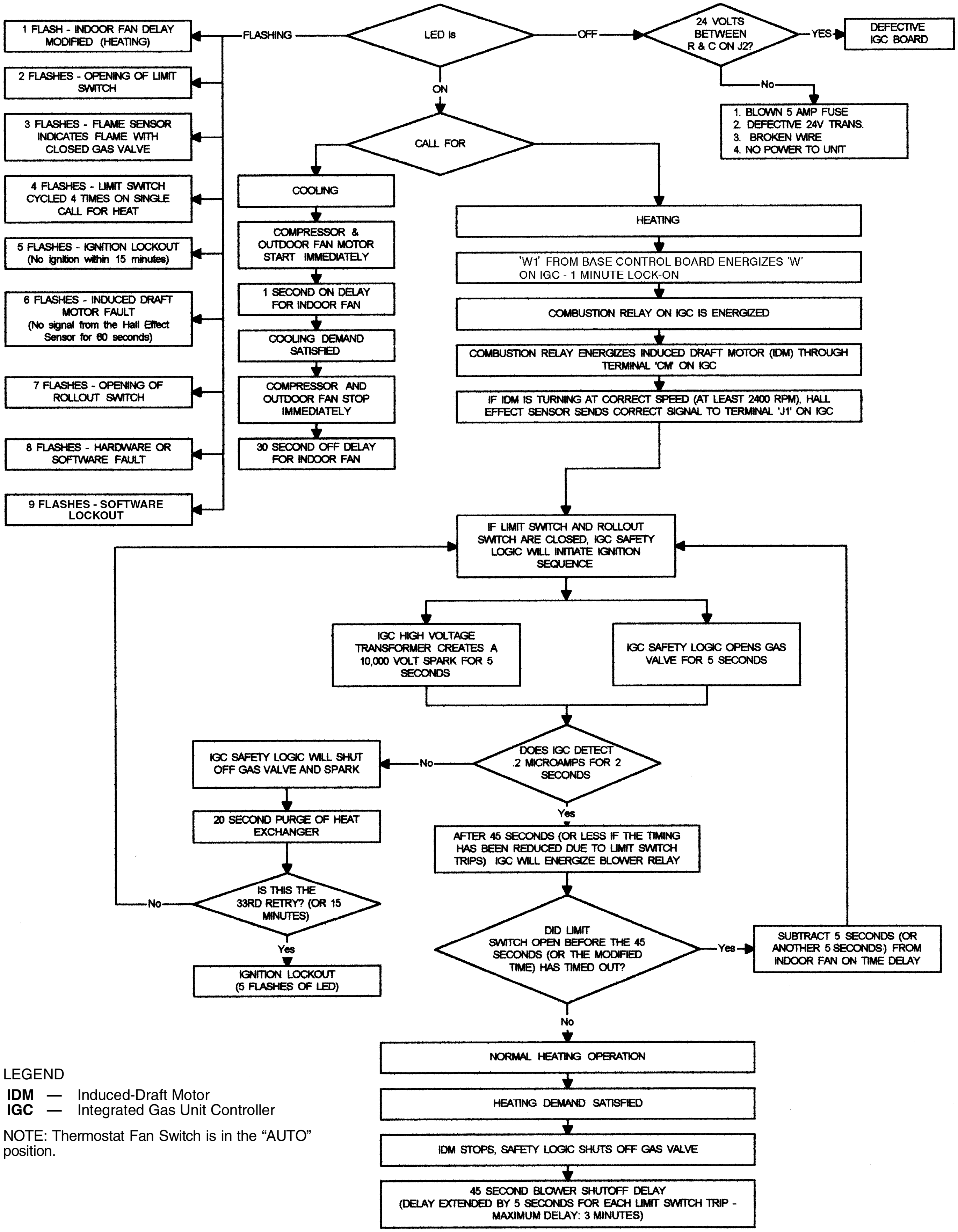
PROBLEM	CAUSE	REMEDY
Unit Initiates a Humidi-MiZer Dehumidification Mode, but Supply Air Temperature is Overheating/Overcooling the Space	Supply air set point for cooling is too high/low	Check the unit supply air set point for cooling operation. This is the temperature that the valves will modulate to meet during a dehumidification mode.
	Evaporator discharge temperature (CCT) or supply air temperature (SAT) thermistor is reading incorrectly	See “Thermistor Troubleshooting” on page 103.
		Check if SAT thermistor is in a location that is measuring stratified air.
	Valve controlling gas bypass around the condenser is not functioning properly	See “Modulating Valves Not Functioning Properly.”
	Valve controlling refrigerant flow to the condenser is not functioning properly	See “Modulating Valves Not Functioning Properly.”
	Modulating valves are not calibrated properly	See “Modulating Valves Not Functioning Properly.”
	Unit control software indicates a Humidi-MiZer Reheat Mode, but the 3-way valve is not functioning properly.	See “3-Way Valve Malfunction.”
	Unit is not sized to meet the load at the current entering air and outdoor conditions.	Check product data tables or ECAT for rated capacity at current entering air and outdoor conditions.
Low Sensible Capacity in Normal Cooling Mode	Valve controlling gas bypass around the condenser is stuck in an open position or leaking.	See “Modulating Valves Not Functioning Properly.”
	Valve controlling refrigerant flow to the condenser is stuck in a position less than 100% open.	See “Modulating Valves Not Functioning Properly.”
	General cooling mode problem	See Table 72.
Modulating Valves Not Functioning Properly	Faulty wire connections	Check that the valve wiring is properly connected from the valve, entering the control box and at the EXV board.
	EXV board malfunction	Check alarm history for A169 (Expansion Valve Control Board Comm Failure.)
	Valve is stuck open/closed	Use Service Test to manually manipulate the valve position and confirm supply air temperature changes during operation.
		Run valve calibration through Service Test.
		Check valve motor for open or short circuited windings. Shut down power to the unit and connect ohmmeter probes across the black and white terminals. Resistance should measure 75 ohms ±10%. Next, connect ohmmeter probes across the red and green terminals. Resistance should measure 75 ohms ±10%. The meter should not show an “open” or a “short” when a winding leg is measured. If either occurs, replace the valve.
	Valve is not calibrated properly.	Run valve calibration through Service Test.

Table 74 — Gas Heating Service Analysis

PROBLEM	CAUSE	REMEDY
Burners Will Not Ignite	Active alarm.	Check active alarms using *Comfort*Link Navigator display.
	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 Navigator display.
	Thermostat or occupancy schedule set point not calling for Cooling.	Check using *Comfort*Link Navigator display.
	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.
	[Post Filter Option Only] Air Flow Switch.	Check switch and wiring. Switch closes when supply fan operating.
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 Navigator display.
	Limit switch cycles main burners.	Check rotation of blower, thermostat heat anticipator settings, and temperature rise of unit. Adjust as needed.
	[Modulating Gas Only] No 24 vac at Modulating Gas Module.	Check transformers TRAN4 and TRAN5 in gas section.
	[Modulating Gas. Only] Modulating gas valve is not operating.	Check for 4 to 20 mA control signal. Check for 24 VAC power at SC-30 and TR1.
	[Post Filter Option Only] Filter Temperature Switch Open.	Check 4 filter temperature switches located on face of post filters. Switch opens on high temperature.
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 Navigator display.
	Unit running in Service Test Mode.	Check using *Comfort*Link Navigator display.

Table 75 — Electric Heat Service Analysis

PROBLEM	CAUSE	REMEDY
No Heat	Power failure.	Check power source. Call power company.
	Fuse blown or circuit breaker tripped. Check fuses and circuit breakers in power, control and electric heat panels.	Replace fuse or reset circuit breaker.
	Thermostat occupancy schedule set point not calling for Heating.	Check using *Comfort*Link Navigator display.
	No 24 vac at primary contactor.	Check transformer and circuit breaker.
	No power (high voltage) to L2 of primary contactor.	Check safety switches manual reset limit, airflow switch, and auto limit.
	Bad electrical elements.	Power off unit and remove high voltage wires. Check resistance of heater, replace if open.
	[SCR Only] No 24 vac at SCR or Step Controller.	Check transformer and connections.
	[SCR Only] Vernier step controller not staging up.	Check for 4 to 20 mA control signal. Check for 24 vac power to step controller.
	[Post Filter Option Only] Filter temperature switch open.	Check for filter temperature switches located on face of post filters. switch opens on high temperature.
Inadequate Heating	Dirty air filters.	Replace air filters.
	Restricted airflow.	Remove restriction.
Heat Will Not Turn Off	Contactor failed closed.	Inspect contactors to look for welded-closed contacts.



LEGEND

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

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

Fig. 16 — IGC Service Analysis Logic

Table 76 — 10K Thermistor vs Resistance (T55, T56, T58, OAT, RAT, EDT, LAT, EAT Sensors) (F)

TEMP (F)	RESISTANCE (Ohms)
–25	196,453
–24	189,692
–23	183,300
–22	177,000
–21	171,079
–20	165,238
–19	159,717
–18	154,344
–17	149,194
–16	144,250
–15	139,443
–14	134,891
–13	130,402
–12	126,183
–11	122,018
–10	118,076
–9	114,236
–8	110,549
–7	107,006
–6	103,558
–5	100,287
–4	97,060
–3	94,020
–2	91,019
–1	88,171
0	85,396
1	82,729
2	80,162
3	77,662
4	75,286
5	72,940
6	70,727
7	68,542
8	66,465
9	64,439
10	62,491
11	60,612
12	58,781
13	57,039
14	55,319
15	53,693
16	52,086
17	50,557
18	49,065
19	47,627
20	46,240
21	44,888
22	43,598
23	42,324
24	41,118
25	39,926
26	38,790
27	37,681
28	36,610
29	35,577
30	34,569
31	33,606
32	32,654
33	31,752
34	30,860
35	30,009
36	29,177
37	28,373
38	27,597
39	26,838
40	26,113
41	25,396
42	24,715
43	24,042
44	23,399
45	22,770
46	22,161
47	21,573
48	20,998
49	20,447
50	19,903
51	19,386
52	18,874
53	18,384
54	17,904
55	17,441
56	16,991
57	16,552
58	16,131
59	15,714
60	15,317
61	14,925
62	14,549
63	14,180
64	13,824
65	13,478
66	13,139
67	12,814
68	12,493
69	12,187
70	11,884
71	11,593
72	11,308
73	11,031
74	10,764
75	10,501
76	10,249
77	10,000
78	9,762
79	9,526
80	9,300
81	9,078
82	8,862
83	8,653
84	8,448
85	8,251
86	8,056
87	7,869
88	7,685
89	7,507
90	7,333
91	7,165
92	6,999
93	6,838
94	6,683
95	6,530
96	6,383
97	6,238
98	6,098
99	5,961
100	5,827
101	5,698
102	5,571
103	5,449
104	5,327
105	5,210
106	5,095
107	4,984
108	4,876
109	4,769
110	4,666
111	4,564
112	4,467
113	4,370
114	4,277
115	4.185
116	4,096
117	4,008
118	3,923
119	3,840
120	3,759
121	3,681
122	3,603
123	3,529
124	3,455
125	3,383
126	3,313
127	3,244
128	3,178
129	3,112
130	3,049
131	2,986
132	2,926
133	2,866
134	2,809
135	2,752
136	2,697
137	2,643
138	2,590
139	2,539
140	2,488
141	2,439
142	2,391
143	2,343
144	2,297
145	2,253
146	2,209
147	2,166
148	2,124
149	2,083
150	2,043
151	2,003
152	1,966
153	1,928
154	1,891
155	1,855
156	1,820
157	1,786
158	1,752
159	1,719
160	1,687
161	1,656
162	1,625
163	1,594
164	1,565
165	1,536
166	1,508
167	1,480
168	1,453
169	1,426
170	1,400
171	1,375
172	1,350
173	1,326
174	1,302
175	1,278
176	1,255
177	1,233
178	1,211
179	1,190
180	1,169
181	1,148
182	1,128
183	1,108
184	1,089
185	1,070
186	1,052
187	1,033
188	1,016
189	998
190	981
191	964
192	947
193	931
194	915
195	900
196	885
197	870
198	855
199	841
200	827
201	814
202	800
203	787
204	774
205	762
206	749
207	737
208	725
209	714
210	702
211	691
212	680
213	670
214	659
215	649
216	639
217	629
218	620
219	610
220	601
221	592
222	583
223	574
224	566
225	557

Table 77 — 10K Thermistor vs Resistance (T55, T56, T58, OAT, RAT, EDT, LAT, EAT Sensor) (C)

TEMP (C)	RESISTANCE (Ohms)
–32	200,510
–31	188,340
–30	177,000
–29	166,342
–28	156,404
–27	147,134
–26	138,482
–25	130,402
–24	122,807
–23	115,710
–22	109,075
–21	102,868
–20	97,060
–19	91,588
–18	86,463
–17	81,662
–16	77,162
–15	72,940
–14	68,957
–13	65,219
–12	61,711
–11	58,415
–10	55,319
–9	52,392
–8	49,640
–7	47,052
–6	44,617
–5	42,324
–4	40,153
–3	38,109
–2	36,182
–1	34,367
0	32,654
1	31,030
2	29,498
3	28,052
4	26,686
5	25,396
6	24,171
7	23,013
8	21,918
9	20,883
10	19,903
11	18,972
12	18,090
13	17,255
14	16,474
15	15,714
16	15,000
17	14,323
18	13,681
19	13,071
20	12,493
21	11,942
22	11,418
23	10,921
24	10,449
25	10,000
26	9,571
27	9,164
28	8,776
29	8,407
30	8,056
31	7,720
32	7,401
33	7,096
34	6,806
35	6,530
36	6,266
37	6,014
38	5,774
39	5,546
40	5,327
41	5,117
42	4,918
43	4,727
44	4,544
45	4,370
46	4,203
47	4,042
48	3,889
49	3,743
50	3,603
51	3,469
52	3,340
53	3,217
54	3,099
55	2,986
56	2,878
57	2,774
58	2,675
59	2,579
60	2,488
61	2,400
62	2,315
63	2,235
64	2,157
65	2,083
66	2,011
67	1,943
68	1,876
69	1,813
70	1,752
71	1,693
72	1,637
73	1,582
74	1,530
75	1,480
76	1,431
77	1,385
78	1,340
79	1,297
80	1,255
81	1,215
82	1,177
83	1,140
84	1,104
85	1,070
86	1,037
87	1,005
88	974
89	944
90	915
91	889
92	861
93	836
94	811
95	787
96	764
97	742
98	721
99	700
100	680
101	661
102	643
103	626
104	609
105	592
106	576
107	561

Table 78 — 86K Thermistor vs Resistance (DTA1, LT-A, LT-B)

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

Table 79 — 5K Thermistor vs Resistance (RTA1, ST-A1, ST-A2, ST-B1, ST-B2) (F)

TEMP (F)	RESISTANCE (Ohms)
–25	98,010
–24	94,707
–23	91,522
–22	88,449
–21	85,486
–20	82,627
–19	79,871
–18	77,212
–17	74,648
–16	72,175
–15	69,790
–14	67,490
–13	65,272
–12	63,133
–11	61,070
–10	59,081
–9	57,162
–8	55,311
–7	53,526
–6	51,804
–5	50,143
–4	48,541
–3	46,996
–2	45,505
–1	44,066
0	42,679
1	41,339
2	40,047
3	38,800
4	37,596
5	36,435
6	35,313
7	34,231
8	33,185
9	32,176
10	31,202
11	30,260
12	29,351
13	28,473
14	27,624
15	26,804
16	26,011
17	25,245
18	24,505
19	23,789
20	23,096
21	22,427
22	21,779
23	21,153
24	20,547
25	19,960
26	19,393
27	18,843
28	18,311
29	17,796
30	17,297
31	16,814
32	16,346
33	15,892
34	15,453
35	15,027
36	14,614
37	14,214
38	13,826
39	13,449
40	13,084
41	12,730
42	12,387
43	12,053
44	11,730
45	11,416
46	11,112
47	10,816
48	10,529
49	10,250
50	9,979
51	9,717
52	9,461
53	9,213
54	8,973
55	8,739
56	8,511
57	8,291
58	8,076
59	7,686
60	7,665
61	7,468
62	7,277
63	7,091
64	6,911
65	6,735
66	6,564
67	6,399
68	6,238
69	6,081
70	5,929
71	5,781
72	5,637
73	5,497
74	5,361
75	5,229
76	5,101
77	4,976
78	4,855
79	4,737
80	4,622
81	4,511
82	4,403
83	4,298
84	4,196
85	4,096
86	4,000
87	3,906
88	3,814
89	3,726
90	3,640
91	3,556
92	3,474
93	3,395
94	3,318
95	3,243
96	3,170
97	3,099
98	3,031
99	2,964
100	2,898
101	2,835
102	2,773
103	2,713
104	2,655
105	2,597
106	2,542
107	2,488
108	2,436
109	2,385
110	2,335
111	2,286
112	2,239
113	2,192
114	2,147
115	2,103
116	2,060
117	2,018
118	1,977
119	1,937
120	1,898
121	1,860
122	1,822
123	1,786
124	1,750
125	1,715
126	1,680
127	1,647
128	1,614
129	1,582
130	1,550
131	1,519
132	1,489
133	1,459
134	1,430
135	1,401
136	1,373
137	1,345
138	1,318
139	1,291
140	1,265
141	1,240
142	1,214
143	1,190
144	1,165
145	1,141
146	1,118
147	1,095
148	1,072
149	1,050
150	1,029
151	1,007
152	986
153	965
154	945
155	925
156	906
157	887
158	868
159	850
160	832
161	815
162	798
163	782
164	765
165	750
166	734
167	719
168	705
169	690
170	677
171	663
172	650
173	638
174	626
175	614
176	602
177	591
178	581
179	570
180	561
181	551
182	542
183	533
184	524
185	516
186	508
187	501
188	494
189	487
190	480
191	473
192	467
193	461
194	456
195	450
196	445
197	439
198	434
199	429
200	424
201	419
202	415
203	410
204	405
205	401
206	396
207	391
208	386
209	382
210	377
211	372
212	367
213	361
214	356
215	350
216	344
217	338
218	332
219	325
220	318
221	311
222	304
223	297
224	289
225	282

Table 80 — 5K Thermistor vs Resistance (RTA1, ST-A1, ST-A2, ST-B1, ST-B2) (C)

TEMP (C)	RESISTANCE (Ohms)
–32	100,260
–31	94,165
–30	88,480
–29	83,170
–28	78,125
–27	73,580
–26	69,250
–25	65,205
–24	61,420
–23	57,875
–22	54,555
–21	51,450
–20	48,536
–19	45,807
–18	43,247
–17	40,845
–16	38,592
–15	38,476
–14	34,489
–13	32,621
–12	30,866
–11	29,216
–10	27,633
–9	26,202
–8	24,827
–7	23,532
–6	22,313
–5	21,163
–4	20,079
–3	19,058
–2	18,094
–1	17,184
0	16,325
1	15,515
2	14,749
3	14,026
4	13,342
5	12,696
6	12,085
7	11,506
8	10,959
9	10,441
10	9,949
11	9,485
12	9,044
13	8,627
14	8,231
15	7,855
16	7,499
17	7,161
18	6,840
19	6,536
20	6,246
21	5,971
22	5,710
23	5,461
24	5,225
25	5,000
26	4,786
27	4,583
28	4,389
29	4,204
30	4,028
31	3,861
32	3,701
33	3,549
34	3,404
35	3,266
36	3,134
37	3,008
38	2,888
39	2,773
40	2,663
41	2,559
42	2,459
43	2,363
44	2,272
45	2,184
46	2,101
47	2,021
48	1,944
49	1,871
50	1,801
51	1,734
52	1,670
53	1,609
54	1,550
55	1,493
56	1,439
57	1,387
58	1,337
59	1,290
60	1,244
61	1,200
62	1,158
63	1,118
64	1,079
65	1,041
66	1,006
67	971
68	938
69	906
70	876
71	836
72	805
73	775
74	747
75	719
76	693
77	669
78	645
79	623
80	602
81	583
82	564
83	547
84	531
85	516
86	502
87	489
88	477
89	466
90	456
91	446
92	436
93	427
94	419
95	410
96	402
97	393
98	385
99	376
100	367
101	357
102	346
103	335
104	324
105	312
106	299
107	285

Table 81 — Suction Pressure Transducer (psig) vs Voltage (SSP-A, SSP-B)

PRESSURE (PSIG)	VOLTAGE DROP (V)
0	0.466
1	0.476
2	0.486
3	0.495
4	0.505
5	0.515
6	0.525
7	0.535
8	0.545
9	0.554
10	0.564
11	0.574
12	0.584
13	0.594
14	0.604
15	0.614
16	0.623
17	0.633
18	0.643
19	0.653
20	0.663
21	0.673
22	0.682
23	0.692
24	0.702
25	0.712
26	0.722
27	0.732
28	0.741
29	0.751
30	0.761
31	0.771
32	0.781
33	0.791
34	0.801
35	0.810
36	0.820
37	0.830
38	0.840
39	0.850
40	0.860
41	0.869
42	0.879
43	0.889
44	0.899
45	0.909
46	0.919
47	0.928
48	0.938
49	0.948
50	0.958
51	0.968
52	0.978
53	0.988
54	0.997
55	1.007
56	1.017
57	1.027
58	1.037
59	1.047
60	1.056
61	1.066
62	1.076
63	1.086
64	1.096
65	1.106
66	1.116
67	1.125
68	1.135
69	1.145
70	1.155
71	1.165
72	1.175
73	1.184
74	1.194
75	1.204
76	1.214
77	1.224
78	1.234
79	1.243
80	1.253
81	1.263
82	1.273
83	1.283
84	1.293
85	1.303
86	1.312
87	1.322
88	1.332
89	1.342
90	1.352
91	1.362
92	1.371
93	1.381
94	1.391
95	1.401
96	1.411
97	1.421
98	1.430
99	1.440
100	1.450
101	1.460
102	1.470
103	1.480
104	1.490
105	1.499
106	1.509
107	1.519
108	1.529
109	1.539
110	1.549
111	1.558
112	1.568
113	1.578
114	1.588
115	1.598
116	1.608
117	1.618
118	1.627
119	1.637
120	1.647
121	1.657
122	1.667
123	1.677
124	1.686
125	1.696
126	1.706
127	1.716
128	1.726
129	1.736
130	1.745
131	1.755
132	1.765
133	1.775
134	1.785
135	1.795
136	1.805
137	1.814
138	1.824
139	1.834
140	1.844
141	1.854
142	1.864
143	1.873
144	1.883
145	1.893
146	1.903
147	1.913
148	1.923
149	1.932
150	1.942
151	1.952
152	1.962
153	1.972
154	1.982
155	1.992
156	2.001
157	2.011
158	2.021
159	2.031
160	2.041
161	2.051
162	2.060
163	2.070
164	2.080
165	2.090
166	2.100
167	2.110
168	2.120
169	2.129
170	2.139
171	2.149
172	2.159
173	2.169
174	2.179
175	2.188
176	2.198
177	2.208
178	2.218
179	2.228
180	2.238
181	2.247
182	2.257
183	2.267
184	2.277
185	2.287
186	2.297
187	2.307
188	2.316
189	2.326
190	2.336
191	2.346
192	2.356
193	2.366
194	2.375
195	2.385
196	2.395
197	2.405
198	2.415
199	2.425
200	2.434
201	2.444
202	2.454
203	2.464
204	2.474
205	2.484
206	2.494
207	2.503
208	2.513
209	2.523
210	2.533
211	2.543
212	2.553
213	2.562
214	2.572
215	2.582
216	2.592
217	2.602
218	2.612
219	2.622
220	2.631
221	2.641
222	2.651
223	2.661
224	2.671
225	2.681
226	2.690
227	2.700
228	2.710
229	2.720
230	2.730
231	2.740
232	2.749
233	2.759
234	2.769
235	2.779
236	2.789
237	2.799
238	2.809
239	2.818
240	2.828
241	2.838
242	2.848
243	2.858
244	2.868
245	2.877
246	2.887
247	2.897
248	2.907
249	2.917
250	2.927
251	2.936
252	2.946
253	2.956
254	2.966
255	2.976
256	2.986
257	2.996
258	3.005
259	3.015
260	3.025
261	3.035
262	3.045
263	3.055
264	3.064
265	3.074
266	3.084
267	3.094
268	3.104
269	3.114
270	3.124
271	3.133
272	3.143
273	3.153
274	3.163
275	3.173
276	3.183
277	3.192
278	3.202
279	3.212
280	3.222
281	3.232
282	3.242
283	3.251
284	3.261
285	3.271
286	3.281
287	3.291
288	3.301
289	3.311
290	3.320
291	3.330
292	3.340
293	3.350
294	3.360
295	3.370
296	3.379
297	3.389
298	3.399
299	3.409
300	3.419
301	3.429
302	3.438
303	3.448
304	3.458
305	3.468
306	3.478
307	3.488
308	3.498
309	3.507
310	3.517
311	3.527
312	3.537
313	3.547
314	3.557
315	3.566
316	3.576
317	3.586
318	3.596
319	3.606
320	3.616
321	3.626
322	3.635
323	3.645
324	3.655
325	3.665
326	3.675
327	3.685
328	3.694
329	3.704
330	3.714
331	3.724
332	3.734
333	3.744
334	3.753
335	3.763
336	3.773
337	3.783
338	3.793
339	3.803
340	3.813
341	3.822
342	3.832
343	3.842
344	3.852
345	3.862
346	3.872
347	3.881
348	3.891
349	3.901
350	3.911
351	3.921
352	3.931
353	3.940
354	3.950
355	3.960
356	3.970
357	3.980
358	3.990
359	4.000
360	4.009
361	4.019
362	4.029
363	4.039
364	4.049
365	4.059
366	4.068
367	4.078
368	4.088
369	4.098
370	4.108
371	4.118
372	4.128
373	4.137
374	4.147
375	4.157
376	4.167
377	4.177
378	4.187
379	4.196
380	4.206
381	4.216
382	4.226
383	4.236
384	4.246
385	4.255
386	4.265
387	4.275
388	4.285
389	4.295
390	4.305
391	4.315
392	4.324
393	4.334
394	4.344
395	4.354
396	4.364
397	4.374
398	4.383
399	4.393
400	4.403
401	4.413
402	4.423
403	4.433
404	4.442
405	4.452
406	4.462
407	4.472
408	4.482
409	4.492
410	4.502
411	4.511
412	4.521
413	4.531
414	4.541
415	4.551
416	4.561
417	4.570
418	4.580
419	4.590
420	4.600

Table 82 — Liquid Pressure Transducer Discharge Pressure Transducer (psig) vs Voltage

PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)	PRESSURE (PSIG)	VOLTAGE DROP (V)
14.5	0.500	**95**	0.993	**176**	1.490	**257**	1.987
16	0.509	**96**	1.000	**177**	1.496	**258**	1.993
17	0.515	**97**	1.006	**178**	1.502	**259**	1.999
18	0.521	**98**	1.012	**179**	1.508	**260**	2.005
19	0.528	**99**	1.018	**180**	1.515	**261**	2.011
20	0.534	**100**	1.024	**181**	1.521	**262**	2.017
21	0.540	**101**	1.030	**182**	1.527	**263**	2.023
22	0.546	**102**	1.036	**183**	1.533	**264**	2.029
23	0.552	**103**	1.043	**184**	1.539	**265**	2.036
24	0.558	**104**	1.049	**185**	1.545	**266**	2.042
25	0.564	**105**	1.055	**186**	1.551	**267**	2.048
26	0.570	**106**	1.061	**187**	1.557	**268**	2.054
27	0.577	**107**	1.067	**188**	1.564	**269**	2.060
28	0.583	**108**	1.073	**189**	1.570	**270**	2.066
29	0.589	**109**	1.079	**190**	1.576	**271**	2.072
30	0.595	**110**	1.085	**191**	1.582	**272**	2.079
31	0.601	**111**	1.092	**192**	1.588	**273**	2.085
32	0.607	**112**	1.098	**193**	1.594	**274**	2.091
33	0.613	**113**	1.104	**194**	1.600	**275**	2.097
34	0.620	**114**	1.110	**195**	1.606	**276**	2.103
35	0.626	**115**	1.116	**196**	1.613	**277**	2.109
35	0.626	**116**	1.122	**197**	1.619	**278**	2.115
36	0.632	**117**	1.128	**198**	1.625	**279**	2.121
37	0.638	**118**	1.134	**199**	1.631	**280**	2.128
38	0.644	**119**	1.141	**200**	1.637	**281**	2.134
39	0.650	**120**	1.147	**201**	1.643	**282**	2.140
40	0.656	**121**	1.153	**202**	1.649	**283**	2.146
41	0.662	**122**	1.159	**203**	1.656	**284**	2.152
42	0.669	**123**	1.165	**204**	1.662	**285**	2.158
43	0.675	**124**	1.171	**205**	1.668	**286**	2.164
44	0.681	**125**	1.177	**206**	1.674	**287**	2.170
45	0.687	**126**	1.184	**207**	1.680	**288**	2.177
46	0.693	**127**	1.190	**208**	1.686	**289**	2.183
47	0.699	**128**	1.196	**209**	1.692	**290**	2.189
48	0.705	**129**	1.202	**210**	1.698	**291**	2.195
49	0.711	**130**	1.208	**211**	1.705	**292**	2.201
50	0.718	**131**	1.214	**212**	1.711	**293**	2.207
51	0.724	**132**	1.220	**213**	1.717	**294**	2.213
52	0.730	**133**	1.226	**214**	1.723	**295**	2.220
53	0.736	**134**	1.233	**215**	1.729	**296**	2.226
54	0.742	**135**	1.239	**216**	1.735	**297**	2.232
55	0.748	**136**	1.245	**217**	1.741	**298**	2.238
56	0.754	**137**	1.251	**218**	1.747	**299**	2.244
57	0.761	**138**	1.257	**219**	1.754	**300**	2.250
58	0.767	**139**	1.263	**220**	1.760	**301**	2.256
59	0.773	**140**	1.269	**221**	1.766	**302**	2.262
60	0.779	**141**	1.275	**222**	1.772	**303**	2.269
61	0.785	**142**	1.282	**223**	1.778	**304**	2.275
62	0.791	**143**	1.288	**224**	1.784	**305**	2.281
63	0.797	**144**	1.294	**225**	1.790	**306**	2.287
64	0.803	**145**	1.300	**226**	1.797	**307**	2.293
65	0.810	**146**	1.306	**227**	1.803	**308**	2.299
66	0.816	**147**	1.312	**228**	1.809	**309**	2.305
67	0.822	**148**	1.318	**229**	1.815	**310**	2.311
68	0.828	**149**	1.325	**230**	1.821	**311**	2.318
69	0.834	**150**	1.331	**231**	1.827	**312**	2.324
70	0.840	**151**	1.337	**232**	1.833	**313**	2.330
71	0.846	**152**	1.343	**233**	1.839	**314**	2.336
72	0.852	**153**	1.349	**234**	1.846	**315**	2.342
73	0.859	**154**	1.355	**235**	1.852	**316**	2.348
74	0.865	**155**	1.361	**236**	1.858	**317**	2.354
75	0.871	**156**	1.367	**237**	1.864	**318**	2.361
76	0.877	**157**	1.374	**238**	1.870	**319**	2.367
77	0.883	**158**	1.380	**239**	1.876	**320**	2.373
78	0.889	**159**	1.386	**240**	1.882	**321**	2.379
79	0.895	**160**	1.392	**241**	1.888	**322**	2.385
80	0.902	**161**	1.398	**242**	1.895	**323**	2.391
81	0.908	**162**	1.404	**243**	1.901	**324**	2.397
82	0.914	**163**	1.410	**244**	1.907	**325**	2.403
83	0.920	**164**	1.416	**245**	1.913	**326**	2.410
84	0.926	**165**	1.423	**246**	1.919	**327**	2.416
85	0.932	**166**	1.429	**247**	1.925	**328**	2.422
86	0.938	**167**	1.435	**248**	1.931	**329**	2.428
87	0.944	**168**	1.441	**249**	1.938	**330**	2.434
88	0.951	**169**	1.447	**250**	1.944	**331**	2.440
89	0.957	**170**	1.453	**251**	1.950	**332**	2.446
90	0.963	**171**	1.459	**252**	1.956	**333**	2.452
91	0.969	**172**	1.466	**253**	1.962	**334**	2.459
92	0.975	**173**	1.472	**254**	1.968	**335**	2.465
93	0.981	**174**	1.478	**255**	1.974	**336**	2.471
94	0.987	**175**	1.484	**256**	1.980	**337**	2.477

Table 82 — Liquid Pressure Transducer Discharge Pressure Transducer (psig) vs Voltage (cont)

PRESSURE (PSIG)	VOLTAGE DROP (V)
338	2.483
339	2.489
340	2.495
341	2.502
342	2.508
343	2.514
344	2.520
345	2.526
346	2.532
347	2.538
348	2.544
349	2.551
350	2.557
351	2.563
352	2.569
353	2.575
354	2.581
355	2.587
356	2.593
357	2.600
358	2.606
359	2.612
360	2.618
361	2.624
362	2.630
363	2.636
364	2.643
365	2.649
366	2.655
367	2.661
368	2.667
369	2.673
370	2.679
371	2.685
372	2.692
373	2.698
374	2.704
375	2.710
376	2.716
377	2.722
378	2.728
379	2.734
380	2.741
381	2.747
382	2.753
383	2.759
384	2.765
385	2.771
386	2.777
387	2.784
388	2.790
389	2.796
390	2.802
391	2.808
392	2.814
393	2.820
394	2.826
395	2.833
396	2.839
397	2.845
398	2.851
399	2.857
400	2.863
401	2.869
402	2.875
403	2.882
404	2.888
405	2.894
406	2.900
407	2.906
408	2.912
409	2.918
410	2.925
411	2.931
412	2.937
413	2.943
414	2.949
415	2.955
416	2.961
417	2.967
418	2.974
419	2.980
420	2.986

PRESSURE (PSIG)	VOLTAGE DROP (V)
421	2.992
422	2.998
423	3.004
424	3.010
425	3.016
426	3.023
427	3.029
428	3.035
429	3.041
430	3.047
431	3.053
432	3.059
433	3.066
434	3.072
435	3.078
436	3.084
437	3.090
438	3.096
439	3.102
440	3.108
441	3.115
442	3.121
443	3.127
444	3.133
445	3.139
446	3.145
447	3.151
448	3.157
449	3.164
450	3.170
451	3.176
452	3.182
453	3.188
454	3.194
455	3.200
456	3.206
457	3.213
458	3.219
459	3.225
460	3.231
461	3.237
462	3.243
463	3.249
464	3.256
465	3.262
466	3.268
467	3.274
468	3.280
469	3.286
470	3.292
471	3.298
472	3.305
473	3.311
474	3.317
475	3.323
476	3.329
477	3.335
478	3.341
479	3.347
480	3.354
481	3.360
482	3.366
483	3.372
484	3.378
485	3.384
486	3.390
487	3.397
488	3.403
489	3.409
490	3.415
491	3.421
492	3.427
493	3.433
494	3.439
495	3.446
496	3.452
497	3.458
498	3.464
499	3.470
500	3.476
501	3.482
502	3.488
503	3.495

PRESSURE (PSIG)	VOLTAGE DROP (V)
504	3.501
505	3.507
506	3.513
507	3.519
508	3.525
509	3.531
510	3.538
511	3.544
512	3.550
513	3.556
514	3.562
515	3.568
516	3.574
517	3.580
518	3.587
519	3.593
520	3.599
521	3.605
522	3.611
523	3.617
524	3.623
525	3.629
526	3.636
527	3.642
528	3.648
529	3.654
530	3.660
531	3.666
532	3.672
533	3.679
534	3.685
535	3.691
536	3.697
537	3.703
538	3.709
539	3.715
540	3.721
541	3.728
542	3.734
543	3.740
544	3.746
545	3.752
546	3.758
547	3.764
548	3.770
549	3.777
550	3.783
551	3.789
552	3.795
553	3.801
554	3.807
555	3.813
556	3.820
557	3.826
558	3.832
559	3.838
560	3.844
561	3.850
562	3.856
563	3.862
564	3.869
565	3.875
566	3.881
567	3.887
568	3.893
569	3.899
570	3.905
571	3.911
572	3.918
573	3.924
574	3.930
575	3.936
576	3.942
577	3.948
578	3.954
579	3.961
580	3.967
581	3.973
582	3.979
583	3.985
584	3.991
585	3.997
586	4.003

PRESSURE (PSIG)	VOLTAGE DROP (V)
587	4.010
588	4.016
589	4.022
590	4.028
591	4.034
592	4.040
593	4.046
594	4.052
595	4.059
596	4.065
597	4.071
598	4.077
599	4.083
600	4.089
601	4.095
602	4.102
603	4.108
604	4.114
605	4.120
606	4.126
607	4.132
608	4.138
609	4.144
610	4.151
611	4.157
612	4.163
613	4.169
614	4.175
615	4.181
616	4.187
617	4.193
618	4.200
619	4.206
620	4.212
621	4.218
622	4.224
623	4.230
624	4.236
625	4.243
626	4.249
627	4.255
628	4.261
629	4.267
630	4.273
631	4.279
632	4.285
633	4.292
634	4.298
635	4.304
636	4.310
637	4.316
638	4.322
639	4.328
640	4.334
641	4.341
642	4.347
643	4.353
644	4.359
645	4.365
646	4.371
647	4.377
648	4.384
649	4.390
650	4.396
651	4.402
652	4.408
653	4.414
654	4.420
655	4.426
656	4.433
657	4.439
658	4.445
659	4.451
660	4.457
661	4.463
662	4.469
663	4.475
664	4.482
665	4.488
666	4.494
667	4.500

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 39 for information on HVAC modes. The occupied status, unit temperatures, unit set points, and stage information can also be shown. See Table 83.

Run Status→VIEW→HVAC

Displays the current HVAC Mode(s) by name. HVAC Modes include:

OFF	VENT	HIGH HEAT
STARTING UO	HIGH COOL	FIRE SHUT DOWN
SHUTTING DOWN	LOW COOL	PRESSURIZATION
DISABLED	UNOCC FREE COOL	EVACUATION
SOFTSTOP REQUEST	TEMPERING HI COOL	SMOKE PURGE
REM SW DISABLE	TEMPERING LO COOL	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→EC1.P

Displays the current actual economizer no. 1 (out) position (in percentage open).

Run Status→VIEW→EC2.P

Displays the current position of actuator no. 2 (ret.) (in percentage open).

Run Status→VIEW→EC3.P

Displays the current position of actuator no. 3 (out) (in percentage open).

Run Status→VIEW→CL.C.P

Displays the current cooling control point (a target value for air temperature leaving the evaporator coil location).

Run Status→VIEW→C.CAP

Displays the current amount of unit cooling capacity (in percent of maximum). Compare to staging tables in Appendix C.

Run Status→VIEW→CL.ST

Displays the current number of requested cooling stages. Compare to staging tables in Appendix C and to ***C.CAP*** above.

Run Status→VIEW→HT.C.P

Displays the current heating control point; for use with staged gas or modulating gas control option only (a target value for air temperature leaving the supply duct).

Run Status→VIEW→HT.ST

Displays the current number of heating stages active (for staged gas control option only). Compare to following point.

Run Status→VIEW→H.MAX

Displays the maximum number of heat stages available for this model.

ECONOMIZER RUN STATUS

The Economizer Run Status display table provides information about the economizer and can be used to troubleshoot economizer problems. See Table 84. 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.

Table 83 — Auto View of Run Status Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
VIEW	AUTO VIEW OF RUN STATUS				
HVAC	ascii string spelling out the hvac modes			string	
OCC	Occupied?	No/Yes		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	
EC1.P	Economizer Out Act.Curr.Pos.	0-100	%	ECONOPOS	
EC2.P	Economzr2 Ret. Act.Curr.Pos.	0-100	%	ECON2POS	
EC3.P	Economzr3 Out Act.Curr.Pos.	0-100	%	ECON3POS	
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	

Table 84 — Economizer Run Status Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
ECON	ECONOMIZER RUN STATUS				
EC1.P	Economzr1 Act.Curr.Pos.	0-100	%	ECON1POS	
EC2.P	Economzr2 Act.Curr.Pos.	0-100	%	ECON2POS	
EC3.P	Economzr3 Act.Curr.Pos.	0-100	%	ECON3POS	
ECN.C	Economizer Act.Cmd.Pos.	0-100	%	ECONOCMD	forcible
ACTV	Economizer Active?	No/Yes		ECACTIVE	
SACA	Single Act CFM Ctl Activ	No/Yes		SACFMCTL	forcible
DISA	ECON DISABLING CONDITIONS				
UNV.1	Econ1 Act. Unavailable?	No/Yes		ECN1UNAV	
UNV.2	Econ2 Act. Unavailable?	No/Yes		ECN2UNAV	
UNV.2	Econ3 Act. Unavailable?	No/Yes		ECN3UNAV	
ENTH	Enth. Switch Read High?	No/Yes		ENTH	
DBC	DBC - OAT Lockout?	No/Yes		DBC_STAT	
DEW	DEW - OA Dewpt.Lockout?	No/Yes		DEW_STAT	
DDBC	DDBD- OAT > RAT Lockout?	No/Yes		DDBCSTAT	
OAEC	OAEC- OA Enth Lockout?	No/Yes		OAECSTAT	
DEC	DEC - Diff.Enth.Lockout?	No/Yes		DEC_STAT	
EDT	EDT Sensor Bad?	No/Yes		EDT_STAT	
OAT	OAT Sensor Bad?	No/Yes		OAT_STAT	
FORC	Economizer Forced?	No/Yes		ECONFORC	
SFON	Supply Fan Not On 30s?	No/Yes		SFONSTAT	
CLOF	Cool Mode Not In Effect?	No/Yes		COOL_OFF	
OAQL	OAQ Lockout in Effect?	No/Yes		OAQLOCKD	
HELD	Econ Recovery Hold Off?	No/Yes		ECONHELD	
DH.DS	Dehumid. Disabled Econ.?	No/Yes		DHDISABL	
O.AIR	OUTSIDE AIR INFORMATION				
OAT	Outside Air Temperature	–40-240	dF	OAT	forcible
OA.RH	Outside Air Rel. Humidity	0-100	%	OARH	forcible
OA.E	Outside Air Enthalpy	–20-10000		OAE	
OA.D.T	Outside Air Dewpoint Temp	–40-240	dF	OADEWTMP	

COOLING INFORMATION

The Cooling Information run status display table provides information on the cooling operation and the Humidi-MiZer® operation of the unit. See Table 85.

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 51.

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

Table 85 — Cooling Information Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
COOL	COOLING INFORMATION				
C.CAP	Current Running Capacity	0-100	%	CAPTOTAL	
CUR.S	Current Cool Stage	0-20		COOL_STG	
REQ.S	Requested Cool Stage	0-20		CL_STAGE	
MAX.S	Maximum Cool Stages	0-20		CLMAXSTG	
DEM.L	Active Demand Limit	0-100	%	DEM_LIM	forcible
SUMZ	COOL CAP. STAGE CONTROL				
SMZ	Capacity Load Factor	–400-400		SMZ	
ADD.R	Next Stage EDT Decrease	0-30	^F	ADDRISE	
SUB.R	Next Stage EDT Increase	0-30	^F	SUBRISE	
R.PCT	Rise Per Percent Capacity	0-10		RISE_PCT	
Y.MIN	Cap Deadband Subtracting	–40-0		Y_MINUS	
Y.PLU	Cap Deadband Adding	0-40		Y_PLUS	
Z.MIN	Cap Threshold Subtracting	–99-0		Z_MINUS	
Z.PLU	Cap Threshold Adding	0-99		Z_PLUS	
H.TMP	High Temp Cap Override	No/Yes		HI_TEMP	
L.TMP	Low Temp Cap Override	No/Yes		LOW_TEMP	
PULL	Pull Down Cap Override	No/Yes		PULLDOWN	
SLOW	Slow Change Cap Override	No/Yes		SLO_CHNG	
HMZR	HUMIDIMIZER				
CAPC	Humidimizer Capacity	0-100		HMZRCAPC	
C.EXV	Condenser EXV Position	0-100		COND_EXV	
B.EXV	Bypass EXV Position	0-100		BYP_EXV	
RHV	Humidimizer 3-Way Valve	No/Yes		HUM3WVAL	
C.CPT	Cooling Control Point	–20-140		COOLCPNT	
EDT	Evaporator Discharge Tmp	–40-240		EDT	
H.CPT	Heating Control Point	–20-140		HEATCPNT	
LAT	Leaving Air Temperature	–40-240		LAT	
EXVS	EXVS INFORMATION				
A1.EX	Circuit A EXV 1 Position	0-100	%	XV1APOSP	
A2.EX	Circuit A EXV 2 Position	0-100	%	XV2APOSP	
B1.EX	Circuit B EXV 1 Position	0-100	%	XV1BPOSP	
B2.EX	Circuit B EXV 2 Position	0-100	%	XV2BPOSP	
SH.A1	Cir A EXV1 Superheat Tmp	–100-200	^F	SH_A1	
SH.A2	Cir A EXV2 Superheat Tmp	–100-200	^F	SH_A2	
SH.B1	Cir B EXV1 Superheat Tmp	–100-200	^F	SH_B1	
SH.B2	Cir B EXV2 Superheat Tmp	–100-200	^F	SH_B2	
CTRL	EXVS CONTROL INFORMATION				
C.SHS	EXV Superheat Ctrl SP	5-40	^F	SH_SP_CT	
C.FLS	EXV SH Flooding Ctrl SP	0-10	^F	FL_SP_CT	
C.EXP	EXV PID Ctrl Prop. Gain	0-5		EXV_PG_C	
C.EXT	EXV Ctrl Integrat. Time	0.5-60		EXV_TI_C	
C.EXM	Cir Strt EXV Mn Ctrl Pos	0-100	%	EXCSMP_C	

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.

EXV INFORMATION DISPLAY TABLE

The EXV information display table provides information on the unit cooling EXVs.

VFD INFORMATION DISPLAY TABLE

The VFD information display table provides information on the supply fan VFD and exhaust fan VFD. See Table 86.

OUTDOOR FAN VFD DISPLAY TABLE

The outdoor fan VFDs display table provides information on the outdoor fan VFD. Specifically the motor commanded speed, 0 to 100%.

MODE TRIP HELPER

The Mode Trip Helper table provides information on the unit modes and when the modes start and stop. See Table 87. This information can be used to help determine why the unit is in the current mode.

CCN/LINKAGE DISPLAY TABLE

The CCN/Linkage display table provides information on unit linkage. See Table 88.

COMPRESSOR RUN HOURS DISPLAY TABLE

The Compressor Run Hours Display Table displays the number of run time hours for each compressor. See Table 89.

COMPRESSOR STARTS DISPLAY TABLE

The Compressor Starts Display Table displays the number of starts for each compressor. See Table 90.

SOFTWARE VERSION NUMBERS DISPLAY TABLE

The Software Version Numbers Display Table displays the software version numbers of the unit boards and devices. See Table 91.

Table 86 — VFD Information Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
VFDS	VFD INFORMATION				
S.VFD	SUPPLY FAN VFD (VFD 1)				
SPD	VFD1 Actual Speed %	0-100	%	VFD1_SPD	
RPM	VFD1 Actual Motor RPM	0-30000		VFD1RPM	
FREQ	VFD1 Actual Motor Freq	0-500		VFD1FREQ	
AMPS	VFD1 Actual Motor Amps	0-999	amps	VFD1AMPS	
TORQ	VFD1 Actual Motor Torque	–200-200	%	VFD1TORQ	
PWR	VFD1 Actual Motor Power	–150-150	kW	VFD1PWR	
VDC	VFD1 DC Bus Voltage	0-1000	voltage	VFD1VDC	
V.OUT	VFD1 Output Voltage	0-1000	voltage	VFD1VOUT	
TEMP	VFD1 Transistor Temp (C)	0-150		VFD1TEMP	
RUN.T	VFD1 Cumulative Run Time	0-65535	hours	VFD1RUNT	
KWH	VFD1 Cumulative kWh	0-65535		VFD1KWH	
LFC	VFD1 Last Fault Code	0-65535		VFD1LFC	
E.VFD	EXHAUST FAN VFD (VFD 2)				
SPD	VFD2 Actual Speed %	0-100	%	VFD2_SPD	
RPM	VFD2 Actual Motor RPM	50-30000		VFD2RPM	
FREQ	VFD2 Actual Motor Freq	10-500		VFD2FREQ	
AMPS	VFD2 Actual Motor Amps	0-999	amps	VFD2AMPS	
TORQ	VFD2 Actual Motor Torque	–200-200	%	VFD2TORQ	
PWR	VFD2 Actual Motor Power	–150-150	kW	VFD2PWR	
VDC	VFD2 DC Bus Voltage	0-1000	voltage	VFD2VDC	
V.OUT	VFD2 Output Voltage	0-1000	voltage	VFD2VOUT	
TEMP	VFD2 Transistor Temp (C)	0-150		VFD2TEMP	
RUN.T	VFD2 Cumulative Run Time	0-65535	hours	VFD2RUNT	
KWH	VFD2 Cumulative kWh	0-65535		VFD2KWH	
LFC	VFD2 Last Fault Code	0-65535		VFD2LFC	
O.VFD	OUTDOOR FAN VFDS				
SPD.A	MtrMaster A Commanded %	0-100	%	MM_A_VFD	
SPD.B	MtrMaster B Commanded %	0-100	%	MM_B_VFD	

Table 87 — Mode Trip Helper Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
TRIP	MODE TRIP HELPER				
UN.C.S	Unoccup. Cool Mode Start	0-100	dF	UCCLSTRT	
UN.C.E	Unoccup. Cool Mode End	0-100	dF	UCCL_END	
OC.C.S	Occupied Cool Mode Start	0-100	dF	OCCLSTRT	
OC.C.E	Occupied Cool Mode End	0-100	dF	OCCL_END	
TEMP	Ctl.Temp RAT,SPT or Zone	0-100	dF	CTRLTEMP	
OC.H.E	Occupied Heat Mode End	0-100	dF	OCHT_END	
OC.H.S	Occupied Heat Mode Start	0-100	dF	OCHTSTRT	
UN.H.E	Unoccup. Heat Mode End	0-100	dF	UCHT_END	
UN.H.S	Unoccup. Heat Mode Start	0-100	dF	UCHTSTRT	

Table 88 — CCN/Linkage Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
LINK	CCN - LINKAGE				
MODE	Linkage Active - CCN	Off/On		MODELINK	
L.Z.T	Linkage Zone Control Tmp	–40-240	dF	LZT	
L.C.SP	Linkage Curr. Cool Setpt	–40-240	dF	LCSP	
L.H.SP	Linkage Curr. Heat Setpt	–40-240	dF	LHSP	

Table 89 — Compressor Run Hours Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
HRS	COMPRESSOR RUN HOURS				
HR.A1	Compressor A1 Run Hours	0-999999	HRS	HOURS_A1	config
HR.A2	Compressor A2 Run Hours	0-999999	HRS	HOURS_A2	config
HR.A3	Compressor A3 Run Hours	0-999999	HRS	HOURS_A3	config
HR.A4	Compressor A4 Run Hours	0-999999	HRS	HOURS_A4	config
HR.B1	Compressor B1 Run Hours	0-999999	HRS	HOURS_B1	config
HR.B2	Compressor B2 Run Hours	0-999999	HRS	HOURS_B2	config
HR.B3	Compressor B3 Run Hours	0-999999	HRS	HOURS_B3	config
HR.B4	Compressor B4 Run Hours	0-999999	HRS	HOURS_B4	config

Table 90 — Compressor Starts Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
STRT	COMPRESSOR STARTS				
ST.A1	Compressor A1 Starts	0-999999		CY_A1	config
ST.A2	Compressor A2 Starts	0-999999		CY_A2	config
ST.A3	Compressor A3 Starts	0-999999		CY_A3	config
ST.A4	Compressor A4 Starts	0-999999		CY_A4	config
ST.B1	Compressor B1 Starts	0-999999		CY_B1	config
ST.B2	Compressor B2 Starts	0-999999		CY_B2	config
ST.B3	Compressor B3 Starts	0-999999		CY_B3	config
ST.B4	Compressor B4 Starts	0-999999		CY_B4	config

Table 91 — Software Version Numbers Display Table

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
VERS	SOFTWARE VERSION NUMBERS				
MBB	CESR131544-xx-xx			string	
RXB	CESR131465-xx-xx			string	
EXB	CESR131465-xx-xx			string	
CEM	CESR131174-xx-xx			string	
CXB	CESR131173-xx-xx			string	
SCB	CESR131226-xx-xx			string	
EXV	CESR131172-xx-xx			string	
EXVA	CESR131172-xx-xx			string	
EXVB	CESR131172-xx-xx			string	
VFD1	VERSION-313D			string	
VFD2	VERSION-313D			string	
NAVI	CESR130227-xx-xx			string	

Alarms and Alerts

There are a variety of different alerts and alarms in the system.

P — Pre-Alert: Part of the unit is temporarily down. The alarm is not broadcast on the CCN network. The alarm relay is not energized. After an allowable number of retries, if the function does not recover, the pre-alert will be upgraded to an alert or an alarm.

T — Alert: Part of the unit is down, but the unit is still partially able to provide cooling or heating.

A — Alarm: The unit is down and is unable to provide cooling or heating.

All alarms are displayed with a code of AXXX where the A is the category of alarm (Pre-Alert, Alert, or Alarm) and XXX is the number.

The response of the control system to various alerts and alarms depends on the seriousness of the particular alert or alarm. In the mildest case, an alert does not affect the operation of the unit in any manner. An alert can also cause a "strike." A "striking" alert will cause the circuit to shut down for 15 minutes. This feature reduces the likelihood of false alarms causing a properly working system to be shut down incorrectly. If 3 strikes occur before the circuit has an opportunity to show that it can function properly, the circuit will strike out, causing the shutdown alarm for that particular circuit. Once activated, the shutdown alarm can only be cleared via an alarm reset.

Circuits with strikes are given an opportunity to reset their strike counter to zero. As discussed above, a strike typically causes the circuit to shut down. Fifteen minutes later, that circuit will once again be allowed to run. If the circuit is able to run for 1 minute, its replacement circuit will be allowed to shut down (if not required to run to satisfy requested stages). However, the "troubled" circuit must run continuously for 5 minutes with no detectable problems before the strike counter is reset to zero.

In addition, the compressors have several diagnostics monitoring the safety of the system, which may cause a number of attempts to be re-tried before locking out the system from operation. This feature reduces the likelihood of false alarms causing a properly working system to be 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 92.

Table 92 — Alert and Alarm Codes

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T048	CktA, Oil Return Not Reliable With Only One Comp Available	Circuit shut down	Automatic
T049	CktB, Oil Return Not Reliable With Only One Comp Available	Circuit shut down	Automatic
T051	Circuit A, Compressor 1 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A051	Circuit A, Compressor 1 Stuck On Failure	Compressor locked off	Manual
T052	Circuit A, Compressor 2 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A052	Circuit A, Compressor 2 Stuck On Failure	Compressor locked off	Manual
T053	Circuit A, Compressor 3 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A053	Circuit A, Compressor 3 Stuck On Failure	Compressor locked off	Manual
T054	Circuit B, Compressor 1 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A054	Circuit B, Compressor 1 Stuck On Failure	Compressor locked off	Manual
T055	Circuit B, Compressor 2 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A055	Circuit B, Compressor 2 Stuck On Failure	Compressor locked off	Manual
T056	Circuit B, Compressor 3 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A056	Circuit B, Compressor 3 Stuck On Failure	Compressor locked off	Manual
T057	Circuit A, High Pressure Switch Trip Alert	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A057	Circuit A, High Pressure Switch Trip Alarm	Compressor locked off	Manual
T058	Circuit B, High Pressure Switch Trip Alert	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A058	Circuit B, High Pressure Switch Trip Alarm	Compressor locked off	Manual
T059	Circuit A, Compressor 4 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A059	Circuit A, Compressor 4 Stuck On Failure	Compressor locked off	Manual
T060	Circuit B, Compressor 4 Failure	Compressor locked off (after 3 strikes)	Automatic then manual after 3 strikes
A060	Circuit B, Compressor 4 Stuck On Failure	Compressor locked off	Manual
T062	Circuit A Suction Pressure Alert	Alert Only	Automatic
T063	Circuit B Suction Pressure Alert	Alert Only	Automatic
T064	EXV A1 Superheat Outside Range	Alert Only	Automatic
T065	EXV A2 Superheat Outside Range	Alert Only	Automatic
T066	EXV B1 Superheat Outside Range	Alert Only	Automatic
T067	EXV B2 Superheat Outside Range	Alert Only	Automatic
A068	Circuit A Suction Gas Thermistor Failure	MLV Disabled	Automatic
T072	Evap. Discharge Reset Sensor Failure	No supply air reset applied	Automatic
T073	Outside Air Temperature Thermistor Failure	No OAT functions allowed	Automatic
T074	Space Temperature Thermistor Failure	No SPT functions allowed	Automatic
T075	Return Air Thermistor Failure	No RAT functions allowed	Automatic
T076	Outside Air Relative Humidity Sensor Fail	No outside air RH functions allowed	Automatic
T077	Space Relative Humidity Sensor Failure	No space RH functions allowed	Automatic
T078	Return Air Relative Humidity Sensor Fail	No return air RH functions allowed	Automatic
T079	Mixed Air Relative Humidity Sensor Fail	No mixed 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

Table 92 — Alert and Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T093	Circ B Suction Press Transducer Failure	Circuit shut down	Automatic
T094	Circ A EXV 1 Thermistor Failure	Circuit shut down	Automatic
T095	Circ A EXV 2 Thermistor Failure	Circuit shut down	Automatic
T096	Circ B EXV 1 Thermistor Failure	Circuit shut down	Automatic
T097	Circ B EXV 2 Thermistor Failure	Circuit shut down	Automatic
T098	Circuit A Liquid Temperature Thermistor Failure	Alert Only - no circuit prognostics	Automatic
T099	Circuit B Liquid Temperature Thermistor Failure	Alert Only - no circuit prognostics	Automatic
T100	Circ A Liquid Press Transducer Failure	Alert Only - no circuit prognostics	Automatic
T101	Circ B Liquid Press Transducer Failure	Alert Only - no circuit prognostics	Automatic
T110	Circuit A Loss of Charge	Circuit locked off	Manual
T111	Circuit B Loss of Charge	Circuit locked off	Manual
T112	Low Circuit A Charge Detected	Alert Only	Automatic
T113	Low Circuit B Charge Detected	Alert Only	Automatic
T114	High Circuit A Charge Detected	Alert Only	Automatic
T115	High Circuit B Charge Detected	Alert Only	Automatic
P120	Circuit A Low Saturated Suction Temp, Comp Shutdown	Circuit staged down	Automatic
T120	Circuit A Low Saturated Suction Temperature Alert	Circuit shut down	Automatic
A120	Circuit A Low Saturated Suction Temperature Alarm	Circuit locked off	Manual
P121	Circuit B Low Saturated Suction Temp, Comp Shutdown	Circuit staged down	Automatic
T121	Circuit B Low Saturated Suction Temperature Alert	Circuit shut down	Automatic
A121	Circuit B Low Saturated Suction Temperature Alarm	Circuit locked off	Manual
T122	Circuit A High Saturated Suction Temperature	Alert Only	Manual
T123	Circuit B High Saturated Suction Temperature	Alert Only	Manual
P126	Circuit A High Head Pressure, Comp Shutdown	Circuit stage down	Automatic
T126	Circuit A High Head Pressure Alert	Circuit shut down	Automatic
A126	Circuit A High Head Pressure Alarm	Circuit locked off	Manual
P127	Circuit B High Head Pressure, Comp Shutdown	Circuit stage down	Automatic
T127	Circuit B High Head Pressure Alert	Circuit shut down	Automatic
A127	Circuit B High Head Pressure Alarm	Circuit locked off	Manual
T128	Digital Scroll A1 High Discharge Temperature Alert	Digital compressor A1 shutdown	Automatic
A128	Digital Scroll A1 High Discharge Temperature Alarm	Digital compressor A1 locked off	Manual
A140	Reverse Rotation Detected	Stop unit	Manual
A150	Unit is in Emergency Stop	Unit shut down	Manual
A152	Unit Down due to Failure	No mechanical cooling available	Automatic
T153	Real Time Clock Hardware Failure	Unit shut down	Automatic
A154	Serial EEPROM Hardware Failure	Unit shut down	Automatic
T155	Serial EEPROM Storage Failure Error	Alert only	Automatic
A156	Critical Serial EEPROM Storage Fail Error	Unit shut down	Automatic
A157	A/D Hardware Failure	Unit shut down	Automatic
A169	EXV Board Communication Failure	Humidimizer control disabled	Automatic
T170	Loss of Communication with the Compressor Expansion Module	Compressors A3, A4, B3 and B4 disabled	Automatic
A171	Staged Gas Control Board Comm Failure	Staged gas control disabled	Automatic
T172	Control Expansion Module Comm Failure	All CEM board functions disabled	Automatic
A173	RXB board Communication Failure	Unit shut down	Automatic
A174	EXB board Communication Failure	All EXB board functions disabled	Automatic
A175	VFD1 Communication Failure	Unit shut down	Automatic
T176	VFD2 Communication Failure	No building pressure control	Automatic
T177	4-20 mA Demand Limit Failure	No demand limiting	Automatic
T178	4-20 mA Static Pressure Reset Fail	No static pressure reset	Automatic
A179	Cir. A EXV Board Communication Failure	Circuit shut down	Automatic
A180	Cir. B EXV Board Communication Failure	Circuit shut down	Automatic
T181	Loss of Communication with Outside Air Limit	Alert only	Automatic
A200	Linkage Timeout Error - Comm Failure	Resorts to local unit set points	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
T248	Exhaust Air CFM Sensor Failure	Alert only	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

Table 92 — Alert and Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T308	Return Air Relative Humidity Below Limit	Alert only	Automatic
T309	Return Air Relative Humidity Above Limit	Alert only	Automatic
T310	Supply Duct Static Pressure Below Limit	Alert only	Automatic
T311	Supply Duct Static Pressure Above Limit	Alert only	Automatic
T312	Building Static Pressure Below Limit	Alert only	Automatic
T313	Building Static Pressure Above Limit	Alert only	Automatic
T314	IAQ Above Limit	Alert only	Automatic
T316	OAT Below Limit	Alert only	Automatic
T317	OAT Above Limit	Alert only	Automatic
T318	Static Pressure (SP) Not Holding Setpoint	Alert only	Automatic
T319	Building Pressure (BP) Not Holding Setpoint	Alert only	Automatic
T320	DELTACFM Not Holding Setpoint	Alert only	Automatic
T321	SH_A1 Not Holding Setpoint	Alert only	Automatic
T322	SH_A2 Not Holding Setpoint	Alert only	Automatic
T323	SH_B1 Not Holding Setpoint	Alert only	Automatic
T324	SH_B2 Not Holding Setpoint	Alert only	Automatic
T325	Circuit A High Pressure Drop Detected – Check Filter Drier	Alert only	Automatic
T326	Circuit B High Pressure Drop Detected – Check Filter Drier	Alert only	Automatic
T327	Heat Not Holding Setpoint	Alert only	Automatic
T328	Cool Not Holding Setpoint	Alert only	Automatic
T329	Possible MLV/HGBP Failure Detected	Alert only	Automatic
T331	SH_A1 Flooding Detected	Alert only	Automatic
T332	SH_A2 Flooding Detected	Alert only	Automatic
T333	SH_B1 Flooding Detected	Alert only	Automatic
T334	SH_B2 Flooding Detected	Alert only	Automatic
T335	Excess Outdoor Air	Alert only	Automatic
A400	Hydronic Freeze Stat Trip	Unit in emergency mode	Automatic
A404	Fire Shut Down Emergency Mode (fire-smoke)	Unit shut down	Automatic
A405	Evacuation Emergency Mode	Run evacuation mode	Automatic
A406	Pressurization Emergency Mode	Run pressurization mode	Automatic
A407	Smoke Purge Emergency Mode	Run smoke purge mode	Automatic
T408	Dirty Main Air Filter	Alert only	Automatic
T409	Supply Fan Commanded Off, Sensed On Failure	Alert only	Manual
A409	Supply Fan Commanded On, Sensed Off Failure	Unit shut down	Manual
A410	Supply Fan VFD Fault	Unit shut down	Manual
T411	Exhaust Fan VFD Fault	Unit shut down	Manual
T412	Dirty Post Air Filter	Alert only	Automatic
A413	Air Pressure Safety Switch Trip	Unit shut down	Manual
T414	Damper Air Not Modulating	Alert only	Manual
P415	Main Air Filter Notification - Change Soon	Alert only	Automatic
P416	Post Air Filter Notification - Change Soon	Alert only	Automatic
T421	Thermostat Y2 Input On without Y1 On	Run on Y2	Automatic
T422	Thermostat W2 Input On without W1 On	Run on W2	Automatic
T423	Thermostat Y and W Inputs On	No cooling or heating	Automatic
T424	Thermostat G Input Off On a Cooling Call	Turn fan on and cool	Automatic
T430	Plenum Pressure Safety Switch Trip	Alert only	Automatic
A430	Plenum Pressure Safety Switch Trip	Unit shut down	Manual
T431	PE Motor Starter Protector Tripped	Alert only	Automatic
A432	PE Motor Starter Protector Lockout	No building pressure control	Automatic
A433	3-Phase Power Failure	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
T504	Current Sensor Board Failure - A3	Alert only	Automatic
T505	Current Sensor Board Failure - B3	Alert only	Automatic
T506	Current Sensor Board Failure - A4	Alert only	Automatic
T507	Current Sensor Board Failure - B4	Alert only	Automatic
T610	Economizer 1 Actuator Out of Calibration	Alert only	Automatic
T611	Economizer 1 Actuator Comm Failure	No economizer functions	Automatic
T612	Economizer 1 Actuator Control Range Increased	Alert only	Automatic
T613	Economizer 1 Actuator Overload, Setpoint Not Reached	Alert only	Automatic
T614	Economizer 1 Excessive Utilization	Alert only	Automatic
T615	Econ 1 (Outside 1) Not Economizing When it Should	Alert only	Automatic
T616	Econ 1 (Outside 1) Economizing When it Should Not	Alert only	Automatic
T617	Econ 1 (Outside 1) Damper Stuck or Jammed	Alert only	Automatic
T620	Economizer 2 Actuator Out of Calibration	Alarm only	Automatic
T621	Economizer 2 Actuator Comm Failure	No economizer functions	Automatic

Table 92 — Alert and Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD
T622	Economizer 2 Actuator Control Range Increased	Alert only	Automatic
T623	Economizer 2 Actuator Overload, Setpoint Not Reached	Alarm only	Automatic
T624	Economizer 2 Actuator Excessive Utilization	Alert only	Automatic
T625	Econ 2 (Return) Not Economizing When it Should	Alert only	Automatic
T626	Econ 2 (Return) Economizing When it Should Not	Alert only	Automatic
T627	Econ 2 (Return) Damper Stuck or Jammed	Alert only	Automatic
T630	Humd/HTC-2 Actuator Out of Calibration	Alert only	Automatic
T631	Humd/HTC-2 Actuator Communication Failure	No humidifer functions	Automatic
T632	Humd/HTC-2 Actuator Control Range Increased	Alert only	Automatic
T633	Humd/HTC-2 Actuator Overload, Setpoint Not Reached	Alert only	Automatic
T634	Humd/HTC-2 Actuator Excessive Utilization	Alert only	Automatic
A640	Heating Coil Actuator Out of Calibration	Alarm only	Automatic
A641	Heating Coil Actuator Comm Fail	No heating coil functions	Automatic
T642	Heating Coil Actuator Control Range Increased	Alert only	Automatic
A643	Heating Coil Actuator Overload, Setpoint Not Reached	Alarm only	Automatic
A644	Heating Coil Actuator Excessive Utilization	Alarm only	Automatic
T650	Economizer 3 Actuator Out of Calibration	Alarm only	Automatic
T651	Economizer 3 Actuator Comm Failure	No economizer functions	Automatic
T652	Economizer 3 Actuator Control Range Increased	Alert only	Automatic
T653	Economizer 3 Actuator Overload, Setpoint Not Reached	Alarm only	Automatic
T654	Economizer 3 Actuator Excessive Utilization	Alert only	Automatic
T655	Econ 3 (Outside 2) Not Economizing When it Should	Alert only	Automatic
T656	Econ 3 (Outside 2) Economizing When it Should Not	Alert only	Automatic
T657	Econ 3 (Outside 2) Damper Stuck or Jammed	Alert only	Automatic
A660	Heating Actuator 3 Out of Calibration	Alert only	Automatic
A661	Heating Actuator 3 Comm Failure	Alert only	Automatic
T662	Heating Actuator 3 Control Range Increased	Alert only	Automatic
A663	Heating Actuator 3 Overload, Setpoint Not Reached	Alert only	Automatic
A664	Heating Actuator 3 Excessive Utilization	Alert only	Automatic
A670	Heating Actuator 4 Out of Calibration	Alert only	Automatic
A671	Heating Actuator 4 Comm Failure	Alert only	Automatic
T672	Heating Actuator 4 Control Range Increased	Alert only	Automatic
A673	Heating Actuator 4 Overload, Setpoint Not Reached	Alert only	Automatic
A674	Heating Actuator 4 Excessive Utilization	Alert only	Automatic
A700	Air Temp Lvg Supply Fan Thermistor Failure	Unit shut down	Automatic
T701	Staged Gas 1 Thermistor Failure	Average remaining sensors	Automatic
T702	Staged Gas 2 Thermistor Failure	Average remaining sensors	Automatic
T703	Staged Gas 3 Thermistor Failure	Average remaining sensors	Automatic
A704	Staged Gas Lvg Air Temp Sum Total Failure	No staged heat function	Automatic
T705	Limit Switch Thermistor Failure	No software limit switch function	Automatic
A706	Hydronic Evap Discharge Thermistor Failure	Unit shut down	Automatic
A707	Digital Scroll A1 Discharge Thermistor Failure	Digital compressor A1 llimited to 50%	Automatic
T800	Cannot Enable MLV and Digital Scroll Simultaneously	Alert only	Automatic
T801	Invalid Sensor Enable. Check Building Pressure Mode	Alert only	Automatic

DIAGNOSTIC ALARM CODES AND POSSIBLE CAUSES

T048 (Ckt A, Oil Return Not Reliable with Only One Comp Available)
T049 (Ckt B, Oil Return Not Reliable with Only One Comp Available)

Alert codes T048 and T049 are for Circuits A and B respectively and are active for 90 and 105 ton units only. The 90 and 105 ton units have 3 compressors per circuit. If load conditions are such that only one compressor is running on a circuit, a second compressor is periodically turned on to equalize compressor oil levels. If a second compressor is unavailable for oil return, the circuit will be shut down, and an alert will be generated. The alert will automatically clear, and the circuit will restart when a second compressor becomes available.

T051 (Circuit A, Compressor 1 Failure)
T052 (Circuit A, Compressor 2 Failure)
T053 (Circuit A, Compressor 3 Failure)
T059 (Circuit A, Compressor 4 Failure)
T054 (Circuit B, Compressor 1 Failure)
T055 (Circuit B, Compressor 2 Failure)
T056 (Circuit B, Compressor 3 Failure)
T060 (Circuit B, Compressor 4 Failure)

If the current sensor board reads OFF while the compressor relay has been commanded ON for a period of 4 continuous seconds, an alert is generated.

Any time this alert occurs, a strike will be logged on the affected compressor. If 3 successive strikes occur the compressor will be locked out requiring a manual reset or power reset of the unit.

The clearing of strikes during compressor operation is a combination of 3 complete cycles or 15 continuous minutes of run time operation. So, if there are one or 2 strikes on the compressor and 3 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 2 strikes, the alert will not be broadcast to the network, nor will the alarm relay be closed.

The possible causes are:

- High-pressure switch open. The high-pressure switch (HPS) for each circuit is wired in series with the compressor contactor coils of each compressor on the circuit to disable compressor operation immediately upon a high discharge pressure condition. If the high-pressure switch opens while the MBB or CXB is commanding the compressor ON, the compressor stops and the CSB no longer detects current, causing the control to activate the alert.
- Compressor circuit breaker tripped.
- Failed CSB or wiring error.

To check out alerts T051, T052, T053, T054, T055, T056, T059, T060:

1. Turn on faulty compressor using Service Test mode. If compressor does not start, then most likely the problem is one of the following: HPS open, compressor circuit breaker tripped, incorrect control wiring, or incorrect compressor wiring.
2. If the compressor starts, verify that the indoor and outdoor fans are operating properly.
3. If the CSB is always detecting current, then verify that the compressor is on. If the compressor is ON, check the contactor and the relay on the MBB or CXB. If the compressor is OFF and there is no current, verify the CSB wiring and replace if necessary.
4. Return to Normal mode and observe compressor operation to verify that compressor current sensor is working and condenser fans are energized.

A051 (Circuit A, Compressor 1 Stuck On Failure)
A052 (Circuit A, Compressor 2 Stuck On Failure)
A053 (Circuit A, Compressor 3 Stuck On Failure)
A059 (Circuit A, Compressor 4 Stuck On Failure)
A054 (Circuit B, Compressor 1 Stuck On Failure)
A055 (Circuit B, Compressor 2 Stuck On Failure)
A056 (Circuit B, Compressor 3 Stuck On Failure)
A060 (Circuit B, Compressor 4 Stuck On Failure)

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

When the HVAC Mode indicates a compressor stuck on condition, the following will occur:

1. The outdoor fans will continue to control head pressure.
2. The supply fan will remain on.
3. Heating will be disabled.

A manual reset or power reset of the unit is required for these alarms.

The possible causes are:

- Compressor contactor has failed closed.
- Relay output on MBB or CXB that drives compressor contactor has failed closed.
- Failed CSB or wiring error.

To check out alarms A051, A052, A053, A054, A055, A056, A059, A061:

1. Place the unit in Service Test mode. All compressors should be OFF.
2. Check for welded compressor contactor.
3. Verify there is not 24 vac across the contactor coil of the compressor in question. If 24 vac is measured across coil, check relay on MBB or CXB and associated wiring.
4. Verify CSB wiring.
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 Trip Alert)
T058 (Circuit B, High Pressure Switch Trip Alert)
A057 (Circuit A, High Pressure Switch Trip Alarm)
A058 (Circuit B, High Pressure Switch Trip Alarm)

The high-pressure switch for each circuit is wired in series with the compressor contactor coils of each compressor on the circuit to disable compressor operation immediately upon a high discharge pressure condition. The normally closed contacts in the switches are calibrated to open at 650 ± 10 psig which corresponds to a saturated condensing temperature of 155.6 ± 1.3°F. The pressure switches will automatically reset when the discharge pressure is reduced to 500 ± 15 psig which corresponds to a saturated condensing temperature of 134.1 ± 2.4°F.

The output of each high-pressure switch is wired to inputs on the RXB to provide the control with an indication of a high-pressure switch trip. This alarm could occur when compressors are off if the wiring to the switch is broken or the switch has failed open.

If the high-pressure switch trips on a circuit with compressors commanded on, the discharge pressure is recorded. If the recorded discharge pressure is between 630 and 660 psig (saturated condensing temperature between 153.0 and 156.9°F), and is also less than the value recorded on any previous high-pressure switch trip, the upper horizontal portion of the compressor operating envelope (see Fig. 17) is lowered 0.4°F (3 psig). The control will not allow the compressor operating envelope to be lowered below 153.0°F (630 psig).

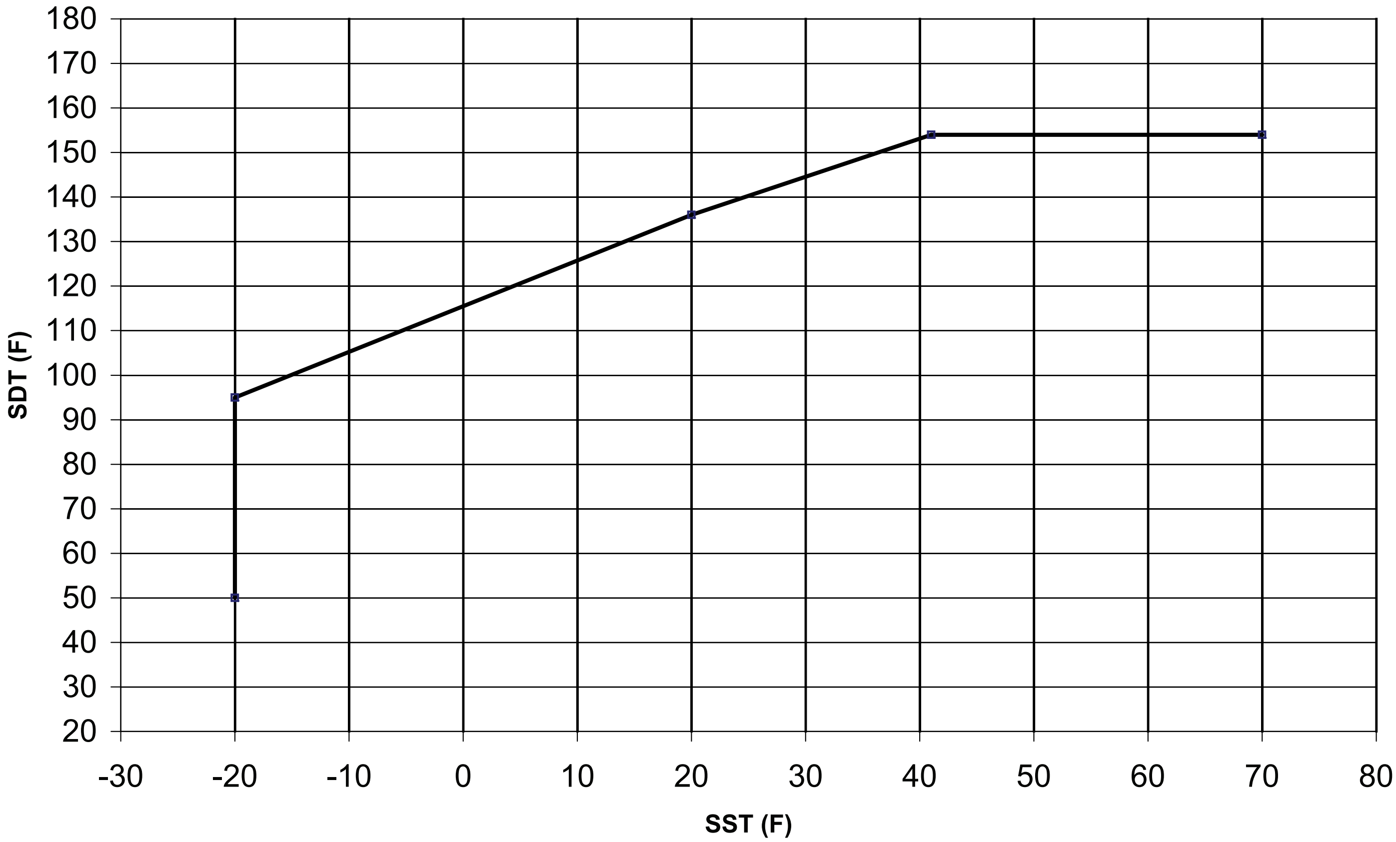


Fig. 17 — High Pressure/SCT Alarm Upper Envelope

This is done to make a rough calibration of the high pressure switch trip point. In most cases this allows the control to detect a high head pressure condition prior to reaching the high pressure switch trip point.

When the trip occurs, all mechanical cooling on the circuit is shut down until the HPS is cleared for 15 minutes. Any time this alert occurs, a HPS trip strike will be logged on the affected circuit. The alert is issued on HPS trip strikes 1 and 2, and an alarm (A057, A058) is issued on strike 3.

An active alert or alarm will always cause the circuit to be shut down. After 15 minutes, the circuit is allowed to restart if there are fewer than 3 strikes on the affected circuit. If 3 successive strikes occur the circuit will be locked out, requiring a manual reset or power reset of the unit. The clearing of HPS trip strikes during compressor operation is achieved through 5 continuous minutes of run time on the affected circuit. So, if there are one or 2 strikes on the circuit and a compressor on the circuit turns on and runs for 5 minutes straight with no failure, the circuit's HPS trip strikes are cleared.

NOTE: This alert/alarm is broadcast to the network.

T062 (Circuit A Suction Pressure Alert)
T063 (Circuit B Suction Pressure Alert)

Alert codes 062 and 063 are for Circuits A and B, respectively. If the circuit suction pressure (***Pressures→REF.P→SP.A, SP.B***) is not reduced by ***Configuration→IAQ→PROG→ AC.SP*** as each compressor is staged on while running the compressor auto-component test, this alert shall be logged. Recovery is automatic. The reason for the alert is that circuit suction pressure did not decrease enough when a compressor was staged on.

T064 (EXV A1 Superheat Outside Range)
T065 (EXV A2 Superheat Outside Range)

If the Circuit A EXV superheat (***Temperatures→REF.T→SH.A1, SH.A2***) is outside the range ***Run Status→EXVS→ CTRL→C.SHS*** ± ***Configuration→IAQ→PROG→AC.DB*** at the end of running the EXVs auto-component test, this alert will be logged. Recovery is automatic. The reason for this alert is that the superheat set point is not being held by EXV.

T066 (EXV B1 Superheat Outside Range)
T067 (EXV B2 Superheat Outside Range)

If the Circuit B EXV superheat (***Temperatures→REF.T→SH.B1, SH.B2***) is outside the range ***Run Status→EXVS→ CTRL→C.SHS*** ± ***Configuration→IAQ→PROG→ AC.DB*** at the end of running the EXVs auto-component test, this alert will be logged. Recovery is automatic. The reason for this alert is that the superheat set point is not being held by EXV.

A068 (Circuit A Suction Gas Thermistor Failure)

This alarm trips during a thermistor failure of the return gas temperature sensor. It is used with MLV option only.

T072 (Evap. 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 require 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 require 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 require 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 Fail)

Failure of this sensor (***Inputs→REL.H→OA.RH***) will disable any elements of the control which require 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 require 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 require 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.

T079 (Mixed Air Relative Humidity Sensor Fail)

Failure of this sensor (***Inputs→REL.H→MA.RH***) will disable any elements of the control which require its use. Elements of failure include humidification and dehumidification prognostics. 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 EXV 1 Thermistor Failure)
T095 (Circ A EXV 2 Thermistor Failure)

The associated circuit becomes disabled whenever this thermistor (***Temperatures→REF.T→ASX1, ASX2***) fails. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on one of the EXV control boards.

T096 (Circ B EXV1 Thermistor Failure)
T097 (Circ B EXV2 Thermistor Failure)

The associated circuit becomes disabled whenever this thermistor (***Temperatures→REF.T→BSX1***, ***BSX2***) fails. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on one of the EXV control boards.

T098 (Circuit A Liquid Temperature Thermistor Failure)
T099 (Circuit B Liquid Temperature Thermistor Failure)

Failure of this sensor (***Temperatures→REF.T→LT.A, LT.B***) will disable any elements of the control which require its use. Elements of failure include charge determination and prognostics. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on one of the EXV control boards.

T100 (Circ A Liquid Press Transducer Failure)
T101 (Circ B Liquid Press Transducer Failure)

Failure of this sensor (***Pressures→REF.P→LP.A, LP.B***) will disable any elements of the control which require its use. Elements of failure include charge determination and prognostics. Recovery from this alert is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the SCB control board.

T110 (Circuit A Loss of Charge)

T111 (Circuit B Loss of Charge)

Alert codes 110 and 111 are for Circuits A and B respectively. These alerts occur when all the compressors on a circuit are OFF and the suction pressure is less than 18 psig, if the OAT is above –5°F for 1 continuous minute. The alert will automatically clear when the suction pressure transducer reading is valid and greater than 54 psig. The cause of the alert is usually low refrigerant pressure or a faulty suction pressure transducer.

T112 (Low Circuit A Charge Detected)
T113 (Low Circuit B Charge Detected)

Alert codes 112 and 113 are for Circuits A and B respectively. These alerts occur when a charge determination using liquid sensors test has been run and the charge has been calculated to be less than ***Configuration→IAQ→PROG→AC.CL***. This result typically indicates charge should be added to the system. The alert will automatically clear when the test is re-run and the charge is calculated to be greater than ***AC.CL***. The cause of the alert is usually low refrigerant charge.

T114 (High Circuit A Charge Detected)
T115 (High Circuit B Charge Detected)

Alert codes 114 and 115 are for Circuits A and B respectively. These alerts occur when a charge determination using liquid sensors test has been run and the charge has been calculated to be greater than ***Configuration→IAQ→PROG→AC.CH***. This result typically indicates charge should be removed to the system. The alert will automatically clear when the test is re-run and the charge is calculated to be less than ***AC.CH***. The cause of the alert is usually high refrigerant charge.

P120 (Circuit A Low Saturated Suction Temp, Comp Shutdown)
T120 (Circuit A Low Saturated Suction Temperature Alert)
A120 (Circuit A Low Saturated Suction Temperature Alarm)
P121 (Circuit B Low Saturated Suction Temp, Comp Shutdown)
T121 (Circuit B Low Saturated Suction Temperature Alert)
A121 (Circuit B Low Saturated Suction Temperature Alarm)

This alert/alarm is used to keep the evaporator coils from freezing and the saturated suction temperature above the low limit for the compressors.

When ***Temperatures→REF.T→SST.A*** or ***Temperatures →REF.T→ SST.B*** is less than 20°F for 4 minutes, less than 10°F for 2 minutes, less than 0°F for 1 minute, or less than –20°F for 20 seconds continuously, a compressor of the affected circuit will be shut down with a local pre-alert (P120, P121) and a 15-minute timeguard will be added to the compressor. If the saturated suction temperature continues to be less than 20°F for 4 minutes, less than 10°F for 2 minutes, less than 0°F for 1 minute, or less than –20°F for 20 seconds continuously, another compressor of the affected circuit, if it exists, will be shut down with a local pre-alert (P120, P121) and a 15-minute timeguard will be added to the compressor. This sequence will continue until the last compressor on the circuit is shut down, at which time the circuit will be shut down with alert (T120, T121).

This failure follows a 3-strike methodology. When the circuit is shut down entirely, an alert (T120, T121) is generated and a strike is logged on the circuit. The Alert and strikes logged will automatically reset if the saturated suction temperature remains above 29.4°F for 15 minutes. On the third strike, alarm (A120, A121) will be generated which will necessitate a manual reset to get the circuit back running. It is important to note that a strike is called out only if all compressors in the circuit are off at the time of alert.

To prevent nuisance alerts, P120 and P121 show up in the alarm history and locally at the display, but are never broadcast to the network. To recover from these pre-alerts, both a 15-minute hold off timer and saturated suction temperature rising above 29.4°F must occur. If recovery occurs, staging will be allowed on the circuit once again. A strike is tied to the circuit going off entirely, not reducing capacity and recovering. Therefore, it is possible that multiple P120 and P121 alerts may be stored in alarm history but not broadcast.

T122 (Circuit A High Saturated Suction Temperature)
T123 (Circuit B High Saturated Suction Temperature)

This alert is for display purposes only. No action is taken by the control when the alert occurs.

When ***Temperatures→REF.T→SST.A*** or ***Temperatures →REF.T→SST.B*** is greater than 70°F for ***Configuration →COOL→H.SST*** minutes, local alert T122 or T123 will occur. The alerts automatically reset when the corresponding saturated suction temperature drops below 70°F.

P126 (Circuit A High Head Pressure, Comp Shutdown)
T126 (Circuit A High Head Pressure Alert)
A126 (Circuit A High Head Pressure Alarm)
P127 (Circuit B High Head Pressure, Comp Shutdown)
T127 (Circuit B High Head Pressure Alert)
A127 (Circuit B High Head Pressure Alarm)

This alert/alarm is used to keep the saturated condensing temperature below the compressor operating envelope outlined in Fig. 17. This alert/alarm also attempts to prevent the saturated condensing temperature from reaching the high pressure switch trip point by reducing the upper horizontal portion of the compressor operating envelope to a level slightly below the saturated condensing temperature recorded upon a high pressure switch trip (T057, T058).

When ***Temperatures→REF.T→SCT.A*** or ***Temperatures →REF.T→SCT.B*** rise above the compressor operating envelope for the corresponding ***Temperatures→REF.T→SST.A*** or ***Temperatures→REF.T→SST.B***, a compressor of the affected circuit will be immediately shut down with pre-alert (P126, P127) and a 10-minute timeguard will be added to the compressor. If the saturated condensing temperature remains above the envelope for 5 more seconds, another compressor of the affected circuit, if it exists, will be shut down with pre-alert (P126, P127) and a 10-minute timeguard will be added to the compressor. This sequence will continue until the last compressor on the circuit is shut down, at which time the circuit will be shut down with alert (T126, T127).

This failure follows a 3-strike methodology. When the circuit is shut down entirely, an alert (T126, T127) is generated and a strike is logged on the circuit. On the third strike, alarm (A126, A127) will be generated which will necessitate a manual reset to get the circuit back running. It is important to note that a strike is called out only if all compressors in the circuit are off at the time of the alert.

To prevent nuisance alerts, P126 and P127 show up in the alarm history and locally at the display, but are never broadcast to the network. To recover from these alerts, both a 10-minute hold off timer and saturated condensing temperature returning under the compressor envelope must occur. If recovery occurs, staging will be allowed on the circuit once again. Again, a strike is tied to the circuit going off entirely, not reducing capacity and recovering. Therefore it is possible that multiple P126 and P127 alerts may be stored in alarm history but not broadcast.

If an excessive number of head pressure Pre Alerts, Alerts, or Alarms are occurring and the causes identified in Table 72 (Cooling Service Analysis) have not been effective in correcting the situation, it may be necessary to raise the EXV minimum position (***EX.MN***) from its default setting of 20%. Note that raising this configuration may result in an increase in the number of flooding alerts.

T128 (Digital Scroll A1 High Discharge Temperature Alert)
A128 (Digital Scroll A1 High Discharge Temperature Alarm)

This alert/alarm is for units with a digital scroll compressor only. The digital scroll compressor is equipped with a temperature thermistor that is attached to the discharge line of the compressor.

The alert occurs when the discharge temperature thermistor has measured a temperature above 268°F or the thermistor is short circuited. The digital scroll compressor will be shut down and alert T128 will be generated. The compressor will be allowed to restart after a 30-minute delay and after the thermistor temperature is below 250°F.

If 5 high discharge temperature alerts have occurred within 4 hours, alarm A128 will be generated which will necessitate a manual reset to start the compressor.

A140 (Reverse Rotation Detected)

This alarm performs a check for correct compressor rotation upon power up of the unit. The method for detecting correct rotation is based on the assumption that there will be a drop in suction pressure upon a compressor start if the compressor is rotating in the correct direction.

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

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

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

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

If (rate after) is less than (rate prior minus 1.25), alarm A140 is generated.

This alarm will disable mechanical cooling and will require a manual reset. This alarm may be disabled once the reverse rotation check has been verified by setting ***Configuration →COOL→RR.VF*** = Yes.

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

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 cannot be verified which may mean MBB replacement. It is possible a re-initialization of the database or particular storage area(s) may clean up this problem. Reset is automatic.

A156 (Critical Serial EEPROM Storage Fail Error)

The unit is completely shut down. Critical configuration data in the serial EEPROM chip cannot be verified which may mean MBB replacement. Recovery is automatic but typically board replacement is necessary.

NOTE: The machine will shut down. This may happen after downloading via the CCN if the device code was corrupted. Try downloading again or use the LEN connection to download.

A157 (A/D Hardware Failure)

The unit will be completely shut down. The analog to digital conversion chip on the MBB has failed. Recovery is automatic but typically board replacement is necessary.

A169 (EXV board Communication Failure)

Cooling is disabled until communication with the EXV control board is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the control board, or damage to the RS-485 drivers on the LEN bus.

T170 (Loss of communication with the Compressor Expansion Module)

Compressors A3, A4, B3 and B4 are disabled until communication with the CEB control board is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the control board, or damage to the RS-485 drivers on the LEN bus.

A171 (Staged Gas Control Board Comm Failure)

Staged Heating is disabled until communication with the staged gas control board is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the staged gas control board, or damage to the RS-485 drivers on the LEN bus.

T172 (Control Expansion Module Comm Failure)

Any function associated with a sensor configured for use that resides on the controls expansion module will be disabled until communication is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the control expansion module, or damage to the RS-485 drivers on the LEN bus.

A173 (RXB board Communication Failure)

As the RXB board is integral to all N Series units, the error will cause a system shutdown until communication is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the RXB board, or damage to the RS-485 drivers on the LEN bus.

A174 (EXB board Communication Failure)

The EXB board is responsible for building pressure control. Building Pressure control configurations that require this board will cause a complete system shut down when communication failure occurs. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the EXB board, or damage to the RS-485 drivers on the LEN bus.

A175 (VFD1 Communication Failure)

The supply fan is disabled until communication with the supply fan VFD is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the VFD, or damage to the RS-485 drivers on the LEN bus.

T176 (VFD2 Communication Failure)

The exhaust fan is disabled until communication with the exhaust fan VFD is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the VFD, or damage to the RS-485 drivers on the LEN bus.

T177 (4-20 MA Demand Limit Failure)

If this transducer fails, and the unit is configured to perform demand limiting with this transducer, no capacity limiting will be performed and an alert will be generated. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T178 (4-20 MA Static Pressure Reset Fail)

If this transducer fails, and the unit is configured to perform static pressure reset with this transducer, no static pressure reset will be performed and an alert will be generated. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

A179 (Cir. A EXV board Communication Failure)

A180 (Cir. B EXV board Communication Failure)

Alarm codes 179 and 180 are for Circuits A and B respectively. The EXV PCBs are integral to the proper functionality of each refrigeration circuit. The corresponding circuit is disabled until communications with the EXV is re-established. Recovery is automatic. Reason for failure may be due to incorrect wiring, power loss to the EXB board, or damage to the RS-485 drivers on the LEN bus.

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 expire since the last communication from a VAV Linkage Master, the unit will remove the link and flag the alert. When the rooftop loses its link, the temperature and set points are derived locally. Recovery is automatic on re-establishment of communications. Reason for failure may be wiring error, too much bus activity, or damaged RS-485 drivers.

T210 (Building Pressure Transducer Failure)

If the building pressure transducer (***Pressures→AIR.P→BP***) fails, building pressure control fails also. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the RXB control board.

T211 (Static Pressure Transducer Failure)

If the static pressure transducer (***Pressures→AIR.P→SP***) fails, static pressure control fails also. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the RXB control board.

T220 (Indoor Air Quality Sensor Failure)

If the indoor air quality sensor (***Inputs→AIR.Q→IAQ***) fails, demand controlled 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 controlled ventilation will continue. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T229 (Economizer Min Pos Override Input Failure)

If the economizer minimum position override input fails, the economizer will operate as if it were not configured for override. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the MBB control board. This error only occurs when the unit is configured for minimum position override and a 4 to 20 mA signal is not present.

T245 (Outside Air CFM Sensor Failure)

If the outside air cfm sensor (***Inputs→CFM→O.CFM***) fails, the economizer will default to discrete positioning of the economizer (***Configuration→IAQ→DCV.C→IAQ.M***, ***Configuration→ ECON→ EC.MN***). Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the CEM control board.

T246 (Supply Air CFM Sensor Failure)

If the supply air cfm sensor (***Inputs→CFM→S.CFM***) fails, fan tracking is not possible and the system will shut down. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the EXB control board.

T247 (Return Air CFM Sensor Failure)

If the return air cfm sensor (***Inputs→CFM→R.CFM***) fails, fan tracking is not possible and the system will shut down. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the EXB control board.

T248 (Exhaust Air CFM Sensor Failure)

If the exhaust air cfm sensor (***Inputs→CFM→E.CFM***) fails, exhaust air cfm will not be properly reported. Recovery is automatic. Reason for error is either a faulty sensor, wiring error, or damaged input on the EXB control board.

T300 (Space Temperature Below Limit)

If the space temperature is below the configurable SPT Low Alert Limits (occupied [***Configuration→IAQ→ALLM→SP.L.O***] for 5 minutes or unoccupied [***Configuration→IAQ→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→IAQ→ALLM→SP.H.O***] for 5 minutes or unoccupied [***Configuration→IAQ→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→IAQ→ ALLM→SA.L.O***) for 5 minutes or the Low Supply air temperature alert limit unoccupied mode (***Configuration→IAQ→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→IAQ→ALLM→SAH.O***) for 5 minutes or the SAT HI Alert Limit/Unocc (***Configuration→IAQ→ ALLM→SA.H.U***) for 10 minutes, then an alert will be broadcast. The alert will automatically reset.

T304 (Return Temperature Below Limit)

If the return air temperature measured by the RAT sensor is below the configurable RAT LO Alert Limit/Occ (***Configuration→IAQ→ALLM→RA.L.O***) for 5 minutes or RAT HI Alert Limit/Occ (***Configuration→IAQ→ALLM→RA.L.U***) for 10 minutes, then an alert will be broadcast.

T305 (Return Temperature Above Limit)

If the return air temperature is below the RAT HI Alert Limit/Occ (***Configuration→IAQ→ALLM→RA.H.O***) for 5 minutes or RAT HI Alert Limit/Occ (***Configuration→IAQ→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→ IAQ→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→ IAQ→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 Static 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→IAQ→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 Static Pressure Above Limit)

If the unit is a VAV unit with a supply duct pressure sensor and measured supply duct static pressure (***Pressures→AIR.P→SP***) is above the configurable SP Low Alert Limit (***Configuration→ IAQ→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→IAQ→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→IAQ→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→ IAQ→ALLM → IAQ.H***) for 5 minutes, then the alert will occur. The unit will continue to run and the alert will automatically reset.

T316 (OAT Below Limit

If the outside-air temperature measured by the OAT thermistor (***Temperatures→AIR.T→ OAT***) is below the configurable OAT Low Alert Limit (***Configuration→IAQ→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→IAQ→ALLM→OAT.H***) for 5 minutes, then the alert will be broadcast.

T318 (Static Pressure (SP) Not Holding Setpoint)

If the static pressure (***Pressures→AIR.P→SP***) is outside the range ***Configuration→SP→SP.SP*** ± ***Configuration→PROG→PG.SP*** for 5 minutes and the Prognostics SP Enable is enabled ***Configuration→ PROG→P.SPE***, this alert will be logged. Recovery is automatic. The reason for the alert is that the static pressure set point is not being held by the supply fan.

T319 (Building Pressure (BP) Not Holding Setpoint)

If the building pressure (***Pressures→ AIR.P→ BP***) is outside the range ***Configuration→ BP→ BP.SP*** ± ***Configuration→ PROG→ PG.BP*** for 5 minutes and the Prognostics BP Enable is enabled, ***Configuration→ PROG→ P.BPE*** this alert will be logged. Recovery is automatic. The reason for the alert is that the building pressure is not being held by the power exhaust or return fan.

T331 (SH_A1 Flooding Detected)
T332 (SH_A2 Flooding Detected)
T333 (SH_B1 Flooding Detected)
T334 (SH_B2 Flooding Detected

If ***EN.SC***=YES, after logging the flooding alert, the circuit shall be marked as failed, forcing a circuit shutdown and recalibration of the shutdown circuit EXVs. The alert shall be automatically cleared ***FL.TM*** after being set. After clearing the alert, the circuit shall be immediately marked as usable. Shutdown due to flooding will not shut down both circuits at same time due to flooding alert. Second circuit will wait for alert to automatically clear on first circuit before shutting down.

If an excessive number of flooding detected alerts are seen in the unit alarm history, it may be necessary to lower the EXV minimum position (***EX.MN***) from its default setting of 20%. Note that lowering this setting could cause an increase in the number of high head pressure alerts. In no case should the setting be below 10%.

T335 (Excess Outdoor Air)

When the control detects a stuck or jammed actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position > commanded position, the alert is set.

A400 (Hydronic Freeze Stat 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 2 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 Main 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.

The timings for failure for both are the same and are illustrated in the following table:

UNIT TYPE/MODE	MINIMUM ON TIME WAIT	MINIMUM OFF TIME WAIT
CV (no gas heat)	30 seconds	1 minute
CV (gas heat)	2 minutes	4 minutes
VAV (no gas heat)	1 minute	1 minute
VAV (gas heat)	3 minutes	4 minutes

Recovery is manual. Reason for failure may be a broken fan belt, failed fan relay or failed supply fan status switch.

A410 (Supply Fan VFD Fault)

The MBB has received a fault status from the supply fan VFD. The unit will be shut down, and a manual reset is required. The

VFD keypad will indicate which fault has occurred. Reset can be done at the unit control (***Alarms→R.CUR***) or the VFD keypad.

T411 (Exhaust Fan VFD Fault)

The MBB has received a fault status from the exhaust fan VFD. Building pressure control will be stopped and a manual reset is required. The VFD keypad will indicate which fault has occurred. Reset can be done at the unit control (***Alarms→R.CUR***) or the VFD keypad.

T412 (Dirty Post Air Filter)

If no dirty post filter switch is installed, the switch will read "clean filter" all the time. Therefore the dirty post 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 post filter switch is monitored. If the dirty post 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 post filters in the unit. Recovery from this alert is through a clearing of all alarms (manual) or after the dirty post filter switch reads clean for 30 continuous seconds (automatic).

A413 (Air Pressure Safety Switch Trip)

If the air pressure switch trips, the unit will be instructed to shut down immediately. Manual reset of the switch is required. Software reset is automatic when switch has been reset. Possible causes are blocked outlets on the building discharge duct, or the duct pressure control system (i.e., duct pressure transducer, VFD, supply fan) has failed.

T414 (Damper Not Modulating)

This alert occurs when the supply air temperature does not change as expected when the damper is moved. Check to determine if the damper is no longer mechanically connected to the actuator. Reset is manual.

P415 (Main Air Filter Notification – Change Soon)

If the unit is configured for Dirty Filter Notification via Schedule, ***Configuration→FLTC→MFL.S = 2 (Schedule)***, this alert will occur when the life remaining in the filter is below the reminder level ***MF.RM***.

If the unit is configured for Dirty Filter Notification via Predictive Life L, ***Configuration→FLTC→MFL.S = 4 (Predictive Life Calculate and Learn)*** or via Predictive Life ***Configuration→FLTC→MFL.S = 5 (Predictive Life Calculate Only)***, this alert will occur when the life remaining in the filter is below the notification level ***F.NOT***.

P416 (Post Air Filter Notification – Change Soon)

If the unit is configured for Dirty Filter Notification via Schedule, ***Configuration→FLTC→PFL.S = 2 (Schedule)***, this alert will occur when the life remaining in the filter is below the reminder level ***PF.RM***.

If the unit is configured for Dirty Filter Notification via Predictive Life L, ***Configuration→FLTC→PFL.S = 4 (Predictive Life Calculate and Learn)*** or via Predictive Life ***Configuration→FLTC→PFL.S = 5 (Predictive Life Calculate Only)***, this alert will occur when the life remaining in the filter is below the notification level ***F.NOT***.

T421 (Thermostat Y2 Input On without Y1 On)

If Y2 is on and Y1 is off, then this alert condition is initiated. The control continues as if both Y1 and Y2 were requested. Alert recovery will not occur until Y1 is seen. This handles some conditions of an incorrectly wired thermostat and may prevent multiple alerts and recoveries from clogging the alarm histories.

T422 (Thermostat W2 Input On without W1 On)

If W2 is on and W1 is off, then this alert condition is initiated. The control continues as if both W1 and W2 were requested. Alert recovery will not occur until W1 is seen. This handles some conditions of an incorrectly wired thermostat and may prevent multiple alerts and recoveries from clogging the alarm histories.

T423 (Thermostat Y and W Inputs On)

Simultaneous calls for heating and cooling are illegal and will be alarmed. Cooling and heating will be locked out. Recovery is automatic when the condition no longer exists.

T424 (Thermostat G Input Off On a Cooling Call)

If G is off and there is a cooling request (Y1 or Y2), then it is possible the G connection has not been made to the unit terminal block. An alert is initiated for this condition as continuous fan operation and manual fan control may not be possible. Cooling is started, if allowed, and the fan is turned on. The controls do not diagnose the fan if a heat request (W1 or W2) is in progress.

T430 (Plenum Pressure Safety Switch Trip)

A430 (Plenum Pressure Safety Switch Trip)

If the unit is configured for fan tracking and the plenum pressure switch trips, the unit will be instructed to shut down immediately. The first 2 times the switch trips, the unit will automatically start up and clear the alert 3 minutes after the switch recovers. The third time the switch trips, the unit shuts down and calls out the alarm. Manual reset of the switch (located in the auxiliary control panel) is required. Software reset is automatic when switch has been reset. Possible causes are blocked exhaust or return dampers causing high pressure at the plenum fan.

T431 (PE Motor Starter Protector Tripped)
A432 (PE Motor Starter Protector Lockout)

If the unit is configured for VFD power exhaust (***BP.CF***=3), the unit monitors the status of the 2 power exhaust motor starter protectors in the power leads between the PE VFD and the PE Motors. If either one of the motor starter protectors trip, the alert T431 will be broadcast. The Building Pressure routine will continue to operate but with only one power exhaust fan. Depending on the operating conditions, the unit may not be able to maintain the desired building pressure.

If both of the motor starter protectors trip, the alert A432 will be broadcast and Building Pressure Control routine will shut down. Possible causes are overloading of the power exhaust motor(s) or wrong setting for the motor starter protector(s). Software reset is automatic when the switch(es) have been reset.

A433 (3-Phase Power Failure)

If the unit is configured for power monitoring (***Configuration→UNIT→PW.MN*** = YES), if the power monitor input trips (***Inputs→GEN.I→PWR.F*** = ALRM), the unit will be instructed to shut down immediately. Software reset is automatic when input has been reset. Possible causes are under/over voltage, phase loss, or phase unbalance.

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

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 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.

T504 (Current Sensor Board Failure - A3)
T505 (Current Sensor Board Failure - B3)
T506 (Current Sensor Board Failure - A4)
T507 (Current Sensor Board Failure - B4)

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 CXB control board.

T610 (Economizer 1 Actuator Out of Calibration)
T620 (Economizer 2 Actuator Out of Calibration)
T650 (Economizer 3 Actuator Out of Calibration)
T630 (Humd/HTC-2 Actuator Out of Calibration)
A640 (Heating Coil Actuator Out of Calibration)
A660 (Heating Actuator 3 Out of Calibration)
A670 (Heating Actuator 4 Out of Calibration)

Each of the actuators must have a minimum control range to operate. If the actuator, after a calibration, has not learned a control range appropriate for the application, this alarm/alert will be sent. No action will be taken on this error. Recovery is automatic. Reason for failure may be an obstruction or stuck linkage that prevents full range calibration.

T611 (Economizer 1 Actuator Comm Failure)
T621 (Economizer 2 Actuator Comm Failure)
A641 (Heating Coil Actuator Comm Fail)
T651 (Economizer 3 Actuator Comm Failure)
T631 (Humd/HTC-2 Actuator Communication Failure)
A661 (Heating Actuator 3 Comm Failure)
A671 (Heating Actuator 4 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 1 Actuator Control Range Increased)
T622 (Economizer 2 Actuator Control Range Increased)
T632 (Humd/HTC-2 Actuator Control Range Increased)
T642 (Heating Coil Actuator Control Range Increased)
T652 (Economizer 3 Actuator Control Range Increased)
T662 (Heating Actuator 3 Control Range Increased)
T672 (Heating Actuator 4 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 (Economizer 1 Actuator Overload, Setpoint Not Reached)
T623 (Economizer 2 Actuator Overload, Setpoint Not Reached)
T633 (Humd/HTC-2 Actuator Overload, Setpoint Not Reached)
A643 (Heating Coil Actuator Overload, Setpoint Not Reached)
T653 (Economizer 3 Actuator Overload, Setpoint Not Reached)
A663 (Heating Actuator 3 Overload, Setpoint Not Reached)
A673 (Heating Actuator 4 Overload, Setpoint Not Reached)

If an actuator is unable to achieve a commanded position within a reasonable period of time, this alarm or alert will be broadcast. This may be an indication of a stuck actuator. No action is taken. Recovery is automatic.

T614 (Economizer 1 Excessive Utilization)
T624 (Economizer 2 Actuator Excessive Utilization)
T634 (Humd/HTC-2 Actuator Excessive Utilization)
A644 (Heating Coil Actuator Excessive Utilization)
T654 (Economizer 3 Actuator Excessive Utilization)
A664 (Heating Actuator 3 Excessive Utilization)
A674 (Heating Actuator 4 Excessive Utilization)

This alert occurs when the commanded actuator position is changing too rapidly. Recovery is automatic.

T615 (Econ 1 (Outside 1) Not Economizing When it Should)
T625 Econ 2 (Return) Not Economizing When It Should
T655 Econ 3 (Outside 2) Not Economizing When it Should

When the control detects a stuck or jammed actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position < commanded position, the alert is set.

T616 (Econ 1 (Outside 1) Economizing When It Should Not)
T626 Econ 2 (Return) Economizing When It Should Not)
T656 Econ 3 (Outside 2) Economizing When It Should Not

When the control detects a stuck or jammed actuator, it shall compare the stuck position to the command position to log additional alerts. If the stuck position > commanded position, the alert is set.

T617 (Econ 1 (Outside 1) Damper Stuck Or Jammed)
T627 Econ 2 (Return) Damper Stuck Or Jammed
T657 Econ 3 (Outside 2) Damper Stuck Or Jammed

The actuator is no longer moving and the actual position is greater than or less than ***E.GAP%*** of the commanded position for ***E.TMR*** seconds. Reset is automatic.

A700 (Air Temp Lvg Supply Fan Thermistor Failure)

The failure of this sensor will shut the system down and generate an alarm, as this thermistor is a critical component to fundamental operation and diagnosis of the rooftop unit. Recovery is automatic. Reason for failure may be incorrect wiring, a faulty thermistor, or a damaged input on the MBB control board.

T701 (Staged Gas 1 Thermistor Failure)
T702 (Staged Gas 2 Thermistor Failure)
T703 (Staged Gas 3 Thermistor Failure)

If any of the staged gas thermistors (***Temperatures→AIR.T→S.G.L1-3***) fails, an alert will be generated and the remaining thermistors will be averaged together (***Temperatures→AIR.T→S.G.LS***) without the failed thermistor. Recovery is automatic. Reason for failure may be incorrect wiring, faulty thermistor, or damaged input on staged gas control board (SCB).

A704 (Staged Gas Lvg Air Temp Sum Total Failure)

If all 3 staged heat thermistors (***Temperatures→AIR.T→S.G.L1,2,3***) fail, staged heat will be shut down and this alarm will be generated. Recovery is automatic. Reason for failure may be faulty wiring, faulty thermistors, or damaged inputs on the staged gas control board (SCB).

T705 (Limit Switch Thermistor Failure)

A failure of this thermistor (***Temperatures→AIR.T→S.G.LM***) will cause an alert to occur and a disabling of the limit switch monitoring function for the staged gas control board (SCB). Recovery is automatic. Reason for failure may be due to faulty wiring, a faulty thermistor, or a damaged input on the staged gas control board (SCB).

A706 (Hydronic Evap Discharge Thermistor Failure)

If the unit is configured for hot water heating (hydronic), then the unit has a thermistor (***Temperatures→AIR.T→CCT***) installed between the evaporator coil and the hot water coils that functions as the evaporator discharge temperature thermistor for cooling. If this thermistor fails, an alarm will be generated and the system will be shut down. Recovery is automatic. Reason for failure may be due to faulty wiring, a faulty thermistor, or a damaged input on the EXB control board.

A707 (Digital Scroll A1 Discharge Thermistor Failure)

If the RXB control board is not receiving a signal from the discharge temperature thermistor, the alarm is generated. The thermistor may be missing or disconnected, or a wire may be broken.

The alert will be generated and the digital scroll capacity will be locked at 50%. Reset is automatic.

T800 (Cannot Enable MLV and Digital Scroll Simultaneously)

This alert occurs when both MLV and digital scroll are enabled in the field. These controls should not be enabled at the same time as cooling capacity control and compressor reliability can be compromised. Disable either MLV or digital scroll.

T801 (Invalid Sensor Enable. Check Building Pressure Mode)

This alert occurs when there has been an illegal combination of configurations made in the Building Pressure configurations.

If the Building Pressure Control is configured for VFD Power Exhaust and the return fan CFM sensor (RCFMSENS) is enabled, this alert will be generated. Only the exhaust fan CFM sensor (ECFMSENS) can be enabled (if installed).

If the Building Pressure Control is configured for VFD Return Fan or Return Fan Power Exhaust and the exhaust fan CFM sensor (ECFMSENS) is enabled, this alert will be generated. Only the return fan CFM sensor (RCFMSENS) can be enabled.

If both RCFMSENS and ECFMSENS are enabled, this alert will be generated. These are mutally exclusive and only one can be enabled at a time.

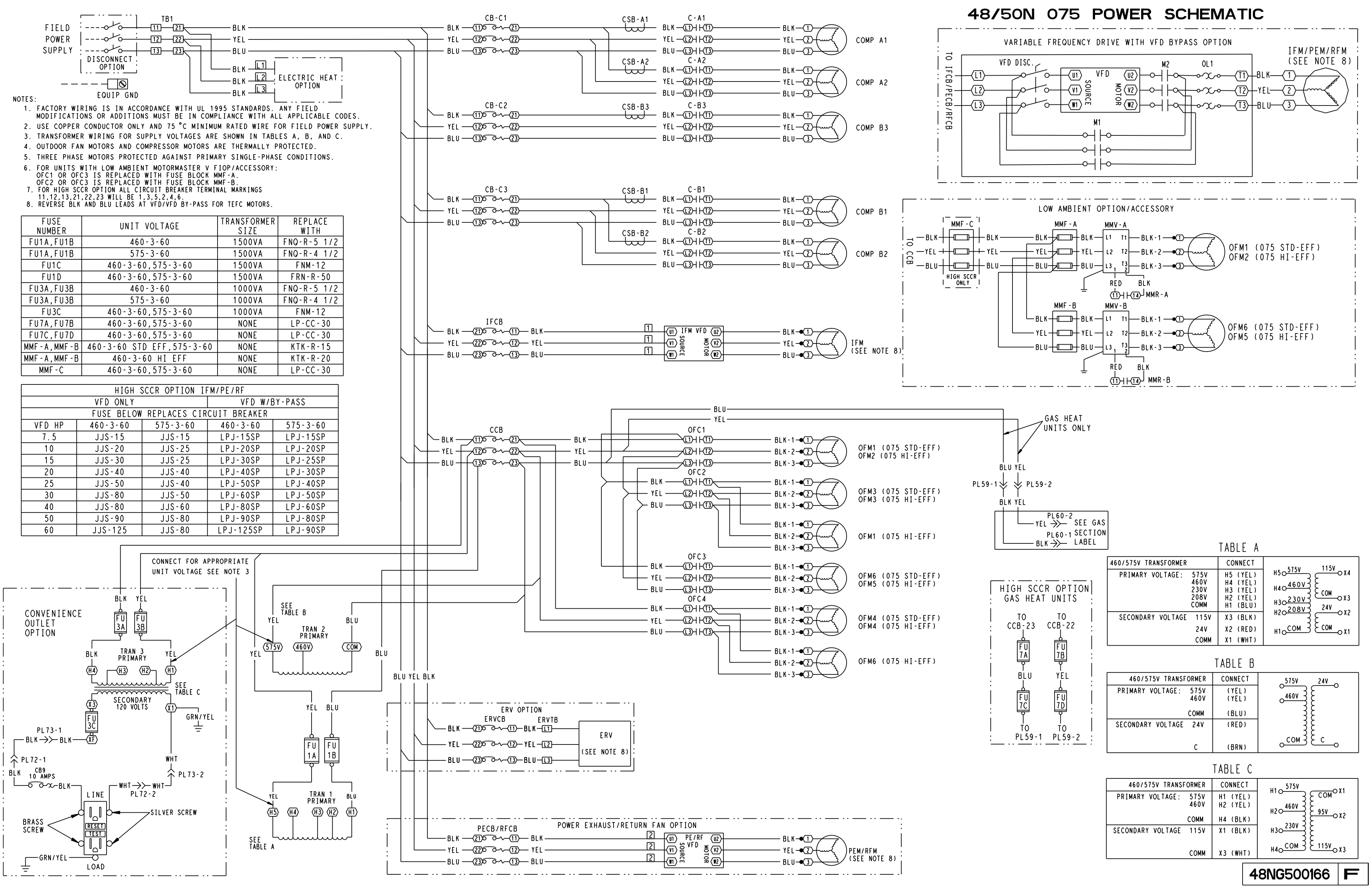
MAJOR SYSTEM COMPONENTS

General

The 48/50N Series package rooftop units with electric cooling and with gas heating (48N units) or electric cooling and electric or hydronic heating (50N 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. Table 93 lists typical wiring diagrams. See Fig. 18-29 for typical control and power component schematics. Figures 30 and 31 show the layout of the power and control box.

Table 93 — Component, Power, and Control Drawings

UNIT	NOMINAL TONS	DESCRIPTION	LOCATION
48N	075	Power Wiring	Fig. 18, page 135
		Typical Gas Heat Section Wiring, Low Heat Units	Fig. 25, page 142
		Typical Modulating Gas Heat Section Wiring, Low Heat Units	Fig. 26, page 143
		Typical Power Component Control Wiring, 460 v	Fig. 28, page 145
		Typical Power Component Control Wiring, 575 v	Fig. 29, page 146
	090 to 105	Power Wiring	Fig. 19, page 136
		Typical Gas Heat Section Wiring, Low Heat Units	Fig. 25, page 142
		Typical Modulating Gas Heat Section Wiring, Low Heat Units	Fig. 26, page 143
		Typical Power Component Control Wiring, 460 v	Fig. 28, page 145
		Typical Power Component Control Wiring, 575 v	Fig. 29, page 146
	120 to 150	Power Wiring	Fig. 19, page 136
		Typical Gas Heat Section Wiring	Fig. 27, page 144
		Typical Power Component Control Wiring, 460 v	Fig. 28, page 145
		Typical Power Component Control Wiring, 575 v	Fig. 29, page 146
	ALL	Main Base Board Input/Output Connections	Fig. 19, page 137
	ALL	RXB, EXB, CEM Input/Output Connections	Fig. 21, page 138
	ALL	EXV, SCB Input/Output Connections	Fig. 22, page 139
	ALL	Typical Modulating Gas Heat Unit Control Wiring	Fig. 23, page 140
	ALL	Component Arrangement Power Box	Fig. 30, page 147
	ALL	Component Arrangement Control Box	Fig. 31, page 148
50N	075	Power Wiring	Fig. 18, page 135
		Typical Electric Heat Unit Control Wiring	Fig. 24, page 141
		Typical Power Component Control Wiring, 460 v	Fig. 28, page 145
		Typical Power Component Control Wiring, 575 v	Fig. 29, page 146
	090 to 150	Power Wiring	Fig. 19, page 136
		Typical Electric Heat Unit Control Wiring	Fig. 24, page 141
		Typical Power Component Control Wiring, 460 v	Fig. 28, page 145
		Typical Power Component Control Wiring, 575 v	Fig. 29, page 146
	ALL	Main Base Board Input/Output Connections	Fig. 19, page 137
	ALL	RXB, EXB, CEM Input/Output Connections	Fig. 21, page 138
	ALL	EXV, SCB Input/Output Connections	Fig. 22, page 139
	ALL	Component Arrangement Power Box	Fig. 30, page 147
	ALL	Component Arrangement Control Box	Fig. 31, page 148



NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE COPPER CONDUCTOR ONLY AND 75 °C MINIMUM RATED WIRE FOR FIELD POWER SUPPLY.
3. TRANSFORMER WIRING FOR SUPPLY VOLTAGES ARE SHOWN IN TABLES A, B, AND C.
4. OUTDOOR FAN MOTORS AND COMPRESSOR MOTORS ARE THERMALLY PROTECTED.
5. THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE-PHASE CONDITIONS.
6. FOR UNITS WITH LOW AMBIENT MOTORMASTER V FIOP/ACCESSORY:
   OFC1 OR OFC3 IS REPLACED WITH FUSE BLOCK MMF-A.
   OFC2 OR OFC3 IS REPLACED WITH FUSE BLOCK MMF-B.
7. FOR HIGH SCCR OPTION ALL CIRCUIT BREAKER TERMINAL MARKINGS 11,12,13,21,22,23 WILL BE 1,3,5,2,4,6.
8. REVERSE BLK AND BLU LEADS AT VFD/VFD BY-PASS FOR TEFC MOTORS.

FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1A,FU1B	460-3-60	1500VA	FNQ-R-5 1/2
FU1A,FU1B	575-3-60	1500VA	FNQ-R-4 1/2
FU1C	460-3-60,575-3-60	1500VA	FNM-12
FU1D	460-3-60,575-3-60	1500VA	FRN-R-50
FU3A,FU3B	460-3-60	1000VA	FNQ-R-5 1/2
FU3A,FU3B	575-3-60	1000VA	FNQ-R-4 1/2
FU3C	460-3-60,575-3-60	1000VA	FNM-12
FU7A,FU7B	460-3-60,575-3-60	NONE	LP-CC-30
FU7C,FU7D	460-3-60,575-3-60	NONE	LP-CC-30
MMF-A,MMF-B	460-3-60 STD EFF,575-3-60	NONE	KTK-R-15
MMF-A,MMF-B	460-3-60 HI EFF	NONE	KTK-R-20
MMF-C	460-3-60,575-3-60	NONE	LP-CC-30

HIGH SCCR OPTION IFM/PE/RF				
	VFD ONLY		VFD W/BY-PASS	
FUSE BELOW REPLACES CIRCUIT BREAKER				
VFD HP	460-3-60	575-3-60	460-3-60	575-3-60
7.5	JJS-15	JJS-15	LPJ-15SP	LPJ-15SP
10	JJS-20	JJS-25	LPJ-20SP	LPJ-20SP
15	JJS-30	JJS-25	LPJ-30SP	LPJ-25SP
20	JJS-40	JJS-40	LPJ-40SP	LPJ-30SP
25	JJS-50	JJS-40	LPJ-50SP	LPJ-40SP
30	JJS-80	JJS-50	LPJ-60SP	LPJ-50SP
40	JJS-80	JJS-60	LPJ-80SP	LPJ-60SP
50	JJS-90	JJS-80	LPJ-90SP	LPJ-80SP
60	JJS-125	JJS-80	LPJ-125SP	LPJ-90SP

TABLE A

460/575V TRANSFORMER		CONNECT
PRIMARY VOLTAGE:	575V	H5 (YEL)
	460V	H4 (YEL)
	230V	H3 (YEL)
	208V	H2 (YEL)
	COMM	H1 (BLU)
SECONDARY VOLTAGE	115V	X3 (BLK)
	24V	X2 (RED)
	COMM	X1 (WHT)

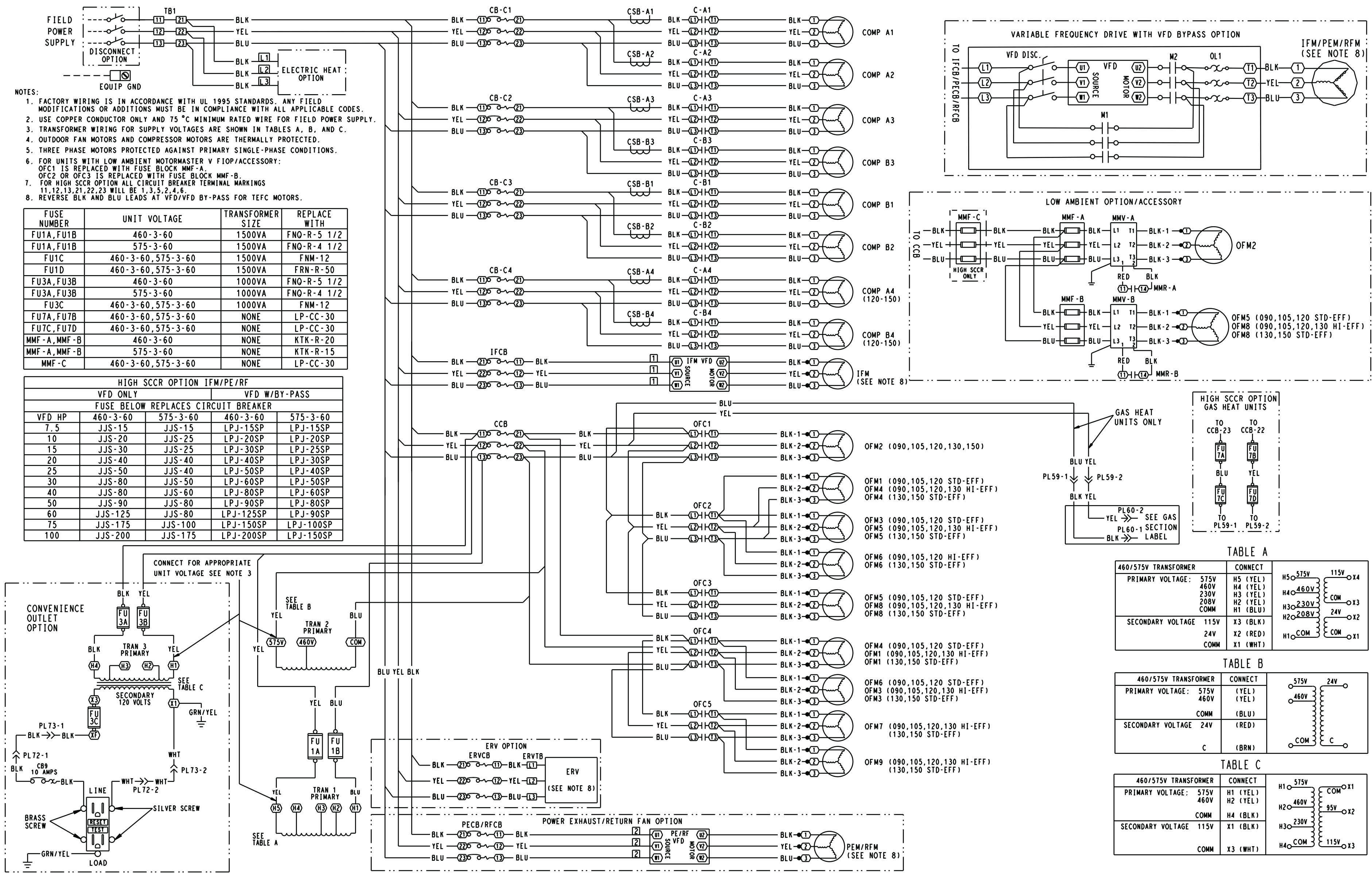
TABLE B

460/575V TRANSFORMER		CONNECT
PRIMARY VOLTAGE:	575V	(YEL)
	460V	(YEL)
	COMM	(BLU)
SECONDARY VOLTAGE	24V	(RED)
	C	(BRN)

TABLE C

460/575V TRANSFORMER		CONNECT
PRIMARY VOLTAGE:	575V	H1 (YEL)
	460V	H2 (YEL)
	COMM	H4 (BLK)
SECONDARY VOLTAGE	115V	X1 (BLK)
	COMM	X3 (WHT)

Fig. 18 — 48/50N Typical Power Schematic (Nominal 075-Ton Unit Shown)



NOTES:

1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE COPPER CONDUCTOR ONLY AND 75 °C MINIMUM RATED WIRE FOR FIELD POWER SUPPLY.
3. TRANSFORMER WIRING FOR SUPPLY VOLTAGES ARE SHOWN IN TABLES A, B, AND C.
4. OUTDOOR FAN MOTORS AND COMPRESSOR MOTORS ARE THERMALLY PROTECTED.
5. THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE-PHASE CONDITIONS.
6. FOR UNITS WITH LOW AMBIENT MOTORMASTER V FIOP/ACCESSORY:
   OFC1 IS REPLACED WITH FUSE BLOCK MMF-A.
   OFC2 OR OFC3 IS REPLACED WITH FUSE BLOCK MMF-B.
7. FOR HIGH SCCR OPTION ALL CIRCUIT BREAKER TERMINAL MARKINGS 11,12,13,21,22,23 WILL BE 1,3,5,2,4,6.
8. REVERSE BLK AND BLU LEADS AT VFD/VFD BY-PASS FOR TEFC MOTORS.

FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1A,FU1B	460-3-60	1500VA	FNQ-R-5 1/2
FU1A,FU1B	575-3-60	1500VA	FNQ-R-4 1/2
FU1C	460-3-60,575-3-60	1500VA	FNM-12
FU1D	460-3-60,575-3-60	1500VA	FRN-R-50
FU3A,FU3B	460-3-60	1000VA	FNQ-R-5 1/2
FU3A,FU3B	575-3-60	1000VA	FNQ-R-4 1/2
FU3C	460-3-60,575-3-60	1000VA	FNM-12
FU7A,FU7B	460-3-60,575-3-60	NONE	LP-CC-30
FU7C,FU7D	460-3-60,575-3-60	NONE	LP-CC-30
MMF-A,MMF-B	460-3-60	NONE	KTK-R-20
MMF-A,MMF-B	575-3-60	NONE	KTK-R-15
MMF-C	460-3-60,575-3-60	NONE	LP-CC-30

HIGH SCCR OPTION IFM/PE/RF				
VFD ONLY			VFD W/BY-PASS	
FUSE BELOW REPLACES CIRCUIT BREAKER				
VFD HP	460-3-60	575-3-60	460-3-60	575-3-60
7.5	JJS-15	JJS-15	LPJ-15SP	LPJ-15SP
10	JJS-20	JJS-25	LPJ-20SP	LPJ-20SP
15	JJS-30	JJS-25	LPJ-30SP	LPJ-25SP
20	JJS-40	JJS-40	LPJ-40SP	LPJ-30SP
25	JJS-50	JJS-40	LPJ-50SP	LPJ-40SP
30	JJS-80	JJS-50	LPJ-60SP	LPJ-50SP
40	JJS-80	JJS-60	LPJ-80SP	LPJ-60SP
50	JJS-90	JJS-80	LPJ-90SP	LPJ-80SP
60	JJS-125	JJS-80	LPJ-125SP	LPJ-90SP
75	JJS-175	JJS-100	LPJ-150SP	LPJ-100SP
100	JJS-200	JJS-175	LPJ-200SP	LPJ-150SP

TABLE A

460/575V TRANSFORMER		CONNECT
PRIMARY VOLTAGE:	575V	H5 (YEL)
	460V	H4 (YEL)
	230V	H3 (YEL)
	208V	H2 (YEL)
	COMM	H1 (BLU)
SECONDARY VOLTAGE	115V	X3 (BLK)
	24V	X2 (RED)
	COMM	X1 (WHT)

TABLE B

460/575V TRANSFORMER		CONNECT
PRIMARY VOLTAGE:	575V	(YEL)
	460V	(YEL)
	COMM	(BLU)
SECONDARY VOLTAGE	24V	(RED)
	C	(BRN)

TABLE C

460/575V TRANSFORMER		CONNECT
PRIMARY VOLTAGE:	575V	H1 (YEL)
	460V	H2 (YEL)
	COMM	H4 (BLK)
SECONDARY VOLTAGE	115V	X1 (BLK)
	COMM	X3 (WHT)

Fig. 19 — 48/50N Typical Power Schematic (Nominal Ton 90-150 Units Shown)

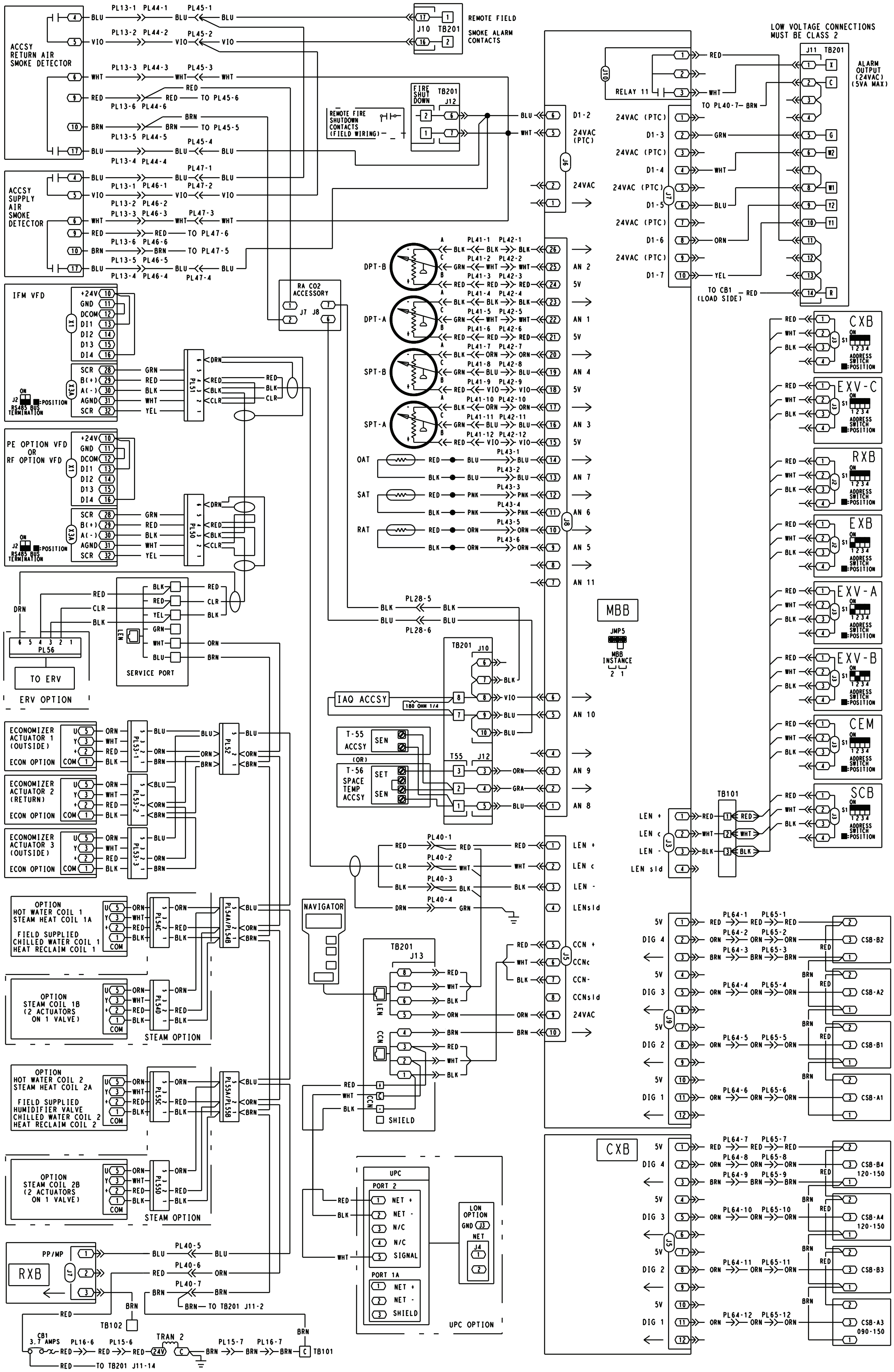


Fig. 20 — 48/50N Main Base Board Input/Output Connections

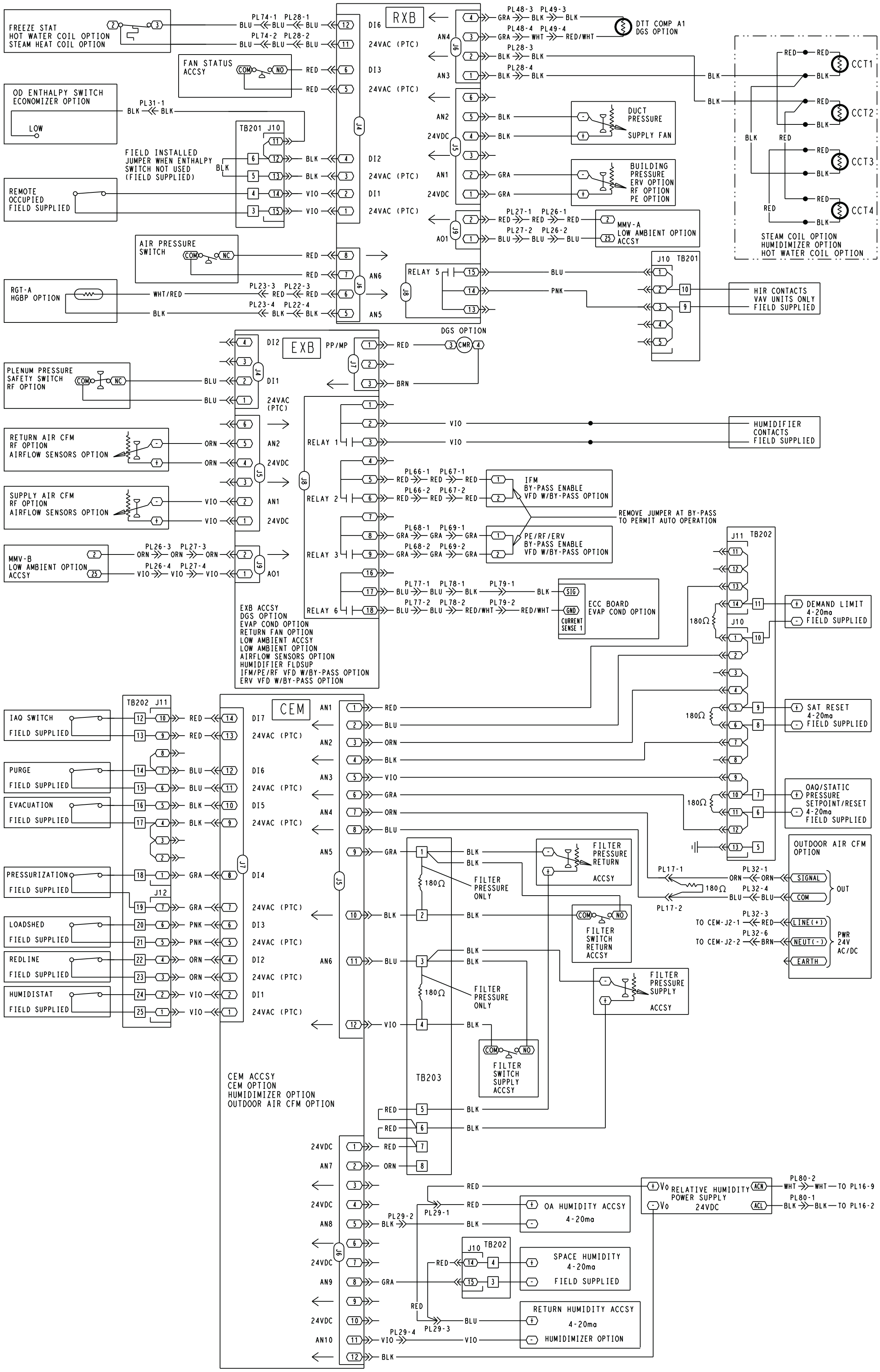


Fig. 21 — 48/50N RXB, EXB, CEM Input/Output Connections

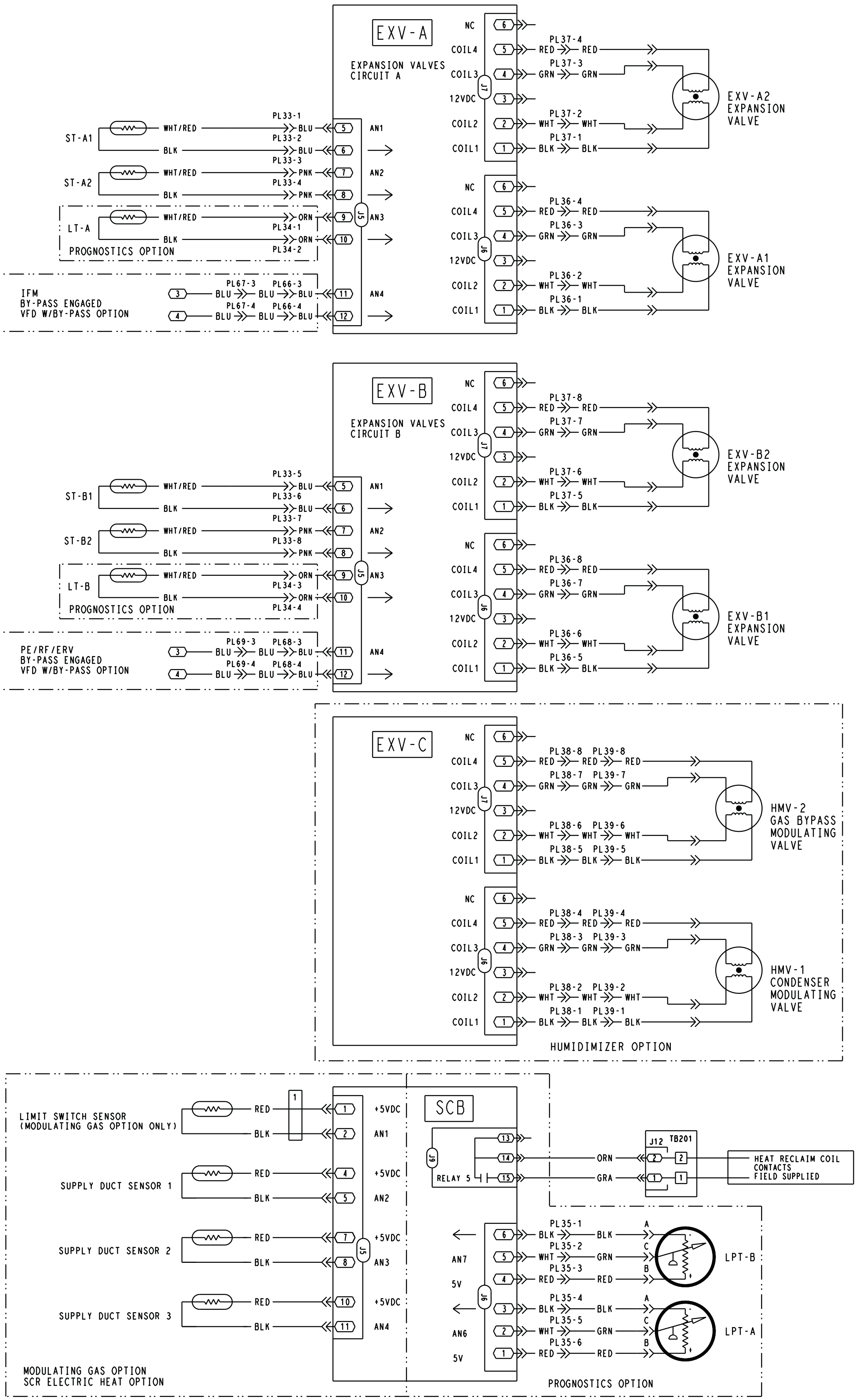


Fig. 22 — 48/50N EXV, SCB Input/Output Connections

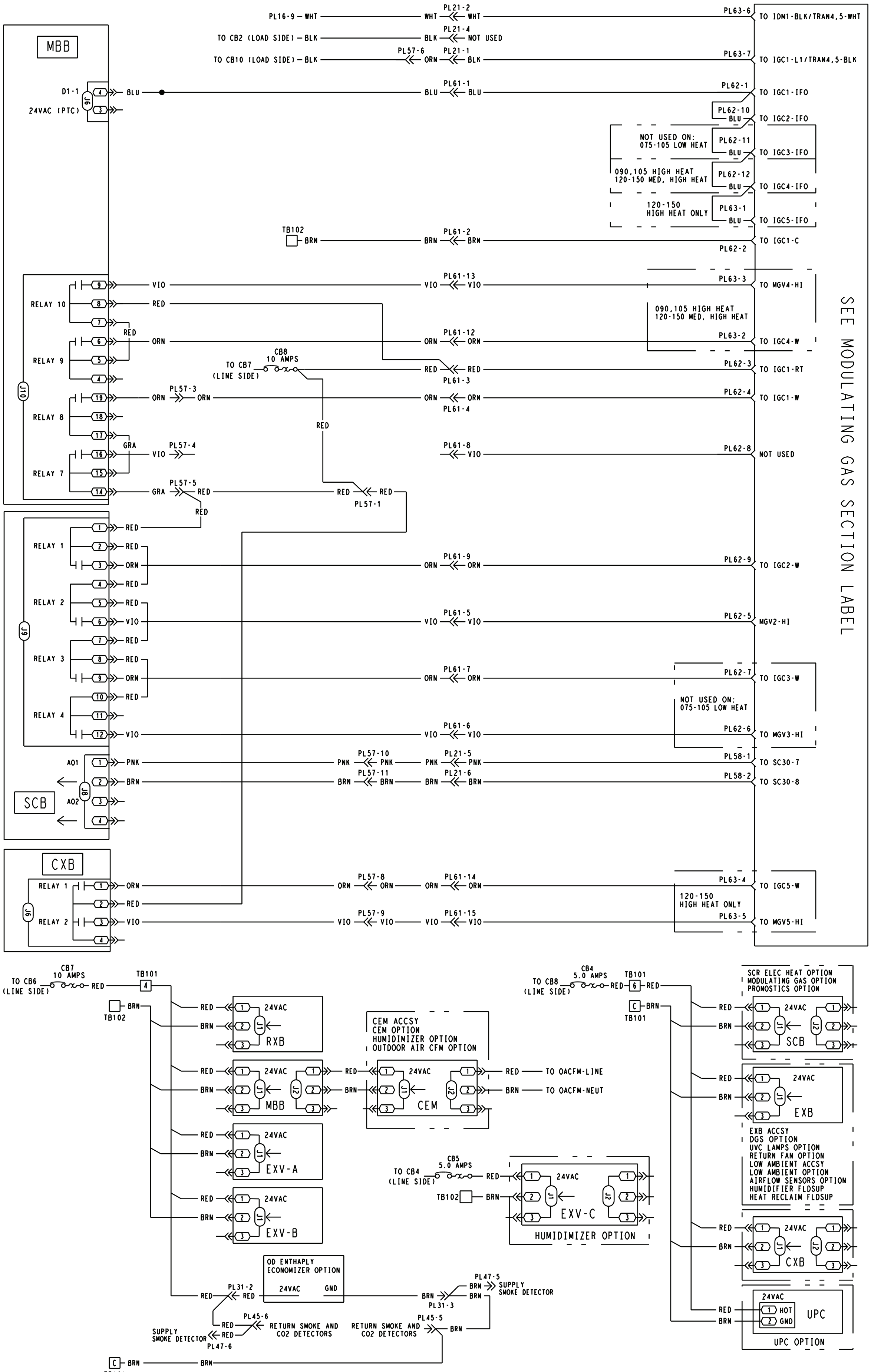


Fig. 23 — 48N Typical Modulating Gas Heat Unit Control Wiring

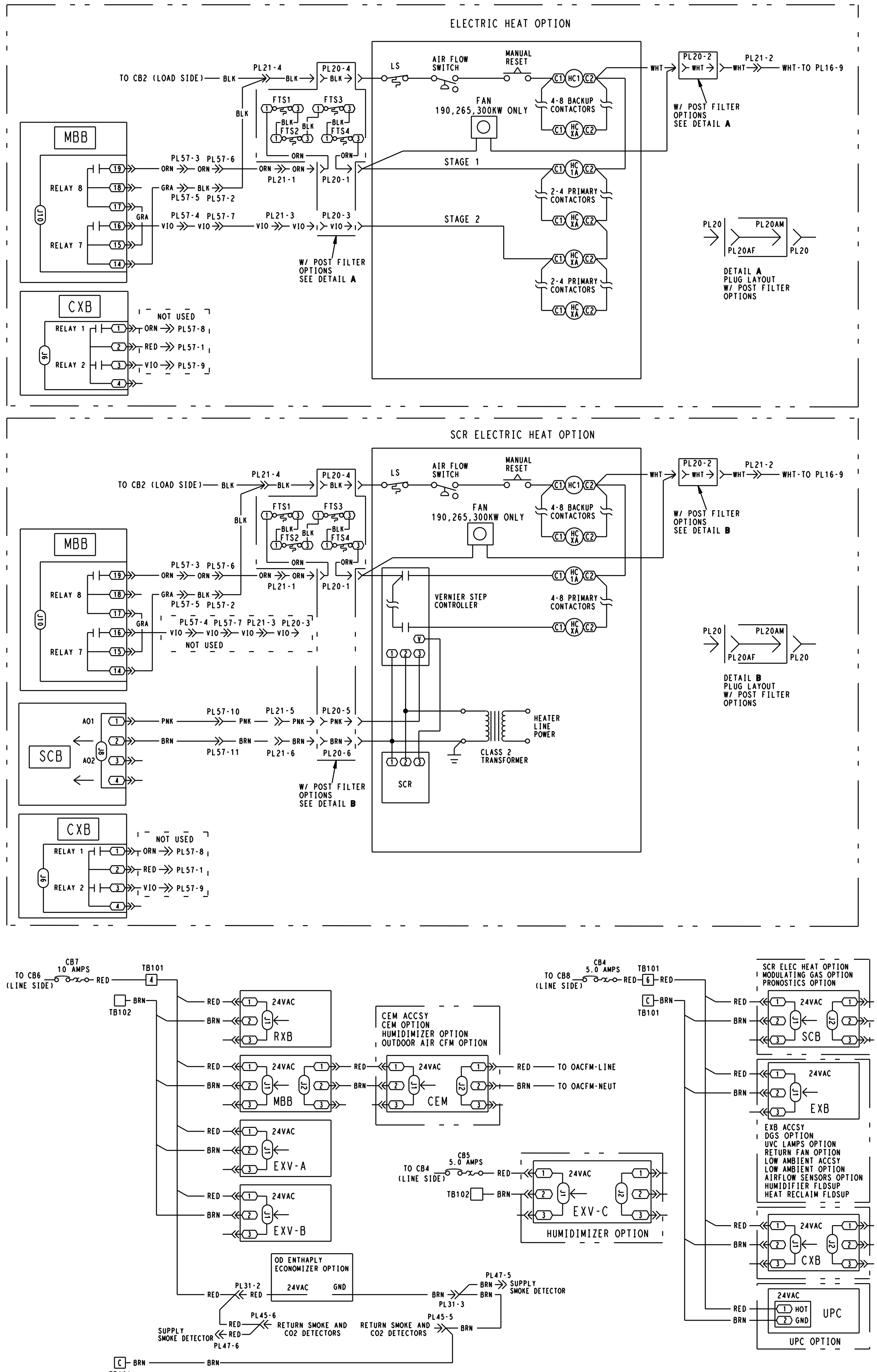


Fig. 24 — 50N Typical Electric Heat Unit Control Wiring

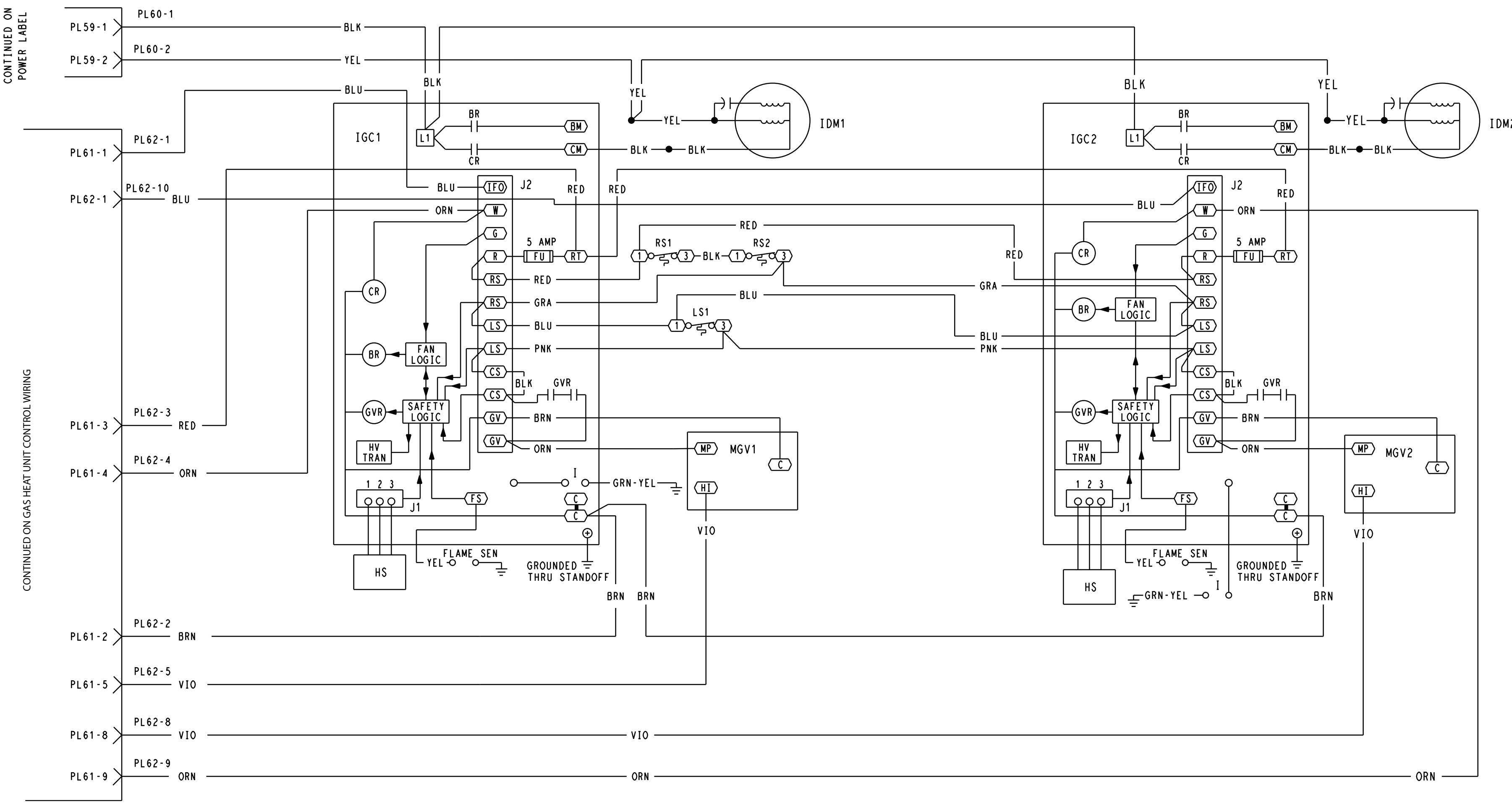


Fig. 25 — 48N Typical Gas Heat Section Wiring (Nominal Ton 75 to 105, Low Heat Units)

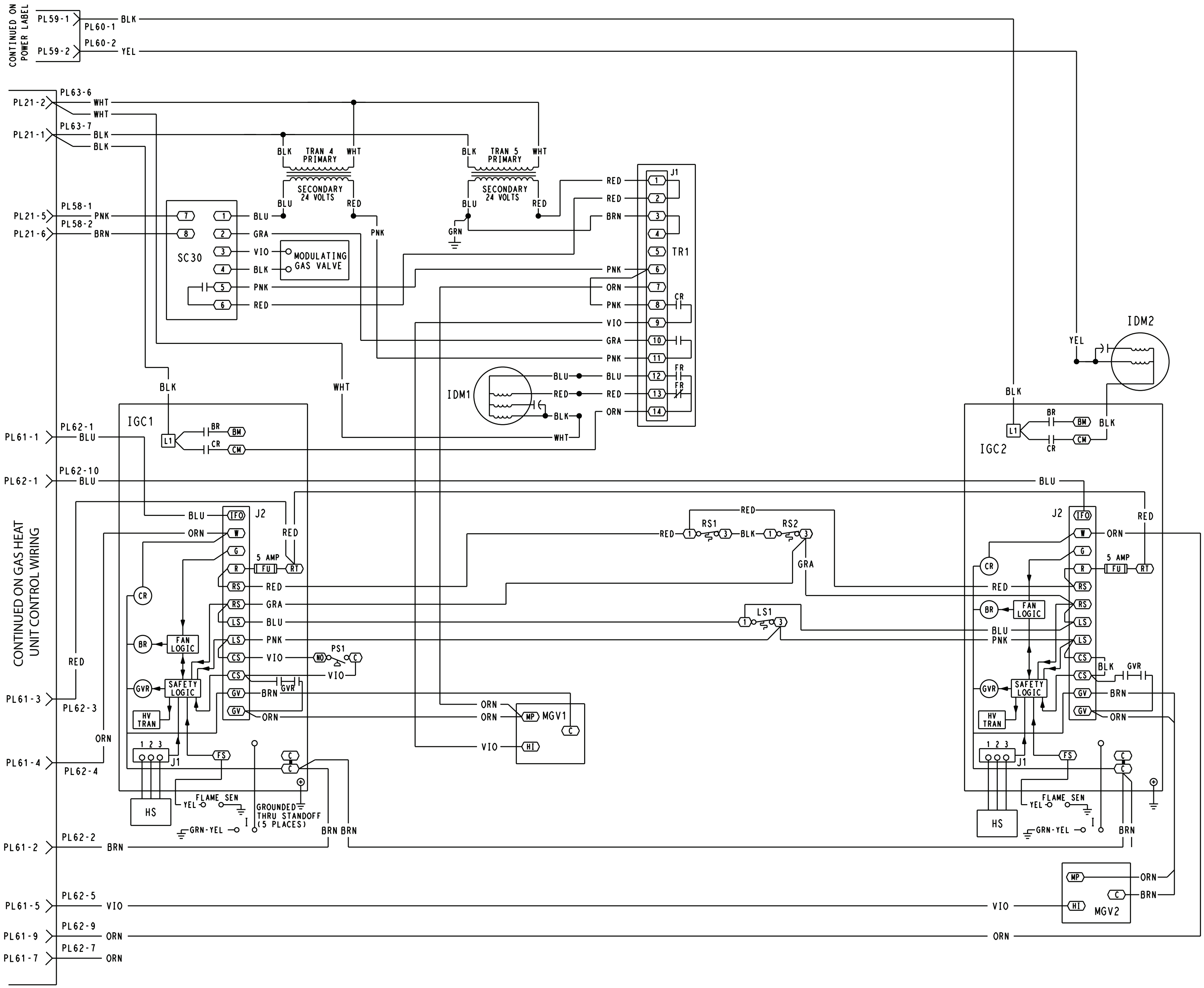


Fig. 26 — 48N Typical Modulating Gas Heat Section Wiring (Nominal Ton 75 to 105, Low Heat Units)

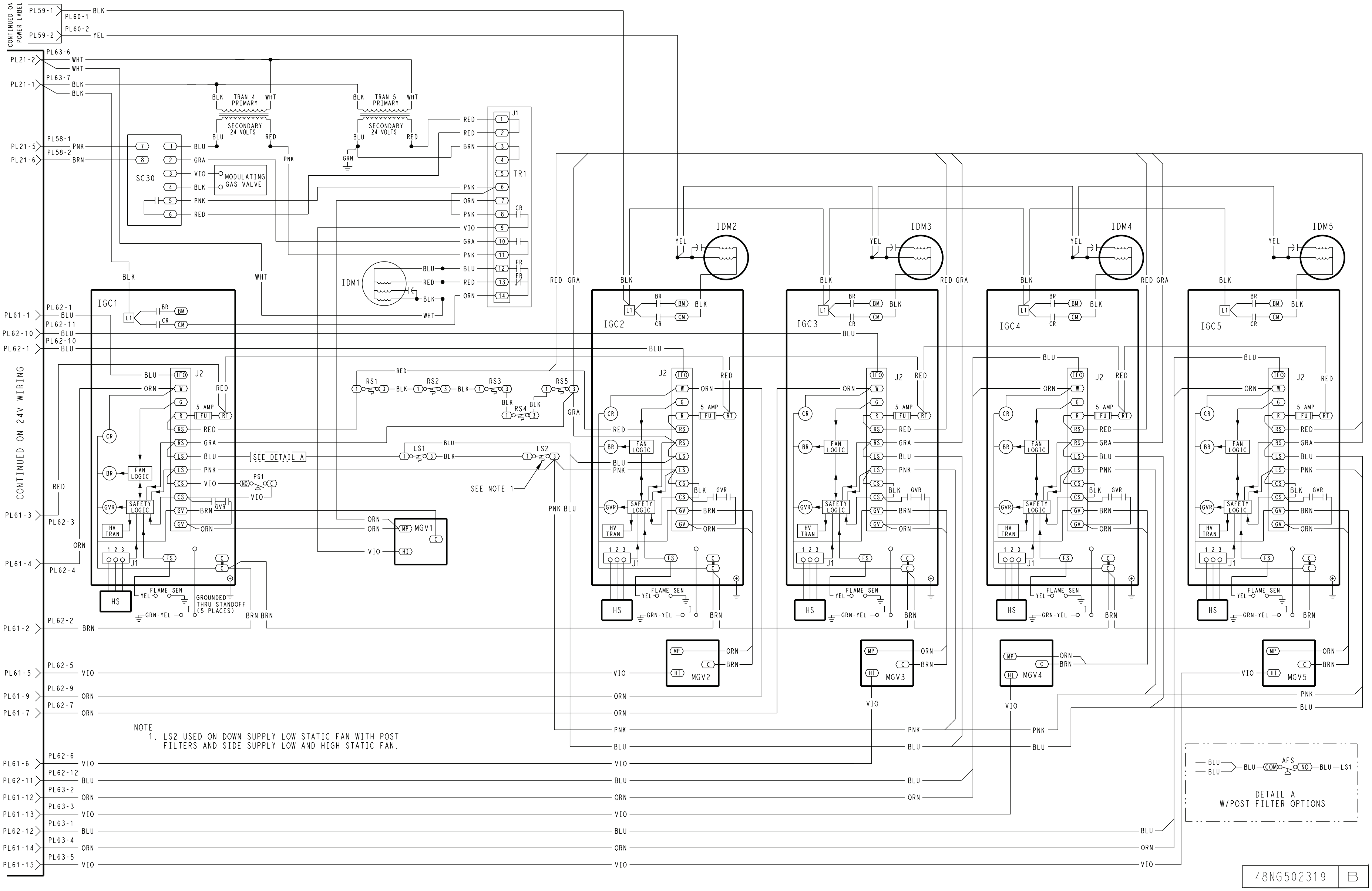


Fig. 27 — 48N Typical Gas Heat Section Wiring (Nominal Ton 120 to 150 Units)

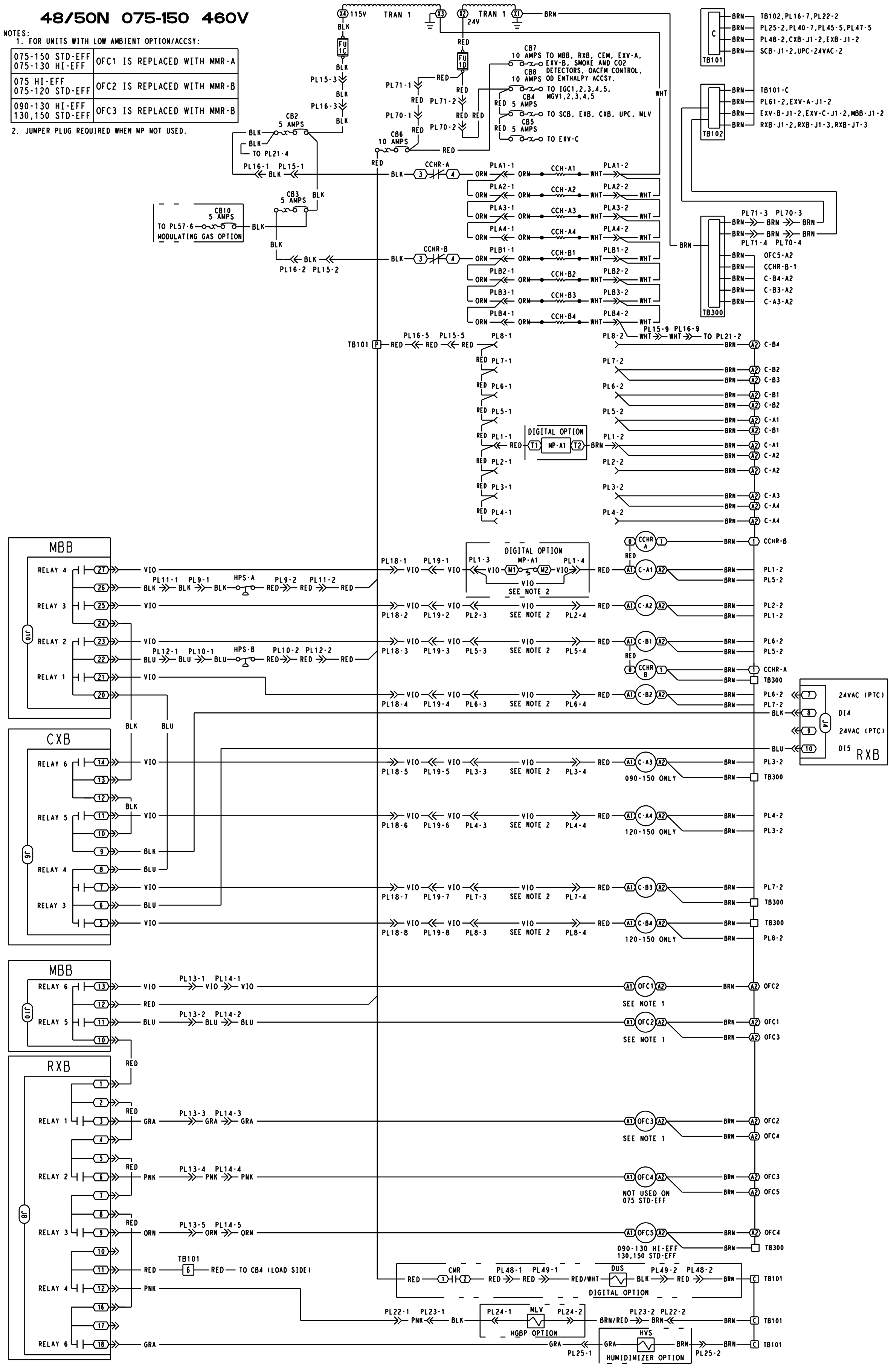


Fig. 28 — 48/50N Typical Power Component Control Wiring, 460 v

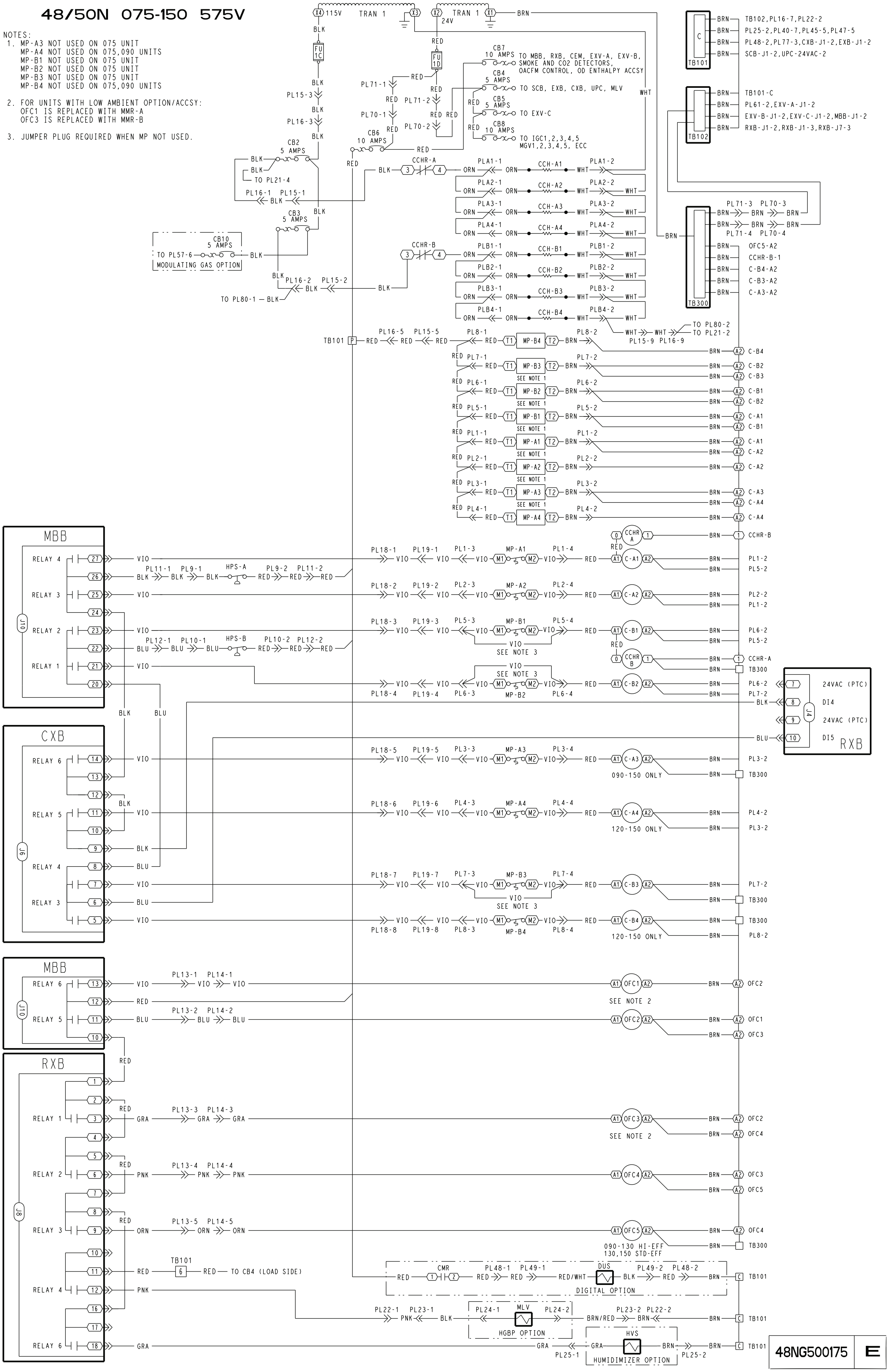


Fig. 29 — 48/50N Component Control Wiring, 575 v (Nominal Ton 075 to 150 Units)

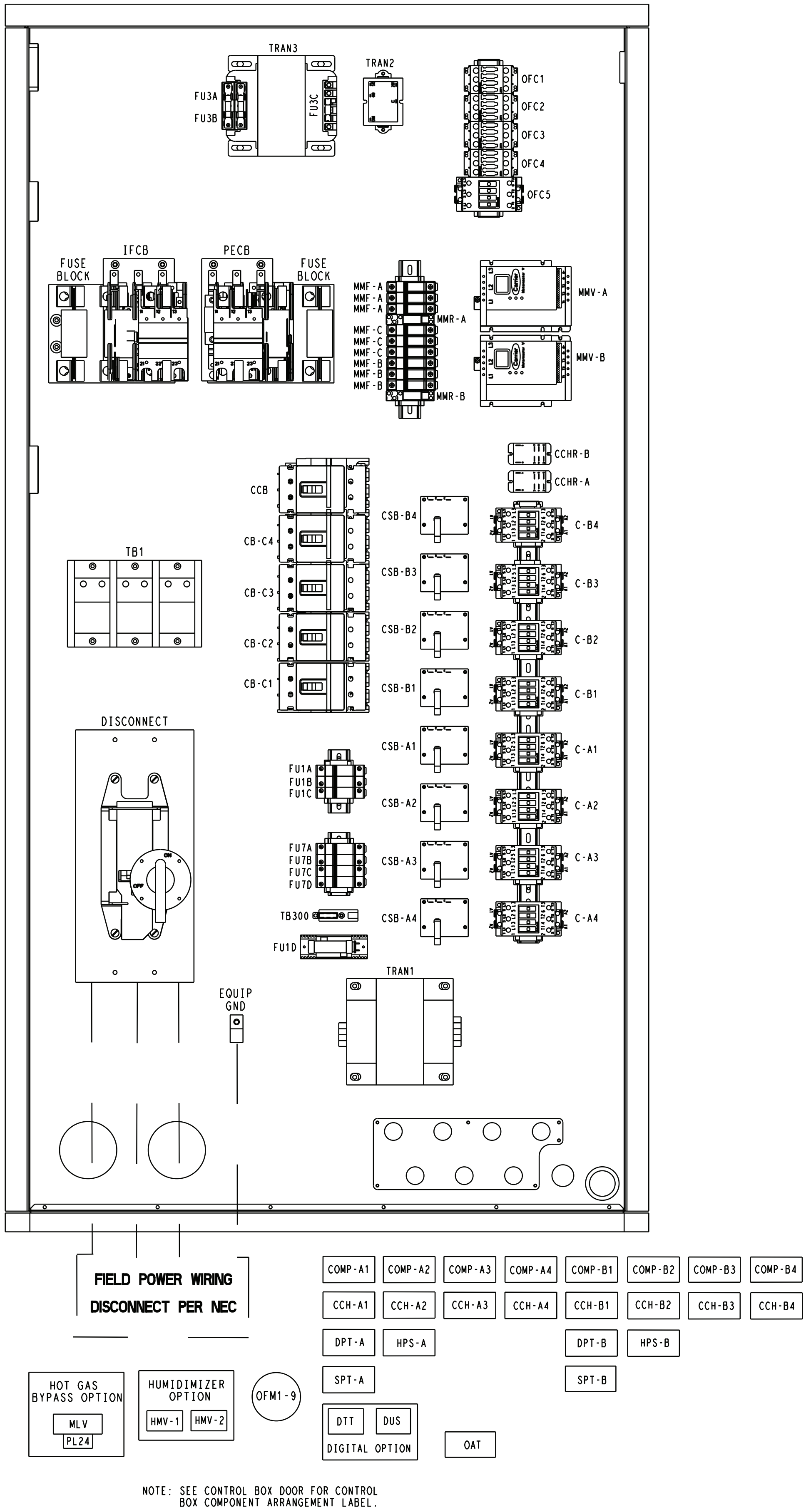


Fig. 30 — 48/50N Component Arrangement Power Box

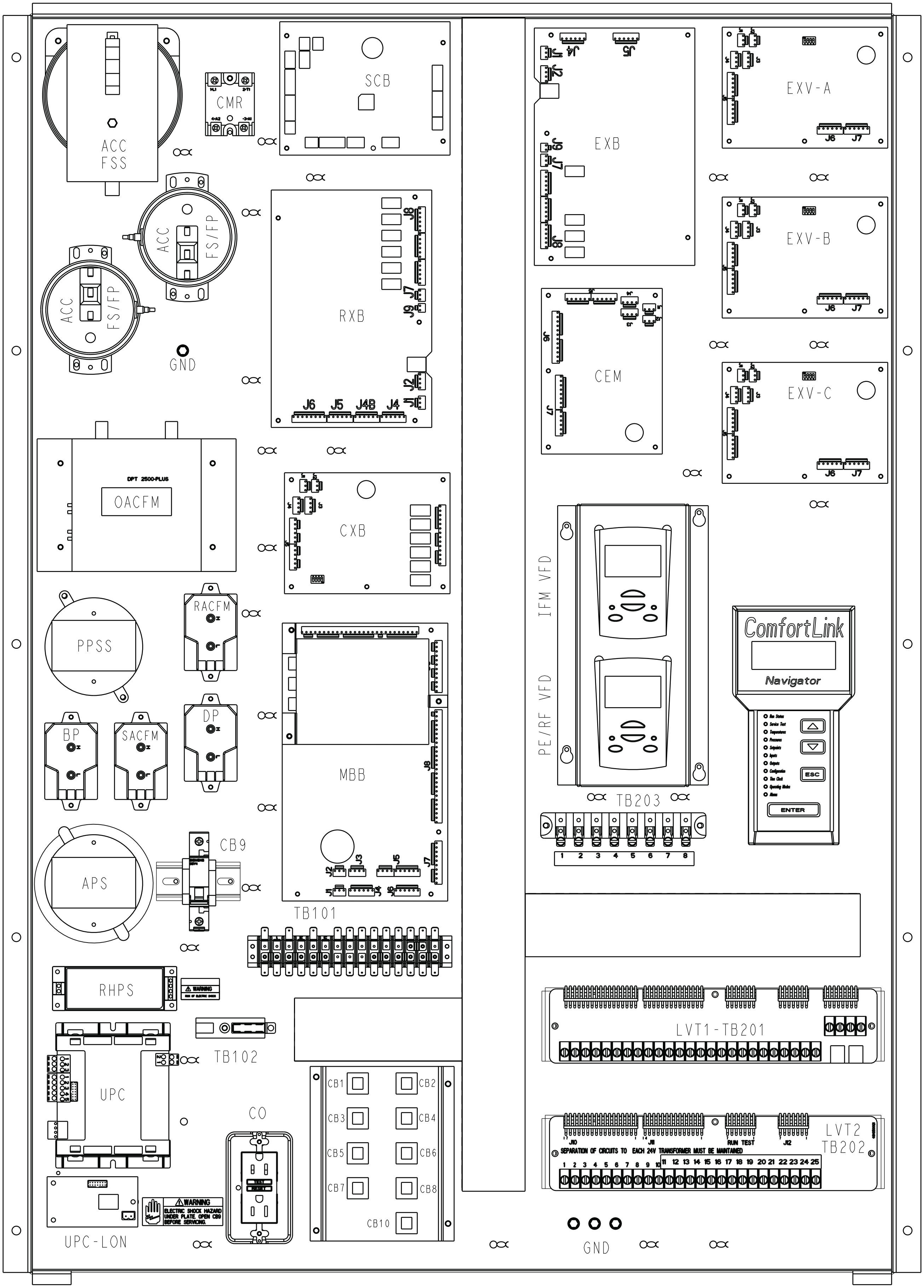


Fig. 31 — 48/50N Component Arrangement Control Box

LEGEND FOR Fig. 18-31

ACCSY	— Accessory
ACC'Y	— Accessory
ACC FSS	— Accessory Fan Status Switch
AN	— Analog
APS	— Air Pressure Switch
BP	— Building Pressure
BR	— Blower Relay
C	— Compressor Contactor
CB	— Compressor Circuit Breaker
CCB	— Control Circuit Breaker
CCH	— Crankcase Heater
CCHR	— Crankcase Heater Relay
CCN	— Carrier Comfort Network®
CCT	— Cooling Coil Thermistor
CEM	— Controls Expansion Module
CMR	— Compressor Modulation Relay
CO	— Convenience Outlet
COMP	— Compressor
CR	— Control Relay
CSB	— Current Sensor Board
CXB	— Compressor Expansion Board
DGS	— Discharge Gas Sensor
DI	— Digital Input
DP	— Duct Pressure
DPT	— Discharge Pressure Transducer
DTT	— Discharge Temperature Thermistor
DUS	— Digital Unloader Solenoid
ECC	— Evaporative Condenser Control
ECON	— Economizer
EQUIP	— Equipment
EXV	— Electronic Expansion Valve
FS	— Filter Switch
FS/FP	— Filter Switch/Filter Pressure
FTS	— Filter Switch
FU	— Fuse
GND	— Ground
GVR	— Gas Valve Relay
HC	— Heater Contactor
HIR	— Heat Induction Relay
HGBP	— Hot Gas Bypass
HMV	— Humidi-MiZer Valve
HPS	— High-Pressure Switch
HS	— Hall Effect Sensor
HV	— High Voltage
HVS	— Humidi-MiZer® Valve Solenoid
I	— Igniter
IAQ	— Indoor Air Quality
IDM	— Induced Draft Motor
IFCB	— Indoor Fan Circuit Breaker
IFM	— Indoor Fan Motor
IGC	— Integrated Gas Controller
LEN	— Local Equipment Network

LON	— Local Operating Network
LPT	— Liquid Pressure Transducer
LS	— Limit Switch
LT	— Liquid Temperature
LVT	— Low Volume Terminal
MBB	— Main Base Board
MGV	— Main Gas Valve
MLV	— Minimum Load Valve
MMF	— Motormaster Fuse
MMR	— Motormaster Relay
MMV	— Motormaster VFD
MP	— Communications
NEC	— National Electrical Code
OA	— Outdoor Air
OAQ	— Outdoor Air Quality
OAT	— Outdoor-Air Thermistor
OD	— Outdoor
OFC	— Outdoor Fan Contactor
OFM	— Outdoor Fan Motor
OL	— Overload
PE	— Power Exhaust
PECB	— Power Exhaust Circuit Breaker
PEM	— Power Exhaust Motor
PL	— Plug Assembly
PP	— Communications
PPSS	— Plenum Pressure Safety Switch
PS	— Pressure Switch
PTC	— Positive Temperature Coefficient Power Reference
RACFM	— Return Air CFM
RAT	— Return Air Thermistor
RF	— Return Fan
RFCB	— Return Fan Circuit Breaker
RFM	— Return Fan Motor
RGT	— Return Gas Thermistor
RHPS	— Relative Humidity Power Supply
RS	— Rollout Switch
RXB	— Rooftop Control Board
SACFM	— Supply Air CFM
SAT	— Supply Air Thermistor
SC30	— Signal Conditioner Control Board
SCB	— Staged Gas Control Board
SCCR	— Short Circuit Current Rating
SCR	— Silicon Controlled Rectifier
SEN	— Sensor
SPT	— Suction Pressure Transducer
ST	— Suction Temperature
TB	— Terminal Block
TR1	— Timer Relay Control Board
TRAN	— Transformer
UPC	— Unitary Protocol Converter
VAV	— Variable Air Volume
VFD	— Variable Frequency Drive

x Terminal Block

Terminal (Unmarked)

x Terminal (Marked)

Splice

Factory Wiring

Field Wiring

To indicate common potential only, not to represent wiring.

To indicate factory-installed option or accessory

Factory-Installed Components

MAIN BASE BOARD (MBB)

See Fig 32. 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 94 for the inputs and output assignments. The MBB also continuously monitors additional data from the EXB, EXV, RXB, SCB, and CEM boards, as well as the VFDs through the LEN communications port. 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 control box.

ROOFTOP CONTROL BOARD (RXB)

The RXB communicates with and controls the damper actuators, hydronic, and humidifier valves. The RXB has additional inputs and outputs required for the control of the unit. All units have an RXB board. See Fig. 33. The board has 9 inputs and 8 outputs. Details can be found in Table 95. The RXB board is located in the control box.

ECONOMIZER CONTROL BOARD (EXB)

The EXB is used on units with options including return fan, digital scroll compressor, VFD with bypass, low ambient or accessory humidifier. See Fig. 33. The board has inputs to sense the return fan cfm and supply fan cfm. This board is located in the control box. Input and output assignments are summarized in Table 96.

STAGED GAS HEAT BOARD (SCB)

When optional modulating gas heat is used, the SCB board is installed and controls additional stages of gas heat. See Fig. 34. The SCB also provides additional sensors for monitoring of the supply-air and limit switch temperatures. For units equipped with modulating gas heat, the SCB provides the 4 to 20 mA signal to the SC30 board that sets the modulating gas section capacity. The SCB is also used for the optional SCR electric heat or prognostics. This board is located in the control box. The inputs and outputs are summarized in Table 97.

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. 35. 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 98.

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
- Air filter monitoring switches and transducers
- Demand limit sequence proportional signals or discrete switches

The CEM is factory-installed when the outdoor air cfm control option is installed.

Table 94 — Main Control Board (MBB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.	UNITS
INPUTS						
IGCFAN	IGC IFO input	Switch Input	DI1	MBB	J6, 3-4	ALL
FSD	Fire Shutdown Switch, RA/SA Smoke Detector	Switch Input	DI2	MBB	J6, 5-6	
G	Thermostat ‘G’ Input	Switch Input	DI3	MBB	J7, 1-2	
W2	Thermostat ‘W2’ Input	Switch Input	DI4	MBB	J7, 3-4	
W1	Thermostat ‘W1’ Input	Switch Input	DI5	MBB	J7, 5-6	
Y2	Thermostat ‘Y2’ Input	Switch Input	DI6	MBB	J7, 7-8	
Y1	Thermostat ‘Y1’ Input	Switch Input	DI7	MBB	J7, 9-10	
CSB_A1	Compressor A1 Feedback	Digital Input	DIG1	MBB	J9, 10-12	
CSB_B1	Compressor B1 Feedback	Digital Input	DIG2	MBB	J9, 7-9	
CSB_A2	Compressor A2 Feedback	Digital Input	DIG3	MBB	J9, 4-6	
CSB_B2	Compressor B2 Feedback	Digital Input	DIG4	MBB	J9, 1-3	
DP_A	Discharge Pressure Circuit A	Thermistor/Transducer (0-5 V)	AN1	MBB	J8, 21-23	
DP_B	Discharge Pressure Circuit B	Thermistor/Transducer (0-5 V)	AN2	MBB	J8, 24-26	
SP_A	Suction Pressure Circuit A	Thermistor/Transducer (0-5 V)	AN3	MBB	J8, 15-17	
SP_B	Suction Pressure Circuit B	Thermistor/Transducer (0-5 V)	AN4	MBB	J8, 18-20	
RAT	Return Air Temperature	Thermistor	AN5	MBB	J8, 9-10	
SAT	Air Temp Lvg Supply Fan	Thermistor	AN6	MBB	J8, 11-12	
OAT	Outside Air Temperature	Thermistor	AN7	MBB	J8, 13-14	
SPT	Space Temperature	Thermistor	AN8	MBB	J8, 1-2	
SPTO	Space Temperature Offset	Thermistor	AN9	MBB	J8, 3-4	
IAQ, IAQMINOV	IAQ Input	Thermistor	AN10	MBB	J8, 5-6	
PWR_STAT	Power Status Input	Thermistor	AN11	MBB	J8, 7-8	
Not Used	Not Used	VFD1 AI1 (% of range)	AI1	ABB VFD1	X, 2-3	ALL ABB IFM VFD
Not Used	Not Used	VFD1 AI2 (% of range)	AI2	ABB VFD1	x, 5-6	
Not Used	Not Used	VFD1 DI1 State	DI1	ABB VFD1	X, 12-13	
Not Used	Not Used	VFD1 DI2 State	DI2	ABB VFD1	X, 12-14	
Not Used	Not Used	VFD1 DI3 State	DI3	ABB VFD1	X, 12-15	
Not Used	Not Used	VFD1 DI4 State	DI4	ABB VFD1	X, 12-16	
Not Used	Not Used	VFD1 DI5 State	DI5	ABB VFD1	X, 12-17	
Not Used	Not Used	VFD1 DI6 State	DI6	ABB VFD1	X, 12-18	
Not Used	Not Used	VFD2 AI1 (% of range)	AI1	ABB VFD2	X, 2-3	ABB VFD P.E. or Ret/Exh Fan VFD
Not Used	Not Used	VFD2 AI2 (% of range)	AI2	ABB VFD2	x, 5-6	
Not Used	Not Used	VFD2 DI1 State	DI1	ABB VFD2	X, 12-13	
Not Used	Not Used	VFD2 DI2 State	DI2	ABB VFD2	X, 12-14	
Not Used	Not Used	VFD2 DI3 State	DI3	ABB VFD2	X, 12-15	
Not Used	Not Used	VFD2 DI4 State	DI4	ABB VFD2	X, 12-16	
MSP1TRIP	MSP1 Tripped	VFD2 DI5 State	DI5	ABB VFD2	X, 12-17	
MSP2TRIP	MSP2 Tripped	VFD2 DI6 State	DI6	ABB VFD2	X, 12-18	
OUTPUTS						
CMPB2	Compressor B2	Relay	RLY 1	MBB	J10, 20-21	ALL
CMPB1	Compressor B1	Relay	RLY 2	MBB	J10, 22-23	
CMPA2	Compressor A2	Relay	RLY 3	MBB	J10, 24-25	
CMPA1	Compressor A1	Relay	RLY 4	MBB	J10, 26-27	
CONDFAN2	Condenser Fan Circuit B	Relay	RLY 5	MBB	J10, 10-11	
CONDFAN1	Condenser Fan Circuit A	Relay	RLY 6	MBB	J10, 12-13	
HS2	Heat Relay 2	Relay	RLY 7	MBB	J10, 14-16	
HS1	Heat Relay 1	Relay	RLY 8	MBB	J10, 17-19	
HS7	Heat Relay 7	Relay	RLY 9	MBB	J10, 4-6	
HS8	Heat Relay 8	Relay	RLY 10	MBB	J10, 7-9	
ALRM	Alarm Relay	Relay	RLY 11	MBB	J10, 1-3	
Not Used	Not Used	ABB Analog Output	AO1	ABB VFD1	X, 6-7	ALL ABB IFM VFD
Not Used	Not Used	ABB Analog Output	AO2	ABB VFD1	X, 8-9	
Not Used	Not Used	ABB Relay Output	RO1	ABB VFD1	X, 19-21	
Not Used	Not Used	ABB Relay Output	RO2	ABB VFD1	X, 22-24	
Not Used	Not Used	ABB Relay Output	RO3	ABB VFD1	X, 25-27	
Not Used	Not Used	ABB Relay Output [OREL 01]	RO4	ABB VFD1	X, 1-3	
Not Used	Not Used	ABB Relay Output [OREL 01]	RO5	ABB VFD1	X, 4-6	
Not Used	Not Used	ABB Relay Output [OREL 01]	RO6	ABB VFD1	X, 7-9	
Not Used	Not Used	ABB Relay Output	AO1	ABB VFD2	X, 6-7	ABB VFD P.E. or Ret/Exh Fan VFD
Not Used	Not Used	ABB Relay Output	AO2	ABB VFD2	X, 8-9	
Not Used	Not Used	ABB Relay Output	RO1	ABB VFD2	X, 19-21	
Not Used	Not Used	ABB Relay Output	RO2	ABB VFD2	X, 22-24	
Not Used	Not Used	ABB Relay Output	RO3	ABB VFD2	X, 25-27	
Not Used	Not Used	ABB Relay Output [OREL 01]	RO4	ABB VFD2	X, 1-3	
Not Used	Not Used	ABB Relay Output [OREL 01]	RO5	ABB VFD2	X, 4-6	
Not Used	Not Used	ABB Relay Output [OREL 01]	RO6	ABB VFD2	X, 7-9	

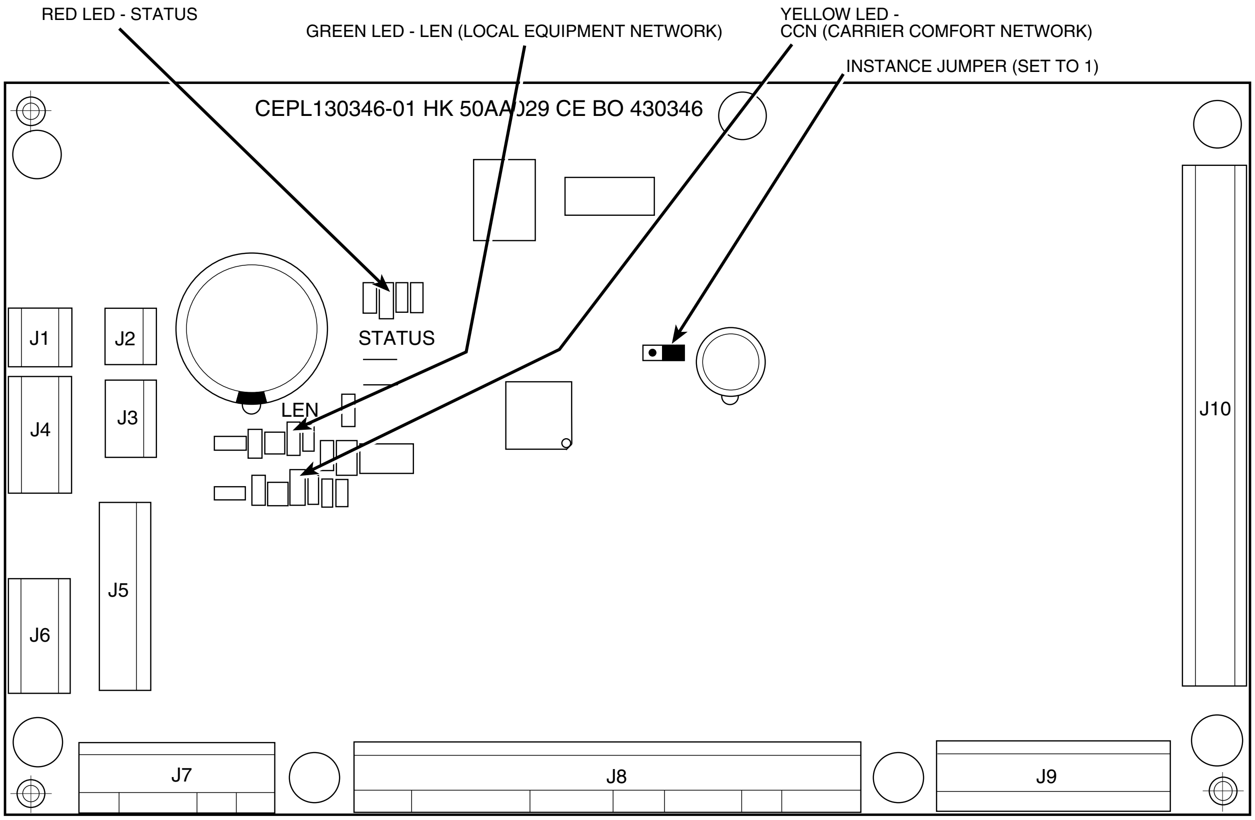


Fig. 32 — Main Base Board (MBB)

Table 95 — Rooftop Control Board (RXB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
RMTIN	Remote Input State	Switch Input	DI1	RXB	J4, 1-2
ENTH	Enth. Switch Read High?	Switch Input	DI2	RXB	J4, 3-4
SFS	Supply Fan Status Switch	Switch Input	DI3	RXB	J4, 5-6
CIRCAHPS	Circ A High Press. Switch	Switch Input	DI4	RXB	J4, 7-8
CIRCBHPS	Circ B High Press. Switch	Switch Input	DI5	RXB	J4, 9-10
FRZ	Freeze Status Switch	Switch Input	DI6	RXB	J4, 11-12
BP	Building Pressure	Transducer (4-20mA)	AN1	RXB	J5, 1-3
SP	Static Pressure	Transducer (4-20mA)	AN2	RXB	J5, 4-6
CCT	Air Temp Lvg Evap Coil	Thermistor	AN3	RXB	J6, 1-2
DTA1	A1 Discharge Temperature	Thermistor	AN4	RXB	J6, 3-4
RGTA	Suction Gas Temp Cir A	Thermistor	AN5	RXB	J6, 5-6
APS	Air Pressure Switch	Thermistor	AN6	RXB	J6, 7-8
OUTPUTS					
MMV_A	Motor Master VFD A	4-20mA		RXB	J9, 1-2
Belimo Actuators		Digital	PP/MP	RXB	
ECONCPOS	Econ Actuator 1 Command Position	0-100% Position	PP/MP	RXB	
ECN2CPOS	Econ Actuator 2 Command Position	0-100% Position	PP/MP	RXB	J7, 1-3
ECN3CPOS	Econ Actuator 3 Command Position	0-100% Position	PP/MP	RXB	
HUMDCPOS	Humidifier Command Pos.	0-100% Position	PP/MP	RXB	
CONDFAN3	Condenser Fan Output 3	Relay	RLY1	RXB	J8, 1-3
CONDFAN4	Condenser Fan Output 4	Relay	RLY2	RXB	J8, 4-6
CONDFAN5	Condenser Fan Output 5	Relay	RLY3	RXB	J8, 7-9
MLV	Minimum Load Valve	Relay	RLY4	RXB	J8, 10-12
HIR	Heat Interlock Relay	Relay	RLY5	RXB	J8, 13-15
HUM3WVAL	Humidimizer 3 Way Valve	Relay	RLY6	RXB	J8, 16-18

Table 96 — Economizer Control Board (EXB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
PPS	Plenum Press. Safety Sw.	Switch Input	DI1	EXB	J4, 1-2
SACFM	Supply Air CFM	Transducer (4-20mA)	AN1	EXB	J5, 1-3
RACFM	Return Air CRM	Transducer (4-20mA)	AN2	EXB	J5, 4-6
OUTPUTS					
MMV_B	Motor Master VFD B	4-20mA	AO1	EXB	J9, 1-2
CMPA1CAP	Compressor A1 Solenoid	Digital	PP/MP	EXB	J7, 1-3
HUMIDRLY	Humidifier Relay	Relay	RLY1	EXB	J8, 1-3
SFBYRLY	Supply Fan Bypass Relay	Relay	RLY2	EXB	J8, 4-6
PEBYRLY	PE/Ret. Fan Bypass Relay	Relay	RLY3	EXB	J8, 7-9

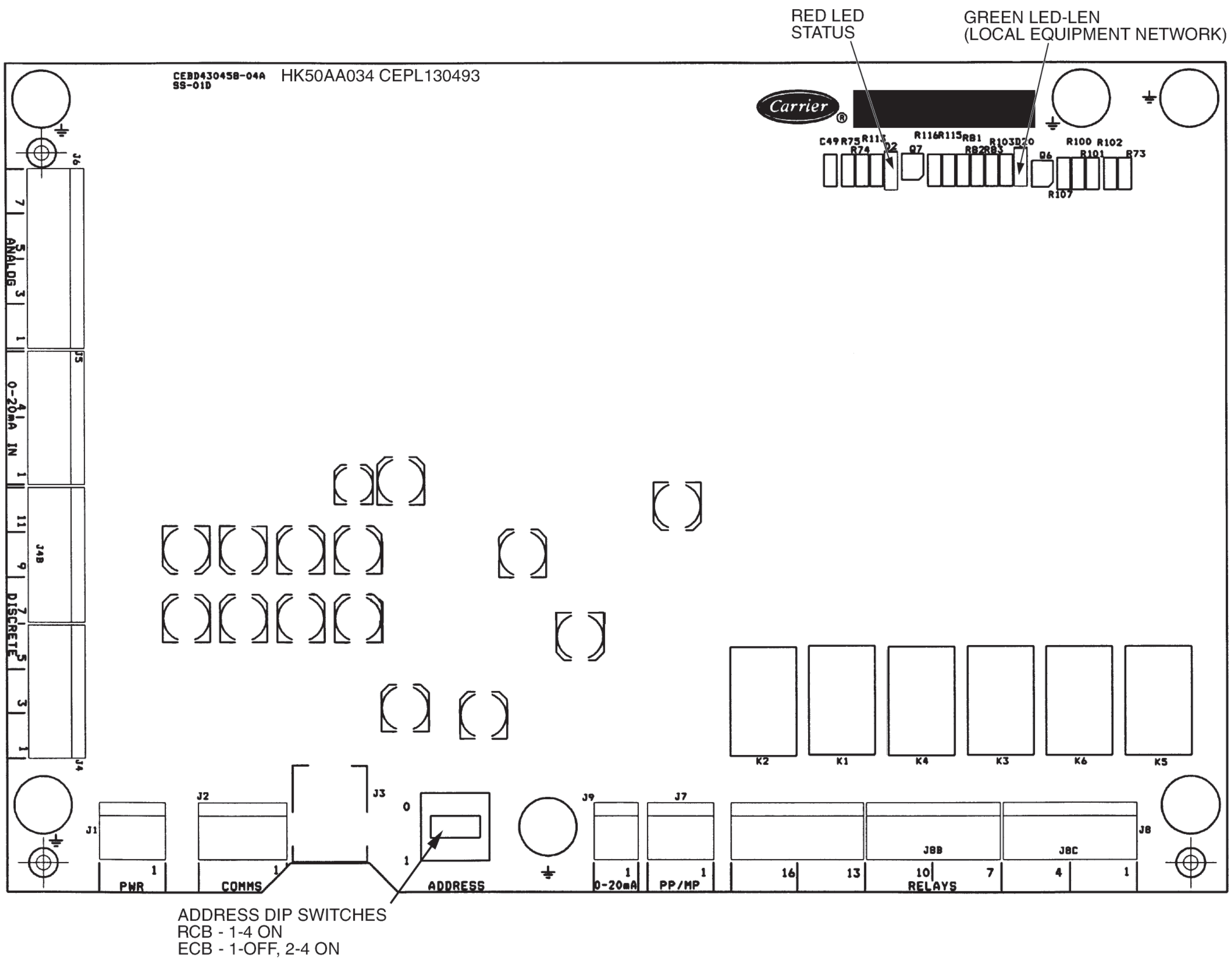


Fig. 33 — Economizer Control Board (EXB) and Rooftop Control Board (RXB)

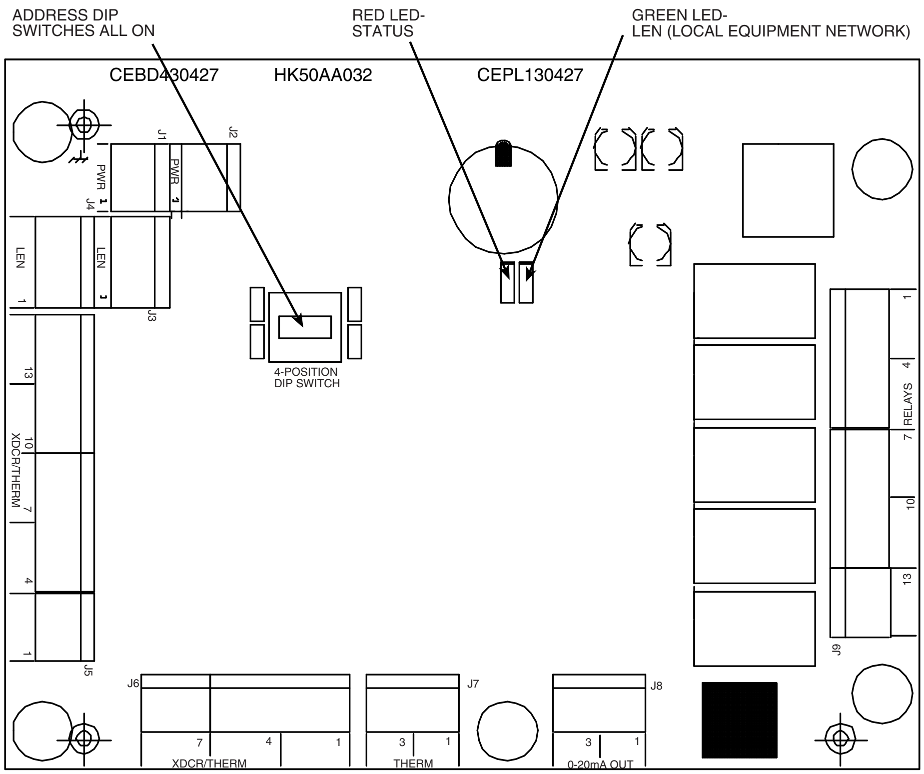


Fig. 34 — Staged Gas Heat Control Board (SCB)

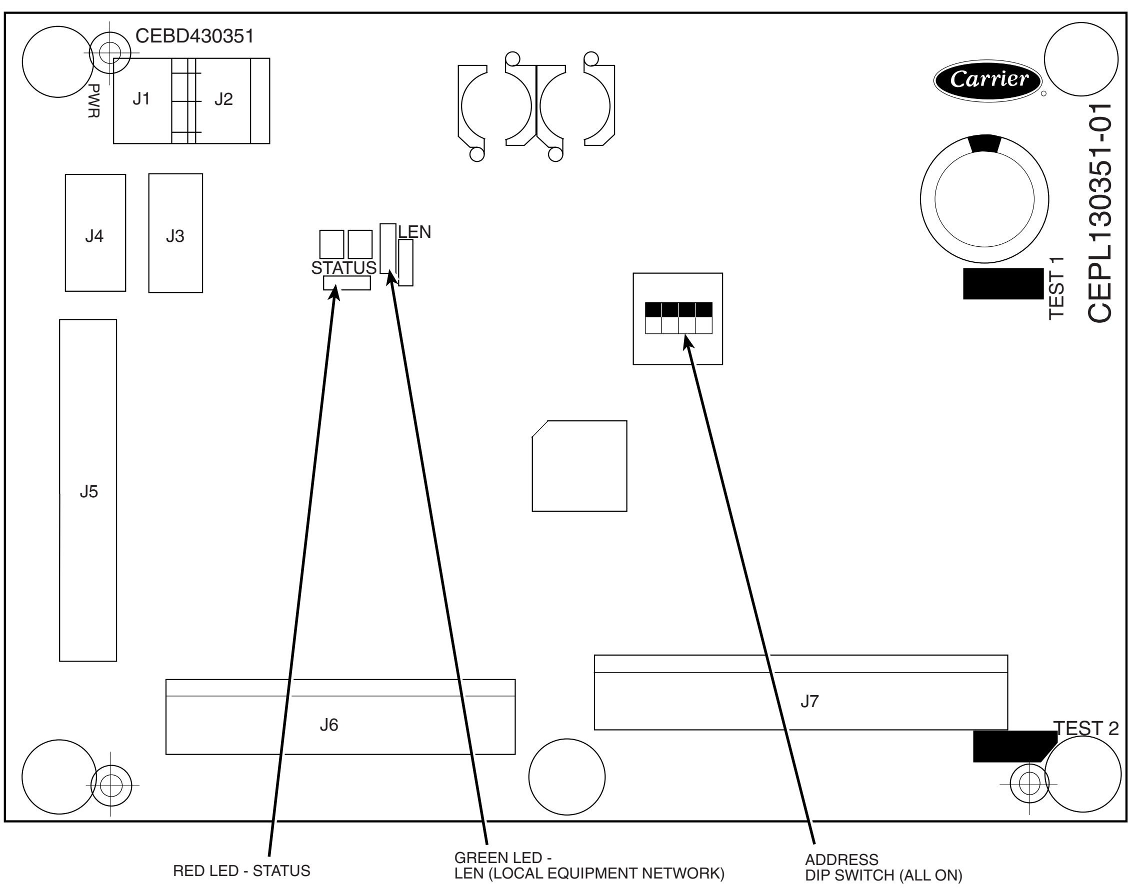


Fig. 35 — Controls Expansion Board (CEM)

Table 97 — Staged Gas Control Board (SCB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
LIMSWTMP	Staged Gas Limit Sw. Temp	Thermistor / Transducer (0-5V)	AN1	SCB	J5, 1-3
LAT1SGAS	Staged Gas LAT 1	Thermistor / Transducer (0-5V)	AN2	SCB	J5, 4-6
LAT2SGAS	Staged Gas LAT 2	Thermistor / Transducer (0-5V)	AN3	SCB	J5, 7-9
LAT3SGAS	Staged Gas LAT 3	Thermistor / Transducer (0-5V)	AN4	SCB	J5, 10-12
Not Used	Not Used	Thermistor / Transducer (0-5V)	AN5	SCB	J5, 13-15
LP_A	Circuit A Liquid Pressure Transducer	Thermistor / Transducer (0-5V)	AN6	SCB	J6, 1-3
LP_B	Circuit B Liquid Pressure Transducer	Thermistor / Transducer (0-5V)	AN7	SCB	J6, 4-6
Not Used	Not Used	Thermistor / Transducer (0-5V)	AN8	SCB	J6, 7-9
Not Used	Not Used	Thermistor	AN9	SCB	J7, 1-2
Not Used	Not Used	Thermistor	AN10	SCB	J7, 3-4
OUTPUTS					
HTMG_CAP	Modulating Gas Capacity	4-20mA	AO1	SCB	J8, 1-2
Not Used	Not Used	4-20mA	AO2	SCB	J8, 3-4
HS3	Relay 3 W1 Gas Valve 2	Relay	RLY1	SCB	J9, 1-3
HS4	Relay 4 W2 Gas Valve 2	Relay	RLY2	SCB	J9, 4-6
HS5	Relay 5 W1 Gas Valve 3	Relay	RLY3	SCB	J9, 7-9
HS6	Relay 6 W2 Gas Valve 3	Relay	RLY4	SCB	J9, 10-12

Table 98 — Control Expansion Module (CEM) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
DHDISCIN	Dehumidify Switch Input	Switch	DI1	CEM	J7, 1-2
DMD_SW1	Demand Limit Switch 1	Switch	DI2	CEM	J7, 3-4
DMD_SW2	Demand Limit Switch 2	Switch	DI3	CEM	J7, 5-6
PRES	Pressurized Input	Switch	DI4	CEM	J7, 7-8
EVAC	Evacuation Input	Switch	DI5	CEM	J7, 9-10
PURG	Smoke Purge Input	Switch	DI6	CEM	J7, 11-12
IAQIN	IAQ - Discrete Input	Switch	DI7	CEM	J7, 13-14
MARH_MA	MARH milliamps	Transducer (4-20mA)	AN7	CEM	J6, 1-3
OARH_MA	OARH milliamps	Transducer (4-20mA)	AN8	CEM	J6, 4-6
SPRH_MA	SPRH milliamps	Transducer (4-20mA)	AN9	CEM	J6, 7-9
RARH_MA	RARH milliamps	Transducer (4-20mA)	AN10	CEM	J6, 10-12
DMDLMTMA	4-20 mA Demand Signal	Thermistor	AN1	CEM	J5, 1-2
SASPRSET	Supply Air Setpnt. Reset	Thermistor	AN2	CEM	J5, 3-4
OAQ_MA, SPRST_MA	OAQ milliamps, SP Reset milliamps	Thermistor	AN3	CEM	J5, 5-6
OACFM	Outside Air CFM	Thermistor	AN4	CEM	J5, 7-8
FLTS/FLT_PDT	Filter Status/Filter Pressure Drop Transducer	Thermistor	AN5	CEM	J5, 9-10
PFLTS, PFLT_PDT	Post Filter Status Input/Pressure Drop Transducer	Thermistor	AN6	CEM	J5, 11-12

COMPRESSOR EXPANSION BOARD (CXB)

The CXB is used to provide additional compressor outputs and CSB inputs. See Table 99.

EXPANSION VALVE CONTROL BOARD (EXV)

The EXV is used on all units to control the EXVs. The EXV board is also used on Humidi-MiZer® equipped units to provide control of the condenser and bypass modulating valves. See Tables 100-102.

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 103. 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. The quantity of IGC boards will range from 2 to 5 depending on the size of the unit and whether the unit is low, medium or high heat. The IGC controls the direct spark ignition system and monitors the rollout switch, limit switches, and induced-draft motor Hall Effect switch.

For units equipped with modulating gas heat, the IGC in the modulating gas section uses a pressure switch in place of the Hall Effect sensor. The IGC is equipped with a LED (light-emitting diode) for diagnostics. See Table 104.

Table 99 — Compressor Expansion Board (CXB) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
CSB_A3	Compressor A3 Feedback	Digital Input	DIG1	CXB	J5, 10-12
CSB_B3	Compressor B3 Feedback	Digital Input	DIG2	CXB	J5, 7-9
CSB_A4	Compressor A4 Feedback	Digital Input	DIG3	CXB	J5, 4-6
CSB_B4	Compressor B4 Feedback	Digital Input	DIG4	CXB	J5, 1-3
OUTPUTS					
HS9	Heat Relay 9	Relay	RLY1	CXB	J6, 1-2
HS10	Heat Relay 10	Relay	RLY2	CXB	J6, 3-4
CMPB4	Compressor B4 Relay	Relay	RLY3	CXB	J6, 5-6
CMPB3	Compressor B3 Relay	Relay	RLY4	CXB	J6, 7-8
CMPA4	Compressor A4 Relay	Relay	RLY5	CXB	J6, 9-11
CMPA3	Compressor A3 Relay	Relay	RLY6	CXB	J6, 12-14

Table 100 — Expansion Valve Control Board A (EXV-A) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
CASTEXV1	Cir A EXV1 Suction Temperature	Thermistor	AN1	EXV-A	J5, 5-6
CASTEXV2	Cir A EXV2 Suction Temperature	Thermistor	AN2	EXV-A	J5, 7-8
LT_A	Circuit A Liquid Temperature	Thermistor	AN3	EXV-A	J5, 9-10
SFBYIN	Supply Fan Bypass Input	Thermistor	AN4	EXV-A	J5, 11-12
Not Used	Not Used	Transducer (4-20mA)	AN5	EXV-A	J5, 1-2
Not Used	Not Used	Transducer (4-20mA)	AN6	EXV-A	J5, 3-4
OUTPUTS					
CA_EXV1	Circuit A EXV 1	Stepper Motor	EXV-1	EXVA	J6, 1-5
CA_EXV2	Circuit B EXV 1	Stepper Motor	EXV-2	EXVA	J7, 1-5

Table 101 — Expansion Valve Control Board B (EXV-B) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
CBSTEXV1	Cir B EXV1 Suction Temperature	Thermistor	AN1	EXV-B	J5, 5-6
CBSTEXV2	Cir B EXV2 Suction Temperature	Thermistor	AN2	EXV-B	J5, 7-8
LT_B	Circuit B Liquid Temperature	Thermistor	AN3	EXV-B	J5, 9-10
PEBYIN	PE/Ret Fan Bypass Input	Thermistor	AN4	EXV-B	J5, 11-12
Not Used	Not Used	Transducer (4-20mA)	AN5	EXV-B	J5, 1-2
Not Used	Not Used	Transducer (4-20mA)	AN6	EXV-B	J5, 3-4
OUTPUTS					
CB_EXV1	Circuit A EXV 2	Stepper Motor	EXV-1	EXVB	J6, 1-5
CB_EXV2	Circuit B EXV 2	Stepper Motor	EXV-2	EXVB	J7, 1-5

Table 102 — Expansion Valve Control Board C (EXV-C) Inputs and Outputs

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONTROL BOARD	CONNECTOR PIN NO.
INPUTS					
Not Used	Not Used	Thermistor	AN1	EXV-C	J5, 5-6
Not Used	Not Used	Thermistor	AN2	EXV-C	J5, 7-8
Not Used	Not Used	Thermistor	AN3	EXV-C	J5, 9-10
Not Used	Not Used	Thermistor	AN4	EXV-C	J5, 11-12
Not Used	Not Used	Transducer (4-20mA)	AN5	EXV-C	J5, 1-2
Not Used	Not Used	Transducer (4-20mA)	AN6	EXV-C	J5, 3-4
OUTPUTS					
COND_EXV	Condenser EXV Position	Stepper Motor	EXV-1	EXV	J6, 1-5
BYP_EXV	Bypass EXV Position	Stepper Motor	EXV-2	EXV	J7, 1-5

Table 103 — Field Terminal Connections

BOARD NO.	TERMINAL NO.	DESCRIPTION	TYPE
TB-1 - POWER CONNECTION OR DISCONNECT (in Power Box)			
TB1	11	L1 power supply	460/575-3-60
	12	L2 power supply	460/575-3-60
	13	L3 power supply	460/575-3-60
GROUND (in Power Box)			
Ground	1	Equipment Ground	
TB201 - FIELD CONNECTIONS (in Control Box)			
TB201	1	Smoke Detector Remote Alarm Input	contact 2.0 A at 30 vac
	2	Smoke Detector Remote Alarm Input	contact 2.0 A at 30 vac
	3	Remote Occupied/Economizer Enable 24 vac out	24 VAC Output
	4	Remote Occupied/Economizer Enable 24 vac in	24 VAC Input
	5	Outdoor Enthalpy Switch 24 VAC out	24 VAC Output
	6	Outdoor Enthalpy Switch 24 VAC in	24 VAC Input
	7	Indoor Air IAQ Remote Sensor/Remote Pot/Remote 4-20 mA	Thermistor input or externally powered 4 to 20 mA when used with 180 ohm resistor
	8	Indoor Air IAQ Remote Sensor/Remote Pot/Remote 4-20 mA	Thermistor input or externally powered 4 to 20 mA when used with 180 ohm resistor
	9	VAV Heater Interlock Relay	Contact (maximum 24 vac, 3 A)
	10	VAV Heater Interlock Relay	Contact (maximum 24 vac, 3 A)
	R	24 VAC Power	24 VAC Output
	Y1	Thermostat Y1 (1st stage cool)	24 VAC Input
	Y2	Thermostat Y2 (2nd stage cool)	24 VAC Input
	W1	Thermostat W1 (1st stage heat)	24 VAC Input
	W2	Thermostat W2 (2nd stage heat)	24 VAC Input
	G	Thermostat G (Fan)	24 VAC Input
	C	24 VAC Common	24 VAC Output
	X	Alarm Output (NO)	24 VAC Output
	FS1	Fire Shut Down	external contact (maximum 24 vac, 3 A)
	FS2	Fire Shut Down	external contact (maximum 24 vac, 3 A)
	T55-1	Space Sensor TH	Thermistor Input
	T55-2	Space Sensor COM	Thermistor Input
	T55-3	Space Sensor Offset Switch	Thermistor Input
	(+)	CCN +	Communication
	(COM)	CCN Common	Communication
	(-)	CCN -	Communication
	SHIELD	Ground	Ground
	LEN	Local Equipment Network	Communication
	CCN	Carrier Comfort Network	Communication
TB202 - FIELD CONNECTIONS CEM (in Main Control Box)			
TB202	1	Not Used	—
	2	Not Used	—
	3	Space Humidity 4-20 mA (-)	4 to 20 mA signal
	4	Space Humidity 4-20 mA (+)	4 to 20 mA loop power
	5	Ground	Ground
	6	Outdoor Air IAQ 4-20 mA (-)	4 to 20 mA signal
	7	Outdoor Air IAQ 4-20 mA (+)	4 to 20 mA loop power
	8	Supply Air Reset 4-20 mA (-)	4 to 20 mA signal
	9	Supply Air Reset 4-20 mA (+)	4 to 20 mA loop power
	10	Demand Limit 4-20 mA (-)	4 to 20 mA signal
	11	Demand Limit 4-20 mA (+)	4 to 20 mA loop power
	12	IAQ Switch 24 VAC in	external contact (maximum 24 vac, 3 A)
	13	IAQ Switch 24 VAC out	external contact (maximum 24 vac, 3 A)
	14	Fire Smoke Purge 24 VAC in	external contact (maximum 24 vac, 3 A)
	15	Fire Smoke Purge 24 VAC out	external contact (maximum 24 vac, 3 A)
	16	Fire Evacuation 24 VAC in	external contact (maximum 24 vac, 3 A)
	17	Fire Evacuation 24 VAC out	external contact (maximum 24 vac, 3 A)
	18	Fire Pressurization 24 VAC in	external contact (maximum 24 vac, 3 A)
	19	Fire Pressurization 24 VAC out	external contact (maximum 24 vac, 3 A)
	20	Demand Limit Loadshed 24 VAC in	external contact (maximum 24 vac, 3 A)
	21	Demand Limit Loadshed 24 VAC out	external contact (maximum 24 vac, 3 A)
	22	Demand Limit Redline 24 VAC in	external contact (maximum 24 vac, 3 A)
	23	Demand Limit Redline 24 VAC out	external contact (maximum 24 vac, 3 A)
	24	Humidistat	external contact (maximum 24 vac, 3 A)
	25	Humidistat	external contact (maximum 24 vac, 3 A)

Table 103 — Field Terminal Connections (cont)

BOARD NO.	TERMINAL NO.	DESCRIPTION	TYPE
TB203 - FIELD CONNECTIONS CEM (in Main Control Box)			
TB203	1	Filter Pressure Switch/Sensor - Return (+)	4 20 mA loop when used with 180 Ohm resistor
	2	Filter Pressure Switch/Sensor - Return (-)	4 20 mA signal when used with 180 Ohm resistor
	3	Filter Pressure Switch/Sensor - Supply (+)	4 20 mA loop when used with 180 Ohm resistor
	4	Filter Pressure Switch/Sensor - Supply (-)	4 20 mA signal when used with 180 Ohm resistor
	5	Filter Pressure Sensor - Return (+24 VDC)	4 20 mA loop power
	6	Filter Pressure Sensor - Supply (+24 VDC)	4 20 mA loop power
	7	Mixed Air Humidity Sensor (+24 VDC)	4 20 mA loop power
	8	Mixed Air Humidity Sensor (-)	4 20 mA signal
	—	Humidifier Output	Contact (maximum 24 vac, 3 A) Violet Wire/Spade Terminal
	—	Humidifier Output	Contact (maximum 24 vac, 3 A) Violet Wire/Spade Terminal

LEGEND

IAQ — Indoor Air Quality
VAV — Variable Air Volume

Table 104 — 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	

Table 105 — TR1 Board Inputs and Outputs

TERMINAL	TYPE OF I/O	RESULT/ACTION
INPUTS		
1, 2	24 Vac Input	Powers TR1
3, 4		
5	Not Used	Not Used
6	24 Vac Input from SC30	Starts Timer no. 2 IDM2 Runs at High Speed MGV2 Operates in High Fire
7	24 Vac Input from IGC2	Starts Timer no. 1 IDM2 Runs at High Speed MGV2 Operates in Low Fire Terminal 6 Input ignored during duration of Timer no. 1
OUTPUTS		
8, 9	Relay Output	MGV2 Operates in High Fire
10, 11	Relay Output	Powers SC30
12, 14	Relay Output	IDM2 Runs at High Speed
13, 14	Relay Output	IDM2 Runs at Low Speed

CURRENT SENSOR BOARD (CSB)

This board monitors the status of the compressor by sensing the current flow to the compressors and then provides digital status signal to the MBB and CXB.

TIMER RELAY CONTROL BOARD (TR1)

The TR1 is used on modulating gas heat equipped units only. It is located in the gas heat section and is used in combination with the SC30 to provide control of the modulating gas heat section. The TR1 receives an input from the IGC, initiates a start-up sequence, powers the SC30, sets the induced-draft motor speed, and provides the main gas valve high fire input. When the start-up sequence is complete, the TR1 checks the input from the SC30 to determine which state to command the induced-draft motor and main gas valve. See Table 105 for TR1 inputs and outputs. The TR1 has status LEDs on the front cover. See Table 106 for TR1 status LED descriptions.

SIGNAL CONDITIONER CONTROL BOARD (SC30)

The SC30 is used on modulating gas heat equipped units only. It is located in the gas heat section and is used in combination with the TR1 to provide control of the modulating gas heat section. The SC30 is powered by an output from the TR1. It receives a capacity input from the SCB, provides a capacity output to the modulating gas valve, and provides an output to the TR1 to determine which state to command the induced-draft motor and main gas valve. See Table 107.

Table 106 — TR1 Status LEDs

LED NAME	POINT DESCRIPTION
ON	Power
SR	Start relay during timer no. 1 duration
MR	Modulating relay - lit after timer no. 1 times out
FR	Fan relay - lit when inducer fan runs on high speed
CR	Control relay - lit when gas valve is in high pressure stage.

Table 107 — SC30 Board Inputs and Outputs

TERMINAL	TYPE OF I/O	RESULT/ACTION
INPUTS		
1	24 Vac Input from TR1	Powers SC30
2		
7	4-20 mA Input from SCB	Sets Output to Modulating Gas Valve
8		
OUTPUTS		
3	0-20 Vdc Output	Output to Modulating Gas Valve
4		
5, 6	Relay Output	Starts TR1 Timer no. 2

NAVIGATOR™ DISPLAY

This device is the interface used to access the control information, read sensor values, and test the unit. The Navigator display is a 4-line, 20-character, LCD display as well as an Alarm Status LED. See Fig. 36. 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

The RXB and EXB boards contain a second LEN port that can be used with the handheld Navigator display.

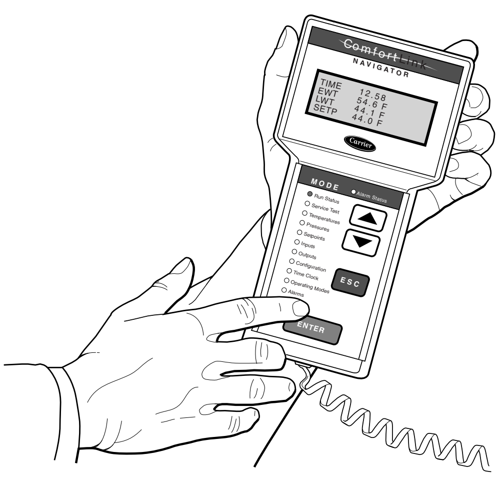


Fig. 36 — Accessory Navigator Display

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. 32-35. 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 48/50N Series units can be connected to the CCN if desired. 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. 37. 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[1], 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).

1. Teflon is a registered trademark of DuPont.

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).

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.

Through the Navigator display, 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 Navigator display 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 Navigator display 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 Navigator display is located in the control box and is standard on all units.

SUPPLY FAN

The 48/50N units are equipped with a single air-foil type supply fan. The units have an optional high and low fan that can be selected to match the airflow requirements of the application. Additionally, the motor horsepower size for the supply fan is also selected to match the airflow requirements of the application. 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)

Supply fans are powered and controlled with VFDs. The supply fan VFD is located in the supply fan section behind an access door. Units equipped with optional power exhaust or return fans will also be powered and controlled with a VFD. The VFD for the power exhaust or return fan is located in the return section behind an access door.

The N Series units use ABB VFDs. The VFDs communicate to the *Comfort*Link MBB over the local equipment network (LEN). The VFD speed is controlled directly by the *Comfort*Link controls over the LEN. The interface wiring for the VFDs is shown in Fig. 38 and the terminal designations are shown in Table 108. The VFD has a keypad display panel that can be used for service diagnostics and setting the initial VFD parameters required to allow the VFD to communicate on the LEN. Additional VFD parameters are set by the *Comfort*Link controls, and sent to the VFD over the LEN at power up of the VFD. The VFD faults can be reset with the VFD keypad or through the *Comfort*Link controls (***Alarms→R.CUR*** =Yes).

Table 108 — VFD Terminal Designations

TERMINAL	FUNCTION
U1 V1 W1	3-phase main circuit input power supply
U2 V2 W2	3-Phase AC Output to Motor, 0 V to Maximum Input Voltage Level
X1-11 (GND) X1-12 (D-COM)	Factory-supplied jumper
X1-10 (+24 V) X1-13 (DI-1)	Factory-supplied jumper
X1-10 (+24 V) X1-16 (DI-4)	Start Enable 1 (Factory-supplied jumper). When opened the drive goes to emergency stop.
X1-28 (SCR) X1-29 (B+) X1-30 (B-) X1-31 (AGND) X1-32 (SCR)	Factory wired for local equipment network LEN communication

POWER EXHAUST

The units can be equipped with an optional power exhaust system. The power exhaust fan is a belt-driven, forward-curved fan. For modulating (CV or VAV) applications, the fan is controlled by the *Comfort*Link controls based on building pressure sensed by the building pressure transducer. The fan speed is modulated to maintain the building pressure set point.

RETURN FAN

The return fan power exhaust assembly consists of one belt-drive plenum fan. The return fan is a belt-driven backward-curved 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 motor actuator-driven through linkages. Communicating economizer motors controls their position. The motor position is controlled by the MBB through the communication bus. This allows for accurate control of the motors as well as feedback information and diagnostics information. The control has a self-calibration routine that allows the motor position to be configured at initial unit start-up. The motors are 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 109.

The units have 2 pressure transducers that are connected to the low side of the system. These 2 pressure transducers measure the low side pressure and are used for low pressure protection and coil freeze protection.

The units also have 2 pressure transducers that are connected to the high side of the system. These 2 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 supply or 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 1 and 2. The sensor is located in the supply or return air sections.

FILTER STATUS SWITCH

The units can be equipped with optional accessory filter status switch on both the return and supply (post) air filters. The switch measures the pressure drop across the filters and closes when an adjustable pressure set point is exceeded. The sensors are located in the control panel. The return filter switch is connected to terminals 1 and 2 on TB203. The 180-ohm resistor is on the terminals for when the filter pressure is used. The resistor must be removed for the switch to operate properly. The supply filter switch is connected to terminals 3 and 4 on TB203. The 180-ohm resistor must be removed.

FILTER PRESSURE SENSOR

The units can be equipped with optional accessory filter pressure sensors on both the return and supply (post) air filters. The sensor measures the pressure drop across the filters and outputs a 4 to 20 mA signal that is read by the *Comfort*Link controls. The sensors are located in the control panel. The return filter sensor is connected to terminals 1 and 2 on TB203. The supply filter sensor is connected to terminals 3 and 4 on TB203. The 180-ohm resistor is on the terminals for when the filter pressure sensors are used. The resistors must remain for the sensors to operate properly.

NOTE: *Comfort*Link controls can accept either the filter status switch OR the filter pressure sensor. It cannot accept both at the same time.

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 controlled 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. 32. For the other boards in the system there is a 4-dip switch header on each board that should be set as shown below.

BOARD	SW1	SW2	SW3	SW4
RXB	0	0	0	0
EXB	1	0	0	0
SCB	0	0	0	0
CEM	0	0	0	0
EXV-A	1	0	0	0
EXV-B	0	1	0	0
EXV-C	0	0	0	0
RXB-E	0	1	0	0

0 = On; 1 = Off

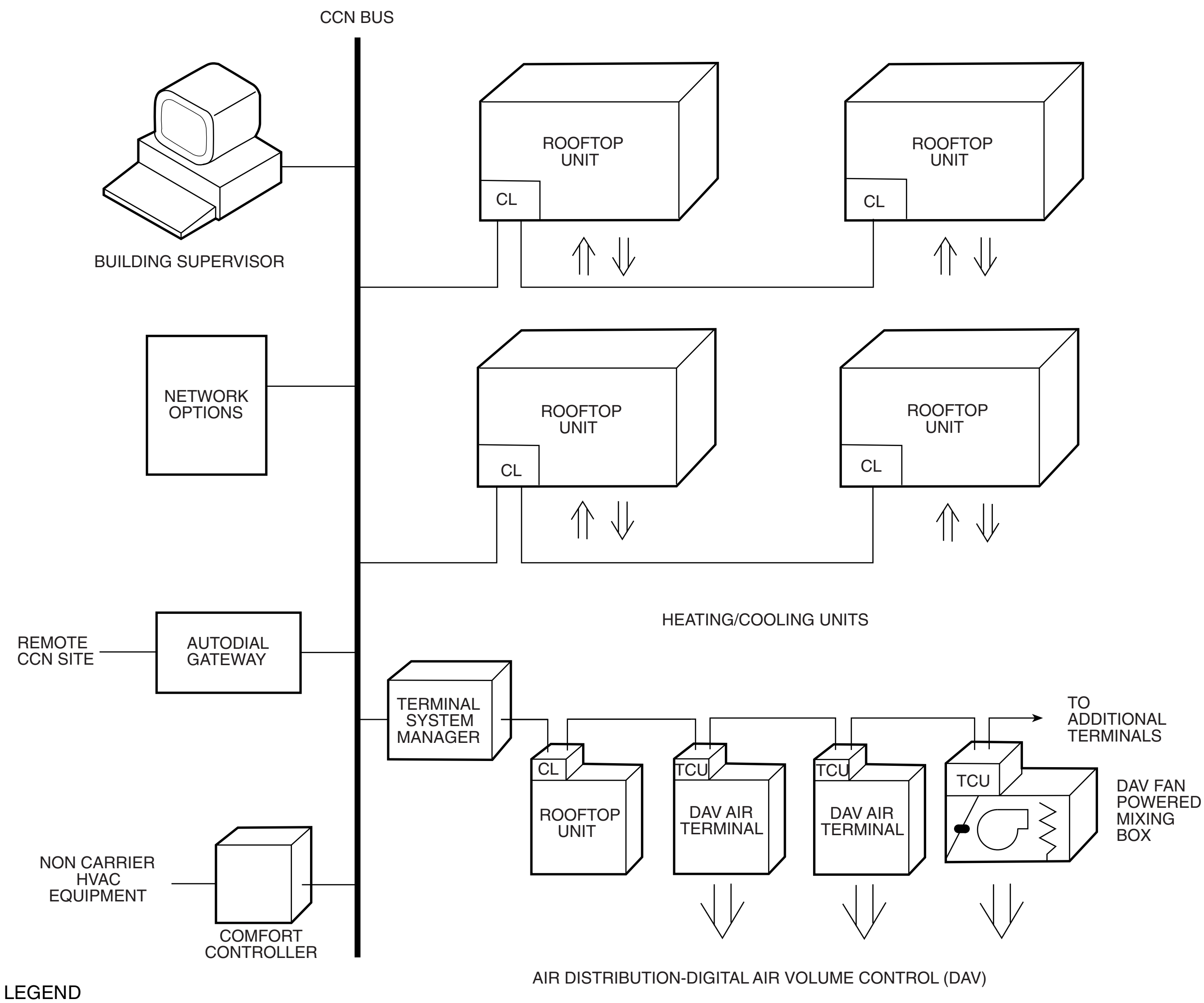
Accessory Control Components

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 thermostats. The *Comfort*Link controls can be configured to run with up to 6 stages of capacity. The room thermostat is connected to TB201.

The *Comfort*Link controls also support the use of space temperature sensors and can be used with the T55 and T56 sensors. The controls can also be used with CCN communicating T58 room sensor. The T55 and T56 sensors are connected to TB201 terminals 1, 2, and 3. The T58 sensor is connected to the CCN connections on COMM board. Whenever a unit equipped with heat is operated without a thermostat, the user must install the red jumpers from R to W1, and W2 on TB201 for the heat function to work correctly.



LEGEND

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

Fig. 37 — CCN System Architecture

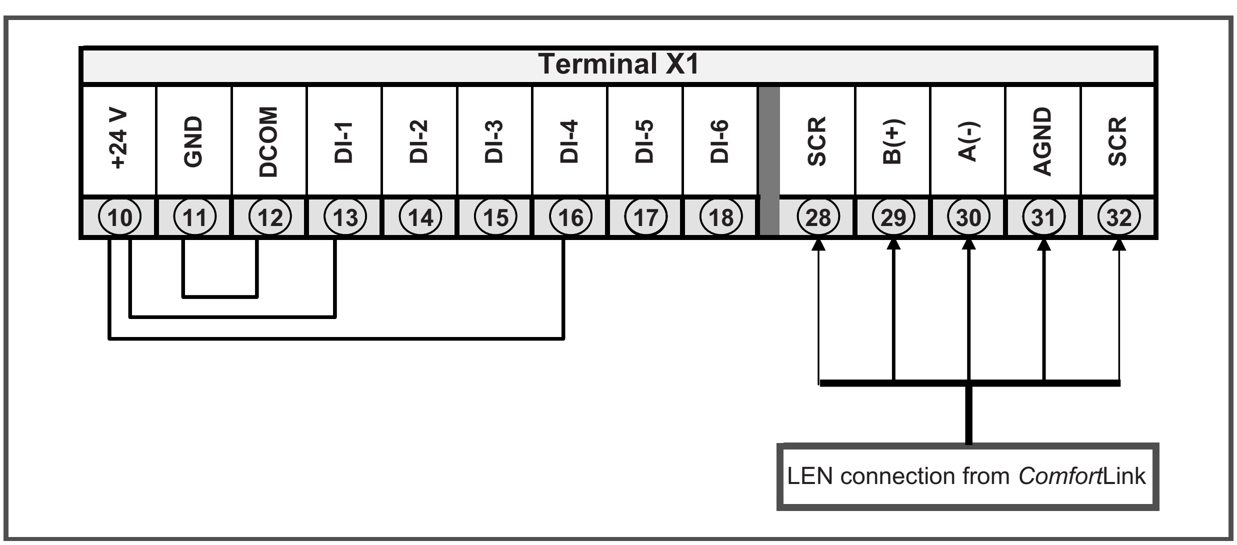


Fig. 38 — VFD Wiring

Table 109 — 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 the condenser section on the back side of the power box.	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 71.)	HH79NZ039
LAT 1,2,3	Leaving Air Thermistors, provided with Staged Heat Control option. Shipped in the control box. Installer must pull out and mount in the supply duct.	HH79NZ034 (3)
ST-A1 **ST-A2**	Suction Thermistor, Circuits A1 and A2. Located in well in evaporator outlet. A1 is top coil, A2 is bottom coil	HH79NZ014 (2)
ST-B1 **ST-B2**	Suction Thermistor, Circuits B1 and B2. Located in well in evaporator outlet. B1 is top coil, B2 is bottom coil	HH79NZ014 (2)
LT_A	Liquid Line Thermistor, Circuit A. Located in evaporator section on inlet to EXV A1 and A2.	HH79EZ003
LT_B	Liquid Line Thermistor, Circuit B. Located in evaporator section on inlet to EXV B1 and B2.	HH79EZ003
Control Pressure Transducers		
BP	Building Pressure. Provided with Power Exhaust and Return Fan options. Located in the control box.	HK05ZG022
DPT-A	Discharge Pressure (refrigerant), Circuit A.	HK05ZZ001
DPT-B	Discharge Pressure (refrigerant), Circuit B.	HK05ZZ001
SPT-A	Suction Pressure (refrigerant), Circuit A.	HK05SZ003
SPT-B	Suction Pressure (refrigerant), Circuit B.	HK05SZ003
DP	Duct Static Pressure. Provided with VAV models equipped with VFD options. Located in the control box.	HK05ZG010
SACFM	Supply Air Cfm (velocity pressure). Provided with factory-option return fan system (75-100 ton only). Located in the control box.	HK05ZG015
RACFM	Return Air Cfm (velocity pressure). Provided with factory-option return fan system (75-100 ton only). Located in control box.	HK05ZG07
OACFM	Outside Air Cfm Monitor (velocity pressure). Provided with the Outside Air Cfm Control option. Located in control box.	48NG501985 (75-105) 48NG501986 (120-150)
DTT	Digital Scroll Discharge Temperature Thermistor. Provided with digital scroll compressor option. Located on discharge line.	HH79EZ003
RGTA	Circuit A Return Gas Thermistor. Provided with MLV option. Located in suction line well.	HH79NZ014
FT_SF SACFM	Supply Air CFM - Sensor bars are mounted on inlet to fan. Transducer is mounted in Control Box and is fan dependent.	HK05ZG019 (Low Fan) HK05ZG023 (High Fan)
FT_PE EACFM	Power Exhaust CFM - Sensor bars are mounted on inlet to fan. Transducer is mounted in Control Box and is fan dependent.	HK05ZG019 (Low Fan) HK05ZG023 (High Fan)
FT_RF RACFM	Return Air CFM - Sensor bars are mounted on inlet to fan. Transducer is mounted in Control Box and is fan dependent.	HK05ZG020 (Low Fan) HK05ZG023 (High Fan)
OACFM	Outside Air CFM - Sensor bars are mounted on air intake, same side as Control Box. Transducer is mounted in Control Box and is Unit size dependent.	48NG501985 (75 - 105) 48NG501986 (120 - 150)
MFDP	Filter Pressure Sensor - Return (+24 VDC, 4 20 mA loop power). Transducer is mounted in Control Box.	HK05ZG019
PFDP	Filter Pressure Sensor - Return (+24 VDC, 4 20 mA loop power). Transducer is mounted in Control Box.	HK06WC035

LEGEND

CCN — Carrier Comfort Network
EXV — Expansion Valve Control Board
MLV — Minimum Load Hot Gas Bypass Valve
VAV — Variable Air Volume
VFD — Variable Frequency Drive

SPACE CO_2 SENSORS

The *Comfort*Link controls also support a CO_2 IAQ sensor that can be located in the space for use in demand controlled ventilation. The sensor must be a 4 to 20 mA sensor and should be connected to TB201 terminals 7 and 8.

ECONOMIZER HUMIDITY CHANGEOVER SENSORS

- The *Comfort*Link controls support 5 different changeover systems for the economizer. These are:
- Outdoor enthalpy switch
- Outdoor air dry bulb
- Differential dry bulb
- Outdoor air enthalpy curves
- Differential enthalpy
- Custom curves (a combination of an enthalpy/dew point 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 2 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.

SERVICE

Service Access

All unit components can be reached through clearly labeled hinged access doors. These doors are equipped with tiebacks.

Each door is held closed with 3 latches and 3 screws at the bottom of the door.

To open the door, remove 3 screws at the bottom edge of the door. Rotate each latch 1/4 turn clockwise to open. See Fig. 39.

Each door has a retaining chain mounted on the inside of the door. To use, unclip the chain on the inside, open the door fully and attach the end of the chain to the adjacent clip. See Fig. 40. To close the door, reverse the procedure.

The unit is also equipped with removable panels to gain access to areas that do not normally require service. To remove panel, remove 3 screws at the bottom of panel, lift panel vertically using handle provided. Next pull bottom of panel out then lower down until the top of the panel clears the top rail. See Fig. 41.

⚠ CAUTION

Panels are heavy; 2 people should remove them. To reinstall, reverse the procedure.

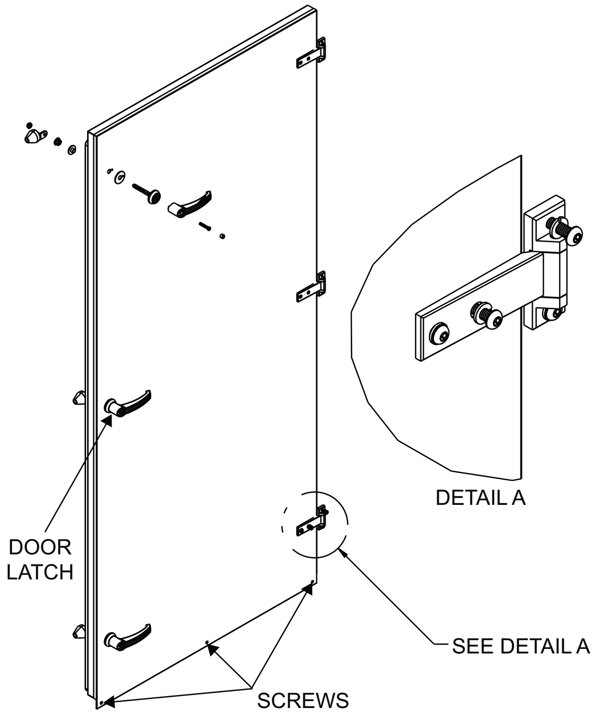


Fig. 39 — Open Access Door

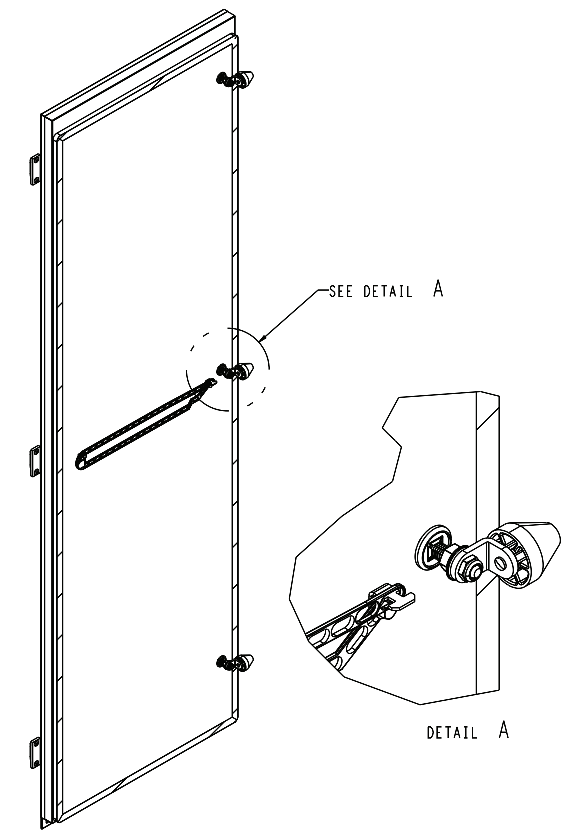


Fig. 40 — Retaining Chain Connection

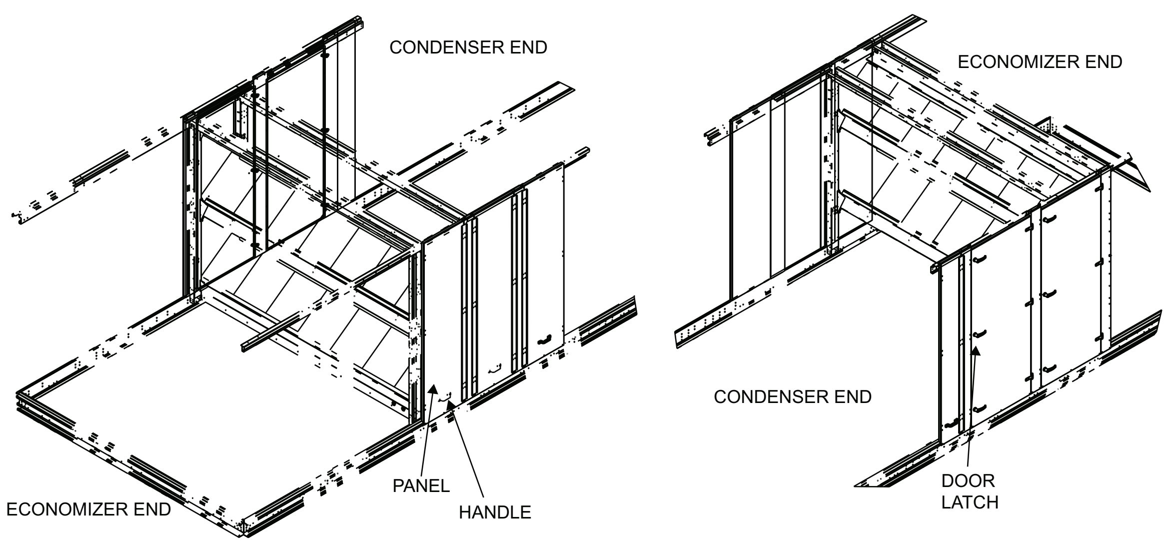


Fig. 41 — Additional Access Panel Removal

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

Each compressor is readily accessible from sides of unit.

LIQUID SERVICE VALVES, SUCTION SERVICE VALVES, AND SIGHT GLASSES

Access to these components is from the sides 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 at the return end of the unit.

RETURN AIR FILTERS

Access to these filters is through the door marked FILTER SECTION.

UNIT CONTROL BOX

Access to this component is through the door marked ELECTRICAL SECTION on the condenser end of the unit.

UNIT POWER BOX

Access to the power components is through the door marked ELECTRICAL SECTION in the condenser section of the unit.

GAS HEAT SECTION (48N ONLY)

Access to the gas heat section is through the door labeled HEAT SECTION on the right side of the unit (when facing return air end). Figures 42 and 43 show typical gas heat sections. For modulating heat units, Fig. 44 replaces section 1 in Fig. 43.

MAIN BURNERS (48N ONLY)

At the beginning of each heating season, inspect for deterioration due to corrosion or other causes. The main burner assembly is shown in Fig. 42-47 for 2-stage heat. For modulating gas heat, see Fig. 46 and 47. Refer to Main Burners Removal and Replacement section on page 184 for burner removal sequence. Observe the main burner flames and adjust if necessary. See Gas System Adjustment sections on page 184.

FLUE GAS PASSAGEWAYS (48N 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. 42 and 43). If cleaning is required, remove heat exchanger baffles and clean tubes with a wire brush.

PRESSURE SWITCH (48N MODULATING GAS ONLY)

Inspect the riveted surface of the pressure fitting (see Fig. 44) by removing the flue box cover. Clean as necessary to ensure the proper function of the combustion air proving switch. When reassembling the flue box, ensure that both ends of pressure switch tubing are tightly pressed into fitting and pressure switch, respectively.

COMBUSTION-AIR BLOWERS (48N 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. 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. See Fig. 48.

ECONOMIZER DAMPER MOTOR(S)

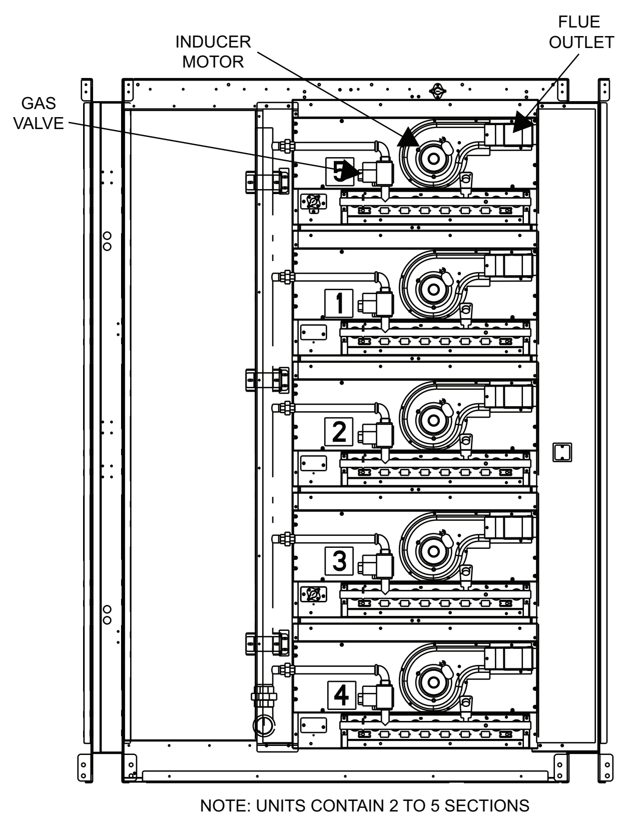
On units so equipped, the economizer motor(s) is located in the mixing box section. Access to it is through the door labeled FILTER SECTION.

CONDENSER FANS AND FAN MOTORS

Remove the wire fan guard on top of the unit to gain access to the condenser fans and motors.

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.



NOTE: 120 to 150 ton units shown. 75 to 105 ton units have a maximum of 4 sections numbered 4, 1, 2, 3 from top to bottom.

Fig. 42 — Standard Gas Heat

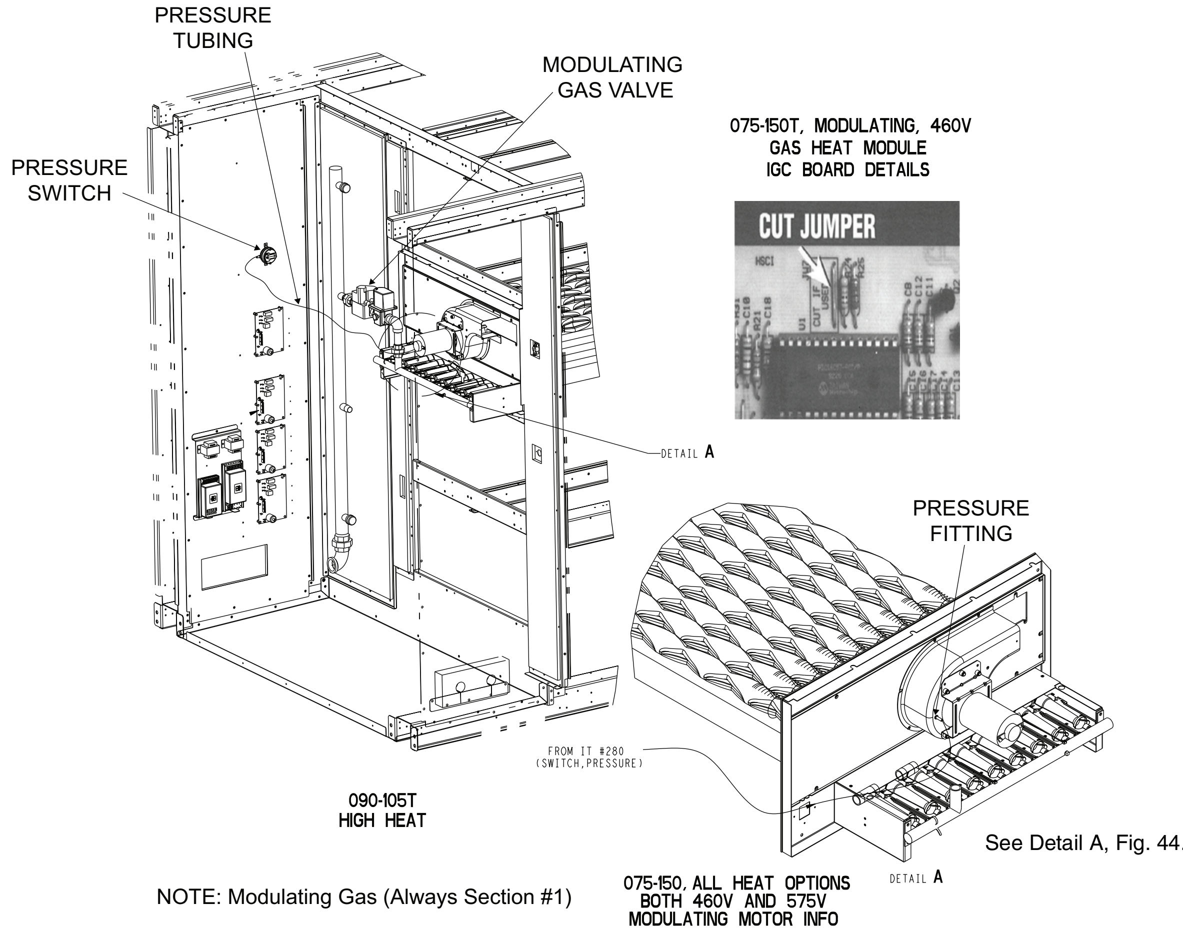


Fig. 43 — Modulating Gas Heat

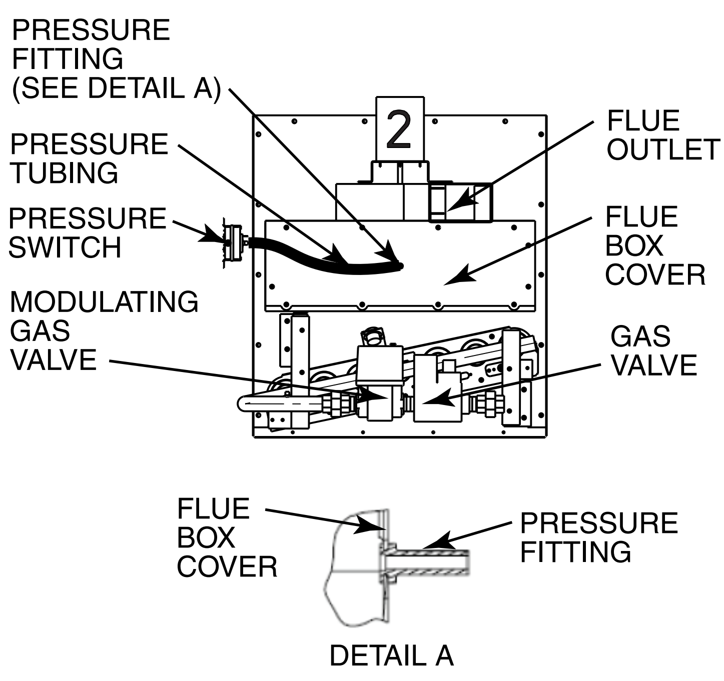


Fig. 44 — Gas Section Detail, Modulating Gas Heat

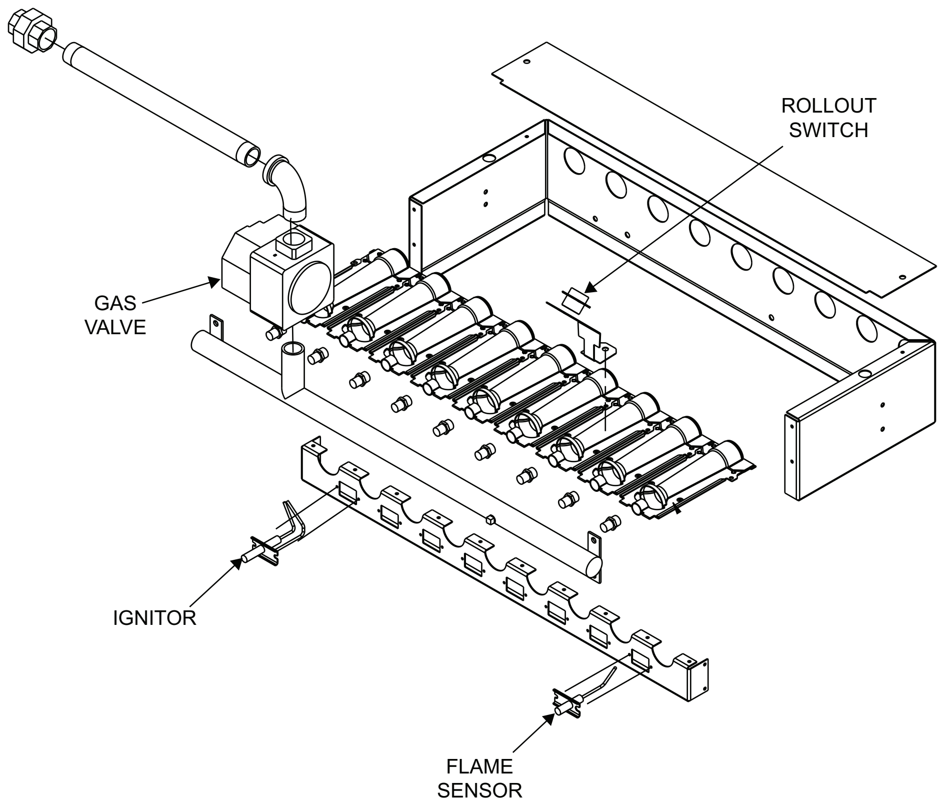


Fig. 45 — Standard Gas Burner Details

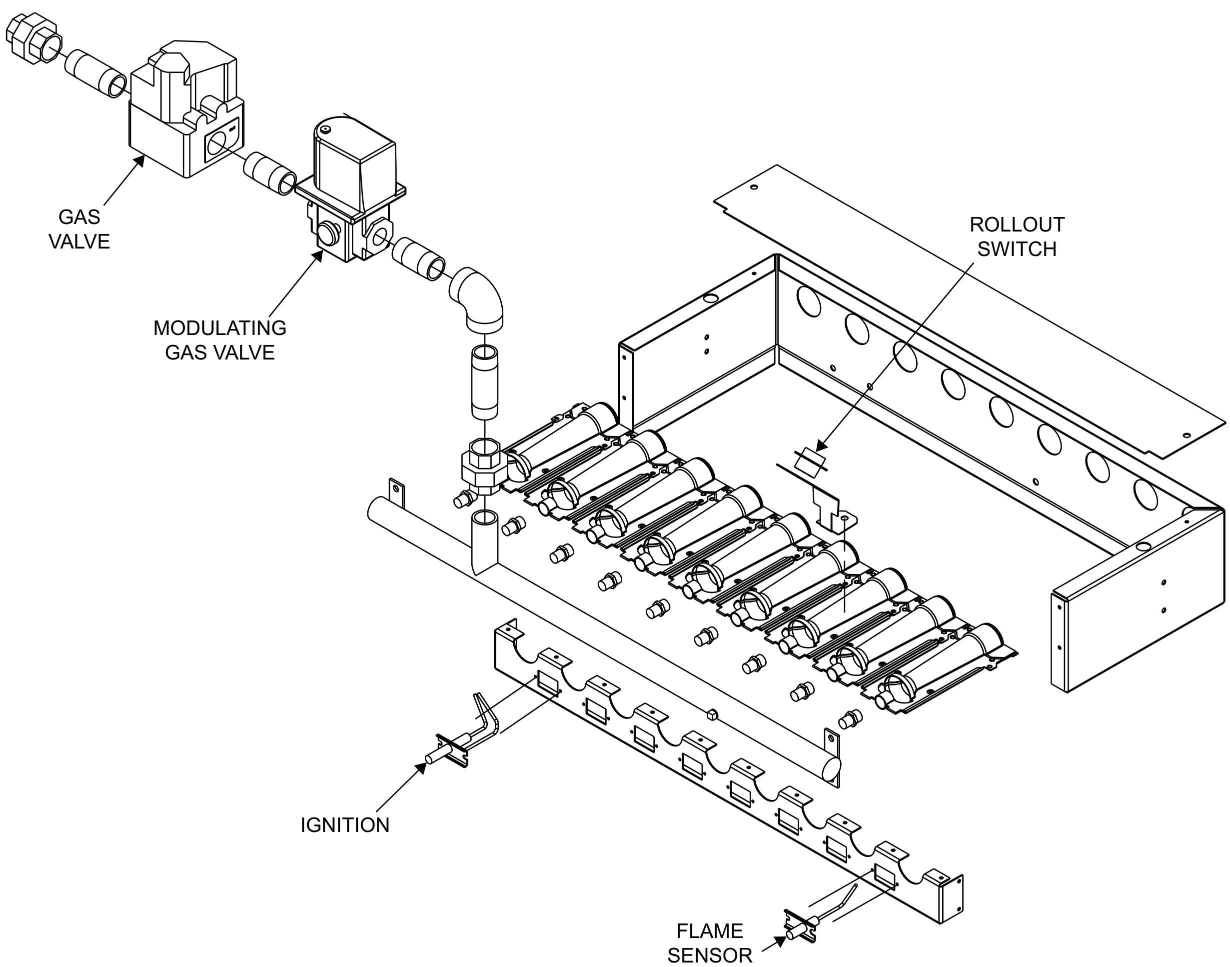


Fig. 46 — Modulating Gas Burner Assembly

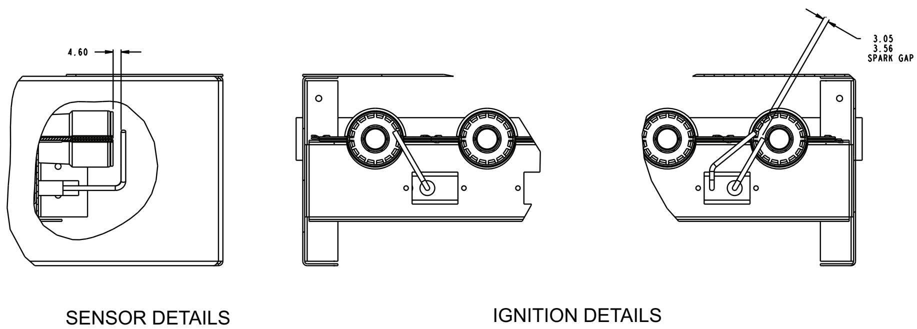


Fig. 47 — Sensor and Ignition Position

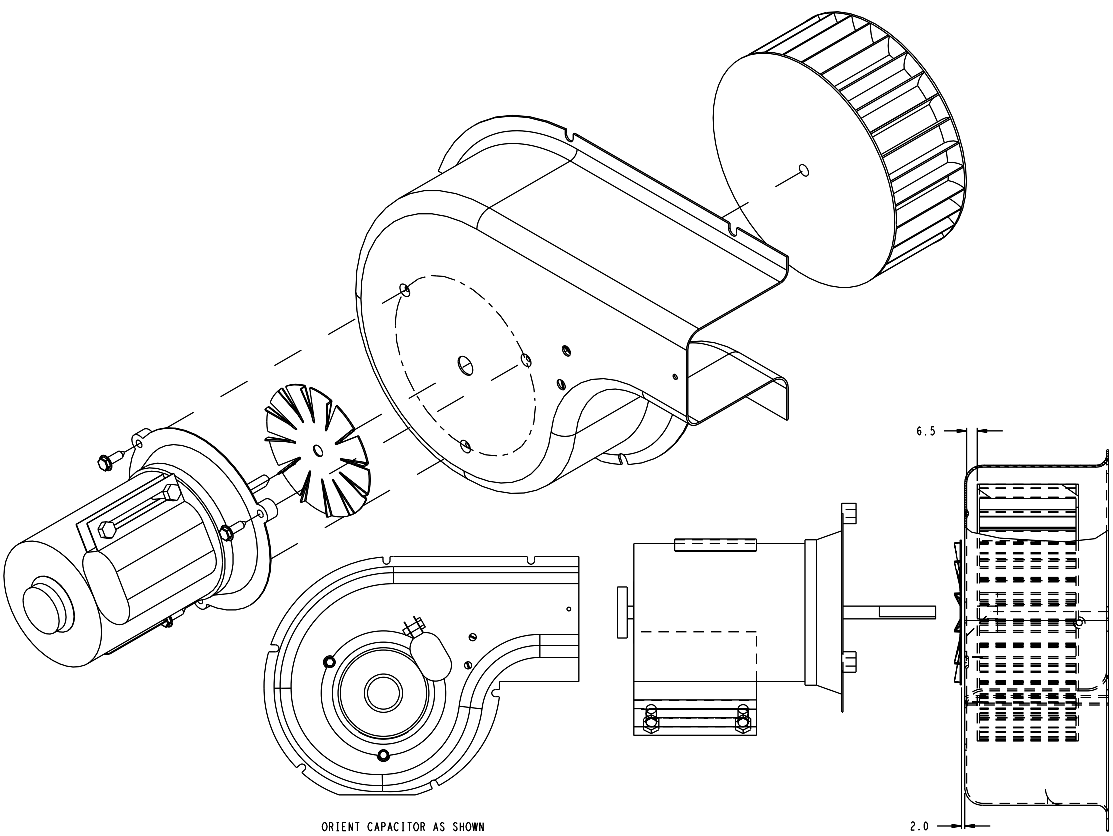


Fig. 48 — Combustion Blower Details

Adjustments

RETURN FAN MOTOR PLATE

Adjust using a wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 49.)
2. Turn the adjusting bolts to move the motor mounting plate toward or away from the fan to loosen or tighten the belts. Make the same number of turns to each bolt.
3. Retighten holddown bolts.

SUPPLY FAN AND POWER EXHAUST MOTOR PLATE

Adjust using a wrench on the adjusting bolts:

1. Loosen holddown bolts. (See Fig. 50.)
2. Turn the adjusting bolts to move the motor mounting plate toward or away from the fan to loosen or tighten the belts. Make the same number of turns to each bolt.
3. Retighten holddown bolts.

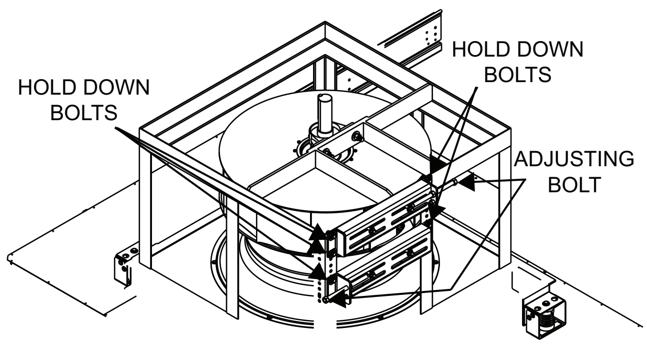


Fig. 49 — Return Fan Motor Plate Adjustment

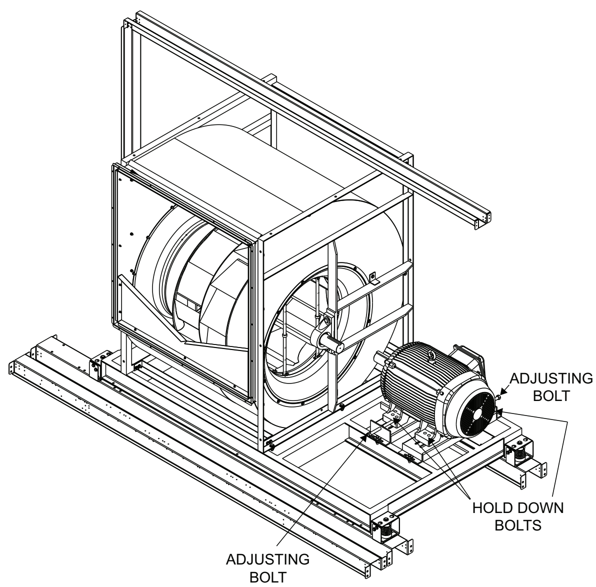


Fig. 50 — Supply and Power Exhaust Fan Motor Plate Adjustment

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.) See Fig. 51.
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. Excessive belt tension shortens belt life and may cause bearing and shaft damage.

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.

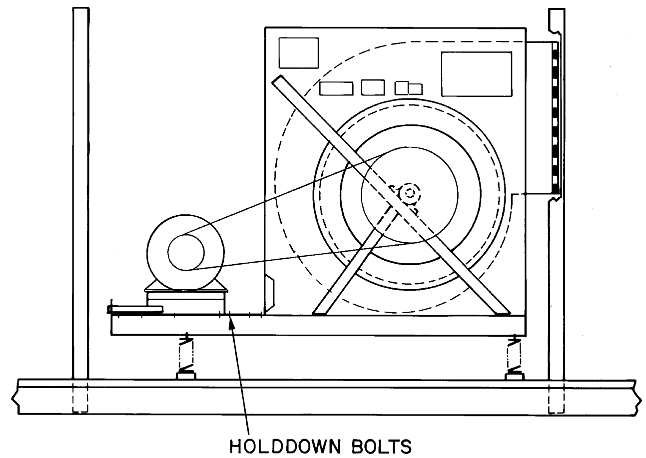


Fig. 51 — Motor Plate Adjustment

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. 52. 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

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 (METAL FANS)

1. Turn off unit power.
2. Remove fan guard and loosen fan hub setscrew.

3. See Fig. 53 and adjust fan height using a straight edge laid across the fan deck.
4. Tighten setscrew to 12.5 to 13.75 ft-lb and replace rubber hubcap to prevent hub from rusting to the motor shaft. Fill hub recess with Permagum if hub has no rubber hubcap.
5. Replace fan guard.

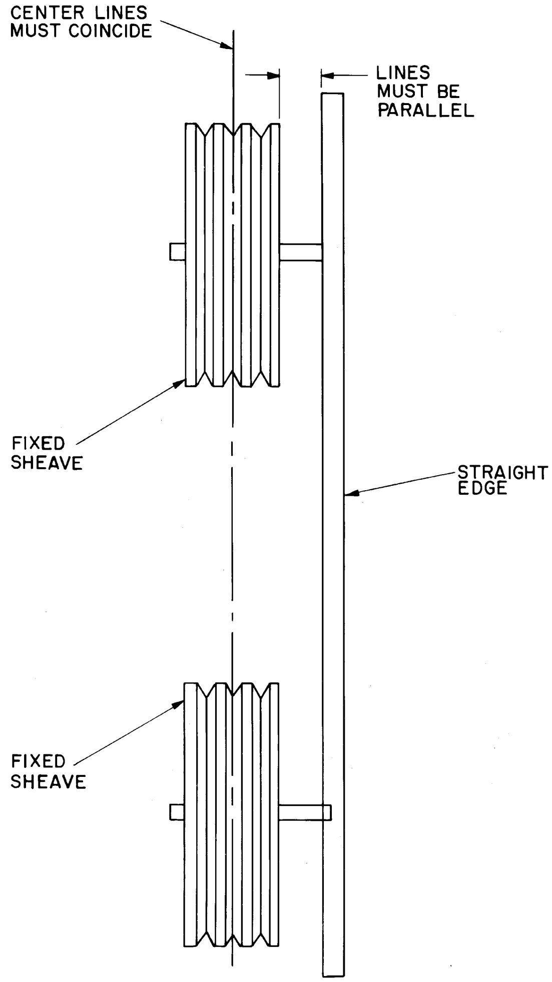


Fig. 52 — Pulley Alignment

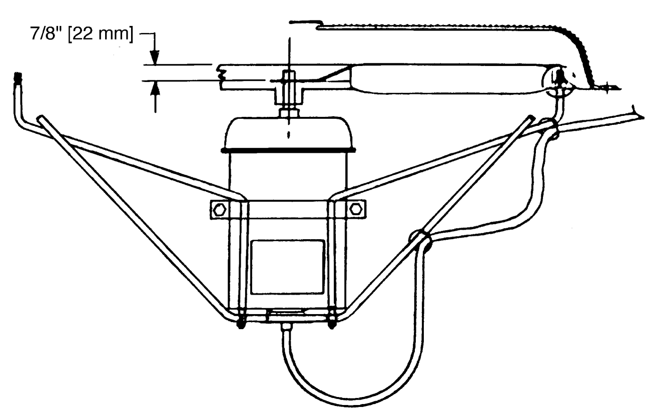


Fig. 53 — Condenser-Fan Adjustment

CONDENSER FAN ADJUSTMENT (PLASTIC FANS)

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. 54. 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.

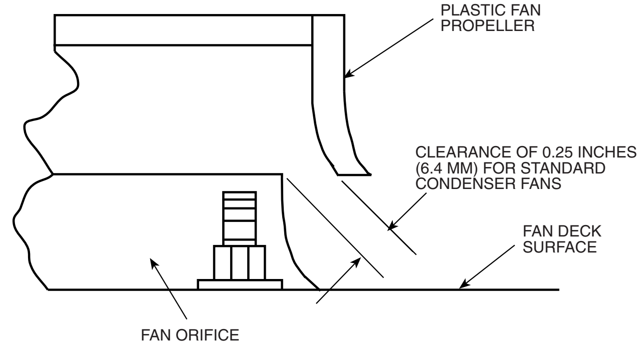


Fig. 54 — Condenser Fan Position (Plastic Fan)

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. 55.
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. 55).
6. Reinstall the transducer in the unit.
7. Restore power to the unit.

TRANSDUCER PART NUMBER	INPUT RANGE (in. wg)	OUTPUT RANGE	OUTPUT AT 0 IN. WG	USAGE
HK05ZG019	0-5	4-20 mA	4 mA	Air Foil Fan Cfm
HK05ZG020	0-1	4-20 mA	4 mA	Return Fan Cfm
HK05ZG022	–0.25-0.25	4-20 mA	12 mA	Building Pressure

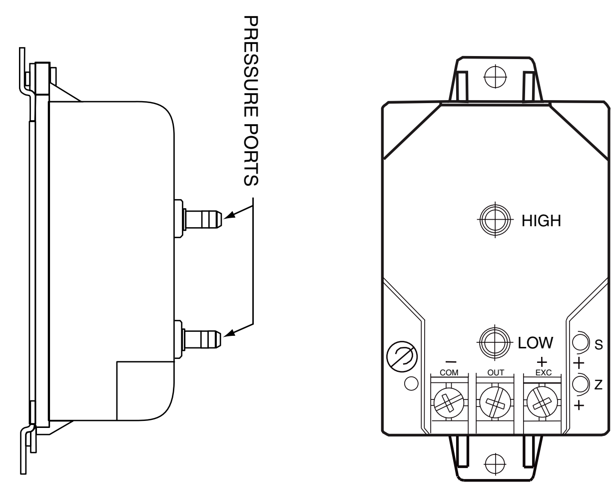


Fig. 55 — Transducer Details

Cleaning

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

MICROCHANNEL HEAT EXCHANGER (MCHX) CONDENSER COIL MAINTENANCE AND CLEANING RECOMMENDATIONS

⚠ CAUTION

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

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

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

⚠ CAUTION

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

CONDENSATE DRAIN

Check and clean each year at start of cooling season. In winter, keep drains and traps dry.

FILTERS

Clean or replace at start of each heating and cooling season or more often if operating conditions require. Refer to Installation Instructions for type and size.

1. Remove economizer outdoor-air filters from the hoods by removing the filter retainers.
2. Clean filters with steam or hot water and mild detergent.
3. Reinstall filters in hoods after cleaning. Never replace cleanable filters with throwaway filters.

OUTDOOR-AIR INLET SCREENS

Clean screens with steam or hot water and a mild detergent. Do not use disposable filters in place of screens.

Lubrication

FAN SHAFT BEARINGS

Lubricate fan shaft bearings at least once a year with suitable bearing grease. Optional extended grease lines may be provided on pulley side of blower. See table for typical lubricants.

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No. 1
Sunoco	Prestige 42
Texaco	Multifak 2

* Preferred lubricant because it contains rust and oxidation inhibitors.

FAN MOTOR BEARINGS

The condenser-fan motors have sealed bearings so no field lubrication is required.

DOOR HINGES

All door hinges should be lubricated at least once a year.

Electronic Expansion Valve (EXV)

Each circuit has 2 EXVs on which superheat may be adjusted if necessary by using the *Comfort*Link controller. Adjustment is not normally required or recommended.

The TXV is set to maintain 10 to 13°F superheat leaving the evaporator coil. It controls the flow of refrigerant to the evaporator coils.

Refrigeration Circuits

LEAK TESTING

Units are shipped with a full operating charge of R-410A (see unit nameplate). If there is no pressure in the system, introduce enough nitrogen to search for the leak. Repair the leak using good refrigeration practices. After leaks are repaired, system must be evacuated and dehydrated using methods described in GTAC II, Module 4, System Dehydration.

REFRIGERANT CHARGE

Amount of refrigerant charge is listed on unit nameplate. Refer to Carrier GTAC II; Module 5; Charging, Recovery, Recycling, and Reclamation section for charging methods and procedures.

Unit panels must be in place when unit is operating during charging procedure.

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

NO CHARGE

Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant from the unit nameplate.

LOW CHARGE COOLING

Due to the compact, all-aluminum design, microchannel heat exchangers will reduce refrigerant charge and overall operating weight. As a result, charging procedures for MCHX units require more accurate measurement techniques. Charge should be added in small increments. Using cooling charging charts provided (Fig. 56-77), add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in $^1/_4$-lb increments until complete. Ensure that all fans are on and all compressors are running when using charging charts.

To Use the Cooling Charging Chart

Use the outdoor air temperature, saturated suction temperature (SST), and saturated condensing temperature (available on the *Comfort*Link display), and find the intersection point on the cooling charging chart. If intersection point is above the line, carefully recover some of the refrigerant. If intersection point is below the line, carefully add refrigerant.

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

Units With Humidi-MiZer® Adaptive Dehumidification System

NOTE: All circuits must be running in normal cooling mode. Indoor airflow must be within specified air quantity limits for cooling. All outdoor fans must be on and running at normal speed.

Use the following procedure to adjust charge on Circuit B of Humidi-MiZer equipped units:

1. Start all compressors and outdoor fans. Allow unit to run for 5 minutes.
2. Switch system to run in a Dehumidification mode for 5 minutes by switching ***RHV*** to ON through the Service Test function ***(Service Test→COOL→RHV***).
3. At the end of the 5-minute period, switch back into Cooling mode through the Service Test function ***(Service Test→COOL→RHV***) by switching ***RHV*** to OFF.
4. Using the cooling charging charts provided (Fig. 56-77), add or remove refrigerant until conditions of the chart are met. As conditions get close to the point on the chart, add or remove charge in $^{1}/_{4}$-lb increments until complete. See paragraph "To Use the Cooling Charging Chart" for additional instructions.
5. If a charge adjustment was necessary in Step 4, then repeat the steps in this paragraph (starting with Step 2) until no charge adjustment is necessary. When no more charge adjustment is necessary after switching from a Dehumidification Mode to a Cooling Mode (Steps 2 and 3), then the charge adjustment procedure is complete.

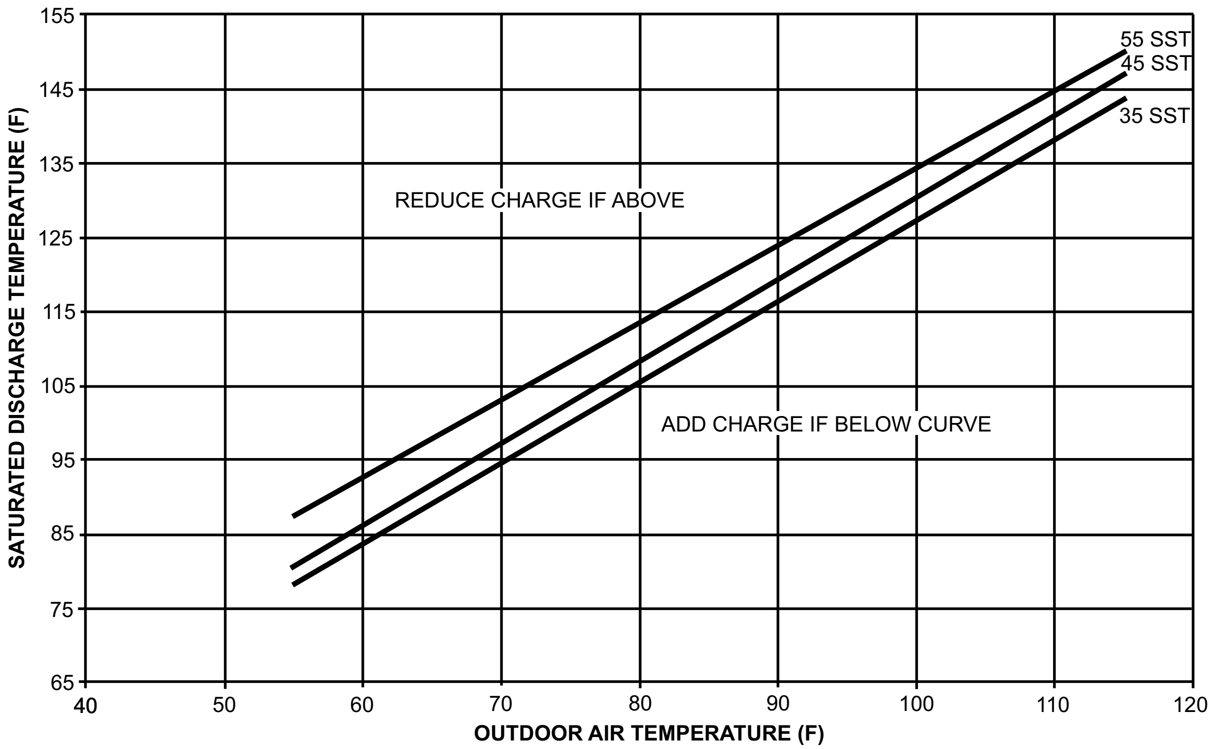


Fig. 56 — Charging Chart — 75 Ton Standard Capacity, Standard Efficiency

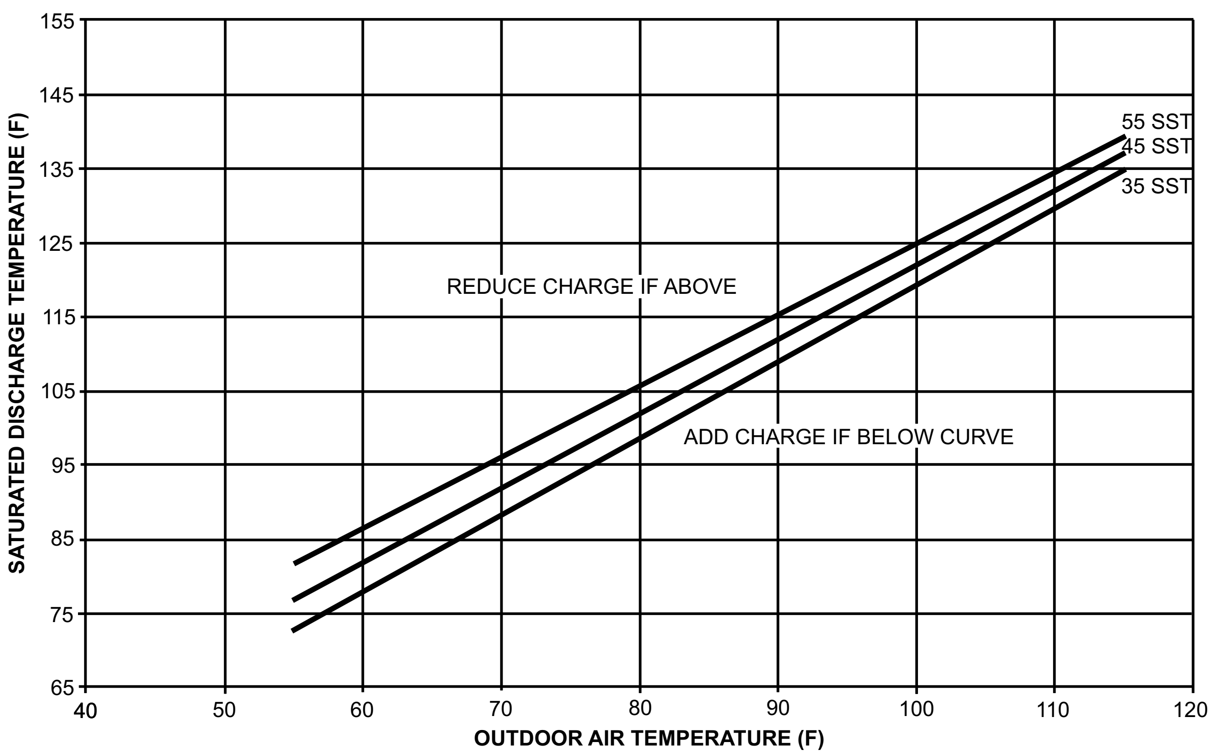


Fig. 57 — Charging Chart — 75 Ton Standard Capacity, High Efficiency

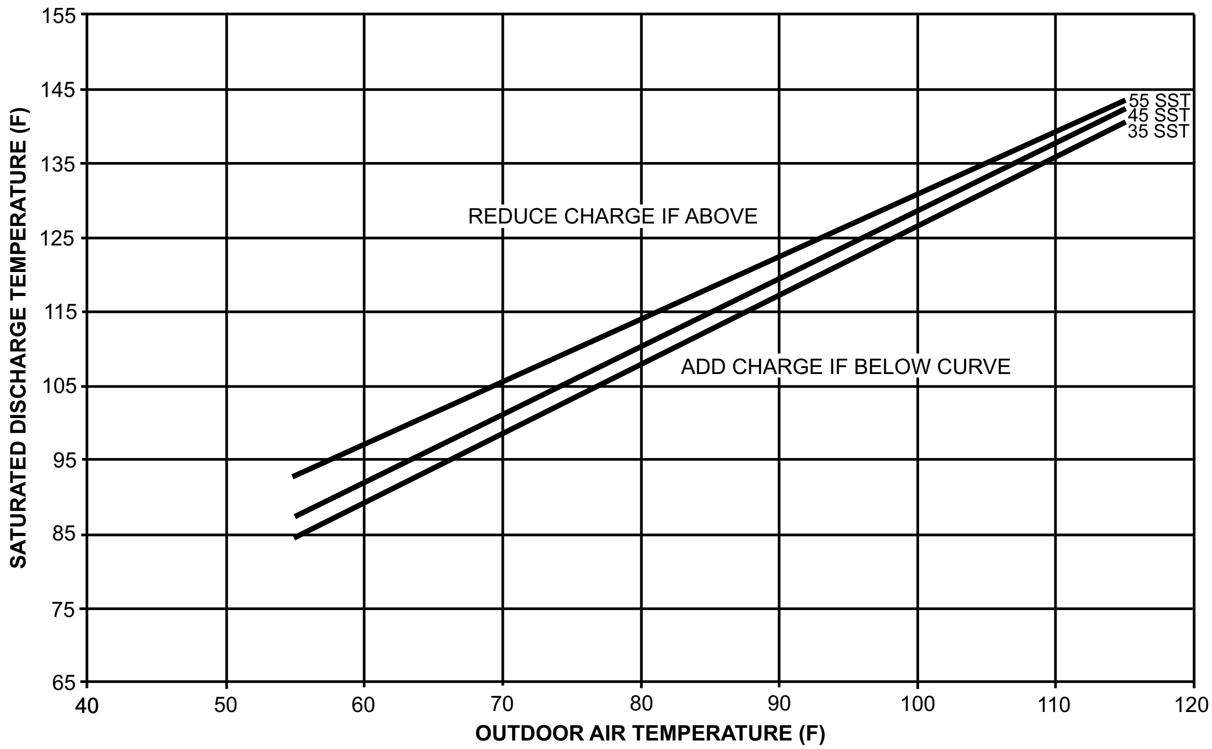


Fig. 58 — Charging Chart — 75 Ton High Capacity, Standard Efficiency

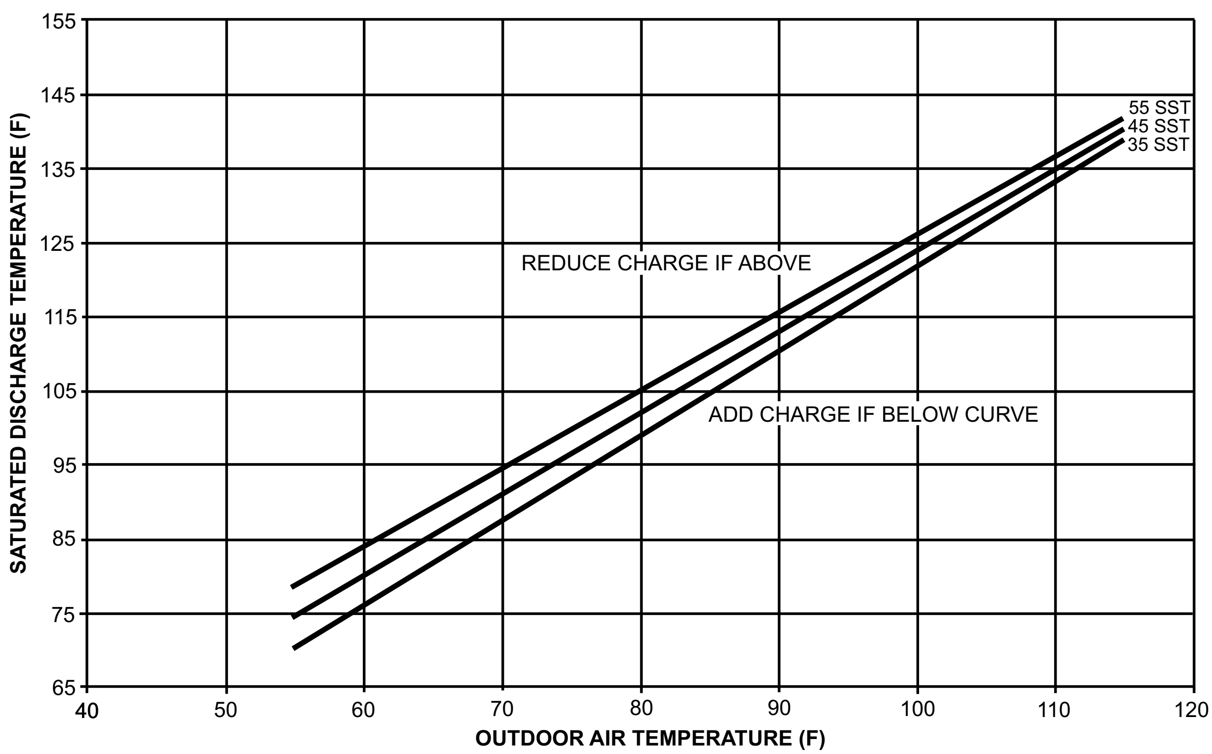


Fig. 59 — Charging Chart — 75 Ton High Capacity, High Efficiency

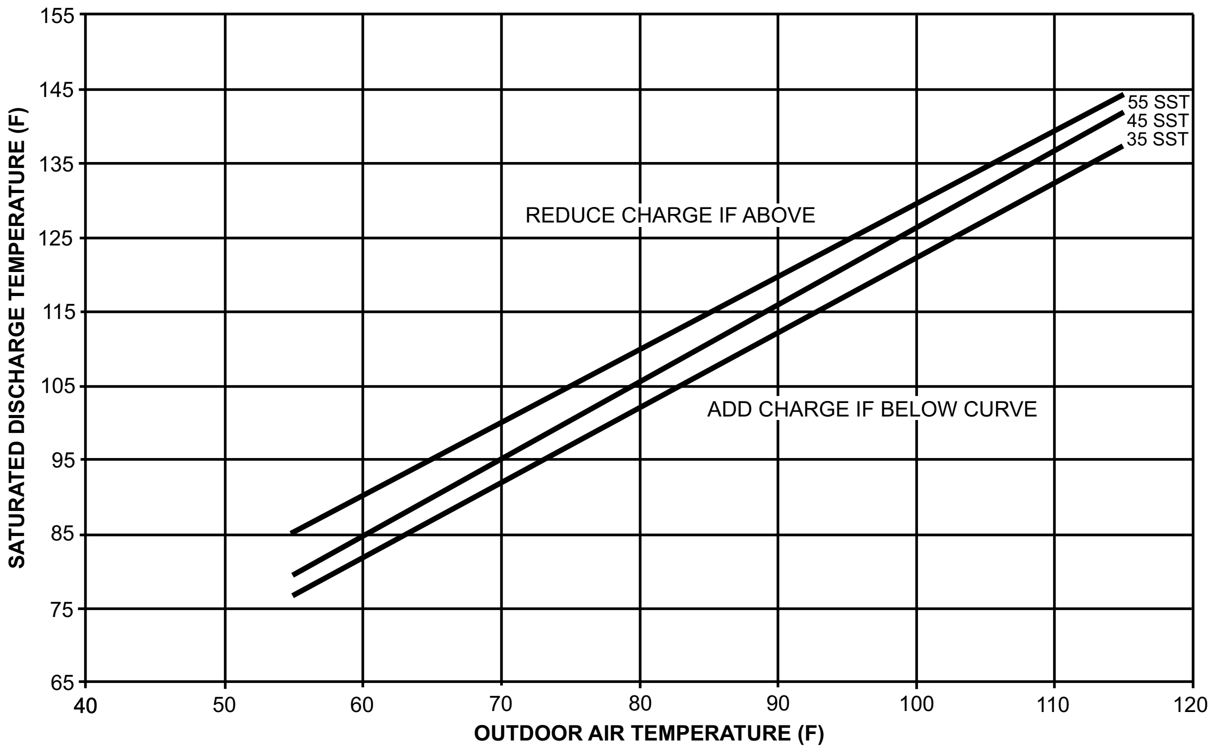


Fig. 60 — Charging Chart — 90 Ton Standard Capacity, Standard Efficiency

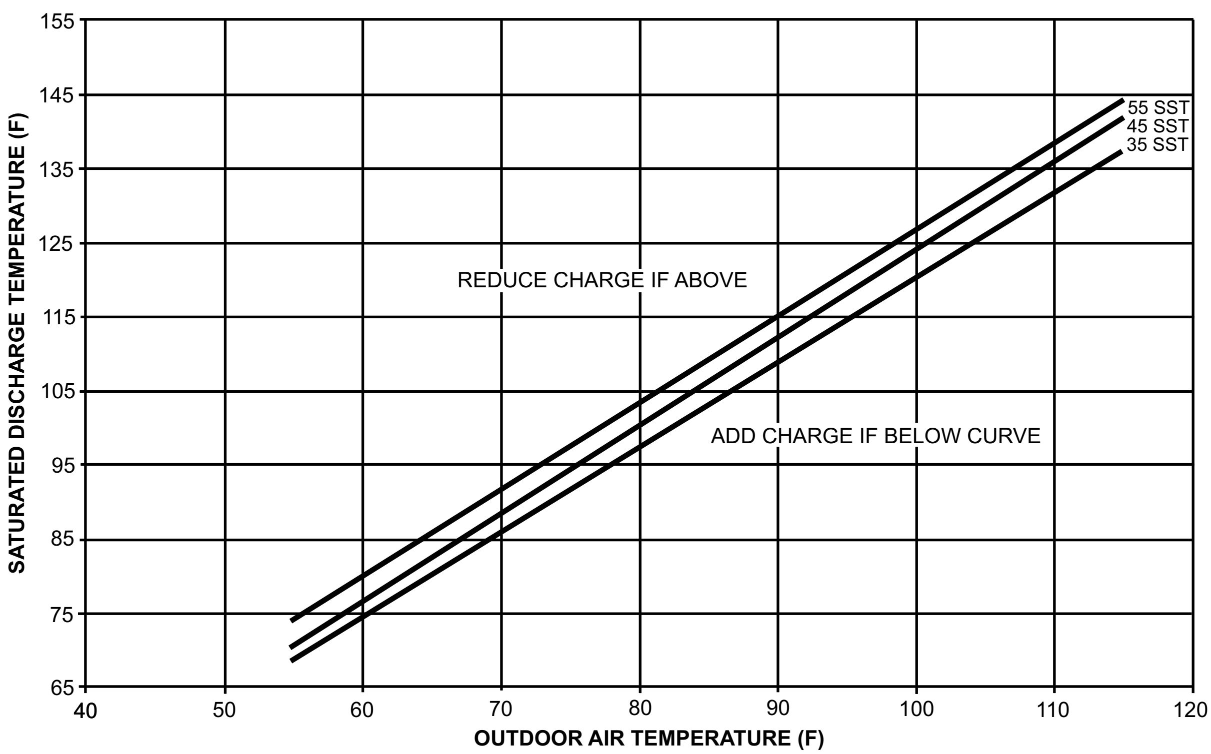


Fig. 61 — Charging Chart — 90 Ton Standard Capacity, High Efficiency

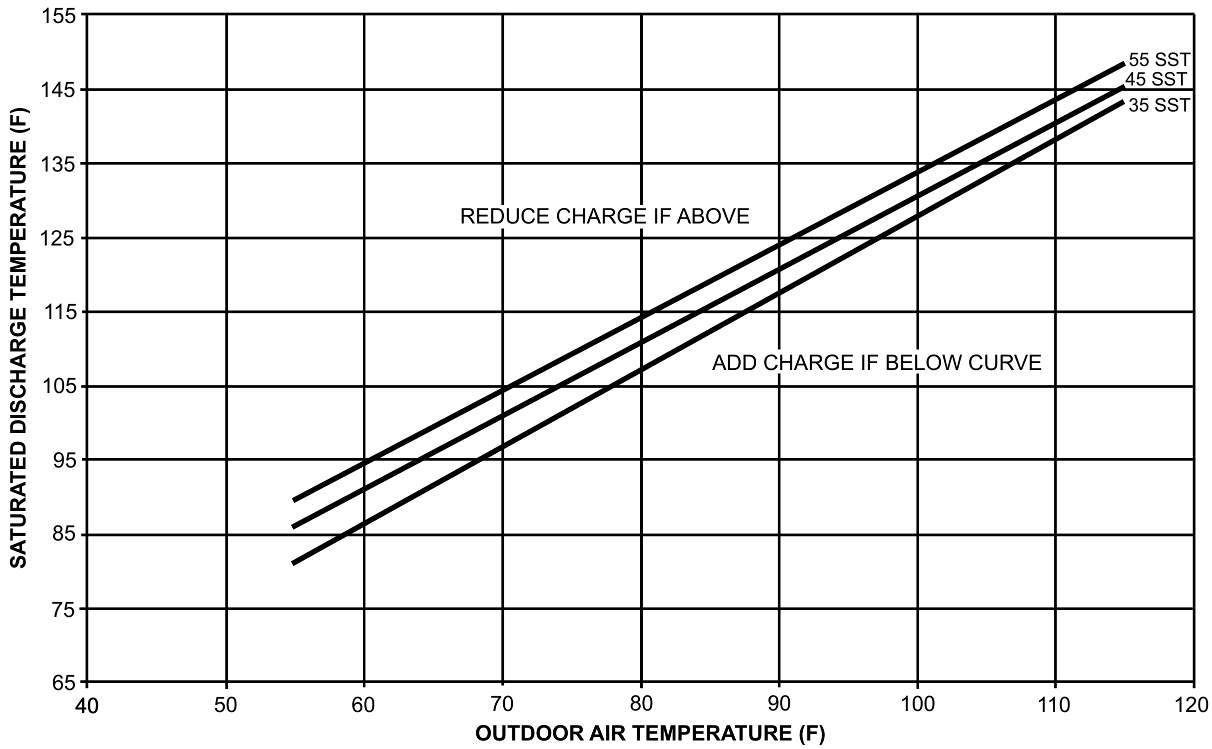


Fig. 62 — Charging Chart — 90 Ton High Capacity, Standard Efficiency

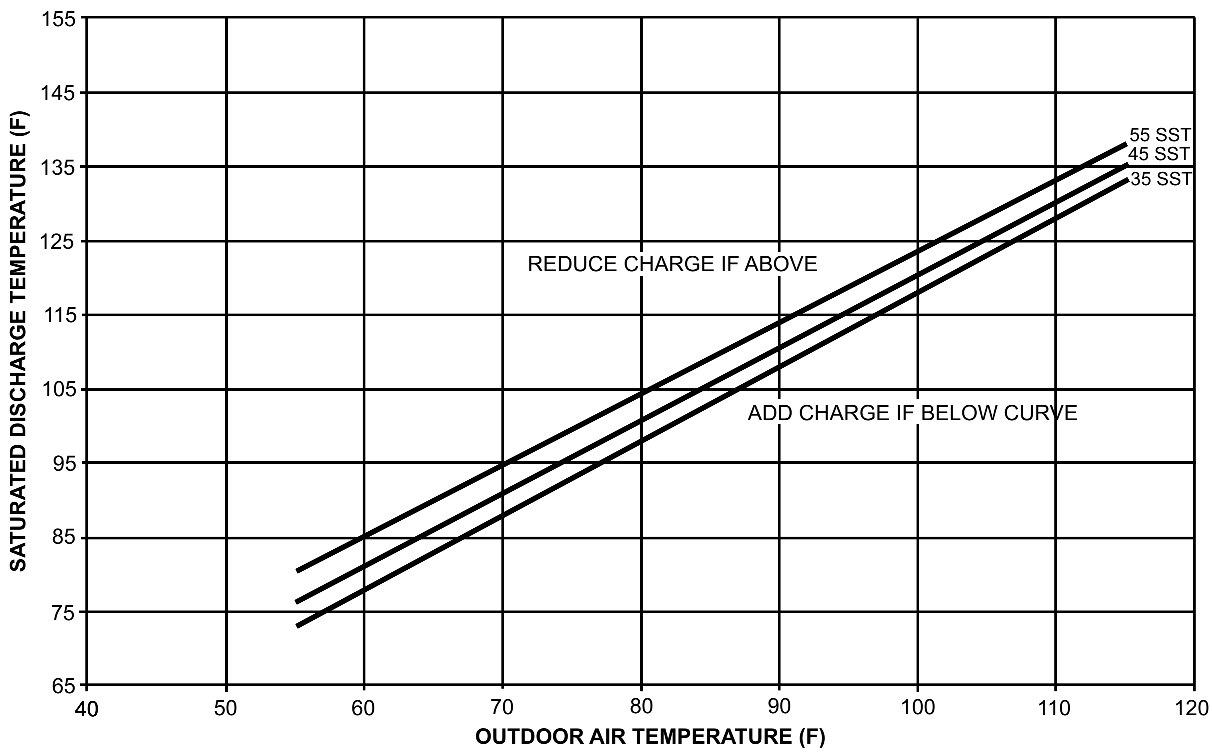


Fig. 63 — Charging Chart — 90 Ton High Capacity, High Efficiency

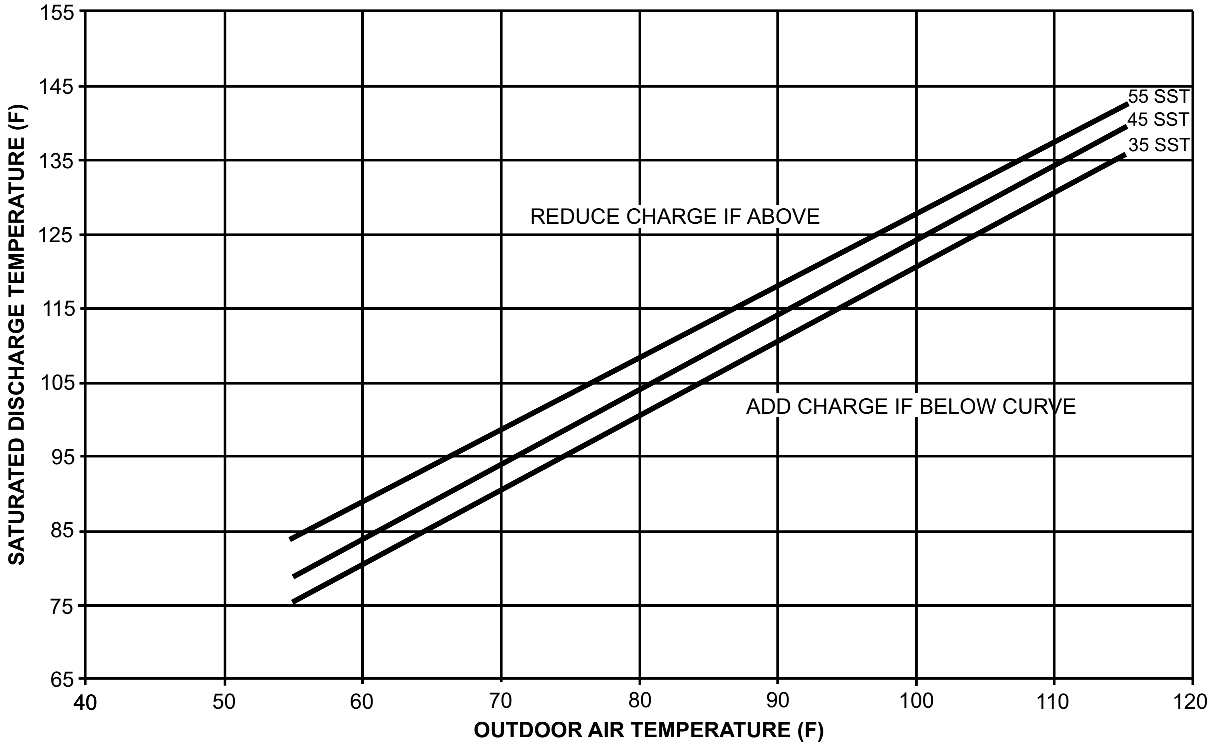


Fig. 64 — Charging Chart — 105 Ton Standard Capacity, Standard Efficiency

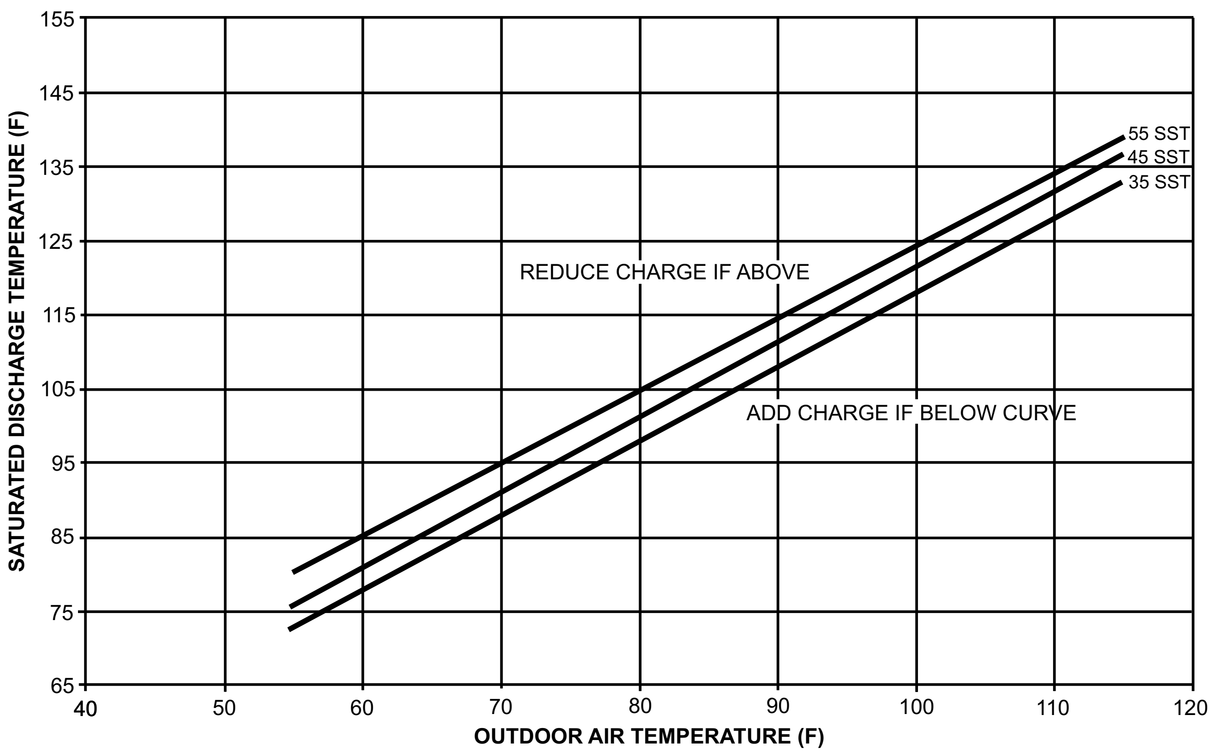


Fig. 65 — Charging Chart — 105 Ton Standard Capacity, High Efficiency

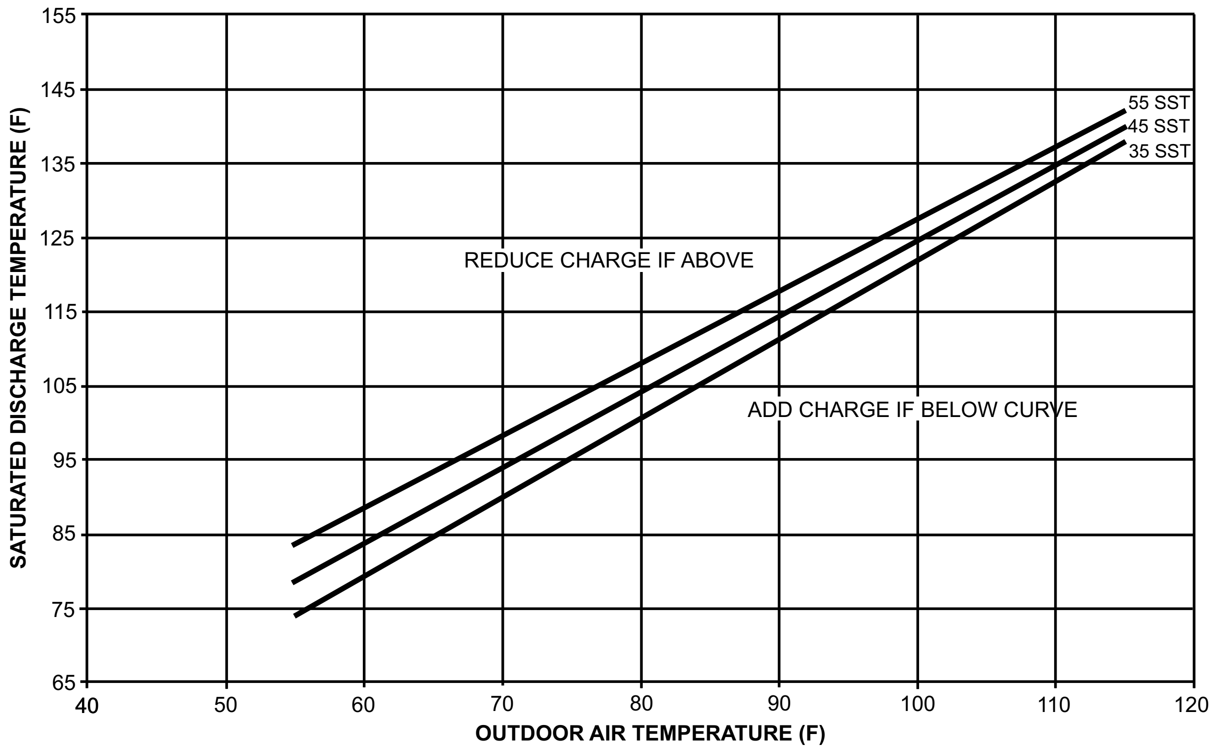


Fig. 66 — Charging Chart — 105 Ton High Capacity, Standard Efficiency

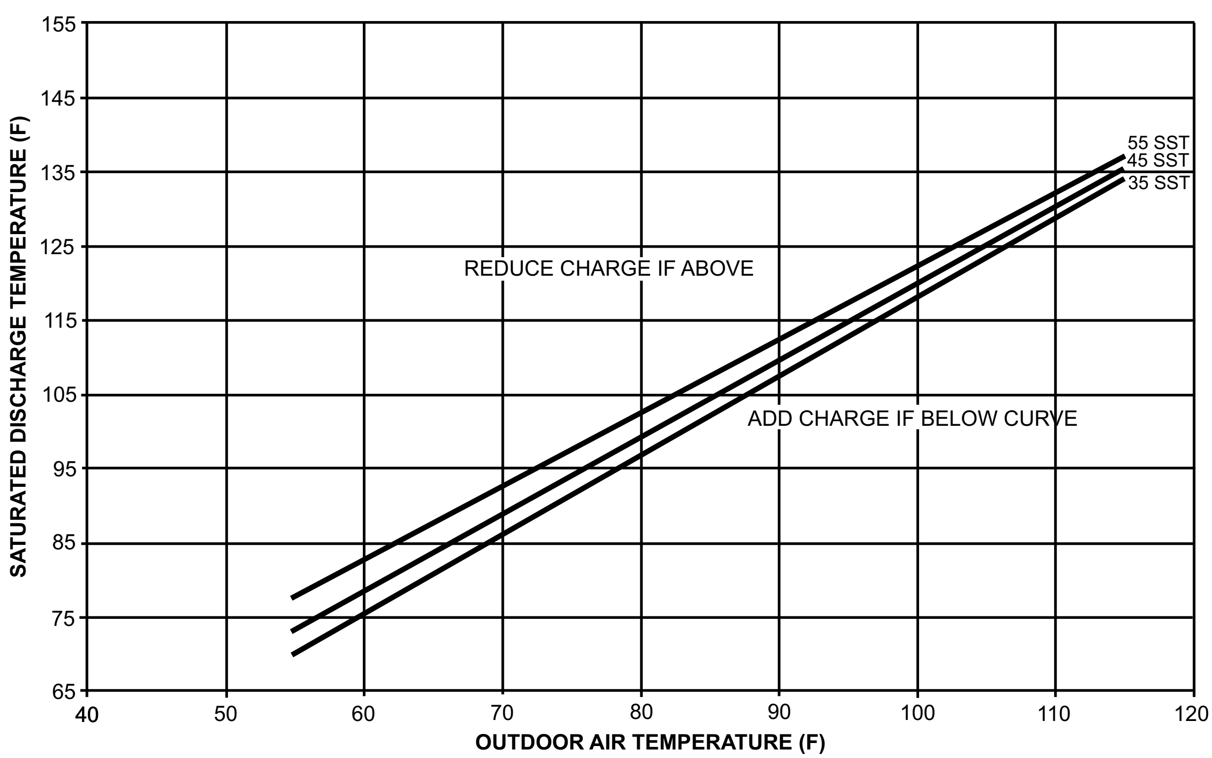


Fig. 67 — Charging Chart — 105 Ton High Capacity, High Efficiency

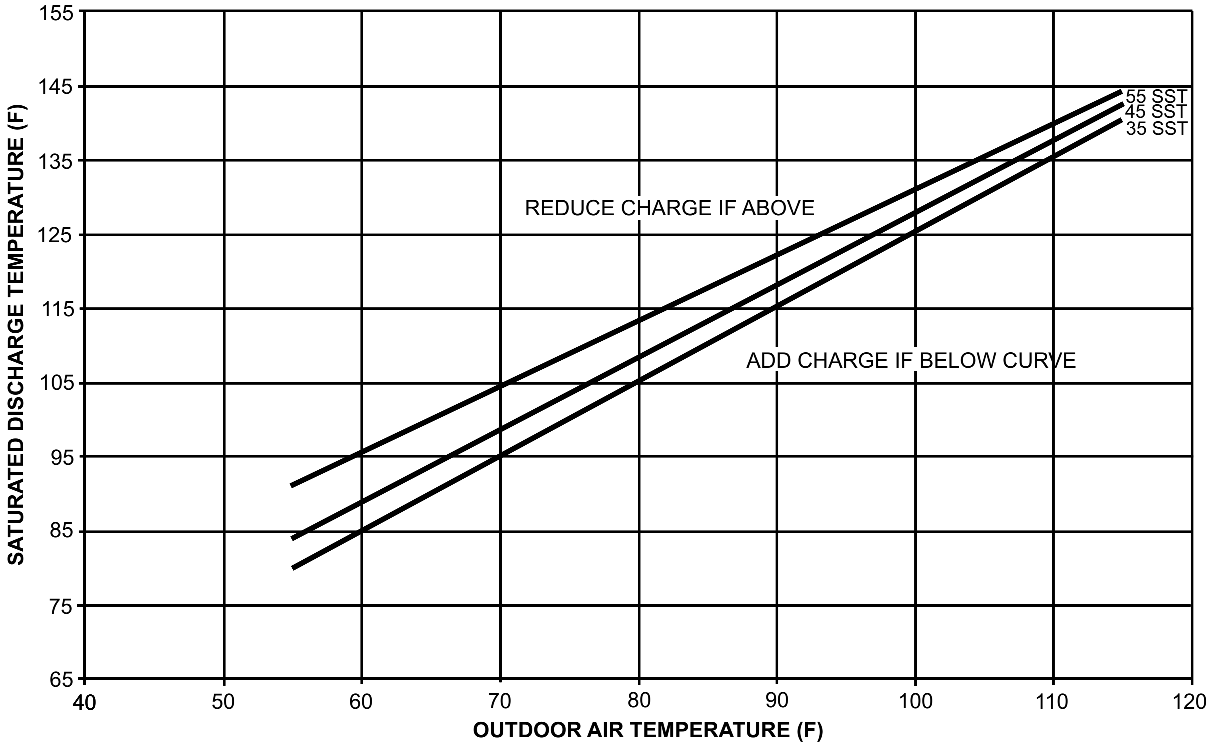


Fig. 68 — Charging Chart — 120 Ton Standard Capacity, Standard Efficiency

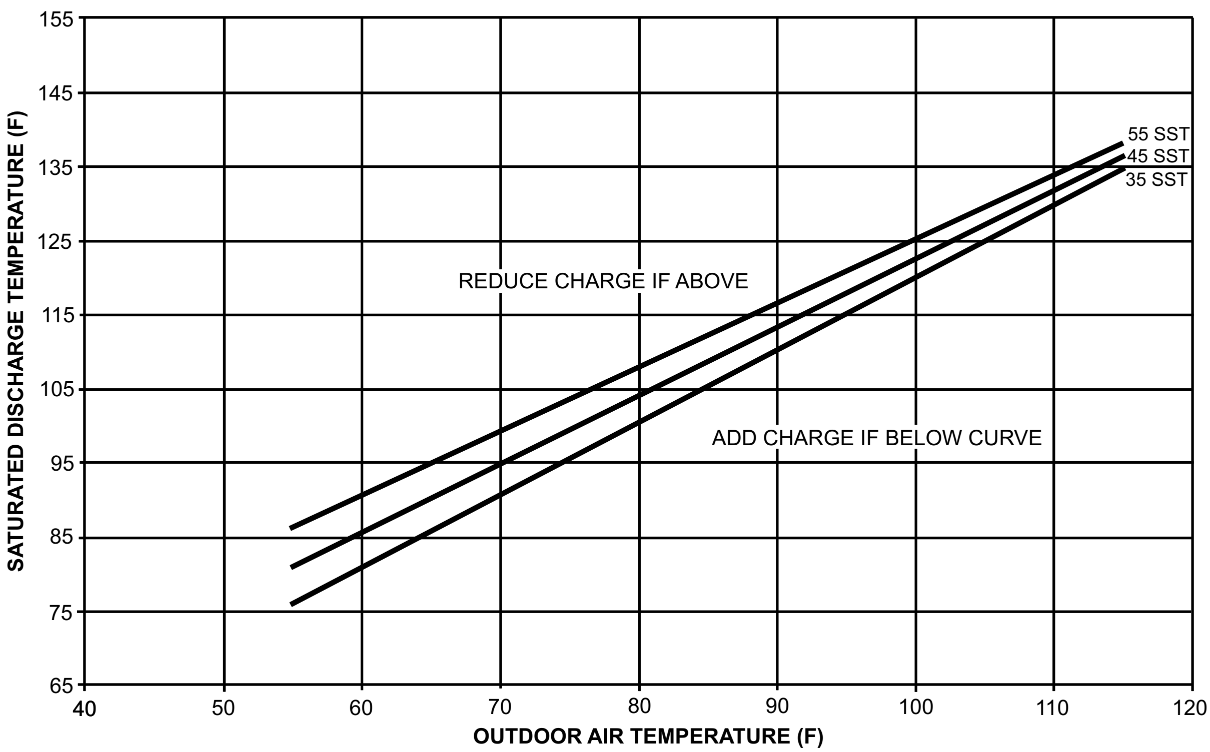


Fig. 69 — Charging Chart — 120 Ton Standard Capacity, High Efficiency

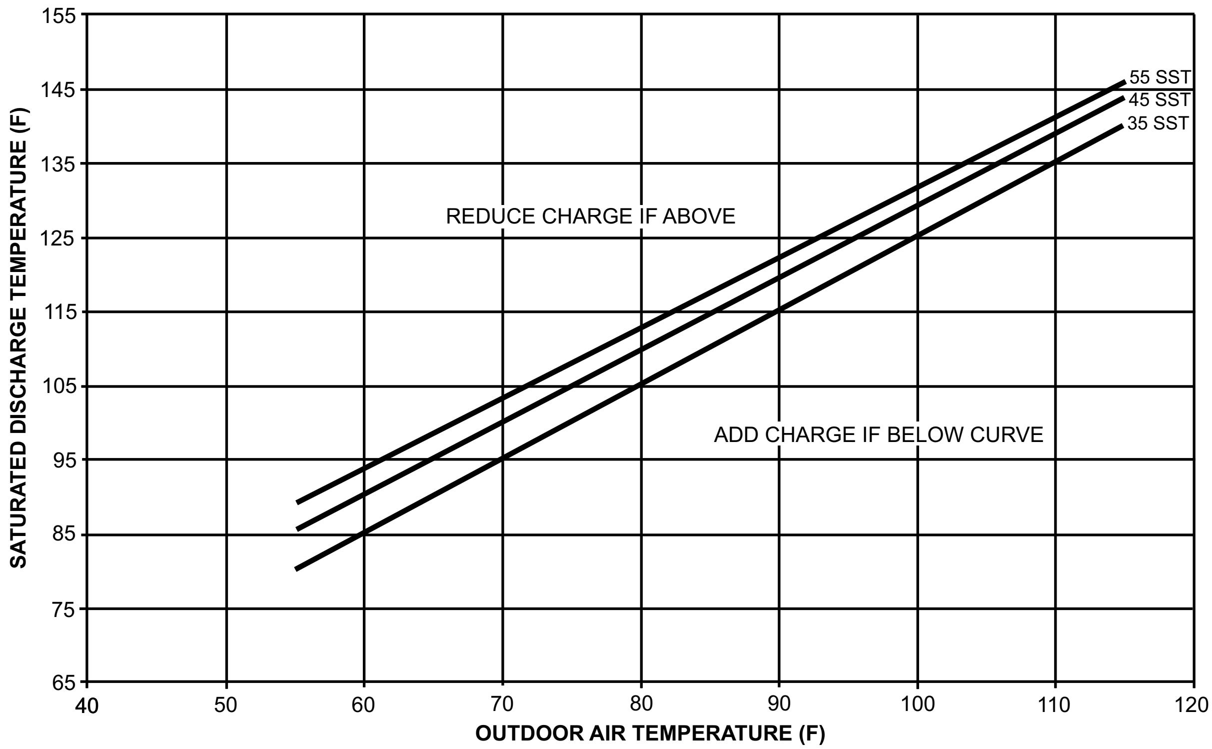


Fig. 70 — Charging Chart — 120 Ton High Capacity, Standard Efficiency

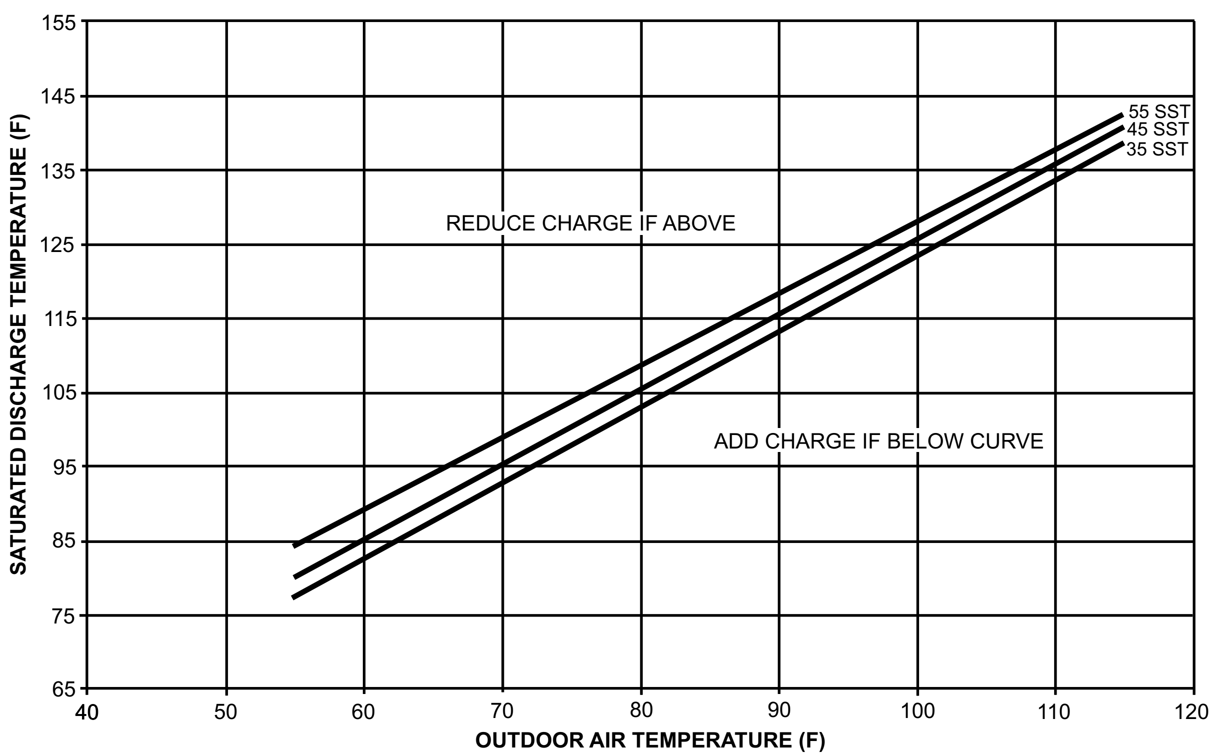


Fig. 71 — Charging Chart — 120 Ton High Capacity, High Efficiency

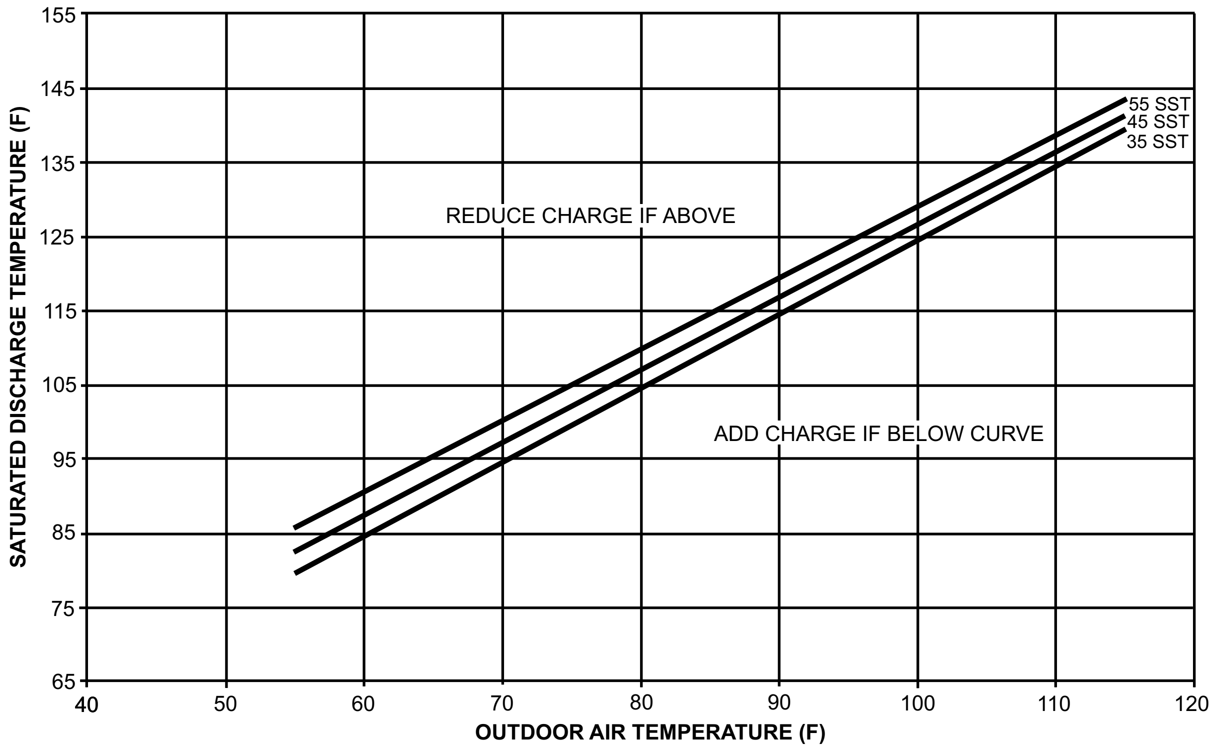


Fig. 72 — Charging Chart — 130 Ton Standard Capacity, Standard Efficiency

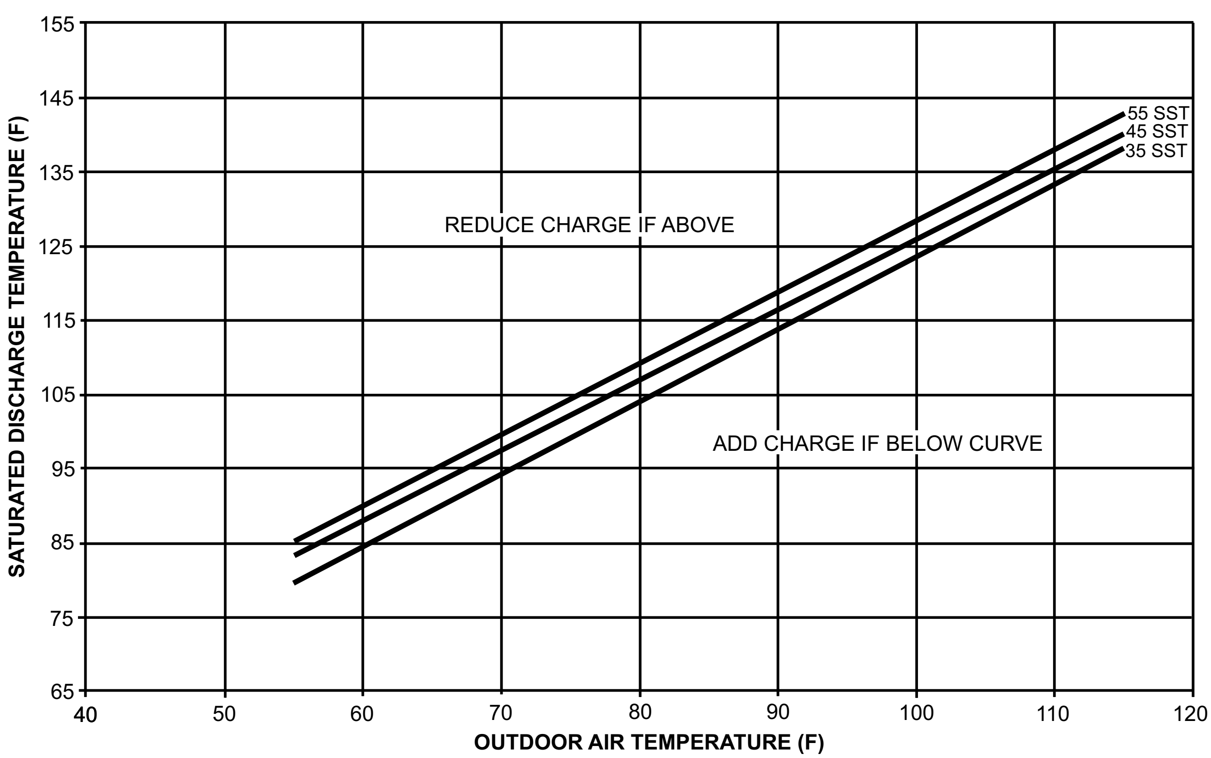


Fig. 73 — Charging Chart — 130 Ton Standard Capacity, High Efficiency

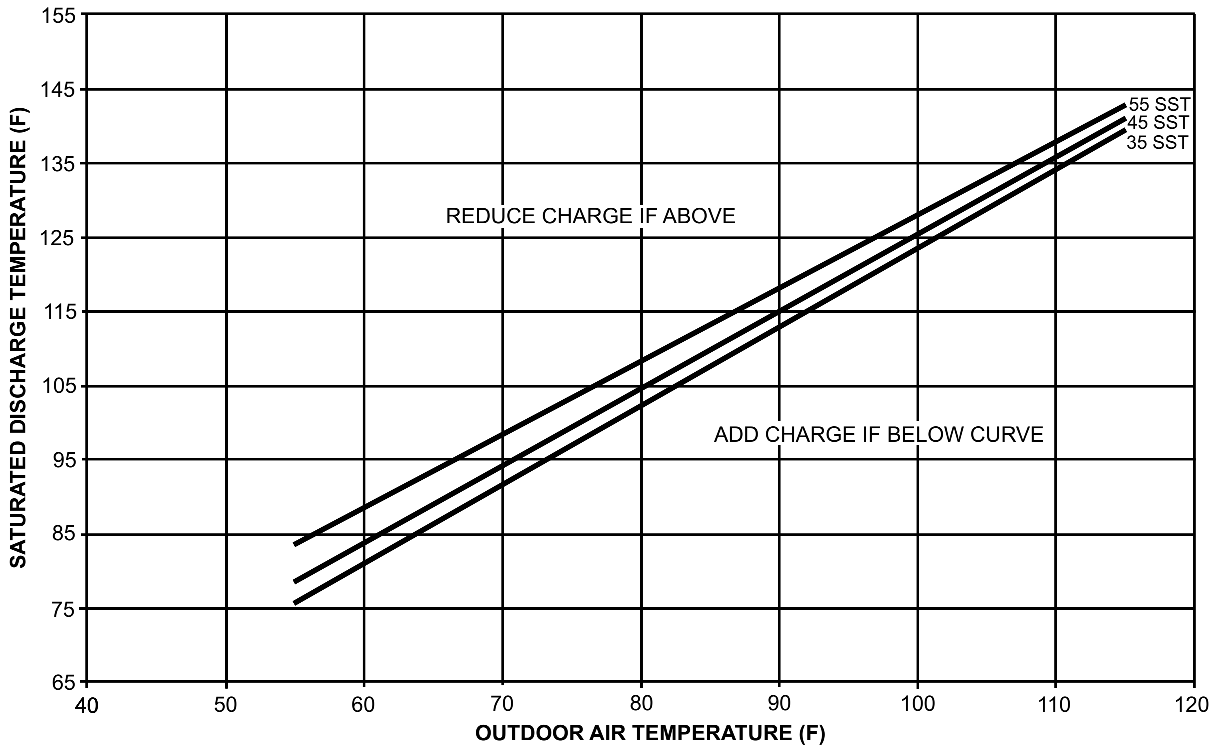


Fig. 74 — Charging Chart — 130 Ton High Capacity, Standard Efficiency

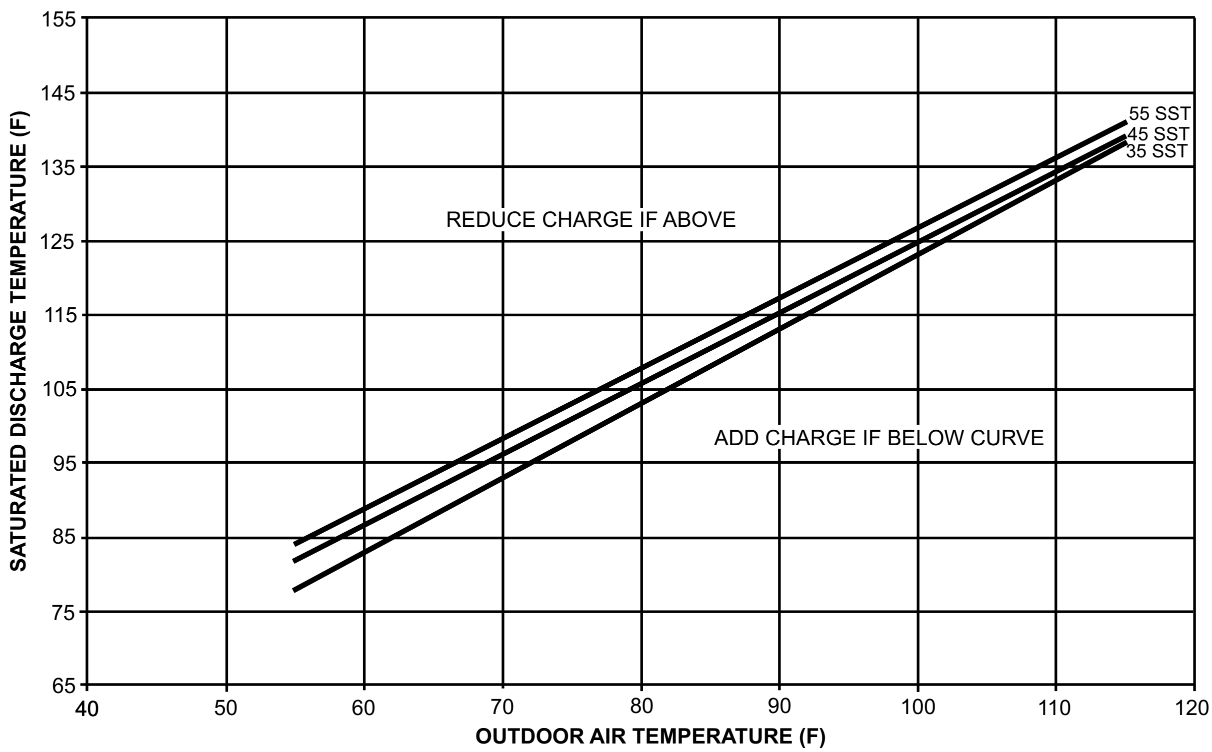


Fig. 75 — Charging Chart — 130 Ton High Capacity, High Efficiency

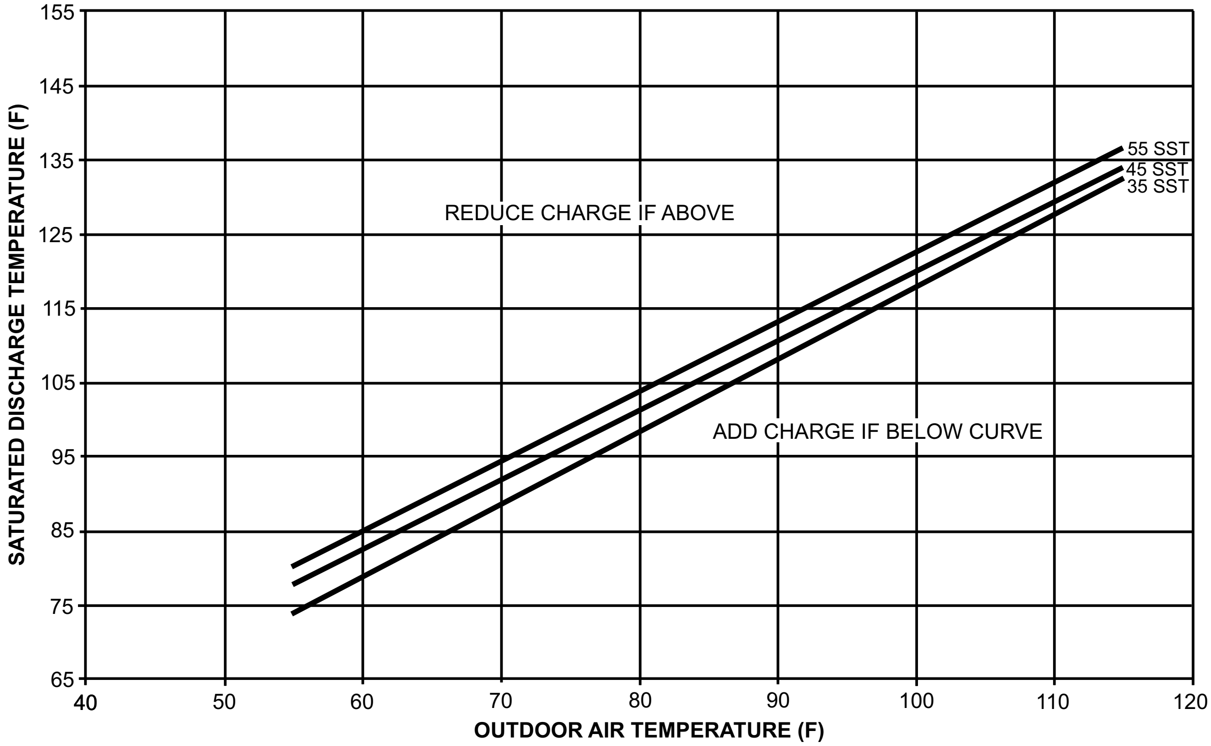


Fig. 76 — Charging Chart — 150 Ton Standard Capacity, Standard Efficiency

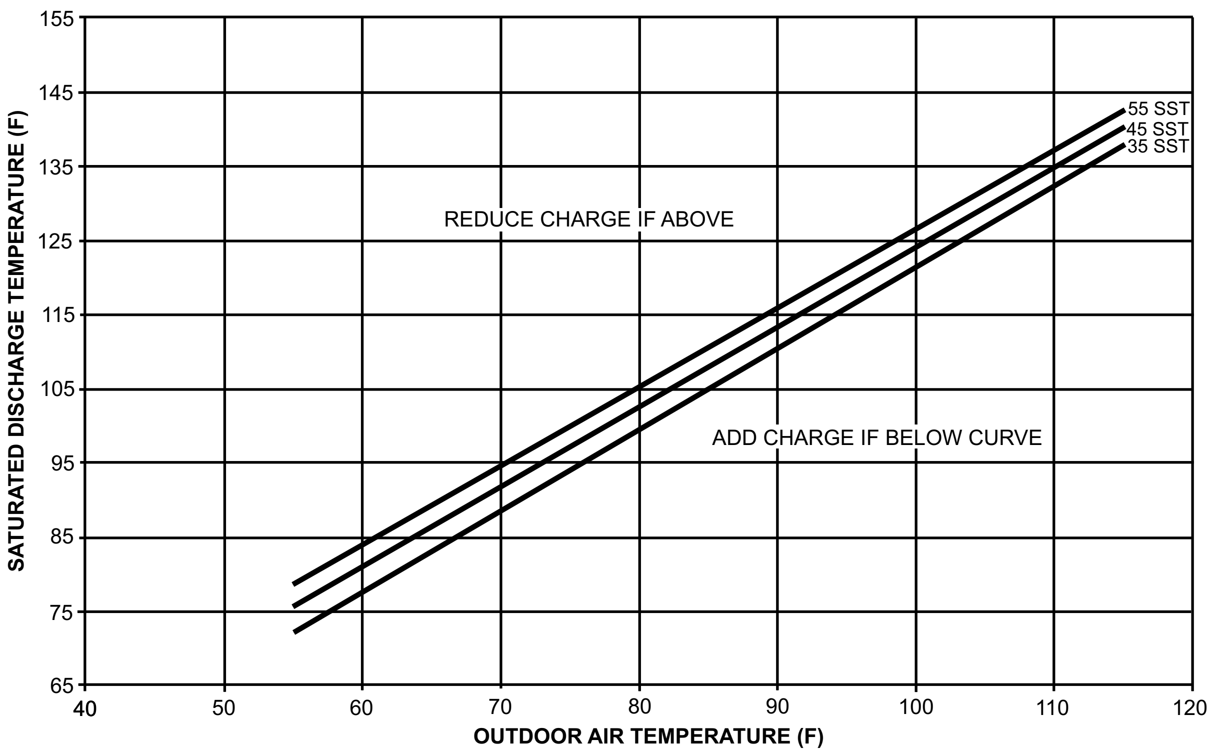


Fig. 77 — Charging Chart — 150 Ton High Capacity, Standard Efficiency

Gas System Adjustment (48N Only)

TWO-STAGE GAS VALVE ADJUSTMENT

The gas valve opens and closes in response to the unit control.

When power is supplied to valve terminals D1 and C2, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body (3.3 in. wg).

To adjust regulator:

1. Set thermostat at setting for no call for heat.
2. Switch main gas valve to OFF position.
3. Remove $^1/_8$-in. pipe plug from manifold or gas valve pressure tap connection. Install a suitable pressure-measuring device.
4. Switch main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment high-fire screw (see Fig. 78).
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, set thermostat setting for no call for heat, turn off main gas valve, remove pressure-measuring device, and replace $^1/_8$-in. pipe plug and screw cap.

MODULATING GAS VALVE ADJUSTMENT

The modulating gas valve is an electrically operated valve controlled by a 0 to 20 vdc input directly to valve terminals or from an external controller. The modulating gas valve is installed downstream from a separate pressure regulator, such as a 2-stage gas valve. See Fig. 79.

The modulating gas valve has both sides fitted for low fire adjustment. When 0 vdc is applied at the connect terminals, the bypass provides a minimum outlet pressure of 0.3 in. wg for 2.0 in. wg at the gas regulator upstream the modulating valve (factory setting).

For low fire adjustment (see Fig. 80):

1. Disconnect a wire from modulating valve connect terminals.
   NOTE: Do not allow wire to come into contact with any other part.
2. Remove the left bypass cap.
3. Turn adjustment screw using a small screwdriver to the desired low fire adjustment.
   NOTE: Clockwise screw rotation reduces flow rate. Do not over tighten.

MAIN BURNERS

For all applications, main burners are factory set and should require no adjustment.

MAIN BURNER REMOVAL AND REPLACEMENT

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Remove gas section access door, door frame, and corner post.
4. Disconnect gas piping from gas valve inlet.
5. Remove wires from gas valve.
6. Remove wires from rollout switch.
7. Remove sensor wire and igniter cable form IGC board.
8. Remove 2 screws securing manifold bracket to basepan.
9. Remove 2 screws that hold the burner support plate flange to the vestibule plate.
10. Lift burner assembly out of unit.
11. Replace burner assembly. Reinstall by reversing Steps 1 to 10.

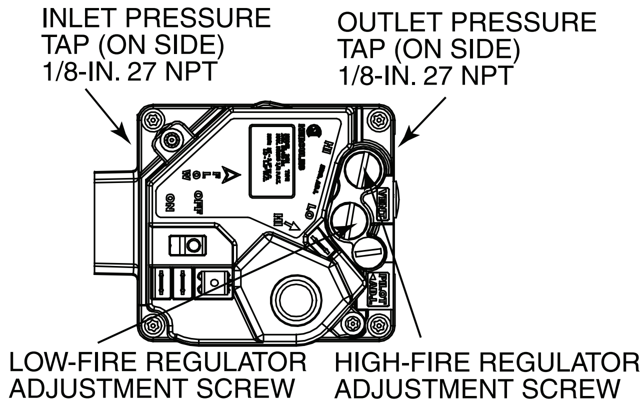


Fig. 78 — Two-Stage Gas Valve

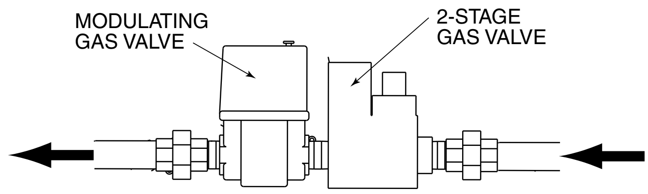


Fig. 79 — Modulating Gas Valve Location

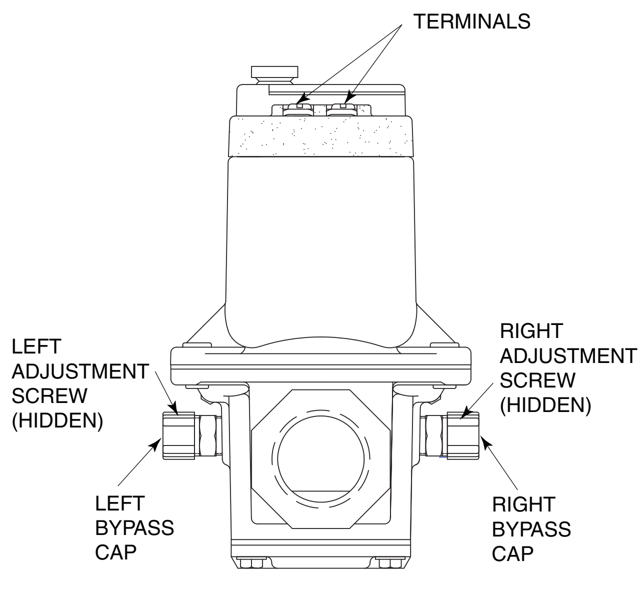


Fig. 80 — Modulating Gas Valve Bypass Adjustment

Moisture/Liquid Indicator

A clear flow of liquid refrigerant indicates sufficient charge in the system. Bubbles indicate undercharged system or the presence of noncondensables. Moisture in the system measured in parts per million (ppm) changes the color of the indicator:

Green — moisture below 45 ppm (dry)
Chartreuse — 45 to 130 ppm (caution!)
Yellow — moisture above 130 ppm (wet)

Change filter driers at the first sign of moisture in the system. See Carrier Charging Handbook for more information.

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

Filter Drier

Replace whenever the moisture/liquid indicator shows moisture in the system or when the system was opened for service.

Liquid Line Service Valves

Use caution when closing liquid line service valves. The expansion of a trapped liquid can create dangerously high pressures. Remove refrigerant immediately from trapped sections or attach a hose from the high side to the low side of the system to provide relief. If equipped with a liquid line solenoid valve in the evaporator section, it will be closed during the off-cycle. This creates the potential for a liquid trap between the solenoid valve and a closed service valve. Remove refrigerant immediately from the section or attach a hose for relief.

Protective Devices

COMPRESSOR PROTECTION

Overcurrent

Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Overtemperature

Each compressor has a protector to protect it against excessively high discharge gas temperatures.

Additionally, some units contain Copeland compressors equipped with advanced scroll temperature protection (ASTP). A label located above the terminal box identifies Copeland Scroll compressor models that contain this technology. See Fig. 81. Advanced scroll temperature protection is a form of internal discharge temperature protection that unloads the scroll compressor when the internal temperature reaches approximately 300°F. At this temperature, an internal bi-metal disk valve opens and causes the scroll elements to separate, which stops compression. Suction and discharge pressures balance while the motor continues to run. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. See Fig. 82.

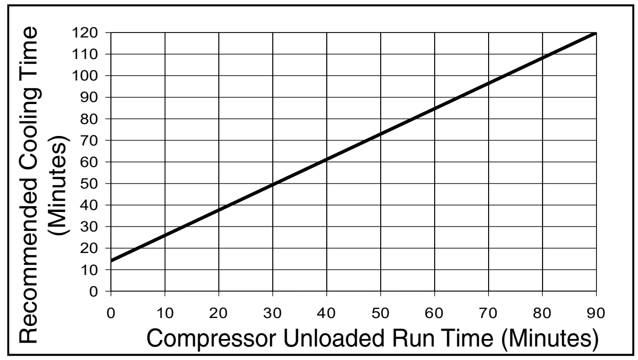
To manually reset ASTP, the compressor should be stopped and allowed to cool. If the compressor is not stopped, the motor will run until the motor protector trips, which occurs up to 90 minutes later. Advanced scroll temperature protection will reset automatically before the motor protector resets, which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

Fig. 81 — Advanced Scroll Temperature Protection Label

Crankcase Heater

Each compressor has a crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since 115-v power for the crankcase heaters is drawn from the unit control circuit, main unit power must be on for the heaters to be energized.

> IMPORTANT: After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressor.



* Times are approximate.

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

Fig. 82 — Recommended Minimum Cool-Down Time After Compressor is Stopped*

EVAPORATOR-FAN MOTOR PROTECTION

A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

CONDENSER-FAN MOTOR PROTECTION

Each condenser-fan motor is internally protected against 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

Settings for these switches are shown in Tables 110 and 111. If either switch trips, that refrigerant circuit will be automatically locked out by the controls. To reset, set ***ALARMS→R.CUR*** = YES.

Table 110 — Pressure Switch Settings (psig)

SWITCH	CUTOUT	CUT-IN
High	650 ± 10	500 ± 15

Table 111 — Pressure Switch Settings (kPa)

SWITCH	CUTOUT	CUT-IN
High	4482 ± 69	3447 ± 103

Temperature Relief Devices

All units have temperature relief devices to protect against damage from excessive pressures caused by extreme high temperatures (i.e., fire). These devices protect the high and low side.

Control Circuit, 115 V

This control circuit is protected against overcurrent by a 10-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Control Circuit, 24 V

This control circuit is protected against overcurrent by two 10-amp and four 3.2-amp circuit breakers. Breakers can be reset. If a breaker trips, determine cause of trouble before resetting.

Gas Heat (48N 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 de-energized. After cooling, the system will reset and fires gas again. If 4 trips occur, the system shuts down into Lockout and 4 flashes occur on the IGC board. The system must then be manually reset by power down and power up of the unit.

LIMIT SWITCH THERMISTOR (STAGED GAS UNIT ONLY)

The limit switch thermistor is a factory-installed component. It is located next to the lower limit switch. The limit switch thermistor senses temperature at limit switch location and prevents the limit from tripping while the unit is operating at low airflow.

PRESSURE SWITCH (MODULATING GAS UNITS ONLY)

This switch senses vacuum to ensure the proper function of combustion induced-draft blower. It is a normally open switch set to close on negative pressure rise. The pressure switch is located next to ignition and modulating gas controllers in the gas section.

ROLLOUT SWITCH

This switch senses any flame or excessive heat in the main burner compartment and deenergizes the gas valve. If this occurs, the gas heating system is locked out (7 flashes on IGC board) until the rollout switch is reset manually. Reset rollout switch manually by powering down and powering up of the unit.

When the rollout switch trips, it usually indicates a flue blockage. Inspect the unit for any obstruction in the flue system, holes in the flue box, a defective hall effect sensor or pressure switch, a defective inducer motor, or a loose combustion blower.

Compressor Removal

All compressors can be removed from the compressor side of the unit.

IMPORTANT: All compressor mounting hardware and support brackets removed during servicing must be reinstalled prior to start-up.

1. Disconnect power to unit; lockout power to compressor.
2. Close suction and discharge service valves.
3. Relieve refrigerant pressure into a refrigerant recovery system.
4. Disconnect power wires at terminal box and disconnect conduit.
5. Disconnect wires from crankcase heater.
6. Lift compressor off mounting bolts and remove.

Compressor Replacement

Perform the following:

1. Reverse procedure in Compressor Removal section.
2. Leak-check and evacuate system, recover refrigerant.
3. Recharge system per pre-start-up and start-up sequences. Recheck oil levels.
4. Energize crankcase heater for 24 hours prior to restart of system.

APPENDIX A — LOCAL DISPLAY TABLES

MODE — RUN STATUS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
VIEW	AUTO VIEW OF RUN STATUS					
HVAC	ascii string spelling out the hvac modes			string		116
OCC	Occupied?	No/Yes		OCCUPIED	forcible	116
MAT	Mixed Air Temperature	-40 to 240	dF	MAT		116
EDT	Evaporator Discharge Tmp	-40 to 240	dF	EDT		116
LAT	Leaving Air Temperature	-40 to 240	dF	LAT		116
EC.C.P	Economizer Control Point	0 to 180	dF	ECONCPNT		81,116
EC1.P	Econ 1 Out Act.Curr.Pos.	0 to 100	%	ECONOPOS		116
EC2.P	Econ 2 Ret Act.Curr.Pos.	0 to 100	%	ECON2POS		116
EC3.P	Econ 3 Out Act.Curr.Pos.	0 to 100	%	ECON3POS		116
CL.C.P	Cooling Control Point	-20 to 140	dF	COOLCPNT		50,81,116
C.CAP	Current Running Capacity	0 to 100	%	CAPTOTAL		116
CL.ST	Requested Cool Stage	0 to 20		CL_STAGE		116
HT.C.P	Heating Control Point	-20 to 140	dF	HEATCPNT		65,116
HT.ST	Requested Heat Stage	0 to 20		HT_STAGE		65,116
H.MAX	Maximum Heat Stages	0 to 20		HTMAXSTG		65,116
ECON	ECONOMIZER RUN STATUS					
EC1.P	Econ 1 Out Act.Curr.Pos.	0 to 100	%	ECONOPOS		56,81,117
EC2.P	Econ 2 Ret Act.Curr.Pos.	0 to 100	%	ECON2POS		56,81,117
EC3.P	Econ 3 Out Act.Curr.Pos.	0 to 100	%	ECON3POS		56,81,117
ECN.C	Econ 1 Out Act.Cmd.Pos.	0 to 100	%	ECONOCMD	forcible	81,117
ACTV	Economizer Active ?	No/Yes		ECACTIVE		81,117
SACA	Single Act CFM Ctl Activ	No/Yes		SACFMCTL	forcible	81,117
DISA	ECON DISABLING CONDITIONS					
UNV.1	Econ1 Out Act Unvailable ?	No/Yes		ECONUNAV		81,118
UNV.2	Econ2 Ret Act Unvailable ?	No/Yes		ECN2UNAV		81,118
UNV.3	Econ3 Out Act Unvailable ?	No/Yes		ECN3UNAV		81,118
ENTH	Enth. Switch Read High ?	No/Yes		ENTH		81,118
DBC	DBC - OAT Lockout ?	No/Yes		DBC_STAT		81,118
DEW	DEW - OA Dewpt.Lockout ?	No/Yes		DEW_STAT		81,118
DDBC	DDBD- OAT > RAT Lockout ?	No/Yes		DDBCSTAT		81,118
OAEC	OAEC- OA Enth Lockout ?	No/Yes		OAECSTAT		81,118
DEC	DEC - Diff.Enth.Lockout ?	No/Yes		DEC_STAT		81,118
EDT	EDT Sensor Bad ?	No/Yes		EDT_STAT		81,118
OAT	OAT Sensor Bad ?	No/Yes		OAT_STAT		81,118
FORC	Economizer Forced ?	No/Yes		ECONFORC		81,118
SFON	Supply Fan Not On 30s ?	No/Yes		SFONSTAT		81,118
CLOF	Cool Mode Not In Effect ?	No/Yes		COOL_OFF		81,118
OAQL	OAQ Lockout in Effect ?	No/Yes		OAQLOCKD		81,118
HELD	Econ Recovery Hold Off ?	No/Yes		ECONHELD		81,118
DH.DS	Dehumid. Disabled Econ.?	No/Yes		DHDISABL		81,118
O.AIR	OUTSIDE AIR INFORMATION					81,118
OAT	Outside Air Temperature	-40 to 240	dF	OAT	forcible	81,118
OA.RH	Outside Air Rel. Humidity	0 to 100	%	OARH	forcible	81,118
OA.E	Outside Air Enthalpy	-20 to 10000		OAE		81,118
OA.D.T	OutsideAir Dewpoint Temp	-40 to 240	dF	OADEWTMP		81,117
COOL	COOLING INFORMATION					
C.CAP	Current Running Capacity	0 to 100	%	CAPTOTAL		51,52,55,117, 118
CUR.S	Current Cool Stage	0 to 20		COOL_STG		51,52,117,118
REQ.S	Requested Cool Stage	0 to 20		CL_STAGE		51,52,117,118
MAX.S	Maximum Cool Stages	0 to 20		CLMAXSTG		51,52,117,118
DEM.L	Active Demand Limit	0 to 100	%	DEM_LIM	forcible	51,52,54,117,118
SUMZ	COOL CAP. STAGE CONTROL					
SMZ	Capacity Load Factor	-400 to 400		SMZ		51-54,117,118
ADD.R	Next Stage EDT Decrease	0 to 30	^F	ADDRISE		51,52,117,118
SUB.R	Next Stage EDT Increase	0 to 30	^F	SUBRISE		52,117,118
R.PCT	Rise Per Percent Capacity	0 to 10		RISE_PCT		52,117,118
Y.MIN	Cap Deadband Subtracting	-40 to 0		Y_MINUS		52,117,118
Y.PLU	Cap Deadband Adding	0 to 40		Y_PLUS		52,117,118
Z.MIN	Cap Threshold Subtracting	-99 to 0		Z_MINUS		52-54,118
Z.PLU	Cap Threshold Adding	0 to 99		Z_PLUS		52-54,118
H.TMP	High Temp Cap Override	No/Yes		HI_TEMP		53-54,118
L.TMP	Low Temp Cap Override	No/Yes		LOW_TEMP		53-54,118
PULL	Pull Down Cap Override	No/Yes		PULLDOWN		53-54,118
SLOW	Slow Change Cap Override	No/Yes		SLO_CHNG		53-54,118

MODE — RUN STATUS (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
COOL (cont)						
HMZR	HUMIDIMIZER					
CAPC	HumidiMizer Capacity	0 to 100	%	HMZRCAPC		52,53,118
C.EXV	Condenser EXV Position	0 to 100	%	COND_EXV		52,53,118
B.EXV	Bypass EXV Position	0 to 100	%	BYP_EXV		52,53,118
RHV	HumidiMizer 3-way Valve	No/Yes		HUM3WVAL		52,53,118
C.CPT	Cooling Control Point	-20 to 140	dF	COOLCPNT		52,53,118
EDT	Evaporator Discharge Temp	-40 to 240	dF	EDT		52,53,118
H.CPT	Heating Control Point	-20 to 140	dF	HEATCPNT		53,118
LAT	Leaving Air Temperature	-40 to 240	dF	LAT		53,118
EXVS	EXVS INFORMATION					
A1.EX	Circuit A EXV 1 Position	0 to 100	%	XV1APOSP		52,118
A2.EX	Circuit A EXV 2 Position	0 to 100	%	XV2APOSP		52,118
B1.EX	Circuit B EXV 1 Position	0 to 100	%	XV1BPOSP		52,118
B2.EX	Circuit B EXV 2 Position	0 to 100	%	XV2BPOSP		52,118
SH.A1	Cir A EXV1 Superheat Tmp	-100 to 200	^F	SH_A1		52,118
SH.A2	Cir A EXV2 Superheat Tmp	-100 to 200	^F	SH_A2		52,118
SH.B1	Cir B EXV1 Superheat Tmp	-100 to 200	^F	SH_B1		52,118
SH.B2	Cir B EXV2 Superheat Tmp	-100 to 200	^F	SH_B2		52,118
CTRL	EXVS CONTROL INFORMATION					
C.SHS	EXV Superheat Ctrl SP	5 to 40	^F	SH_SP_CT	forcible	52,118,126
C.FLS	EXV SH Flooding Ctrl SP	0 to 10	^F	FL_SP_CT	forcible	52,118
C.XMP	CompCir EXV ctrl Min%	0 to 100	%	COXMP_C		51,111
C.EXP	EXV PID Ctrl Prop. Gain	0 to 5		EXV_PG_C	forcible	52,118
C.EXT	EXV Ctrl Integrat. Time	0.5 to 60		EXV_TI_C	forcible	52,118
C.EXM	Cir Strt EXV Mn Ctrl Pos	0 to 100	%	EXCSMP_C	forcible	52,118
VFDS	VFD INFORMATION					
S.VFD	SUPPLY FAN VFD (VFD 1)					119
SPD	VFD1 Actual Speed %	0 to 100	%	VFD1_SPD		119
RPM	VFD1 Actual Motor RPM	0 to 30000		VFD1RPM		119
FREQ	VFD1 Actual Motor Freq	0 to 500		VFD1FREQ		119
AMPS	VFD1 Actual Motor Amps	0 to 999	amps	VFD1AMPS		119
TORQ	VFD1 Actual Motor Torque	-200 to 200	%	VFD1TORQ		119
PWR	VFD1 Actual Motor Power	-150 to 150	kW	VFD1PWR		119
VDC	VFD1 DC Bus Voltage	0 to 1000	voltage	VFD1VDC		119
V.OUT	VFD1 Output Voltage	0 to 1000	voltage	VFD1VOUT		119
TEMP	VFD1 Transistor Temp (C)	0 to 150		VFD1TEMP		119
RUN.T	VFD1 Cumulative Run Time	0 to 65535	hours	VFD1RUNT		119
KWH	VFD1 Cumulative kWh	0 to 65535		VFD1KWH		119
LFC	VFD1 Last Fault Code	0 to 65535		VFD1LFC		119
E.VFD	EXHAUST FAN VFD (VFD 2)					
SPD	VFD2 Actual Speed %	0 to 100	%	VFD2_SPD		119
RPM	VFD2 Actual Motor RPM	50 to 30000		VFD2RPM		119
FREQ	VFD2 Actual Motor Freq	10 to 500		VFD2FREQ		119
AMPS	VFD2 Actual Motor Amps	0 to 999	amps	VFD2AMPS		119
TORQ	VFD2 Actual Motor Torque	-200 to 200	%	VFD2TORQ		119
PWR	VFD2 Actual Motor Power	-150 to 150	kW	VFD2PWR		119
VDC	VFD2 DC Bus Voltage	0 to 1000	voltage	VFD2VDC		119
V.OUT	VFD2 Output Voltage	0 to 1000	voltage	VFD2VOUT		119
TEMP	VFD2 Transistor Temp (C)	0 to 150		VFD2TEMP		119
RUN.T	VFD2 Cumulative Run Time	0 to 65535	hours	VFD2RUNT		119
KWH	VFD2 Cumulative kWh	0 to 65535		VFD2KWH		119
LFC	VFD2 Last Fault Code	0 to 65535		VFD2LFC		119
O.VFD	OUTDOOR FAN VFD					
SPD.A	MtrMaster A Commanded %	0 to 100	%	MM_A_VFD		119
SPD.B	MtrMaster B Commanded %	0 to 100	%	MM_B_VFD		119
TRIP	MODE TRIP HELPER					
UN.C.S	Unoccup. Cool Mode Start	0 to 100	dF	UCCLSTRT		51,120
UN.C.E	Unoccup. Cool Mode End	0 to 100	dF	UCCL_END		51,120
OC.C.S	Occupied Cool Mode Start	0 to 100	dF	OCCLSTRT		51,120
OC.C.E	Occupied Cool Mode End	0 to 100	dF	OCCL_END		51,120
TEMP	Ctl.Temp RAT,SPT or ZONE	0 to 100	dF	CTRLTEMP		
OC.H.E	Occupied Heat Mode End	0 to 100	dF	OCHT_END		51,120
OC.H.S	Occupied Heat Mode Start	0 to 100	dF	OCHTSTRT		51,120
UN.H.E	Unoccup. Heat Mode End	0 to 100	dF	UCHT_END		51,120
UN.H.S	Unoccup. Heat Mode Start	0 to 100	dF	UCHTSTRT		51,120

APPENDIX A — LOCAL DISPLAY TABLES (CONT)

MODE — RUN STATUS (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
LINK	CCN - LINKAGE					
MODE	Linkage Active - CCN	Off/On		MODELINK		120
L.Z.T	Linkage Zone Control Tmp	-40 to 240	dF	LZT		120
L.C.SP	Linkage Curr. Cool Setpt	-40 to 240	dF	LCSP		120
L.H.SP	Linkage Curr. Heat Setpt	-40 to 240	dF	LHSP		120
HRS	COMPRESSOR RUN HOURS					
HR.A1	Compressor A1 Run Hours	0 to 999999	hours	HOURS_A1	config	120
HR.A2	Compressor A2 Run Hours	0 to 999999	hours	HOURS_A2	config	120
HR.A3	Compressor A3 Run Hours	0 to 999999	hours	HOURS_A3	config	120
HR.A4	Compressor A4 Run Hours	0 to 999999	hours	HOURS_A4	config	120
HR.B1	Compressor B1 Run Hours	0 to 999999	hours	HOURS_B1	config	120
HR.B2	Compressor B2 Run Hours	0 to 999999	hours	HOURS_B2	config	120
HR.B3	Compressor B3 Run Hours	0 to 999999	hours	HOURS_B3	config	120
HR.B4	Compressor B4 Run Hours	0 to 999999	hours	HOURS_B4	config	120
STRT	COMPRESSOR STARTS					
ST.A1	Compressor A1 Starts	0 to 999999		CY_A1	config	120
ST.A2	Compressor A2 Starts	0 to 999999		CY_A2	config	120
ST.A3	Compressor A3 Starts	0 to 999999		CY_A3	config	120
ST.A4	Compressor A4 Starts	0 to 999999		CY_A4	config	120
ST.B1	Compressor B1 Starts	0 to 999999		CY_B1	config	120
ST.B2	Compressor B2 Starts	0 to 999999		CY_B2	config	120
ST.B3	Compressor B3 Starts	0 to 999999		CY_B3	config	120
ST.B4	Compressor B4 Starts	0 to 999999		CY_B4	config	120
VERS	SOFTWARE VERSION NUMBERS					
MBB	CESR131544-xx-xx			string		120
RXB	CESR131465-xx-xx			string		120
EXB	CESR131465-xx-xx			string		120
CEM	CESR131174-xx-xx			string		120
CXB	CESR131173-xx-xx			string		120
SCB	CESR131226-xx-xx			string		120
EXV	CESR131172-xx-xx			string		120
EXVA	CESR131172-xx-xx			string		120
EXVB	CESR131172-xx-xx			string		120
VFD1	VERSION-313D			string		120
VFD2	VERSION-313D			string		120
NAVI	CESR130227-xx-xx			string		120

APPENDIX A — LOCAL DISPLAY TABLES (CONT)
MODE — SERVICE TEST

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
TEST	Service Test Mode	Off/On		MAN_CTRL		29,30,34
STOP	Local Machine Disable	No/Yes		UNITSTOP	config	29,30
S.STP	Soft Stop Request	No/Yes		SOFTSTOP	forcible	29,30
FAN.F	Supply Fan Request	No/Yes		SFANFORC	forcible	29,30
INDP	TEST INDEPENDENT OUTPUTS					
HUM.R	Humidifier Relay	Off/On		HUMR_TST		30
ALRM	Remote Alarm / Aux Relay	Off/On		ALRM_TST		30
FANS	TEST FANS					
F.MOD	Fan Test Mode Automatic?	No/Yes		FANAUTO		29,30
E.POS	Econ 1 Out Act.Cmd.Pos.	0 to 100	%	ECONFANS		30
SF.BY	Supply Fan Bypass Relay	Off/On		SFBY_TST		30
S.VFD	Supply Fan Commanded %	0 to 100	%	SFVFDTST		30
PE.BY	Power Exhaust Bypass Rly	Off/On		PEBY_TST		30
E.VFD	Exhaust Fan Commanded %	0 to 100	%	EFVFDTST		30
A.VFD	MtrMaster A Commanded %	0 to 100	%	OAVFDTST		30
B.VFD	MtrMaster B Commanded %	0 to 100	%	OBVFDTST		30
CDF.1	Condenser Fan Output 1	Off/On		CDF1_TST		30
CDF.2	Condenser Fan Output 2	Off/On		CDF2_TST		30
CDF.3	Condenser Fan Output 3	Off/On		CDF3_TST		30
CDF.4	Condenser Fan Output 4	Off/On		CDF4_TST		30
CDF.5	Condenser Fan Output 5	Off/On		CDF5_TST		30
AC.T.C	CALIBRATE TEST-ACTUATORS					
EC1.C	Econ 1 Out Act.Cmd.Pos.	0 to 100	%	ECON1TST		30
E1.CL	Economizer Calibrate Cmd	No/Yes		ECONOCAL		30
E1C.A	Econ 1 Out Act Ctl Angle	0 to 100		ECONCANG		30
EC2.C	Econ 2 Ret Act.Cmd.Pos.	0 to 100	%	ECON2TST		30
E2.CL	Economzr 2 Calibrate Cmd	No/Yes		ECON2CAL		30
E2C.A	Econ 2 Ret Act Ctl Angle	0 to 100		ECN2CANG		30
EC3.C	Econ 3 Out Act.Cmd.Pos.	0 to 100	%	ECON3TST		30
E3.CL	Economzr 3 Calibrate Cmd	No/Yes		ECON3CAL		30
E3C.A	Humidifier Act.Ctrl.Ang.	0 to 100		HUMDCANG		30
HTC.C	Ht.Coil Command Position	0 to 100	%	HTCLACTS		30
HT.CL	Heating Coil Act.Cal.Cmd	No/Yes		HCOILCAL		30
HTC.A	Heat Coil Act.Ctl.Angle	0 to 100		HTCLCANG		30
HMD.C	Humidifier Command Pos.	0 to 100	%	HUMD_TST		30
HM.CL	Humidifier Act. Cal. Cmd	No/Yes		HUMIDCAL		30
HMD.A	Humidifier Act.Ctrl.Ang.	0 to 100		HUMDCANG		30
HTC.3	Ht.Coil Command Position	0 to 100		HTC3ACTS		30
HC.3L	Heat Coil Act 3 Cal Cmd	No/Yes		HTC3_CAL		30
HC3.A	Heat Coil Act 3 Cal Cmd	0 to 100		HTC3CANG		30
HTC.4	Ht.Coil Command Position	0 to 100		HTC4ACTS		30
HC.4L	Heat Coil Act 4 Cal Cmd	No/Yes		HTC4_CAL		30
HC4.A	HTC4 Control Angle	0 to 100		HTC4CANG		30
SRCH	SEARCH FOR SERIAL NUMBER					
ACTV	Belimo Serial Num Search	No/Yes		BELSERCH		30
ECN.1	Economizer 1 Search	No/Yes		EC1SERCH	forcible	30
ECN.2	Economizer 2 Search	No/Yes		EC2SERCH	forcible	30
ECN.3	Economizer 3 Search	No/Yes		EC3SERCH	forcible	30
HT.CL	Heat Coil Valve Search	No/Yes		HTCSERCH	forcible	30
HUMD	Humidifier Valve Search	No/Yes		HUMSERCH	forcible	30
HT.C3	Heat Coil 3 Valve Search	No/Yes		HTC3SRCH		30
HT.C4	Heat Coil 4 Valve Search	No/Yes		HTC4SRCH		30
HMZR	TEST HUMIDIMIZER					
RHV	HumidiMizer 3-way Valve	Off/On		RHVH_TST		30,33
C.EXV	Condenser EXV Position	0 to 100	%	CEXVHTST		30,33
B.EXV	Bypass EXV Position	0 to 100	%	BEXVHTST		30,33
C.CAL	Condenser EXV Calibrate	Off/On		CEXV_CAL		30,33
B.CAL	Bypass EXV Calibrate	Off/On		BEXV_CAL		30,33
EXVS	TEST CIRCUIT EXVS					
A1.EX	Circuit A EXV 1 Position	0 to 100	%	A_X1_TST		30
A2.EX	Circuit A EXV 2 Position	0 to 100	%	A_X2_TST		30
B1.EX	Circuit B EXV 1 Position	0 to 100	%	B_X1_TST		30
B2.EX	Circuit B EXV 2 Position	0 to 100	%	B_X2_TST		30
A1.CL	Cir A EXV 1 Calibrate	Off/On		A_X1_CAL		30
A2.CL	Cir A EXV 2 Calibrate	Off/On		A_X2_CAL		30
B1.CL	Cir B EXV 1 Calibrate	Off/On		B_X1_CAL		30
B2.CL	Cir B EXV 2 Calibrate	Off/On		B_X2_CAL		30

MODE — SERVICE TEST (CONT)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
COOL	TEST COOLING					
E.POS	Econ 1 Out Act.Cmd.Pos.	0 to 100	%	ECONCOOL		30,33
SP.SP	Static Pressure Setpoint	0 to 5	"H2O	SPSPCTST		30,33
CL.ST	Requested Cool Stage	0 to 8		CLST_TST		30,33
MLV	Minimum Load Valve Relay	Off/On		MLV_TST		30
A1	Compressor A1 Relay	Off/On		CMPA1TST		30
A1.CP	Compressor A1 Capacity	20 to 100	%	A1CAPTST		30
A1.B1	Two Circuit Start A1,B1	Off/On		CMPABTST		30
A2	Compressor A2 Relay	Off/On		CMPA2TST		30
A3	Compressor A3 Relay	Off/On		CMPA3TST		30
A4	Compressor A4 Relay	Off/On		CMPA4TST		30
B1	Compressor B1 Relay	Off/On		CMPB1TST		30
B2	Compressor B2 Relay	Off/On		CMPB2TST		30
B3	Compressor B3 Relay	Off/On		CMPB3TST		30
B4	Compressor B4 Relay	Off/On		CMPB4TST		30
RHV	HumidiMizer 3-way Valve	Off/On		RHVC_TST		30,34,172
C.EXV	Condenser EXV Position	0 to 100	%	CEXVCTST		30,34
B.EXV	Bypass EXV Position	0 to 100	%	BEXVCTST		30,34
HEAT	TEST HEATING					
HT.ST	Requested Heat Stage	0 to 15		HTST_TST		31,34
HT.1	Heat Relay 1	Off/On		HS1_TST		31,34
H1.CP	Modulating Heat Capacity	0 to 100	%	MGAS_TST		31,34
HT.2	Heat Relay 2	Off/On		HS2_TST		31,34
HT.3	Relay 3 W1 Gas Valve 2	Off/On		HS3_TST		31,34
HT.4	Relay 4 W2 Gas Valve 2	Off/On		HS4_TST		31,34
HT.5	Relay 5 W1 Gas Valve 3	Off/On		HS5_TST		31,34
HT.6	Relay 6 W2 Gas Valve 3	Off/On		HS6_TST		31,34
HT.7	Relay 7 W1 Gas Valve 4	Off/On		HS7_TST		31,34
HT.8	Relay 8 W2 Gas Valve 4	Off/On		HS8_TST		31,34
HT.9	Relay 9 W1 Gas Valve 5	Off/On		HS9_TST		31,34
HT.10	Relay 10 W2 Gas Valve 5	Off/On		HS10_TST		31,34
HIR	Heat Interlock Relay	Off/On		HIR_TST		31,34
HTC.C	Ht.Coil Command Position	0 to 100	%	HTCLHEAT		31,34
AC.DT	AUTO-COMPONENT DIAG TEST					
CP.TS	COMPRESSOR AUTO-TEST					31,34,35
CP.TR	Run Compressor Auto-Test	No/Yes		AC_CT		31
CT.ST	Test Status & Timer	0 to 1		DD_TEXT		31,35
SP.A	Cir A Suction Pressure	-14 to 750	psig	SP_A		31,35
SP.B	Cir B Suction Pressure	-14 to 750	psig	SP_B		31,35
RSLT	COMPS. AUTO-TEST RESULTS					31,34,35
A1	Comp A1 Auto-Test Result	0 to 3		AC_CP_A1		31,35
A2	Comp A2 Auto-Test Result	0 to 3		AC_CP_A2		31,35
A3	Comp A3 Auto-Test Result	0 to 3		AC_CP_A3		31,35
A4	Comp A4 Auto-Test Result	0 to 3		AC_CP_A4		31,35
B1	Comp B1 Auto-Test Result	0 to 3		AC_CP_B1		31,35
B2	Comp B2 Auto-Test Result	0 to 3		AC_CP_B2		31,35
B3	Comp B3 Auto-Test Result	0 to 3		AC_CP_B3		31,35
B4	Comp B4 Auto-Test Result	0 to 3		AC_CP_B4		31,35
DS.TS	DIG SCROLL AUTO-TEST					31,34
DS.TR	Run Dig Scroll Auto-Test	No/Yes		AC_DS		31,35
DS.DT	Test Status & Timer	0 to 1		DD_TEXT		31,35
A1.CP	Compressor A1 Capacity	0 to 100	%	CMPA1CAP		31,35
SP.A	Cir A Suction Pressure	-14 to 750	psig	SP_A		31,35
SP.AV	Avg Suction Pressure A	-100 to 1000	psig	SP_A_AVG		31,35
DS.RS	Dig Scroll AutoTest Stat	0 to 3		AC_DSST		31,35
EX.TS	EXVS AUTO-COMPONENT TEST					32,34
EX.TR	Run EXVs Auto-Test	No/Yes		AC_EX		32,35
XT.ST	Test Status and Timer	0 to 1		DD_TEXT		32,35
SH.SP	EXV Superheat Ctrl SP	5 to 40	^F	SH_SP_CT		32,35
SH.A1	Cir A EXV1 Superheat Tmp	-100 to 200	^F	SH_A1		32,35
SH.A2	Cir A EXV2 Superheat Tmp	-100 to 200	^F	SH_A2		32,35
SH.B1	Cir B EXV1 Superheat Tmp	-100 to 200	^F	SH_B1		32,35
SH.B2	Cir B EXV2 Superheat Tmp	-100 to 200	^F	SH_B2		32,35
XA1S	EXV A1 Auto-Test Status	0 to 3		AC_XA1ST		32,35
XA2S	EXV A2 Auto-Test Status	0 to 3		AC_XA2ST		32,35
XB1S	EXV B1 Auto-Test Status	0 to 3		AC_XB1ST		32,35
XB2S	EXV B2 Auto-Test Status	0 to 3		AC_XB2ST		32,35

APPENDIX A — LOCAL DISPLAY TABLES (CONT)
MODE — SERVICE TEST (CONT)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS	PAGE NO.
AC.DT (cont)	AUTO-COMPONENT DIAG TEST (cont)					
CD.TS	CHARGE TST W/O LQD SENS.					32,34
CD.TR	Run Chrg Tst w/o Lqd Sen	No/Yes		AC_CDTR		32
CD.ET	Test Status and Timer	0 to 1		DD_TEXT		32
SCT.A	Cir A Sat.Condensing Tmp	-40 to 240	dF	SCTA		32
SST.A	Cir A Sat.Suction Temp.	-40 to 240	dF	SSTA		32
OAT	Outside Air Temperature	-40 to 240	dF	OAT		32
SCT.B	Cir A Sat.Condensing Tmp	-40 to 240	dF	SCTA		32
SST.B	Cir A Sat.Suction Temp.	-40 to 240	dF	SSTA		32
ML.TS	MLV/HGBP AUTO-TEST					32,34
ML.TR	Run MLV/HGBP Auto-Test	No/Yes		AC_MLV		32,36
ML.DT	Test Status & Timer	0 to 1		DD_TEXT		32,36
MLV	Minimum Load Valve Relay	Off/On		MLV_TST		32,36
DP.A	Cir A Discharge Pressure	-14 to 750	psig	DP_A		32,36
ML.ST	MLV/HGBP AutoTest Result	0 to 3		AC_MLVST		32,36
SF.TS	SUPPLY FAN AUTO-TEST					32,34
SF.TR	Run Supply Fan Auto-Test	No/Yes		AC_SF		32,36
SF.DT	Test Status & Timer	0 to 1		DD_TEXT		32,36
S.VFD	VFD1 Actual Speed %	0 to 100	%	VFD1_SPD		32,36
S.PWR	VFD1 Actual Motor Power	-150 to 150	kW	VFD1PWR		32,36
SP	Static Pressure	-20 to 20	“H20	SP		32,36
SF.ST	SF Auto-Test Result	0 to 3		AC_SF_ST		32,36
EC.TS	ECONOMIZER AUTO-TEST					
EC.TR	Run Economizer Auto-Test	No/Yes		AC_EC		32
EC.DT	Test Status & Timer			DD_TEXT		32
S.VFD	VFD1 Actual Speed %	0 to 100	%	VFD1_SPD		32
TORQ	VFD1 Torque Moving Avg			VFD1TMAV		32
ECN.P	Econ 1 Out Act.Curr.Pos.			ECONOPOS		32
EC2.P	Econ 2 Ret Act.Curr.Pos.			ECON2POS		32
EC3.P	Econ 3 Out Act.Curr.Pos.			ECON3POS		32
EC.ST	Econ Auto-Test Result	0 to 3		AC_EC_ST		32

APPENDIX A — LOCAL DISPLAY TABLES (CONT)
MODE — TEMPERATURES

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
AIR.T	AIR TEMPERATURES				
CTRL	CONTROL TEMPS				
EDT	Evaporator Discharge Tmp	-40 to 240	dF	EDT	
LAT	Leaving Air Temperature	-40 to 240	dF	LAT	
MAT	Mixed Air Temperature	-40 to 240	dF	MAT	
R.TMP	Controlling Return Temp	-40 to 240	dF	RETURN_T	forcible
S.TMP	Controlling Space Temp	-40 to 240	dF	SPACE_T	forcible
SAT	Air Tmp Lvg Supply Fan	-40 to 240	dF	SAT	
OAT	Outside Air Temperature	-40 - 240	dF	OAT	forcible
RAT	Return Air Temperature	-40 to 240	dF	RAT	forcible
SPT	Space Temperature	-40 to 240	dF	SPT	forcible
SPTO	Space Temperature Offset	-10 to 10	^F	SPTO	forcible
CCT	Air Temp Lvg Evap Coil	-40 to 240	dF	CCT	
S.G.LS	Staged Heat LAT Sum	-40 to 240	dF	LAT_SGAS	
S.G.L1	Staged Heat LAT 1	-40 to 240	dF	LAT1SGAS	
S.G.L2	Staged Heat LAT 2	-40 to 240	dF	LAT2SGAS	
S.G.L3	Staged Heat LAT 3	-40 to 240	dF	LAT3SGAS	
S.G.LM	Staged Gas Limit Sw.Temp	-40 to 240	dF	LIMSWTMP	
REF.T	REFRIGERANT TEMPERATURES				
SCT.A	Cir A Sat.Condensing Tmp	-40 to 240	dF	SCTA	
SST.A	Cir A Sat.Suction Temp.	-40 to 240	dF	SSTA	
LT.A	Cir A Liquid Temperature	-40 to 240	dF	LT_A	
SLT.A	Cir A Sat. Liquid Temp.	-40 to 240	dF	SLTA	
SC.A	Cir A Subcooling Temp.	-100 to 200	^F	SC_A	
SCT.B	Cir B Sat.Condensing Tmp	-40 to 240	dF	SCTB	
SST.B	Cir B Sat.Suction Temp.	-40 to 240	dF	SSTB	
LT.B	Cir B Liquid Temperature	-40 to 240	dF	LT_B	
SLT.B	Cir B Sat. Liquid Temp.	-40 to 240	dF	SLTB	
SC.B	Cir B Subcooling Temp.	-100 to 200	^F	SC_B	
RGT.A	Suction Gas Temp Circ A	-40 to 240	dF	RGTA	
DT.A1	A1 Discharge Temperature	-40 to 240	dF	DTA1	
ASX1	Cir A EXV1 Suction Temp.	-40 to 240	dF	CASTEXV1	
ASX2	Cir A EXV2 Suction Temp.	-40 to 240	dF	CASTEXV2	
BSX1	Cir B EXV1 Suction Temp.	-40 to 240	dF	CBSTEXV1	
BSX2	Cir B EXV2 Suction Temp.	-40 to 240	dF	CBSTEXV2	
SH.A1	Cir A EXV1 Superheat Tmp	-100 to 200	^F	SH_A1	
SH.A2	Cir A EXV2 Superheat Tmp	-100 to 200	^F	SH_A2	
SH.B1	Cir B EXV1 Superheat Tmp	-100 to 200	^F	SH_B1	
SH.B2	Cir B EXV2 Superheat Tmp	-100 to 200	^F	SH_B2	

MODE — PRESSURES

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
AIR.P	AIR PRESSURES				
SP	Static Pressure	-20 to 20	"H2O	SP	
BP	Building Pressure	-20 to 20	"H2O	BP	
MFDP	Main Filter Delta Press	0 to 5	"H2O	MF_DP	
PFDP	Post Filter Delta Press	0 to 5	"H2O	PF_DP	
REF.P	REFRIGERANT PRESSURES				
DP.A	Cir A Discharge Pressure	-14 to 750	PSIG	DP_A	
SP.A	Cir A Suction Pressure	-14 to 750	PSIG	SP_A	
LP.A	Cir A Liquid Pressure	-14 to 750	PSIG	LP_A	
DP.B	Cir B Discharge Pressure	-14 to 750	PSIG	DP_B	
SP.B	Cit B Suction Pressure	-14 to 750	PSIG	SP_B	
LP.B	Cit B Liquid Pressure	-14 to 750	PSIG	LP_B	

MODE — SETPOINTS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT
OHSP	Occupied Heat Setpoint	40 to 99	dF	OHSP	68
OCSP	Occupied Cool Setpoint	40 to 99	dF	OCSP	75
UHSP	Unoccupied Heat Setpoint	40 to 99	dF	UHSP	55
UCSP	Unoccupied Cool Setpoint	40 to 110	dF	UCSP	90
GAP	Heat-Cool Setpoint Gap	2 to 10	^F	HCSP_GAP	5
V.C.ON	VAV Occ. Cool On Delta	0 to 25	^F	VAVOCON	3.5
V.C.OF	VAV Occ. Cool Off Delta	1 to 25	^F	VAVOCOFF	2
SASP	Supply Air Setpoint	45 to 75	dF	SASP	55
SA.HI	Supply Air Setpoint Hi	45 to 75	dF	SASP_HI	55
SA.LO	Supply Air Setpoint Lo	45 to 75	dF	SASP_LO	60
SA.HT	Heating Supply Air Setpt	65 to 120	dF	SASPHEAT	85
T.PRG	Tempering Purge SASP	-20 to 80	dF	TEMPPURG	50
T.CL	Tempering in Cool SASP	5 to 75	dF	TEMPCOOL	5
T.V.OC	Tempering Vent Occ SASP	-20 to 80	dF	TEMPVOCC	65
T.V.UN	Tempering Vent Unocc. SASP	-20 to 80	dF	TEMPVUNC	50

APPENDIX A — LOCAL DISPLAY TABLES (CONT)

MODE — INPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
GEN.I	GENERAL INPUTS				
PWR.F	Power Fault Input	Normal/Alarm		PWRFAULT	forcible
MFL.S	Main Filter Status Input	Clean/Dirty		FLTS	forcible
PFL.S	Post Filter Status Input	Clean/Dirty		PFLTS	forcible
G.FAN	Fan request from IGC	Off/On		IGCFAN	
REMT	Remote Input State	Off/On		RMTIN	forcible
ENTH	Enth. Switch Read High?	No/Yes		ENTH	forcible
S.FN.S	Supply Fan Status Switch	Off/On		SFS	forcible
FRZ.S	Freeze Status Switch	Normal/Alarm		FRZ	forcible
PP.SW	Plenum Press.Safety Sw.	Low/High		PPS	forcible
AP.SS	Air Press.Safety Switch	Low/High		APS	forcible
DL.S1	Demand Limit Switch 1	Off/On		DMD_SW1	forcible
DL.S2	Demand Limit Switch 2	Off/On		DMD_SW2	forcible
DH.IN	Dehumidify Switch Input	Off/On		DHDISCIN	forcible
SF.BY	Supply Fan Bypass Input	Off/On		SFBYIN	forcible
PE.BY	Power Exh. Bypass Input	Off/On		PEBYIN	forcible
FD.BK	COMPRESSOR FEEDBACK				
HPS.A	Circ A High Press. Switch	Low/High		CIRCAHPS	
HPS.B	Circ B High Press. Switch	Low/High		CIRCBHPS	
CS.A1	Compressor A1 Feedback	Off/On		CSB_A1	
CS.A2	Compressor A2 Feedback	Off/On		CSB_A2	
CS.A3	Compressor A3 Feedback	Off/On		CSB_A3	
CS.A4	Compressor A4 Feedback	Off/On		CSB_A4	
CS.B1	Compressor B1 Feedback	Off/On		CSB_B1	
CS.B2	Compressor B2 Feedback	Off/On		CSB_B2	
CS.B3	Compressor B3 Feedback	Off/On		CSB_B3	
CS.B4	Compressor B4 Feedback	Off/On		CSB_B4	
STAT	THERMOSTAT INPUTS				
G	Thermostat G Input	Off/On		G	forcible
W1	Thermostat W1 Input	Off/On		W1	forcible
W2	Thermostat W2 Input	Off/On		W2	forcible
Y1	Thermostat Y1 Input	Off/On		Y1	forcible
Y2	Thermostat Y2 Input	Off/On		Y2	forcible
FIRE	FIRE-SMOKE INPUTS				
FSD	Fire Shutdown Input	Normal/Alarm		FSD	forcible
PRES	Pressurization Input	Normal/Alarm		PRES	forcible
EVAC	Evacuation Input	Normal/Alarm		EVAC	forcible
PURG	Smoke Purge Input	Normal/Alarm		PURG	forcible
REL.H	RELATIVE HUMIDITY				
OA.RH	Outside Air Rel. Humidity	0 to 100	%	OARH	forcible
OA.EN	Outdoor Air Enthalpy	-20 to 10000		OAE	
OA.DP	OutsideAir Dewpoint Temp	-40 to 240	dF	OADEWTMP	
RA.RH	Return Air Rel. Humidity	0 to 100	%	RARH	forcible
RA.EN	Return Air Enthalpy	-20 to 10000		RAE	
SP.RH	Space Relative Humidity	0 to 100	%	SPRH	forcible
MA.RH	Mixed Air Rel.Humidity	0 to 100	%	MARH	forcible
SP.EN	Space Enthalpy	-20 to 10000		SPE	
AIR.Q	AIR QUALITY SENSORS				
IAQ.I	IAQ - Discrete Input	Low/High		IAQIN	forcible
IAQ	IAQ - PPM Return CO2	0 to 5000		IAQ	forcible
OAQ	OAQ - PPM Return CO2	0 to 5000		OAQ	forcible
DAQ	Diff.Air Quality in PPM	0 to 5000		DAQ	
IQ.P.O	IAQ Min.Pos. Override	0 to 100	%	IAQMINOV	forcible
CFM	CFM SENSORS				
O.CFM	Outside Air CFM	0 to 65000	CFM	OACFM	
OC.AV	Outside Air CFM Mov Avg	0 to 65000	CFM	OACFMAVG	
R.CFM	Return Air CFM	0 to 65000	CFM	RACFM	
S.CFM	Supply Air CFM	0 to 65000	CFM	SACFM	
D.CFM	Fan Track Control D.CFM	-20000 to 20000	CFM	DELTACFM	
E.CFM	Exhaust Air CFM	0 to 65000	CFM	EACFM	
RSET	RESET INPUTS				
SA.S.R	Supply Air Setpnt. Reset	0 to 20	^F	SASPRSET	forcible
SP.RS	Static Pressure Reset	0 to 15		SPRESET	forcible

MODE — INPUTS (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
4-20	4-20 MILLIAMP INPUTS				
IAQ.M	IAQ Milliamps	0 to 20	ma	IAQ_MA	
OAQ.M	OAQ Milliamps	0 to 15	ma	OAQ_MA	
SP.R.M	SP Reset milliamps	0 to 20	ma	SPRST_MA	
DML.M	4-20 ma Demand Signal	0 to 20	ma	DMDLMTMA	forcible
EDR.M	EDT Reset Milliamps	0 to 20	ma	EDTRESMA	
ORH.M	OARH Milliamps	0 to 20	ma	OARH_MA	
SRH.M	SPRH Milliamps	0 to 20	ma	SPRH_MA	
RRH.M	RARH Milliamps	0 to 20	ma	RARH_MA	
MRH.M	MARH milliamps	0 to 20	ma	MARH_MA	
SAC.M	SACFM Milliamps	0 to 20	ma	SACFM_MA	
SA.M.T	Supply Air CFM Trim (ma)	-2 to 2		SAMATRIM	config
RAC.M	RACFM Milliamps	0 to 22	ma	RACFM_MA	
RA.M.T	Return Air CFM Trim (ma)	-2 to 2		RAMATRIM	config
EAC.M	EACFM milliamps	0 to 22	ma	EACFM_MA	
EA.M.T	Exh. Air CFM Trim (ma)	-2 to 2		EAMATRIM	config
OAC.M	OACFM Milliamps	0 to 22	ma	OACFM_MA	
OA.M.T	Outside Air CFM Trim(ma)	-2 to 2		OAMATRIM	config
BP.M	BP Milliamps	0 to 22	ma	BP_MA	
BP.M.T	Bldg. Pressure Trim (ma)	-2 to 2		BPMATRIM	config
SP.M	SP Milliamps	0 to 22	ma	SP_MA	
SP.M.T	Static Press. Trim (ma)	-2 to 2		SPMATRIM	config
MF.DP	Main Filter DeltaPressMa	0 to 22	ma	MF_DP_MA	
PF.DP	Post Filter DeltaPressMa	0 to 22	ma	PF_DP_MA	

MODE — OUTPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
FANS	FANS				
SF.BY	Supply Fan Bypass Relay	Off/On		SFBYRLY	
S.VFD	Supply Fan VFD Speed	0 to 100	%	SFAN_VFD	
E.VFD	Exhaust Fan VFD Speed	0 to 100	%	EFAN_VFD	
PE.BY	Power Exhaust Bypass Rly	Off/On		PEBYRLY	
A.VFD	MtrMaster A Commanded %	0 to 100	%	MM_A_VFD	
B.VFD	MtrMaster B Commanded %	0 to 100	%	MM_b_VFD	
CDF.1	Condenser Fan Output 1	Off/On		CONDFAN1	
CDF.2	Condenser Fan Output 2	Off/On		CONDFAN2	
CDF.3	Condenser Fan Output 3	Off/On		CONDFAN3	
CDF.4	Condenser Fan Output 4	Off/On		CONDFAN4	
CDF.5	Condenser Fan Output 5	Off/On		CONDFAN5	
COOL	COOLING				
A1	Compressor A1 Relay	Off/On		CMPA1	
A2	Compressor A2 Relay	Off/On		CMPA2	
A3	Compressor A3 Relay	Off/On		CMPA3	
A4	Compressor A4 Relay	Off/On		CMPA4	
B1	Compressor B1 Relay	Off/On		CMPB1	
B2	Compressor B2Relay	Off/On		CMPB2	
B3	Compressor B3 Relay	Off/On		CMPB3	
B4	Compressor B4 Relay	Off/On		CMPB4	
A1.CP	Compressor A1 Capacity	0 to 100	%	CMPA1CAP	
MLV	Minimum Load Valve Relay	Off/On		MLV	
RHV	Humidimizer 3-Way Valve	Off/On		HUM3WVAL	
C.EXV	Condenser EXV Position	0 to 100	%	COND_EXV	
B.EXV	Bypass EXV Position	0 to 100	%	BYP_EXV	
A1.EX	Circuit A EXV 1 Position	0 to 100	%	XV1APOSP	
A2.EX	Circuit A EXV 2 Position	0 to 100	%	XV2APOSP	
B1.EX	Circuit B EXV 1 Position	0 to 100	%	XV1BPOSP	
B2.EX	Circuit B EXV 2 Position	0 to 100	%	XV2BPOSP	
HEAT	HEATING				
HT.1	Heat Relay 1	Off/On		HS1	
H1.CP	Modulating Heat Capacity	0 to 100	%	HTMG_CAP	
HT.2	Heat Relay 2	Off/On		HS2	
HT.3	Relay 3 W1 Gas Valve 2	Off/On		HS3	
HT.4	Relay 4 W2 Gas Valve 2	Off/On		HS4	
HT.5	Relay 5 W1 Gas Valve 3	Off/On		HS5	
HT.6	Relay 6 W2 Gas Valve 3	Off/On		HS6	
HT.7	Relay 7 W2 Gas Valve 4	Off/On		HS7	
HT.8	Relay 8 W2 Gas Valve 4	Off/On		HS8	
HT.9	Relay 9 W2 Gas Valve 5	Off/On		HS9	
HT.10	Relay 10 W2 Gas Valve 5	Off/On		HS10	
H.I.R	Heat Interlock Relay	Off/On		HIR	forcible
HTC.P	Ht.Coil Act.Current Pos.	0 to 100	%	HTCLRPOS	
ACTU	ACTUATORS				
EC1.P	Econ 1 Out Act.Curr.Pos.	0 to 100	%	ECONOPOS	
EC2.P	Econ 2 Ret Act.Curr.Pos.	0 to 100	%	ECON2POS	
EC3.P	Econ 3 Out Act.Curr.Pos.	0 to 100	%	ECON3POS	
ECN.C	Econ 1 Out Act.Cmd.Pos.	0 to 100	%	ECONOCMD	forcible
HTC.P	Ht.Coil Act.Current Pos.	0 to 100	%	HTCLRPOS	
HTC.C	Ht.Coil Command Position	0 to 100	%	HTCLCPOS	
HMD.P	Humidifier Act.Curr.Pos.	0 to 100	%	HUMDRPOS	
HMD.C	Humidifier Command Pos.	0 to 100	%	HUMDCPOS	
HC3.P	HTC3 Actuator Curr.Pos.	0 to 100	%	HTC3RPOS	
HC3.C	HTC3 Command Position	0 to 100	%	HTC3CPOS	
HC4.P	HTC4 Actuator Curr.Pos.	0 to 100	%	HTC4RPOS	
HC4.C	HTC4 Command Position	0 to 100	%	HTC4CPOS	
GEN.O	GENERAL OUTPUTS				
HUM.R	Humidifier Relay	Off/On		HUMIDRLY	
ALRM	Remote Alarm / Aux Relay	Off/On		ALRM	forcible

MODE — CONFIGURATION

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
UNIT	UNIT CONFIGURATION					
C.TYP	Machine Control Type	1 to 4		CTRLTYPE	3	27,39,42,44,47-51, 56,81,89
SIZE	Unit Size (75 - 150)	75 to 150		UNITSIZE	75	42,45
FN.MD	Fan Mode (0=Auto, 1=Cont)	0 to 1		FAN_MODE	1	42
RM.CF	Remote Switch Config	0 to 3		RMTINCFG	0	42
CEM	CEM Module Installed	No/Yes		CEM_BRD	No	42
LQ.SN	Liquid Sensors Installed	No/Yes		LQ_SENS	No	42
PW.MN	Power Monitor Installed	No/Yes		PWR_MON	No	42
VFD.B	VFD Bypass Enable?	No/Yes		VFD_BYEN	No	42
SM.MN	Enable Smart Menus?	Disable/Enable		SMART_MN	Enable	42
TCS.C	Temp.Cmp.Strt.Cool Factr	0 to 60	Minute	TCSTCOOL	0	42
TCS.H	Temp.Cmp.Strt.Heat Factr	0 to 60	Minute	TCSTHEAT	0	42
SFS.S	Fan fail shuts down unit	No/Yes		SFS_SHUT	No	42,131
SFS.M	Fan Stat Monitoring Type	0 to 2		SFS_MON	0	42,43,131
VAV.S	VAV Unocc.Fan Retry Time	0 to 720	Minute	SAMPMINS	50	42,43
MAT.S	MAT Calc Config	0 to 2		MAT_SEL	1	42,42
MAT.R	Reset MAT Table Entries?	No/Yes		MATRESET	No	42,43
MAT.D	MAT Outside Air Default	0 to 100	%	MATOAPOS	20	42
ALTI	Altitude........in feet:	-1000 to 60000		ALTITUDE	0	42,44
DLAY	Startup Delay Time	0 to 900		DELAY	0	42,44
AUX.R	Auxiliary Relay Config	0 to 3	Seconds	AUXRELAY	0	42,44
SENS	INPUT SENSOR CONFIG					
SPT.S	Space Temp Sensor	Disable/Enable		SPTSENS	Disable	42,44
SP.O.S	Space Temp Offset Sensor	Disable/Enable		SPTOSENS	Disable	42,44
SP.O.R	Space Temp Offset Range	1 to 10	dF	SPTO_RNG	5	42,44
SRH.S	Space Air RH Sensor	Disable/Enable		SPRHSENS	Disable	42,44
RRH.S	Return Air RH Sensor	Disable/Enable		RARHSENS	Disable	42-44
MRH.S	Mixed Air RH Sensor	Disable/Enable		MARHSENS	Disable	42-44
FACT	FACTORY CONFIGURATION					
MD.MN	Model Number			MODEL_NM		42,44
F.RST	Perform Factory Restore?	0 to 1		FACT_RST	0	42,44
COOL	COOLING CONFIGURATION					
A1.EN	Enable Compressor A1	Disable/Enable		CMPA1ENA	Enable	45,48
A2.EN	Enable Compressor A2	Disable/Enable		CMPA2ENA	Enable	45,48
A3.EN	Enable Compressor A3	Disable/Enable		CMPA3ENA	Enable	45,48
A4.EN	Enable Compressor A4	Disable/Enable		CMPA4ENA	Enable	45,48
B1.EN	Enable Compressor B1	Disable/Enable		CMPB1ENA	Enable	45,48
B2.EN	Enable Compressor B2	Disable/Enable		CMPB2ENA	Enable	45,48
B3.EN	Enable Compressor B3	Disable/Enable		CMPB3ENA	Enable	45,48
B4.EN	Enable Compressor B4	Disable/Enable		CMPB4ENA	Enable	45,48
CS.A1	CSB A1 Feedback Alarm	Disable/Enable		CSB_A1EN	Enable	45,48
CS.A2	CSB A2 Feedback Alarm	Disable/Enable		CSB_A2EN	Enable	45,48
CS.A3	CSB A3 Feedback Alarm	Disable/Enable		CSB_A3EN	Enable	45,48
CS.A4	CSB A4 Feedback Alarm	Disable/Enable		CSB_A4EN	Enable	45,48
CS.B1	CSB B1 Feedback Alarm	Disable/Enable		CSB_B1EN	Enable	45,48
CS.B2	CSB B2 Feedback Alarm	Disable/Enable		CSB_B2EN	Enable	45,48
CS.B3	CSB B3 Feedback Alarm	Disable/Enable		CSB_B3EN	Enable	45,48
CS.B4	CSB B4 Feedback Alarm	Disable/Enable		CSB_B4EN	Enable	45,48
Z.GN	Capacity Threshold Adjust	0.1 to 10		Z_GAIN	1.0	45,48
DT.GN	SUMZ EDT Derivative Gain	0.1 to 3		DTGAIN	1.5	45,48,51
MC.LO	Compressor Lockout Temp	-25 to 55	dF	OATLCOMP	40	46,48,54
LLAG	Lead/Lag Configuration	0 to 2		LEAD_LAG	0	46,48
HC.EV	High Capacity Evaporator	No/Yes		HCAPEVAP	No	48
H.ODF	High Efficiency OD Fans?	No/Yes		HIGH_EFF	No	48
M.M	Motor Master Control ?	No/Yes		MOTRMAST	No	46,48,55
MM.OF	MM Setpoint Offset	-20 to 20	dF	MMSPOFST	-10.0	48

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
COOL (cont)	COOLING CONFIGURATION (cont)					
M.PID	MOTORMASTER PID CONFIGS					
MM.RR	Motor Master PI Run Rate	5 to 120	Seconds	MM_RATE	5	48
MM.PG	Motor Master Prop. Gain	0 to 5		MM_PG	1.0	48
MM.PD	Motor Master Deriv. Gain	0 to 5		MM_DG	0.3	48
MM.TI	Motor Master Integ. Time	0.5 to 50		MM_TI	30.0	48
SCT.H	Maximum Condenser Temp	100 to 150	dF	SCT_MAX	115	46,48,55
SCT.L	Minimum Condenser Temp	40 to 90	dF	SCT_MIN	80	46,48,55
DG.A1	A1 is a Digital Scroll	No/Yes		DIGCMPA1	No	46,48
MC.A1	A1 Min Digital Capacity	30 to 100	%	MINCAPA1	40	46,48
DS.AP	Dig Scroll Adjust Delta	0 to 100	%	DSADJPCT	15	46,48
DS.AD	Dig Scroll Adjust Delay	15 to 60	Seconds	DSADJDLY	15	46,48
DS.RP	Dig Scroll Reduce Delta	0 to 100	%	DSREDPCT	10	46,48
DS.RD	Dig Scroll Reduce Delay	15 to 60	Seconds	DSREDDLY	15	46,48
DS.RO	Dig Scroll Reduction OAT	70 to 120	dF	DSREDOAT	95	46,48
DS.MO	Dig Scroll Max Only OAT	70 to 120	dF	DSMAXOAT	105	47,48
MLV	Min Load Valve Enable	Disable/Enable		MLV_ENAB	Disable	36,47,48
H.SST	Hi SST Alert Delay Time	5 to 30	Minutes	HSSTTIME	10	47,48
RR.VF	Rev Rotation Verified ?	No/Yes		REVR_VER	No	47,48
CS.HP	Use CSBs for HPS detect?	No/Yes		CSBHPDET	Yes	47,48
EXV.C	EXV CIRCUIT CONFIGS					
EX.SA	Cir. EXV Start Algorithm	0 to 1		EXV_STAL	0	48
SH.SP	EXV Superheat Setpoint	5 to 40	dF	SH_SP	12.0	48
SH.DB	EXV Superheat Deadband	0 to 2	dF	SH_DB	0.5	48
MOP.S	Max Oper. Pressure SP	40 to 120	dF	MOP_SP	70	48
CS.DE	EXV Cir Start Delay Secs	10 to 240	Seconds	EXVCSDLY	240	48
CS.PD	EXV Cir PreMove Dly Secs	0 to 30	Seconds	EXVCPDLY	30	48
EX.MN	Comp. Cir. Exv. Min Pos%	0 to 100	%	CC_XMPOS	20.0	48
EX.MC	Comp Cir EXV Mn Strt Pos	0 to 100	%	EXV_CSMP	30	48
EN.SC	Enab Cir Shtdwn w/ flood	No/Yes		FL_ENCSD	Yes	47,48
FL.TM	Flooding Detect Time	15 to 900		FL_DETTM	120	47,48
E.PID	EXV PID CONFIGS					
EX.RR	EXV PID Run Rate	5 to 120	Seconds	EXV_RATE	5	48
EX.PG	EXV PID Prop. Gain	0 to 5		EXV_PG	0.5	48
EX.TI	EXV Integration Time	0.5 to 60		EXV_TI	50	48
EX.HO	High OAT Lim (EXV Gain)	50 to 95	dF	HIGHOAT	70	48
EX.LO	Low OAT Lim (EXV Gain)	40 to 80	dF	LOWOAT	60	48
EX.FG	%EXV Move on Cir. Stg Up	0 to 100	%	EXV_FF_G	10	48
EX.FD	%EXV Move on Cir. Stg Dw	0 to 100	%	EXV_FF_D	15.0	48
EX.CF	EXV Pre-Move Config	0 to 3	Seconds	EXVPMCFG	1	48
EX.PM	EXV Pre-Move Delay Secs	0 to 30	Seconds	EXVPMDLY	10	48
FL.SP	EXV SH Flooding Setpoint	0 to 10	^F	FL_SP	6.0	48
FL.OC	Flood Ovrde Press Cutoff	0 to 1000	PSIG	FL_ODPC	600.0	48
FL.OD	Flooding Override Delay	0 to 255	sec	FL_OD	0	48
EX.SL	EXV Init Pos Slope	-100 to 100		EXV_SLP	–0.4	48
EX.IN	EXV Init Pos Intercept	-200 to 200		EXV_INT	66	48
EX.SM	EXV Smoothing Algorithm	0 to 1		EXV_SMAL	0	48
EX.EP	SH Error Exponent	1 to 1.5		ERR_POW	1	48
DP.OC	DP OVERRIDE CONFIGS					
DP.RS	DP Rate of Change Set	2 to 15	°psig	DP_RC_ST	10	48
DP.RC	DP Rate of Change Clr	0 to 5	°psig	DP_RC_CL	1	48
DP.L1	DP Override Limit 1	400 to 450	psig	DP_OD_L1	400	48
DP.L2	DP Override Limit 2	480 to 550	psig	DP_OD_L2	500	48
DP.TO	DP Override Timeout	6 to 150	Seconds	DP_OD_TO	90	48
DP.OR	DP Override Percent	0 to 15	%	DP_OD_PT	10	48
EDT.R	EVAP.DISCHRGE TEMP RESET					
RS.CF	EDT Reset Configuration	0 to 3		EDRSTCFG	2	27,46
RTIO	Reset Ratio	0 to 10		RTIO	2	27,46
LIMT	Reset Limit	0 to 20	^F	LIMT	10	27,46
RES.S	EDT 4-20 ma Reset Input	Disable/Enable		EDTRSENS	Disable	27,46
HEAT	HEATING CONFIGURATION					
HT.CF	Heating Control Type	0 to 5		HEATTYPE	0*	60-61,68
HT.SP	Heating Supply Air Setpt	65 to 120	dF	SASPHEAT	85	60,61
OC.EN	Occupied Heating Enabled	No/Yes		HTOCCENA	No	60,61
LAT.M	MBB Sensor Heat Relocate	No/Yes		HTLATMON	No	60,61

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
SG.CF	STAGED HEAT CONFIGS					60,64
HT.ST	Modulating Gas Type	0 to 3		HTSTGTYP	0*	60,64
CAP.M	Max Cap Change per Cycle	5 to 45	%	HTCAPMAX	45*	60,64
M.R.DB	St.Ht DB min.dF/PID Rate	0 to 5		HT_MR_DB	0.5	60,64
S.G.DB	St.Heat Temp. Dead Band	0 to 5	^F	HT_SG_DB	2	60,64-65
RISE	Heat Rise dF/sec Clamp	0.05 to 0.2		HTSGRISE	0.06	60,64
LAT.L	LAT Limit Config	0 to 20	^F	HTLATLIM	10	60,64
LIM.M	Limit Switch Monitoring?	No/Yes		HTLIMMON	Yes	60,64,67
SW.H.T	Limit Switch High Temp	80 to 210	dF	HT_LIMHI	170*	60,64,67
SW.L.T	Limit Switch Low Temp	80 to 210	dF	HT_LIMLO	160*	60,64,67
HT.P	Heat Control Prop. Gain	0 to 1.5		HT_PGAIN	1	60,64-65
HT.D	Heat Control Derv. Gain	0 to 1.5		HT_DGAIN	1	60,64-65
HT.TM	Heat PID Rate Config	30 to 300	Seconds	HTSGPIDR	90	60,64
HH.CF	HYDRONIC HEAT CONFIGS					
HW.P	Hydronic Ctl.Prop. Gain	0 to 1.5		HW_PGAIN	1	60
HW.I	Hydronic Ctl.Integ. Gain	0 to 1.5		HW_IGAIN	1	60
HT.D	Hydronic Ctl.Derv. Gain	0 to 1.5		HW_DGAIN	1	60
HT.TM	Hydronic PID Rate Config	15 to 300	Seconds	HOTWPIDR	90	60
ACT.C	HYDR.HEAT ACTUATOR CFGS.					
SN.1.1	Hydronic Ht.Serial Num.1	0 - 9999		HTC1_SN1	0	60,64
SN.1.2	Hydronic Ht.Serial Num.2	0 - 6		HTC1_SN2	0	60,64
SN.1.3	Hydronic Ht.Serial Num.3	0 - 9999		HTC1_SN3	0	60,64
SN.1.4	Hydronic Ht.Serial Num.4	0 - 254		HTC1_SN4	0	60,64
C.A.L1	Hydr.Ht.Ctl.Ang Lo Limit	0 - 90		HTC1CALM	0	60,64
SN.2.1	Humd/HTC2 Ser Num 1	0 - 9999		HTC2_SN1	0	60,64
SN.2.2	Humd/HTC2 Ser Num 2	0 - 6		HTC2_SN2	0	60,64
SN.2.3	Humd/HTC2 Ser Num 3	0 - 9999		HTC2_SN3	0	60,64
SN.2.4	Humd/HTC2 Ser Num 4	0 - 254		HTC2_SN4	0	60,64
C.A.L2	Humd/HTC2 Ctl Ang Lo Lim	0 - 90		HTC2CALM	0	60,64
SN.3.1	HTC3 Serial Number 1	0 - 9999		HTC3_SN1	0	60,64
SN.3.2	HTC3 Serial Number 2	0 - 6		HTC3_SN2	0	60,64
SN.3.3	HTC3 Serial Number 3	0 - 9999		HTC3_SN3	0	60,64
SN.3.4	HTC3 Serial Number 4	0 - 254		HTC3_SN4	0	60,64
C.A.L3	HTC3 Ctrl Angle Lo Limit	0 - 90		HTC3CALM	0	60,64
SN.4.1	HTC4 Serial Number 1	0 - 9999		HTC4_SN1	0	60,64
SN.4.2	HTC4 Serial Number 2	0 - 6		HTC4_SN2	0	60,64
SN.4.3	HTC4 Serial Number 3	0 - 9999		HTC4_SN3	0	60,64
SN.4.4	HTC4 Serial Number 4	0 - 254		HTC4_SN4	0	60,64
C.A.L4	HTC4 Ctrl Angle Lo Limit	0 - 90		HTC4CALM	0	60,64
SP	SUPPLY STATIC PRESS.CFG.					
SP.CF	Static Pressure Control	Disable/Enable		STATICFG	Disable	69,70
SP.SV	Staged Air Volume Ctrl	Disable/Enable		STGAVCFG	Disable	69,70
SP.S	Static Pressure Sensor	Disable/Enable		SPSENS	Disable	69,70
SP.LO	Static Press. Low Range	-10 to 0	in. wg	SP_LOW	0	69,70
SP.HI	Static Press. High Range	0 to 10	in. wg	SP_HIGH	5	69,70
SP.SP	Static Pressure Setpoint	0 to 5	in. wg	SPSP	1.5	69,70
SP.MN	VFD Minimum Speed	10 to 100	%	STATPMIN	20	69,70
SP.MX	VFD Maximum Speed	0 to 100	%	STATPMAX	100	69,70
SP.FS	VFD Fire Speed Override	0 to 100	%	STATPFSO	100	69,70
SP.RS	Stat. Pres. Reset Config	0 to 4		SPRSTCFG	0	69,70
SP.RT	SP Reset Ratio	0 to 2	in. wg	SPRRATIO	0.2	69,70
SP.LM	SP Reset Limit	0 to 2	in. wg	SPRLIMIT	0.75	69,70
SP.EC	SP Reset Econo.Position	0 to 100	%	ECONOSPR	5	69
S.PID	STAT.PRESS.PID CONFIGS					
SP.TM	Stat.Pres.PID Run Rate	5 to 120	Seconds	SPIDRATE	7	69,70
SP.P	Static Press. Prop. Gain	0 to 5		STATP_PG	0.5	69,70
SP.I	Static Press. Intg. Gain	0 to 2		STATP_IG	0.5	69,70
SP.D	Static Press. Derv. Gain	0 to 5		STATP_DG	0.3	69,70

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
ECON	ECONOMIZER CONFIGURATION					
EC.EN	Economizer Installed?	No/Yes		ECON_ENA	Yes	27,76,77
EC.MN	Economizer Min.Position	0 to 100	%	ECONOMIN	5	27,76,77
EC.MX	Economizer Max.Position	0 to 100	%	ECONOMAX	98	27,76,77
E.TRM	Economzr Trim For SumZ ?	No/Yes		ECONTRIM	Yes	27,76,77
E.SEL	Econ Change Over Select	0 to 3		ECON_SEL	0	27,76,77
DDB.O	Diff Dry Bulb RAT Offset	0,-2,-4,-6	dF	EC_DDBCO	0	76
OA.E.C	OA Enthalpy ChgOvr Selct	1 to 5		OAEC_SEL	4	27,76
OA.EN	Outdr.Enth Compare Value	18 to 28		OAEN_CFG	24	27,76
OAT.L	High OAT Lockout Temp	-40 to 120	dF	OAT_LOCK	60	27,76
O.DEW	OA Dewpoint Temp Limit	50 to 62	dF	OADEWCFG	55	27,76
ORH.S	Outside Air RH Sensor	Disable/Enable		OARHSENS	Disable	27,76
CFM.C	OUTDOOR AIR CFM CONTROL					27,76
OCF.S	Outdoor Air CFM Sensor	0-2		OCFMSENS	0	76,80
O.C.MX	Economizer Min.Flow	0 to 20000	CFM	OACFMMAX	2000	76,80
O.C.MN	IAQ Demand Vent Min.Flow	0 to 20000	CFM	OACFMMIN	0	76,80
O.C.DB	Econ.Min.Flow Deadband	200 to 1000	CFM	OACFM_DB	400	76,80
OA.RR	OACFM Econ Ctrl Run Rate	3 to 120	sec	OCFMECRT	20	76,80
OA.MP	OACFM Econ Ctrl Min Pos	0 to 10	%	OCFMECMN	0	76,80
EN.DO	Enable DCFM/OACFM Clamp	No/Yes		EN_DOCFM	Yes	76,80
E.SAC	Enable Single Act CFM	No/Yes		ENSACFMC	No	76,80
S.MX.C	Single Act. Max CFM	0 to 20000	CFM	SAMAXCFM	7500	76,80
S.M.DB	Single Act. Max CFM DB	0 to 5000	CFM	SAMAXCDB	2500	76,80
E.CFG	ECON.OPERATION CONFIGS					27,76
E.P.GN	Economizer Prop.Gain	0.7 to 3		EC_PGAIN	1	76
E.RNG	Economizer Range Adjust	0.5 to 5	^F	EC_RANGE	2.5	76
E.SPD	Economizer Speed Adjust	0.1 to 10		EC_SPEED	0.75	76
E.DBD	Economizer Deadband	0.1 to 2	^F	EC_DBAND	0.5	76
UEFC	UNOCC.ECON.FREE COOLING					27,76
FC.CF	Unoc Econ Free Cool Cfg	0 to 2		UEFC_CFG	0	76
FC.TM	Unoc Econ Free Cool Time	0 to 720	min	UEFCTIME	120	76
FC.L.O	Un.Ec.Free Cool OAT Lock	40 to 70	dF	UEFCNTLO	50	76
ACT.C	ECON.ACTUATOR CONFIGS					27,76
SN.1.1	Econ 1 Out Ser Number 1	0 to 9999		ECN1_SN1	0	76
SN.1.2	Econ 1 Out Ser Number 2	0 to 6		ECN1_SN2	0	76
SN.1.3	Econ 1 Out Ser Number 3	0 to 9999		ECN1_SN3	0	76
SN.1.4	Econ 1 Out Ser Number 4	0 to 254		ECN1_SN4	0	76
C.A.L1	Ecn1 Out Ctl Angl Lo Lmt	0 to 90		ECONCALM	85	76
SN.2.1	Econ 2 Ret Ser Number 1	0 to 9999		ECN2_SN1	0	76
SN.2.2	Econ 2 Ret Ser Number 2	0 to 6		ECN2_SN2	0	76
SN.2.3	Econ 2 Ret Ser Number 3	0 to 9999		ECN2_SN3	0	76
SN.2.4	Econ 2 Ret Ser Number 4	0 to 254		ECN2_SN4	0	76
C.A.L2	Ecn2 Ret Ctl Angl Lo Lmt	0 to 90		ECN2CALM	85	76
SN.3.1	Econ 3 Out Ser Number 1	0 to 9999		ECN3_SN1	0	76
SN.3.2	Econ 3 Out Ser Number 2	0 to 6		ECN3_SN2	0	76
SN.3.3	Econ 3 Out Ser Number 3	0 to 9999		ECN3_SN3	0	76
SN.3.4	Econ 3 Out Ser Number 4	0 to 254		ECN3_SN4	0	76
C.A.L3	Ecn3 Out Ctl Angl Lo Lmt	0 to 90		ECN3CALM	85	76
T.24.C	TITLE 24 CONFIGS					
LOG.F	Log Title 24 Faults	No/Yes		T24LOGFL	No	75,76
EC.MD	T24 Econ Move Detect	1 - 10		T24ECMDB	1	75,76
EC.ST	T24 Econ Move SAT Test	10 - 20		T24ECSTS	10	75,76
S.CHG	T24 Econ Move SAT Change	0 - 5		T24SATMD	0.2	75,76
E.SOD	T24 Econ RAT-OAT Diff	5 - 20		T24RATDF	15	75,76
E.CHD	T24 Heat/Cool End Delay	0 - 60		T24CHDLY	25	75,76
ET.MN	T24 Test Minimum Pos.	0 - 50		T24TSTMN	15	75,76
ET.MX	T24 Test Maximum Pos.	50 - 100		T24TSTMX	85	75,76
SAT.T	SAT Settling Time	10 - 900		SAT_SET	240	76
AC.EC	Economizer Deadband Temp	0 - 10		AC_EC_DB	4	76
E.GAP	Econ Fault Detect Gap	2 - 100		EC_FLGAP	5	76
E.TMR	Econ Fault Detect Timer	10 - 240		EC_FLTMR	20	76
X.CFM	Excess Air CFM	400 - 4000		EX_ARCFM	800	76
X.TMR	Excess Air Detect Timer	30 - 240		EX_ARTMR	150	76
AC.MR	T24 AutoTest SF Run Time	1 - 10		T24ACMRT	2	76
AC.SP	T24 Auto-Test VFD Speed	10 - 50		T24ACSPD	20	76
AC.OP	T24 Auto-Test Econ % Opn	1 - 100		T24ACOPN	30	76
VF.PC	T24 Auto-Test VFD % Chng	1 - 20		T24VFDPC	10	76

APPENDIX A — LOCAL DISPLAY TABLES (CONT)

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
ECON (cont)	ECONOMIZER CONFIGURATION (cont)					
EC.DY	T24 Econ Auto-Test Day	0=Never, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday		T24_ECDY	6=Saturday	76
EC.TM	T24 Econ Auto-Test Time	0 - 23		T24_ECTM	2	76
BP	BUILDING PRESS. CONFIGS					
BP.CF	Building Press. Config	0 to 2		BLDG_CFG	0*	82
BP.S	Building Pressure Sensor	Disable/Enable		BPSENS	Disable*	82
BP.R	Bldg. Press. (+/-) Range	0.1 to 0.25	"H2O	BP_RANGE	0.25	82
BP.SP	Building Pressure Setp.	-0.25 to 0.25	"H2O	BPSP	0.05	28,82
BP.SO	BP Setpoint Offset	0 to 0.5	"H2O	BPSO	0.05	28,82
B.V.A	VFD/ACTUATOR CONFIG					
BP.FS	VFD Fire Speed	0 to 100	%	BLDGPFSO	100	28,82
BP.MN	VFD Minimum Speed	0 to 100	%	BLDGPMIN	10	28,82
BP.MX	VFD Maximum Speed	0 to 100	%	BLDGPMAX	100	28,82
FAN.T	FAN TRACKING CONFIG					
FT.CF	Fan Track Learn Enable	No/Yes		DCFM_CFG	No	28,82
FT.TM	Fan Track Learn Rate	5 to 60	min	DCFMRATE	15	28,82
FT.ST	Fan Track Initial DCFM	-20000 to 20000	CFM	DCFMSTRT	2000	28,83
FT.MX	Fan Track Max Clamp	0 to 20000	CFM	DCFM_MAX	4000	28,83
FT.AD	Fan Track Max Correction	0 to 20000	CFM	DCFM_ADJ	1000	28,83
FT.OF	Fan Track Internl EEPROM	-20000 to 20000	CFM	DCFM_OFF	0	28,82
FT.RM	Fan Track Internal RAM	-20000 to 20000	CFM	DCFM_RAM	0	28,82
FT.RS	Fan Track Reset Internal	No/Yes		DCFMRSET	No	28,82
FAN.C	SUPPLY, RET/EXH FAN CFG					
SCF.C	Supply Air CFM Config	1 to 2		SCFM_CFG	2	82
REF.C	Ret/Exh Air CFM Config	1 to 2		RECFMCFG	2	82
SCF.S	Supply Air CFM Sensor	Disable/Enable		SCFMSENS	Disable*	82
RCF.S	Return Air CFM Sensor	Disable/Enable		RCFMSENS	Disable*	82
ECF.S	Exhaust Air CFM Sensor	Disable/Enable		ECFMSENS	Disable*	82
B.PID	BLDG.PRESS.PID CONFIGS					
BP.TM	Bldg.Pres.PID Run Rate	1 to 60	Seconds	BPIDRATE	10	82
BP.P	Bldg.Press. Prop. Gain	0 to 5		BLDGP_PG	0.5	82
BP.I	Bldg.Press. Integ. Gain	0 to 2		BLDGP_IG	0.5	82,83
BP.D	Bldg.Press. Deriv. Gain	0 to 5		BLDGP_DG	0.3	82,83
D.LV.T	COOL/HEAT SETPT. OFFSETS					
L.H.ON	Dmd Level Lo Heat ON	0 to 2	^F	DMDLHON	1.5	51,62
H.H.ON	Dmd Level(+) Hi Heat ON	0.5 to 20	^F	DMDHHON	0.5	51,62
L.H.OF	Dmd Level(-) Lo Heat OFF	0.5 to 2	^F	DMDLHOFF	1	51,62
L.C.ON	Dmd Level Lo Cool ON	0 to 2	^F	DMDLCON	1.5	51,62
H.C.ON	Dmd Level(+) Hi Cool ON	0.5 to 20	^F	DMDHCON	0.5	51,62
L.C.OF	Dmd Level(-) Lo Cool OFF	0.5 to 2	^F	DMDLCOFF	1	51,62
C.T.LV	Cool Trend Demand Level	0.1 to 5	^F	CTRENDLV	0.1	51,62
H.T.LV	Heat Trend Demand Level	0.1 to 5	^F	HTRENDLV	0.1	51,62
C.T.TM	Cool Trend Time	30 to 600	Seconds	CTRENDTM	120	51,62
H.T.TM	Heat Trend Time	30 to 600	Seconds	HTRENDTM	120	51,62
DMD.L	DEMAND LIMIT CONFIG.					
DM.L.S	Demand Limit Select	0 to 3		DMD_CTRL	0	54,56
D.L.20	Demand Limit at 20 ma	0 to 100	%	DMT20MA	100	56
SH.NM	Loadshed Group Number	0 to 99		SHED_NUM	0	56
SH.DL	Loadshed Demand Delta	0 to 60	%	SHED_DEL	0	56
SH.TM	Maximum Loadshed Time	0 to 120	Minutes	SHED_TIM	6	56
D.L.S1	Demand Limit Sw.1 Setpt.	0 to 100	%	DLSWSP1	80	56
D.L.S2	Demand Limit Sw.2 Setpt.	0 to 100	%	DLSWSP2	50	56
IAQ	INDOOR AIR QUALITY CFG.					
DCV.C	DCV ECONOMIZER SETPOINTS					
EC.MN	Economizer Min.Position	0 to 100	%	ECONOMIN	5	38,86,88
IAQ.M	IAQ Demand Vent Min.Pos.	0 to 100	%	IAQMINP	0	38,86,88,130
O.C.MX	Economizer Min.Flow	0 to 20000	CFM	OACFMMAX	2000	38,86,88
O.C.MN	IAQ Demand Vent Min.Flow	0 to 20000	CFM	OACFMMIN	0	38,86,88
O.C.DB	Econ.Min.Flow Deadband	200 to 1000	CFM	OACFM_DB	400	86,88
AQ.CF	AIR QUALITY CONFIGS					
IQ.A.C	IAQ Analog Sensor Config	0 to 4		IAQANCFG	0	38,86
IQ.A.F	IAQ 4-20 ma Fan Config	0 to 2		IAQANFAN	0	38,86

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
IAQ (cont)	INDOOR AIR QUALITY CFG. (cont)					
IQ.I.C	IAQ Discrete Input Confg	0 to 2		IAQINCFG	0	38,42,86
IQ.I.F	IAQ Disc.In. Fan Config	0 to 2		IAQINFAN	0	38,86
OQ.A.C	OAQ 4-20ma Sensor Config	0 to 2		OAQANCFG	0	42,86
AQ.SP	AIR QUALITY SETPOINTS					
IQ.O.P	IAQ Econo Override Pos.	0 to 100	%	IAQOVPOS	100	38,86
IQ.O.C	IAQ Override Flow	0 to 31000	CFM	IAQOVCFM	10000	86
DAQ.L	Diff.Air Quality LoLimit	0 to 1000		DAQ_LOW	100	38,86,88
DAQ.H	Diff.Air Quality HiLimit	100 to 2000		DAQ_HIGH	700	38,86,88
D.F.OF	DAQ PPM Fan Off Setpoint	0 to 2000		DAQFNOFF	200	38,86
D.F.ON	DAQ PPM Fan On Setpoint	0 to 2000		DAQFNON	400	38,86
IAQ.R	Diff. AQ Responsiveness	-5 to 5		IAQREACT	0	86
OAQ.L	OAQ Lockout Value	0 to 2000		OAQLOCK	0	86
OAQ.U	User determined OAQ	0 to 5000		OAQ_USER	400	38,86
AQ.SR	AIR QUALITY SENSOR RANGE					
IQ.R.L	IAQ Low Reference	0 to 5000		IAQREFL	0	38,86
IQ.R.H	IAQ High Reference	0 to 5000		IAQREFH	2000	38,86
OQ.R.L	OAQ Low Reference	0 to 5000		OAQREFL	0	86
OQ.R.H	OAQ High Reference	0 to 5000		OAQREFH	2000	86
IAQ.P	IAQ PRE-OCCUPIED PURGE					
IQ.PG	IAQ Purge	No/Yes		IAQPURGE	No	86
IQ.P.T	IAQ Purge Duration	5 to 60	Minutes	IAQPTIME	15	86
IQ.P.L	IAQ Purge LoTemp Min Pos	0 to 100	%	IAQPLTMP	10	86
IQ.P.H	IAQ Purge HiTemp Min Pos	0 to 100	%	IAQPHTMP	35	86
IQ.L.O	IAQ Purge OAT Lockout	35 to 70	dF	IAQPNTLO	50	86
HUMD	HUMIDITY CONFIGURATION					
HM.CF	Humidifier Control Cfg.	0 to 4		HUMD_CFG	0	88
HM.SP	Humidifier Setpoint	0 to 100	%	HUSP	40	88
H.PID	HUMIDIFIER PID CONFIGS					
HM.TM	Humidifier PID Run Rate	10 to 120	Seconds	HUMDRATE	30	88
HM.P	Humidifier Prop. Gain	0 to 5		HUMID_PG	1	88
HM.I	Humidifier Integral Gain	0 to 5		HUMID_IG	0.3	88
HM.D	Humidifier Deriv. Gain	0 to 5		HUMID_DG	0.3	88
ACT.C	HUMIDIFIER ACTUATOR CFGS					
SN.1	Humd Serial Number 1	0 to 9999		HUMD_SN1	0	88,89
SN.2	Humd Serial Number 2	0 to 6		HUMD_SN2	0	88,89
SN.3	Humd Serial Number 3	0 to 9999		HUMD_SN3	0	88,89
SN.4	Humd Serial Number 4	0 to 254		HUMD_SN4	0	88,89
C.A.LM	Humd Ctrl Angle Lo Limit	0 to 90		HUMDCALM	85	88,89
DEHU	DEHUMIDIFICATION CONFIG.					
D.SEL	Dehumidification Config	0 to 5		DHSELECT	0	89,91
D.SEN	Dehumidification Sensor	1 to 3		DHSENSOR	1	42,89,91
D.EC.D	Econ disable in DH mode?	No/Yes		DHECDISA	Yes	89,91
D.V.CF	Vent Reheat Setpt Select	0 to 1		DHVHTCFG	0	89,90,91
D.V.RA	Vent Reheat RAT offset	0 to 8	^F	DHVRAOFF	0	90,91
D.V.HT	Vent Reheat Setpoint	55 to 95	dF	DHVHT_SP	70	90,91
D.C.SP	Dehumidify Cool Setpoint	40 to 55	dF	DHCOOLSP	45	90,91
D.RH.S	Dehumidify RH Setpoint	10 to 90	%	DHRELHSP	55	90,91
DH.DB	Dehumidify RH Deadband	1 to 30	%	DHSENSDB	5	90,91
DH.TG	Dehum Discrete Timeguard	10 to 90	Seconds	DHDISCTG	30	90,91
HZ.RT	HumidiMizer Adjust Rate	5 to 120	Seconds	HMZRRATE	30	91
HZ.PG	HumidiMizer Prop. Gain	0 to 10		HMZR_PG	0.8	91
CCN	CCN CONFIGURATION					
CCN.A	CCN Address	1 to 239		CCNADD	1	93,95
CCN.B	CCN Bus Number	0 to 239		CCNBUS	0	93,95
BAUD	CCN Baud Rate	1 to 5		CCNBAUDD	3	93,95
BROD	CCN BROADCST DEFINITIONS					
TM.DT	CCN Time/Date Broadcast	Off/On		CCNBC	On	93,95
OAT.B	CCN OAT Broadcast	Off/On		OATBC	Off	94,95
ORH.B	CCN OARH Broadcast	Off/On		OARHBC	Off	94,95
OAQ.B	CCN OAQ Broadcast	Off/On		OAQBC	Off	94,95
GS.B	Global Schedule Broadcst	Off/On		GSBC	Off	94,95
B.ACK	CCN Broadcast Ack'er	Off/On		CCNBCACK	Off	94,95
SC.OV	CCN SCHEDULES-OVERRIDES					
SCH.N	Schedule Number	0 to 99		SCHEDNUM	1	27,94,95
HOL.T	Accept Global Holidays?	No/Yes		HOLIDAYT	No	94,95
OTL	Override Time Limit	0 to 4	Hours	OTL	1	94,95

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
CCN (cont)	CCN CONFIGURATION (cont)					
SC.OV (cont)	CCN SCHEDULES-OVERRIDES (cont)					
OV.EX	Override Time Limit	0 to 4	Hours	OVR_EXT	0	94,95
SPT.O	SPT Override Enabled ?	No/Yes		SPT_OVER	Yes	94,95
T58.O	T58 Override Enabled ?	No/Yes		T58_OVER	Yes	94,95
GL.OV	Global Sched. Override ?	No/Yes		GLBLOVER	No	94,95
ALLM	ALERT LIMIT CONFIG.					
SP.L.O	SPT lo alert limit/occ	-10 to 245	dF	SPLO	60	94,96,130
SP.H.O	SPT hi alert limit/occ	-10 to 245	dF	SPHO	85	94,96,130
SP.L.U	SPT lo alert limit/unocc	-10 to 245	dF	SPLU	45	94,96,130
SP.H.U	SPT hi alert limit/unocc	-10 to 245	dF	SPHU	100	94,96,130
SA.L.O	EDT lo alert limit/occ	-40 to 245	dF	SALO	40	95,96,130
SA.H.O	EDT hi alert limit/occ	-40 to 245	dF	SAHO	100	95,130
SA.L.U	EDT lo alert limit/unocc	-40 to 245	dF	SALU	40	95,130
SA.H.U	EDT hi alert limit/unocc	-40 to 245	dF	SAHU	100	95,130
RA.L.O	RAT lo alert limit/occ	-40 to 245	dF	RALO	60	95,130
RA.H.O	RAT hi alert limit/occ	-40 to 245	dF	RAHO	90	95,130
RA.L.U	RAT lo alert limit/unocc	-40 to 245	dF	RALU	40	95,130
RA.H.U	RAT hi alert limit/unocc	-40 to 245	dF	RAHU	100	95,130
OAT.L	OAT low alert limit	-40 to 245	dF	OATL	-40	95,131
OAT.H	OAT high alert limit	-40 to 245	dF	OATH	150	95,131
R.RH.L	RARH low alert limit	0 to 100	%	RRHL	0	95,130
R.RH.H	RARH high alert limit	0 to 100	%	RRHH	100	95,130
O.RH.L	OARH low alert limit	0 to 100	%	ORHL	0	95,96
O.RH.H	OARH high alert limit	0 to 100	%	ORHH	100	95,96
SP.L	SP low alert limit	0 to 5	"H20	SPL	0	95,96,130
SP.H	SP high alert limit	0 to 5	"H20	SPH	2	95,96,130
BP.L	BP low alert limit	-0.25 to 0.25	"H20	BPL	-0.25	96,130
BP.H	BP high alert limit	-0.25 to 0.25	"H20	BPH	0.25	95,96,130
IAQ.H	IAQ high alert limit	0 to 5000		IAQH	1200	96,131
TRIM	SENSOR TRIM CONFIG.					
SAT.T	Air Temp Lvg SF Trim	-10 to 10	^F	SAT_TRIM	0	96,97
RAT.T	RAT Trim	-10 to 10	^F	RAT_TRIM	0	96,97
OAT.T	OAT Trim	-10 to 10	^F	OAT_TRIM	0	96,97
SPT.T	SPT Trim	-10 to 10	^F	SPT_TRIM	0	96,97
L.SW.T	Limit Switch Trim	-10 to 10	^F	LSW_TRIM	0	96,97
CCT.T	Air Tmp Lvg Evap Trim	-10 to 10	^F	CCT_TRIM	0	96,97
DTA.1	A1 Discharge Temp Trim	-10 to 10	^F	DTA1TRIM	0	96,97
SP.A.T	Suct.Press.Circ.A Trim	-50 to 50	^F	SPA_TRIM	0	96,97
SP.B.T	Suct.Press.Circ.B Trim	-50 to 50	PSIG	SPB_TRIM	0	96,97
DP.A.T	Dis.Press.Circ.A Trim	-50 to 50	PSIG	DPA_TRIM	0	96,97
DP.B.T	Dis.Press.Circ.B Trim	-50 to 50	PSIG	DPB_TRIM	0	96,97
LP.A.T	Lqd.Press.Circ.A Trim	-50 to 50	PSIG	LPA_TRIM	0	96,97
LP.B.T	Lqd.Press.Circ.B Trim	-50 to 50	PSIG	LPB_TRIM	0	96,97
SW.LG	SWITCH LOGIC:NO / NC					
PWS.L	Power Fault Input - Good	Open/Close		PWRFLOGC	Close	98
MFT.L	Filter Status Inpt-Clean	Open/Close		FLTSLOGC	Open	96,98
PFT.L	Post Filter Stat. In-Cln	Open/Close		PFLTSLGC	Open	98
IGC.L	IGC Feedback - Off	Open/Close		GASFANLG	Open	98
RMI.L	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG	Open	37,98,100
ENT.L	Enthalpy Input - Low	Open/Close		ENTHLOGC	Close	98
SFS.L	Fan Status Sw. - Off	Open/Close		SFSLOGIC	Open	98
DL1.L	Dmd.Lmt.Sw.1 - Off	Open/Close		DMD_SW1L	Open	37,98
DL2.L	Dmd.Lmt.Sw.2 - Off	Open/Close		DMD_SW2L	Open	37,98
IAQ.L	IAQ Disc.Input - Low	Open/Close		IAQINLOG	Open	37,98
FSD.L	Fire Shutdown - Off	Open/Close		FSDLOGIC	Open	37,98
PRS.L	Press. Switch - Off	Open/Close		PRESLOGC	Open	98
EVC.L	Evacuation Sw. - Off	Open/Close		EVACLOGC	Open	98
PRG.L	Smoke Purge Sw. - Off	Open/Close		PURGLOGC	Open	98
DH.LG	Dehumidify Sw. - Off	Open/Close		DHDISCLG	Open	98
SFB.L	SF Bypass Sw. - Off	Open/Close		SFBYLOGC	Open	98
PEB.L	PE Bypass Sw. - Off	Open/Close		PEBYLOGC	Open	98
DISP	DISPLAY CONFIGURATION					
TEST	Test Display LEDs	Off/On		DISPTEST	Off	98,99
METR	Metric Display	Off/On		DISPUNIT	Off	98,99
LANG	Language Selection	0 to 0		LANGUAGE	0	98,99
PAS.E	Password Enable	Disable/Enable		PASS_EBL	Enable	98,99

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	DEFAULT	PAGE NO.
ALLM (cont)	ALERT LIMIT CONFIG. (cont)					
DISP (cont)	DISPLAY CONFIGURATION (cont)					
PASS	Service Password	0000 to 9999		PASSWORD	1111	99
S.VFD	SUPPLY FAN VFD CONFIG					
N.VLT	VFD1 Nominal Motor Volts	0 to 999	Voltage	VFD1NVLT	460*	99
N.AMP	VFD1 Nominal Motor Amps	0 to 999	AMPS	VFD1NAMP	55.0*	99
N.FRQ	VFD1 Nominal Motor Freq	10 to 500		VFD1NFRQ	60	99
N.RPM	VFD1 Nominal Motor RPM	50 to 30000		VFD1NRPM	1750	99
N.PWR	VFD1 Nominal Motor HPwr	0 to 500		VFD1NPWR	40*	99
M.DIR	VFD1 Motor Direction	0 to 1		VFD1MDIR	0	99
ACCL	VFD1 Acceleration Time	0 to 1800	Seconds	VFD1ACCL	30	99
DECL	VFD1 Deceleration Time	0 to 1800	Seconds	VFD1DECL	30	99
SW.FQ	VFD1 Switching Frequency	0 to 3		VFD1SWFQ	2	99
E.VFD	EXHAUST FAN VFD CONFIG					
N.VLT	VFD2 Nominal Motor Volts	0 to 999	Voltage	VFD2NVLT	460*	98,99
N.AMP	VFD2 Nominal Motor Amps	0 to 999	AMPS	VFD2NAMP	28.7*	98,99
N.FRQ	VFD2 Nominal Motor Freq	10 to 500		VFD2NFRQ	60	99
N.RPM	VFD2 Nominal Motor RPM	50 to 30000		VFD2NRPM	1750	99
N.PWR	VFD2 Nominal Motor HPwr	0 to 500		VFD2NPWR	20*	99
M.DIR	VFD2 Motor Direction	0 to 1		VFD2MDIR	0	99
ACCL	VFD2 Acceleration Time	0 to 1800	Seconds	VFD2ACCL	30	99
DECL	VFD2 Deceleration Time	0 to 1800	Seconds	VFD2DECL	30	99
SW.FQ	VFD2 Switching Frequency	0 to 3		VFD2SWFQ	2	99
FLTC	FILTER CONFIGURATION					
FS.FT	Filter Stat. Fault Timer	0 to 10	Minutes	FS_FT	2	72,73
F.NOT	Filter Notification Cut	20 to 50		FS_NOTIF	25	
F.ALT	Filter Alert Cutoff	0 to 20		FS_ALERT	10	
MFL.S	Main Filter Status Cfg.	0 to 5		FLTS_ENA	0	42,73
MF.TY	Main Filter Type	0 to 9		MF_TY	0	72
MF.FR	Main Filter Final Resis.	0 to 10		MF_FR	1	72
MF.LT	Main Filter Life	0 to 60		MF_LT	12	72
MF.RM	Main Filter Reminder	0 to 60		MF_RM	10	72
MF.RS	Reset Main Filter Sched.	No/Yes		MF_RS	No	72
MF.ST	Main Filter Status	0 to 100	%	MF_STAT	0	
MFT.R	Reset MFT Table Entries?	No/Yes		MFTRESET	No	73
PFL.S	Post Filter Status Cfg.	0 to 5		PFLS_ENA	0	42,73
PF.TY	Post Filter Type	0 to 6		PF_TY	0	73
PF.FR	Post Filter Final Resis.	0 to 10		PF_FR	1	73
PF.LT	Post Filter Life	0 to 60		PF_LT	12	73
PF.RM	Post Filter Reminder	0 to 60		PF_RM	10	73
PF.RS	Reset Post Filter Sched.	No/Yes		PF_RS	No	73
PF.ST	Post Filter Status	0 to 100	%	PF_STAT	0	
PFT.R	Reset PFT Table Entries?	No/Yes		PFTRESET	No	73
PROG	PROGNOSTICS CONFIG.					
LQ.SN	Liquid Sensors Installed	No/Yes		LQ_SENS	No	
P.SPE	Prognostics SP Enable	Disable/Enable		PG_SP_EN	Disable	
PG.SP	Prognostics SP Deadband	0 to 5	"H20	PG_SP_DB	0.25	131
P.BPE	Prognostics BP Enable	Disable/Enable		PG_BP_EN	Disable	
PG.BP	Prognostics BP Deadband	0 to 1	"H20	PG_BP_DB	0.05	
AC.DB	EXV Superheat Deadband	0 to 2	^F	AC_SH_DB	2	126
AC.SP	Auto-Comp Suct.Pres Drop	0 to 10	^F	AC_SP_DR	3	126
AC.DS	Auto-Comp DS SP Drop	0 to 10	^F	AC_DS_SP	2.5	
ML.DR	MLV/HGBP DP Drop	0 to 2	^F	AC_MLVDR	5	
AC.CL	Low Charge Alert Cutoff	-10 to 0	^F	AC_CH_LO	-3	127
AC.CH	High Charge Alert Cutoff	0 to 10	^F	AC_CH_HI	1	127
AC.MS	Min Charge SST	20 to 100	^F	AC_SST_M	40	
AC.EC	Economizer Deadband Temp	0 to 10		AC_EC_DB	5.0	

* 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 — TIMECLOCK

ITEM	EXPANSION	RANGE	UNITS	CNN POINT	DEFAULTS	PAGE NO.
TIME	TIME OF DAY					
HH.MM	Hour and Minute	00:00 to 23:59		TIME		101
DATE	MONTH,DATE,DAY AND YEAR					
MNTH	Month of Year	multi text string		MOY		101
DOM	Day of Month	1 to 31		DOM		101
DAY	Day of Week	multi text string		DOWDISP		101
YEAR	Year	e.g. 2013		YOCDISP		101
SCH.L	LOCAL TIME SCHEDULE					
PER.1	PERIOD 1					27,29,101
DAYS	DAY FLAGS FOR PERIOD 1				Period 1 only	29,101
MON	Monday in Period	No/Yes		PER1MON	Yes	29,101
TUE	Tuesday in Period	No/Yes		PER1TUE	Yes	101
WED	Wednesday in Period	No/Yes		PER1WED	Yes	101
THU	Thursday in Period	No/Yes		PER1THU	Yes	101
FRI	Friday in Period	No/Yes		PER1FRI	Yes	101
SAT	Saturday in Period	No/Yes		PER1SAT	Yes	101
SUN	Sunday in Period	No/Yes		PER1SUN	Yes	101
HOL	Holiday in Period	No/Yes		PER1HOL	Yes	101
OCC	Occupied from	0 to 6144		PER1_OCC	00:00	101
UNC	Occupied to	0 to 6144		PER1_UNC	24:00	29,101
Repeated for periods 2 to 8						29,101
HOL.L	LOCAL HOLIDAY SCHEDULES					
HD.01	HOLIDAY SCHEDULE 01					101
MON	Holiday Start Month	0 to 12		HOL_MON1		101
DAY	Holiday Start Day	0 to 31		HOL_DAY1		101
LEN	Holiday Duration (Days)	0 to 99		HOL_LEN1		101
Repeated for holidays 2 to 30						101
DAY.S	DAYLIGHT SAVINGS TIME					
DS.ST	DAYLIGHT SAVINGS START					101
ST.MN	Month	1 to 12		STARTM	3	101
ST.WK	Week	1 to 5		STARTW	2	101
ST.DY	Day	1 to 7		STARTD	7	101
MIN.A	Minutes to Add	0 to 90		MINADD	60	101
DS.SP	DAYLIGHTS SAVINGS STOP					
SP.MN	Month	1 to 12		STOPM	11	101,102
SP.WK	Week	1 to 5		STOPW	1	101,102
SP.DY	Day	1 to 7		STOPD	7	101,102
MIN.S	Minutes to Subtract	0 to 90		MINSUB	60	101,102

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	Off/On		MODEOCCP
T.OVR	Timed Override in Effect	Off/On		MODETOVR
DCV	DCV Resetting Min Pos	Off/On		MODEADCV
SA.R	Supply Air Reset	Off/On		MODESARS
DMD.L	Demand Limit in Effect	Off/On		MODEDMLT
T.C.ST	Temp.Compensated Start	Off/On		MODETCST
IAQ.P	IAQ Pre-Occ Purge Active	Off/On		MODEIQPG
LINK	Linkage Active - CCN	Off/On		MODELINK
LOCK	Mech.Cooling Locked Out	Off/On		MODELOCK
H.NUM	HVAC Mode Numerical Form	0 to 40		MODEHVAC

MODE — ALARMS

ITEM	EXPANSION	RANGE	UNITS	CCN POINT	WRITE STATUS
CURR	CURRENTLY ACTIVE ALARMS				
	this is a dynamic list of active alarms				
R.CUR	Reset All Current Alarms	No/Yes		ALRESET	ram config
HIST	ALARM HISTORY				
	this is a record of the last 20 alarms				

APPENDIX B — CCN TABLES

All N 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 *Comfort*Link Navigator™ display 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..............:	16-char ASCII			
	Control Mode...........:	16-char ASCII			
	Current Running Capacity		%	CAPTOTAL	
	Total Capacity Needed		%	COOLCALC	
	Current Cool Stage			COOL_STG	
	Requested Cool Stage			CL_STAGE	
	Maximum Cool Stage			CLMAXSTG	
	Cooling Control Point		degF	COOLCPNT	
	Evaporator Discharge Tmp		degF	EDT	
	Mixed Air Temperature		degF	MAT	
	Next capacity step down		%	CAPNXTDN	
	Next capacity step up		%	CAPNXTUP	
COOL_A					
	Current Cool Stage			COOL_STG	
	Cir A Discharge Pressure		PSIG	DP_A	
	Cir A Suction Pressure		PSIG	SP_A	
	Cir A Liquid Pressure		PSIG	LP_A	
	Cir A Sat.Condensing Tmp		degF	SCTA	
	Cir A Sat.Suction Temp.		degF	SSTA	
	Cir A Sat. Liquid Temp.		degF	SLTA	
	Cir A Liquid Temperature		degF	LT_A	
	Cir A Subcooling Temp.		deltaF	SC_A	
	A1 Discharge Temperature		degF	DTA1	forcible
	Suction Gas Temp Circ A		degF	RGTA	forcible
	Compressor A1 Relay	Off/On		CMPA1	
	Compressor A2 Relay	Off/On		CMPA2	
	Compressor A3 Relay	Off/On		CMPA3	
	Compressor A4 Relay	Off/On		CMPA4	
	Compressor A1 Feedback	Off/On		CSB_A1	
	Compressor A2 Feedback	Off/On		CSB_A2	
	Compressor A3 Feedback	Off/On		CSB_A3	
	Compressor A4 Feedback	Off/On		CSB_A4	
	Circ A High Press.Switch	Low/High		CIRCAHPS	forcible
	Cir A EXV1 Suction Temp.		degF	CASTEXV1	
	Cir A EXV1 Superheat Tmp		deltaF	SH_A1	
	Circuit A EXV 1 Position		%	XV1APOSP	
	Cir A EXV2 Suction Temp.		degF	CASTEXV2	
	Cir A EXV2 Superheat Tmp		deltaF	SH_A2	
	Circuit A EXV 2 Position		%	XV2APOSP	
COOL_B					
	Current Cool Stage			COOL_STG	
	Cir B Discharge Pressure		PSIG	DP_B	
	Cir B Suction Pressure		PSIG	SP_B	
	Cir B Liquid Pressure		PSIG	LP_B	
	Cir B Sat.Condensing Tmp		degF	SCTB	
	Cir B Sat.Suction Temp.		degF	SSTB	
	Cir B Sat. Liquid Temp.		degF	SLTB	
	Cir B Liquid Temperature		degF	LT_B	
	Cir B Subcooling Temp.		deltaF	SC_B	
	Compressor B1 Relay	Off/On		CMPB1	
	Compressor B2 Relay	Off/On		CMPB2	
	Compressor B3 Relay	Off/On		CMPB3	
	Compressor B4 Relay	Off/On		CMPB4	
	Compressor B1 Feedback	Off/On		CSB_B1	
	Compressor B2 Feedback	Off/On		CSB_B2	
	Compressor B3 Feedback	Off/On		CSB_B3	
	Compressor B4 Feedback	Off/On		CSB_B4	
	Circ B High Press.Switch	Low/High		CIRCBHPS	forcible
	Cir B EXV1 Suction Temp.		degF	CBSTEXV1	
	Cir B EXV1 Superheat Tmp		deltaF	SH_B1	
	Circuit B EXV 1 Position		%	XV1BPOSP	
	Cir B EXV2 Suction Temp.		degF	CBSTEXV2	
	Cir B EXV2 Superheat Tmp		deltaF	SH_B2	
	Circuit B EXV 2 Position		%	XV2BPOSP	

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
ECONDIAG					
	Economizer Active ?	No/Yes		ECACTIVE	
	Conditions which prevent economizer being active:				
	Econ1 Out Act Unvailabl?	No/Yes		ECONUNAV	
	Econ2 Ret Act Unvailabl?	No/Yes		ECN2UNAV	
	Econ3 Out Act Unvailabl?	No/Yes		ECN3UNAV	
	Enth. Switch Read High ?	No/Yes		ENTH	forcible
	DBC - OAT lockout?	No/Yes		DBC_STAT	
	DEW - OA Dewpt.lockout?	No/Yes		DEW_STAT	
	DDBC- OAT > RAT lockout?	No/Yes		DDBCSTAT	
	OAEC- OA Enth Lockout?	No/Yes		OAECSTAT	
	DEC - Diff.Enth.Lockout?	No/Yes		DEC_STAT	
	EDT Sensor Bad ?	No/Yes		EDT_STAT	
	OAT Sensor Bad ?	No/Yes		OAT_STAT	
	Economizer forced ?	No/Yes		ECONFORC	
	Supply Fan not on 30s ?	No/Yes		SFONSTAT	
	Cool Mode not in effect?	No/Yes		COOL_OFF	
	OAQ lockout in effect ?	No/Yes		OAQLOCKD	
	Econ recovery hold off?	No/Yes		ECONHELD	
	Dehumid. disabled Econ.?	No/Yes		DHDISABL	
ECONOMZR					
	Econ 1 Out Act.Curr.Pos.		%	ECONOPOS	
	Econ 2 Ret Act.Curr.Pos.		%	ECON2POS	
	Econ 3 Out Act.Curr.Pos.		%	ECON3POS	
	Econ 1 Out Act.Cmd.Pos.		%	ECONOCMD	forcible
	Economizer Active ?	No/Yes		ECACTIVE	
	Economizer Control Point		degF	ECONCPNT	
	Outside Air Temperature		degF	OAT	forcible
	Evaporator Discharge Tmp		degF	EDT	
	Controlling Return Temp		degF	RETURN_T	forcible
	Econo Current Min. Pos.		%	ECMINPOS	forcible
	Econo Current Min. CFM		CFM	ECMINCFM	
	Outside Air CFM		CFM	OACFM	
GENERAL					
	Occupied ?	No/Yes		OCCUPIED	forcible
	Static Pressure		in H2O	SP	forcible
	Building Pressure		in H2O	BP	forcible
	Outside Air CFM		CFM	OACFM	
	Return Air CFM		CFM	RACFM	
	Exhaust Air CFM		CFM	EACFM	
	Supply Air CFM		CFM	SACFM	
	Mixed Air Rel.Humidity		%	MARH	forcible
	Outside Air Rel.Humidity		%	OARH	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Space Relative Humidity		%	SPRH	forcible
	Space Temperature Offset		deltaF	SPTO	forcible
	Supply Air Setpnt. Reset		deltaF	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
	Main Filter Delta Press		in H2O	MF_DP	forcible
	Main Filter Status		%	MF_STAT	forcible
	Post Filter Delta Press		in H2O	PF_DP	forcible
	Post Filter Status		%	PF_STAT	forcible
GENERIC					
	20 points dependent upon the configuration of the "generics" table. See “GENERIC STATUS DISPLAY TABLE” on page 5.				
HEATING					
	HVAC Mode..............:	16-char ASCII			
	Control Mode...........:	16-char ASCII			
	Heat Control Type......:	16-char ASCII			
	Re-Heat Control Type...:	16-char ASCII			
	Heating Mode...........:	12-char ASCII			
	Requested Heat Stage			HT_STAGE	
	Ht.Coil Act.Current Pos.		%	HTCLRPOS	
	Heating Control Point		degF	HEATCPNT	
	Heat Relay 1	Off/On		HS1	
	Modulating Heat Capacity		%	HTMG_CAP	
	Heat Relay 2	Off/On		HS2	
	Relay 3 W1 Gas Valve 2	Off/On		HS3	
	Relay 4 W2 Gas Valve 2	Off/On		HS4	

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
HEATING (cont)	Relay 5 W1 Gas Valve 3	Off/On		HS5	
	Relay 6 W2 Gas Valve 3	Off/On		HS6	
	Relay 7 W1 Gas Valve 4	Off/On		HS7	
	Relay 8 W2 Gas Valve 4	Off/On		HS8	
	Relay 9 W1 Gas Valve 5	Off/On		HS9	
	Relay 10 W2 Gas Valve 5	Off/On		HS10	
	Heat Interlock Relay	Off/On		HIR	forcible
HMZR					
	HVAC Mode.............:	16-char ASCII			
	HumidiMizer Capacity		%	HMZRCAPC	
	Condenser EXV Position		%	COND_EXV	
	Bypass EXV Position		%	BYP_EXV	
	HumidiMizer 3-way Valve	Off/On		HUM3WVAL	
	Cooling Control Point		degF	COOLCPNT	
	Evaporator Discharge Tmp		degF	EDT	
	Heating Control Point		degF	HEATCPNT	
	Leaving Air Temperature		degF	LAT	
MODEDISP					
	System Mode...........:	24-char ASCII			
	HVAC Mode.............:	16-char ASCII			
	Control Mode..........:	16-char ASCII			
	Currently Occupied	Off/On		MODEOCCP	
	Timed Override in effect	Off/On		MODETOVR	
	DCV resetting min pos	Off/On		MODEADCV	
	Supply Air Reset	Off/On		MODESARS	
	Demand Limit in Effect	Off/On		MODEDMLT	
	Temp.Compensated Start	Off/On		MODETCST	
	IAQ pre-occ purge active	Off/On		MODEIQPG	
	Linkage Active - CCN	Off/On		MODELINK	
	Mech.Cooling Locked Out	Off/On		MODELOCK	
	HVAC Mode Numerical Form			MODEHVAC	
MODETRIP					
	Unoccup. Cool Mode Start		degF	UCCLSTRT	
	Unoccup. Cool Mode End		degF	UCCL_END	
	Occupied Cool Mode Start		degF	OCCLSTRT	
	Occupied Cool Mode End		degF	OCCL_END	
	Ctl.Temp RAT,SPT or ZONE		degF	CTRLTEMP	
	Occupied Heat Mode End		degF	OCHT_END	
	Occupied Heat Mode Start		degF	OCHTSTRT	
	Unoccup. Heat Mode End		degF	UCHT_END	
	Unoccup. Heat Mode Start		degF	UCHTSTRT	
	HVAC Mode.............:	16-char ASCII			
	Unoccup. Cool Mode Start		degF	UCCLSTRT	
TEMPCTRL					
	Evaporator Discharge Tmp		degF	EDT	
	Leaving Air Temperature		degF	LAT	
	Mixed Air Temperature		degF	MAT	
	Controlling Return Temp		degF	RETURN_T	forcible
	Controlling Space Temp		degF	SPACE_T	forcible
TEMPS					
	Air Temp Lvg Supply Fan		degF	SAT	
	Return Air Temperature		degF	RAT	forcible
	Outside Air Temperature		degF	OAT	forcible
	Space Temperature		degF	SPT	forcible
	Space Temperature Offset		deltaF	SPTO	forcible
	Staged Heat LAT Sum		degF	LAT_SGAS	
	Staged Heat LAT 1		degF	LAT1SGAS	
	Staged Heat LAT 2		degF	LAT2SGAS	
	Staged Heat LAT 3		degF	LAT3SGAS	
	Staged Gas Limit Sw.Temp		degF	LIMSWTMP	
	Air Temp Lvg Evap Coil		degF	CCT	forcible
	Cir A Sat.Condensing Tmp		degF	SCTA	
	Cir B Sat.Condensing Tmp		degF	SCTB	
	Cir A Sat.Suction Temp.		degF	SSTA	
	Cir B Sat.Suction Temp.		degF	SSTB	
	Cir A EXV1 Suction Temp.		degF	CASTEXV1	
	Cir A EXV2 Suction Temp.		degF	CASTEXV2	
	Cir B EXV1 Suction Temp.		degF	CBSTEXV1	
	Cir B EXV2 Suction Temp.		degF	CBSTEXV2	
	Cir A EXV1 Superheat Tmp		deltaF	SH_A1	
	Cir A EXV2 Superheat Tmp		deltaF	SH_A2	
	Cir B EXV1 Superheat Tmp		deltaF	SH_B1	
	Cir B EXV2 Superheat Tmp		deltaF	SH_B2	
	Cir A Subcooling Temp.		deltaF	SC_A	
	Cir B Subcooling Temp.		deltaF	SC_B	

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
TSTAT					
	Control Mode...........:	16-char ASCII			
	Thermostat Y1 Input	Off/On		Y1	forcible
	Thermostat Y2 Input	Off/On		Y2	forcible
	Thermostat W1 Input	Off/On		W1	forcible
	Thermostat W2 Input	Off/On		W2	forcible
	Thermostat G Input	Off/On		G	forcible
UINPUTS					
	Power Fault Input	Normal/Alarm		PWRFAULT	forcible
	Main Filter Status Input	Clean/Dirty		FLTS	forcible
	Post Filter Status Input	Clean/Dirty		PFLTS	forcible
	Fan request from IGC	Off/On		IGCFAN	
	Fire Shutdown Input	Normal/Alarm		FSD	forcible
	Thermostat G Input	Off/On		G	forcible
	Thermostat W2 Input	Off/On		W2	forcible
	Thermostat W1 Input	Off/On		W1	forcible
	Thermostat Y2 Input	Off/On		Y2	forcible
	Thermostat Y1 Input	Off/On		Y1	forcible
	Remote Input State	Off/On		RMTIN	forcible
	Enth. Switch Read High ?	No/Yes		ENTH	forcible
	Supply Fan Status Switch	Off/On		SFS	forcible
	Circ A High Press.Switch	Low/High		CIRCAHPS	forcible
	Circ B High Press.Switch	Low/High		CIRCBHPS	forcible
	Freeze Status Switch	Normal/Alarm		FRZ	forcible
	Plenum Press.Safety Sw.	Low/High		PPS	forcible
	Demand Limit Switch 1	Off/On		DMD_SW1	forcible
	Demand Limit Switch 2	Off/On		DMD_SW2	forcible
	Pressurization Input	Normal/Alarm		PRES	forcible
	Evacuation Input	Normal/Alarm		EVAC	forcible
	Smoke Purge Input	Normal/Alarm		PURG	forcible
	IAQ - Discrete Input	Low/High		IAQIN	forcible
	Dehumidify Switch Input	Off/On		DHDISCIN	forcible
	Air Press.Safety Switch	Low/High		APS	forcible
	Supply Fan Bypass Input	Off/On		SFBYIN	forcible
	Power Exh. Bypass Input	Off/On		PEBYIN	forcible
UOUTPUT1					
	FANS				
	Supply Fan Bypass Relay	Off/On		SFBYRLY	
	Supply Fan Commanded %		%	SFAN_VFD	
	Supply Fan Request	No/Yes		SFANFORC	forcible
	Exhaust Fan Commanded %		%	EFAN_VFD	
	Power Exhaust Bypass Rly	Off/On		PEBYRLY	
	MtrMaster A Commanded %		%	MM_A_VFD	
	MtrMaster B Commanded %		%	MM_B_VFD	
	Condenser Fan Output 1	Off/On		CONDFAN1	
	Condenser Fan Output 2	Off/On		CONDFAN2	
	Condenser Fan Output 3	Off/On		CONDFAN3	
	Condenser Fan Output 4	Off/On		CONDFAN4	
	Condenser Fan Output 5	Off/On		CONDFAN5	
	COOLING				
	Compressor A1 Relay	Off/On		CMPA1	
	Compressor A2 Relay	Off/On		CMPA2	
	Compressor A3 Relay	Off/On		CMPA3	
	Compressor A4 Relay	Off/On		CMPA4	
	Compressor B1 Relay	Off/On		CMPB1	
	Compressor B2 Relay	Off/On		CMPB2	
	Compressor B3 Relay	Off/On		CMPB3	
	Compressor B4 Relay	Off/On		CMPB4	
	Compressor A1 Capacity		%	CMPA1CAP	
	Minimum Load Valve Relay	Off/On		MLV	
	HumidiMizer 3-way Valve	Off/On		HUM3WVAL	
	Condenser EXV Position		%	COND_EXV	
	Bypass EXV Position		%	BYP_EXV	
	Circuit A EXV 1 Position		%	XV1APOSP	
	Circuit A EXV 2 Position		%	XV2APOSP	
	Circuit B EXV 1 Position		%	XV1BPOSP	
	Circuit B EXV 2 Position		%	XV2BPOSP	

APPENDIX B — CCN TABLES (CONT)

STATUS DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
UOUTPUT2					
	HEATING				
	Heat Relay 1	Off/On		HS1	
	Modulating Heat Capacity		%	HTMG_CAP	
	Heat Relay 2	Off/On		HS2	
	Relay 3 W1 Gas Valve 2	Off/On		HS3	
	Relay 4 W2 Gas Valve 2	Off/On		HS4	
	Relay 5 W1 Gas Valve 3	Off/On		HS5	
	Relay 6 W2 Gas Valve 3	Off/On		HS6	
	Relay 7 W1 Gas Valve 4	Off/On		HS7	
	Relay 8 W2 Gas Valve 4	Off/On		HS8	
	Relay 9 W1 Gas Valve 5	Off/On		HS9	
	Relay 10 W2 Gas Valve 5	Off/On		HS10	
	Heat Interlock Relay	Off/On		HIR	forcible
	Heat Reclaim Relay	Off/On		HTRCLRLY	
	ACTUATORS				
	Econ 1 Out Act Curr Pos		%	ECONRPOS	
	Econ 1 Out Cmd Position		%	ECONCPOS	forcible
	Econ 2 Ret Act Curr Pos		%	ECN2RPOS	
	Econ 2 Ret Cmd Position		%	ECN2CPOS	forcible
	Humidifier Act.Curr.Pos.		%	HUMDRPOS	
	Humidifier Command Pos.		%	HUMDCPOS	
	Ht.Coil Act.Current Pos.		%	HTCLRPOS	
	Ht.Coil Command Position		%	HTCLCPOS	
	Econ 3 Out Act.Curr.Pos.		%	ECN3RPOS	
	Econ 3 Out Cmd Position		%	ECN3CPOS	forcible
	GENERAL OUTPUTS				
	Humidifier Relay	Off/On		HUMIDRLY	
	Remote Alarm/Aux Relay	Off/On		ALRM	forcible
VFD_DATA					
	VFD1 Status Word 1			VFD1STAT	
	VFD1 Actual Speed %		%	VFD1_SPD	
	VFD1 Actual Motor RPM			VFD1RPM	
	VFD1 Actual Motor Freq			VFD1FREQ	
	VFD1 Actual Motor Amps		amps	VFD1AMPS	
	VFD1 Actual Motor Torque		%	VFD1TORQ	
	VFD1 Actual Motor Power		kW	VFD1PWR	
	VFD1 DC Bus Voltage		volts	VFD1VDC	
	VFD1 Output Voltage		volts	VFD1VOUT	
	VFD1 Transistor Temp (C)			VFD1TEMP	
	VFD1 Cumulative Run Time		hours	VFD1RUNT	
	VFD1 Cumulative kWh			VFD1KWH	
	VFD1 Last Fault Code			VFD1LFC	
	VFD1 DI1 State	Open/Close		VFD1_DI1	forcible
	VFD1 DI2 State	Open/Close		VFD1_DI2	forcible
	VFD1 DI3 State	Open/Close		VFD1_DI3	forcible
	VFD1 DI4 State	Open/Close		VFD1_DI4	forcible
	VFD1 DI5 State	Open/Close		VFD1_DI5	forcible
	VFD1 DI6 State	Open/Close		VFD1_DI6	forcible
	VFD1 AI1 (% of range)		%	VFD1_AI1	forcible
	VFD1 AI2 (% of range)		%	VFD1_AI2	forcible
	VFD2 Status Word 1			VFD2STAT	
	VFD2 Actual Speed		%	VFD2_SPD	
	VFD2 Actual Motor RPM			VFD2RPM	
	VFD2 Actual Motor Freq			VFD2FREQ	
	VFD2 Actual Motor Amps		amps	VFD2AMPS	
	VFD2 Actual Motor Torque		%	VFD2TORQ	
	VFD2 Actual Motor Power		kW	VFD2PWR	
	VFD2 DC Bus Voltage		volts	VFD2VDC	
	VFD2 Output Voltage		volts	VFD2VOUT	
	VFD2 Transistor Temp (C)			VFD2TEMP	
	VFD2 Cumulative Run Time		hours	VFD2RUNT	
	VFD2 Cumulative kWh			VFD2KWH	
	VFD2 Last Fault Code			VFD2LFC	
	VFD2 DI1 State	Open/Close		VFD2_DI1	forcible
	VFD2 DI2 State	Open/Close		VFD2_DI2	forcible
	VFD2 DI3 State	Open/Close		VFD2_DI3	forcible
	VFD2 DI4 State	Open/Close		VFD2_DI4	forcible
	VFD2 DI5 State	Open/Close		VFD2_DI5	forcible
	VFD2 DI6 State	Open/Close		VFD2_DI6	forcible
	VFD2 AI1 (% of range)		%	VFD2_AI1	forcible
	VFD2 AI2 (% of range)		%	VFD2_AI2	forcible

SET POINT TABLE

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
SET_PNT					
	Occupied Heat Setpoint		degF	OHSP	68
	Occupied Cool Setpoint		degF	OCSP	75
	Unoccupied Heat Setpoint		degF	UHSP	55
	Unoccupied Cool Setpoint		degF	UCSP	90
	Heat-Cool Setpoint Gap		deltaF	HCSP_GAP	5
	VAV Occ. Cool On Delta		deltaF	VAVOCON	3.5
	VAV Occ. Cool Off Delta		deltaF	VAVOCOFF	2
	Supply Air Setpoint		degF	SASP	55
	Supply Air Setpoint Hi		degF	SASP_HI	55
	Supply Air Setpoint Lo		degF	SASP_LO	60
	Heating Supply Air Setpt		degF	SASPHEAT	85
	Tempering Purge SASP		degF	TEMPPURG	50
	Tempering in Cool SASP		deltaF	TEMPCOOL	5
	Tempering Vent Occ SASP		degF	TEMPVOCC	65
	Temper Vent Unocc. SASP		degF	TEMPVUNC	50

CONFIG TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
BRODEFS					
	CCN Time/Date Broadcast	Off/On		CCNBC	Off
	CCN OAT Broadcast	Off/On		OATBC	Off
	CCN OARH Broadcast	Off/On		OARHBC	Off
	CCN OAQ Broadcast	Off/On		OAQBC	Off
	Global Schedule Broadcst	Off/On		GSBC	Off
	CCN Broadcast Ack'er	Off/On		CCNBCACK	Off
	Daylight Savings Start:				
	Month			STARTM	3
	Week			STARTW	2
	Day			STARTD	7
	Minutes to Add			MINADD	60
	Daylight Savings Stop:				
	Month			STOPM	11
	Week			STOPW	1
	Day			STOPD	7
	Minutes to Subtract			MINSUB	60
SCHEDOVR					
	Schedule Number			SCHEDNUM	0
	Accept Global Holidays?	No/Yes		HOLIDAYT	No
	Override Time Limit		hours	OTL	1
	Timed Override Hours		hours	OVR_EXT	0
	Accepting an Override:				
	SPT Override Enabled ?	No/Yes		SPT_OVER	Yes
	T58 Override Enabled ?	No/Yes		T58_OVER	Yes
	Allowed to Broadcast a				
	Global Sched. Override ?	No/Yes		GLBLOVER	No
	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

APPENDIX B — CCN TABLES (CONT)

SERVICE-CONFIG TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
ACDT_CFG					
	EXV Superheat Deadband		deltaF	AC_SH_DB	2
	Auto-Comp Suct.Pres Drop		deltaF	AC_SP_DR	3
	Auto-Comp DS SP Drop		deltaF	AC_DS_SP	2.5
	MLV/HGBP DP Drop		deltaF	AC_MLVDR	5
	Low Charge Alert Cutoff		deltaF	AC_CH_LO	-3
	High Charge Alert Cutoff		deltaF	AC_CH_HI	1
	Min Charge SST		deltaF	AC_SST_M	40
ACTUATOR					
	Econ 1 Out Ser Number 1			ECN1_SN1	0
	Econ 1 Out Ser Number 2			ECN1_SN2	0
	Econ 1 Out Ser Number 3			ECN1_SN3	0
	Econ 1 Out Ser Number 4			ECN1_SN4	0
	Ecn1 Out Ctl Angl Lo Lmt			ECONCALM	85
	Econ 2 Ret Ser Number 1			ECN2_SN1	0
	Econ 2 Ret Ser Number 2			ECN2_SN2	0
	Econ 2 Ret Ser Number 3			ECN2_SN3	0
	Econ 2 Ret Ser Number 4			ECN2_SN4	0
	Ecn2 Ret Ctl Angl Lo Lmt			ECN2CALM	85
	Humd Serial Number 1			HUMD_SN1	0
	Humd Serial Number 2			HUMD_SN2	0
	Humd Serial Number 3			HUMD_SN3	0
	Humd Serial Number 4			HUMD_SN4	0
	Humd Ctrl Angle Lo Limit			HUMDCALM	85
	Hydronic Ht.Serial Num.1			HTCL_SN1	0
	Hydronic Ht.Serial Num.2			HTCL_SN2	0
	Hydronic Ht.Serial Num.3			HTCL_SN3	0
	Hydronic Ht.Serial Num.4			HTCL_SN4	0
	Hydr.Ht.Ctl.Ang Lo Limit			HTCLCALM	85
	Econ 3 Out Ser Number 1			ECN3_SN1	0
	Econ 3 Out Ser Number 2			ECN3_SN2	0
	Econ 3 Out Ser Number 3			ECN3_SN3	0
	Econ 3 Out Ser Number 4			ECN3_SN4	0
	Ecn3 Out Ctl Angl Lo Lmt			ECN3CALM	85
ALLM					
	SPT lo alert limit/occ		degF	SPLO	60
	SPT hi alert limit/occ		degF	SPHO	85
	SPT lo alert limit/unocc		degF	SPLU	45
	SPT hi alert limit/unocc		degF	SPHU	100
	EDT lo alert limit/occ		degF	SALO	40
	EDT hi alert limit/occ		degF	SAHO	100
	EDT lo alert limit/unocc		degF	SALU	40
	EDT hi alert limit/unocc		degF	SAHU	100
	RAT lo alert limit/occ		degF	RALO	60
	RAT hi alert limit/occ		degF	RAHO	90
	RAT lo alert limit/unocc		degF	RALU	40
	RAT hi alert limit/unocc		degF	RAHU	100
	OAT low alert limit		degF	OATL	-40
	OAT high alert limit		degF	OATH	150
	RARH low alert limit		%	RRHL	0
	RARH high alert limit		%	RRHH	100
	OARH low alert limit		%	ORHL	0
	OARH high alert limit		%	ORHH	100
	SP low alert limit		in H2O	SPL	0
	SP high alert limit		in H2O	SPH	2
	BP low alert limit		in H2O	BPL	-0.25
	BP high alert limit		in H2O	BPH	0.25
	IAQ high alert limit			IAQH	1200
BP__					
	Building Press. Config			BLDG_CFG	0
	Building Pressure Sensor	Disable/Enable		BPSENS	Enable
	Bldg. Press. (+/-) Range		in H2O	BP_RANGE	0.25
	Building Pressure Setp.		in H2O	BPSP	0.05
	BP Setpoint Offset		in H2O	BPSO	0.05
	VFD Fire Speed		%	BLDGPFSO	100
	VFD Minimum Speed		%	BLDGPMIN	10
	VFD Maximum Speed		%	BLDGPMAX	100

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
BP__ (cont)					
	Fan Track Learn Enable	No/Yes		DCFM_CFG	No
	Fan Track Learn Rate		mins	DCFMRATE	15
	Fan Track Initial DCFM		CFM	DCFMSTRT	2000
	Fan Track Max Clamp		CFM	DCFM_MAX	4000
	Fan Track Max Correction		CFM	DCFM_ADJ	1000
	Fan Track Internl EEPROM		CFM	DCFM_OFF	0
	Fan Track Internal RAM		CFM	DCFM_RAM	0
	Fan Track Reset Internal	No/Yes		DCFMRSET	No
	Supply Air CFM Config			SCFM_CFG	2
	Ret/Exh Air CFM Config			RECFMCFG	2
	Bldg.Pres.PID Run Rate		secs	BPIDRATE	10
	Bldg.Press. Prop. Gain			BLDGP_PG	0.5
	Bldg.Press. Integ. Gain			BLDGP_IG	0
	Bldg.Press. Deriv. Gain			BLDGP_DG	Enable
COOL					
	Enable Compressor A1	Disable/Enable		CMPA1ENA	Enable
	Enable Compressor A2	Disable/Enable		CMPA2ENA	Enable
	Enable Compressor A3	Disable/Enable		CMPA3ENA	Enable
	Enable Compressor A4	Disable/Enable		CMPA4ENA	Enable
	Enable Compressor B1	Disable/Enable		CMPB1ENA	Enable
	Enable Compressor B2	Disable/Enable		CMPB2ENA	Enable
	Enable Compressor B3	Disable/Enable		CMPB3ENA	Enable
	Enable Compressor B4	Disable/Enable		CMPB4ENA	Enable
	CSB A1 Feedback Alarm	Disable/Enable		CSB_A1EN	Enable
	CSB A2 Feedback Alarm	Disable/Enable		CSB_A2EN	Enable
	CSB A3 Feedback Alarm	Disable/Enable		CSB_A3EN	Enable
	CSB A4 Feedback Alarm	Disable/Enable		CSB_A4EN	Enable
	CSB B1 Feedback Alarm	Disable/Enable		CSB_B1EN	Enable
	CSB B2 Feedback Alarm	Disable/Enable		CSB_B2EN	Enable
	CSB B3 Feedback Alarm	Disable/Enable		CSB_B3EN	Enable
	CSB B4 Feedback Alarm	Disable/Enable		CSB_B4EN	Enable
	Capacity Threshold Adjst			Z_GAIN	1
	Compressor Lockout Temp		degF	OATLCOMP	40
	Lead/Lag Configuration			LEAD_LAG	0
	High Capacity Evaporator	No/Yes		HCAPEVAP	No
	High Efficiency OD Fans?	No/Yes		HIGH_EFF	No
	Motor Master Control ?	No/Yes		MOTRMAST	No
	MM Setpoint Offset		degF	MMSPOFST	-10
	Maximum Condenser Temp		degF	SCT_MAX	115
	Minimum Condenser Temp		degF	SCT_MIN	80
	A1 is a Digital Scroll	No/Yes		DIGCMPA1	No
	A1 Min Digital Capacity		%	MINCAPA1	50
	Dig Scroll Adjust Delta		%	DSADJPCT	100
	Dig Scroll Adjust Delay		secs	DSADJDLY	20
	Dig Scroll Reduce Delta		%	DSREDPCT	6
	Dig Scroll Reduce Delay		secs	DSREDDLY	30
	Dig Scroll Reduction OAT		degF	DSREDOAT	95
	Dig Scroll Max Only OAT		degF	DSMAXOAT	105
	Min Load Valve Enable	Disable/Enable		MLV_ENAB	Disable
	Hi SST Alert Delay Time		mins	HSSTTIME	10
	Rev Rotation Verified ?	No/Yes		REVR_VER	No
	Use CSBs for HPS detect?	No/Yes		CSBHPDET	Yes
DEHU					
	Dehumidification Config			DHSELECT	0
	Dehumidification Sensor			DHSENSOR	1
	Econ disable in DH mode?	No/Yes		DHECDISA	Yes
	Vent Reheat Setpt Select			DHVHTCFG	0
	Vent Reheat RAT offset		deltaF	DHVRAOFF	0
	Vent Reheat Setpoint		degF	DHVHT_SP	70
	Dehumidify Cool Setpoint		degF	DHCOOLSP	45
	Dehumidify RH Setpoint		%	DHRELHSP	55
	Dehumidify RH Deadband		%	DHSENSDB	5
	Dehum Discrete Timeguard		secs	DHDISCTG	30
	HumidiMizer Adjust Rate		secs	HMZRRATE	30
	HumidiMizer Prop. Gain			HMZR_PG	0.8
	Bypass EXV Max Open		%	BYP_MAX	40

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
DEHU (cont)					
	Condenser EXV Max Open		%	COND_MAX	40
	LAT Sample Buffer Length			LAT_SAMP	10
	LAT Sample Rate Seconds		secs	LAT_RATE	4
DISP					
	Metric Display	Off/On		DISPUNIT	Off
	Language Selection			LANGUAGE	0
	Password Enable	Disable/Enable		PASS_EBL	Enable
	Service Password			PASSWORD	1111
	Contrast Adjustment			CNTR_ADJ	0
	Brightness Adjustment			BRTS_ADJ	0
DLVT					
	Dmd Level Lo Heat ON		deltaF	DMDLHON	1.5
	Dmd Level(+) Hi Heat ON		deltaF	DMDHHON	0.5
	Dmd Level(-) Lo Heat OFF		deltaF	DMDLHOFF	1
	Dmd Level Lo Cool ON		deltaF	DMDLCON	1.5
	Dmd Level(+) Hi Cool ON		deltaF	DMDHCON	0.5
	Dmd Level(-) Lo Cool OFF		deltaF	DMDLCOFF	1
	Cool Trend Demand Level		deltaF	CTRENDLV	0.1
	Heat Trend Demand Level		deltaF	HTRENDLV	0.1
	Cool Trend Time		secs	CTRENDTM	120
	Heat Trend Time		secs	HTRENDTM	120
DMDL					
	Demand Limit Select			DMD_CTRL	0
	Demand Limit at 20 ma		%	DMT20MA	100
	Loadshed Group Number			SHED_NUM	0
	Loadshed Demand Delta		%	SHED_DEL	0
	Maximum Loadshed Time		mins	SHED_TIM	60
	Demand Limit Sw.1 Setpt.		%	DLSWSP1	80
	Demand Limit Sw.2 Setpt.		%	DLSWSP2	50
ECON					
	Economizer Installed ?	No/Yes		ECON_ENA	Yes
	Economizer Min.Position		%	ECONOMIN	5
	Economizer Max.Position		%	ECONOMAX	98
	Economzr trim for sumZ ?	No/Yes		ECONTRIM	Yes
	Econ ChangeOver Select			ECON_SEL	0
	OA Enthalpy ChgOvr Selct			OAEC_SEL	4
	Outdr.Enth Compare Value			OAEN_CFG	24
	High OAT Lockout Temp		degF	OAT_LOCK	60
	OA Dewpoint Temp Limit		degF	OADEWCFG	55
	Outside Air RH Sensor	Disable/Enable		OARHSENS	Disable
	Outdoor Air CFM Sensor	Disable/Enable		OCFMSENS	Disable
	Economizer Min.Flow		CFM	OACFMMAX	2000
	IAQ Demand Vent Min.Flow		CFM	OACFMMIN	0
	Econ.Min.Flow Deadband		CFM	OACFM_DB	400
	Economizer Prop.Gain			EC_PGAIN	1
	Economizer Range Adjust		deltaF	EC_RANGE	2.5
	Economizer Speed Adjust			EC_SPEED	0.75
	Economizer Deadband		deltaF	EC_DBAND	0.5
	Unoc Econ Free Cool Cfg			UEFC_CFG	0
	Unoc Econ Free Cool Time		mins	UEFCTIME	120
	Un.Ec.Free Cool OAT Lock		degF	UEFCNTLO	50
	Econ 1 Out Ser Number 1			ECN1_SN1	0
	Econ 1 Out Ser Number 2			ECN1_SN2	0
	Econ 1 Out Ser Number 3			ECN1_SN3	0
	Econ 1 Out Ser Number 4			ECN1_SN4	0
	Ecn1 Out Ctl Angl Lo Lmt			ECONCALM	85
	Econ 2 Ret Ser Number 1			ECN2_SN1	0
	Econ 2 Ret Ser Number 2			ECN2_SN2	0
	Econ 2 Ret Ser Number 3			ECN2_SN3	0
	Econ 2 Ret Ser Number 4			ECN2_SN4	0
	Ecn2 Ret Ctl Angl Lo Lmt			ECN2CALM	85
	Econ 3 Out Ser Number 1			ECN3_SN1	0
	Econ 3 Out Ser Number 2			ECN3_SN2	0
	Econ 3 Out Ser Number 3			ECN3_SN3	0
	Econ 3 Out Ser Number 4			ECN3_SN4	0
	Ecn3 Out Ctl Angl Lo Lmt			ECN3CALM	85

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
EDTR					
	EDT Reset Configuration			EDRSTCFG	0
	Reset Ratio			RTIO	2
	Reset Limit		deltaF	LIMT	10
	EDT 4-20 ma Reset Input	Disable/Enable		EDTRSENS	Disable
EXVS					
	Cir. EXV Start Algorithm	NNN		EXV_STAL	1
	EXV Superheat Setpoint	NN.n	deltaF	SH_SP	12
	EXV Superheat Deadband	NN.nn	deltaF	SH_DB	0.5
	Max Oper. Pressure SP	NN.n	degF	MOP_SP	112
	EXV Cir Start Delay Secs	NNN	secs	EXVCSDLY	240
	EXV Cir PreMove Dly Secs	NNN	secs	EXVCPDLY	0
	EXV PID Run Rate	NNN	secs	EXV_RATE	5
	EXV PID Prop. Gain	N.nn		EXV_PG	0.5
	EXV Integration Time	NN		EXV_TI	50
	SH Error Exponent	N.n		ERR_POW	.5
	High OAT Lim (EXV Gain)	NNN.n	degF	HIGHOAT	70
	Low OAT Lim (EXV Gain)	NNN.n	degF	LOWOAT	60
EXVS_TST					
	EXV Pre-Move Delay Secs		secs	EXVPMDLY	10
	EXV Pre-Move Config		secs	EXVPMCFG	1
	%EXV Move on Cir. Stg Up		%	EXV_FF_G	10
	%EXV Move on Cir. Stg Dw		%	EXV_FF_D	15
	EXV SH Flooding Setpoint		deltaF	FL_SP	6
	Flood Ovrde Press Cutoff		PSIG	FL_ODPC	600
	Flooding Override Delay			FL_OD	0
	EXV Init Pos Slope			EXV_SLP	–0.4
	EXV Init Pos Intercept			EXV_INT	66
	EXV Smoothing Algorithm			EXV_SMAL	1
	Comp. Cir. Exv. Min Pos%		%	CC_XMPOS	7.0
	DP Rate of Change Set			DP_RC_ST	10
	DP Rate of Change Clr			DP_RC_CL	1
	DP Override Limit 1			DP_OD_L1	400
	DP Override Limit 2			DP_OD_L2	500
	DP Override Timeout			DP_OD_TO	90
	DP Override Percent			DP_OD_PT	10
	Enab Cir Shtdwn w/flood			FL_ENCSD	Enable
	Flooding Detect Time		secs	FL_DETTM	120
HEAT					
	Heating Control Type			HEATTYPE	0
	Heating Supply Air Setpt		degF	SASPHEAT	85
	Occupied Heating Enabled	No/Yes		HTOCCENA	No
	MBB Sensor Heat Relocate	No/Yes		HTLATMON	No
	Modulating Gas Type			HTSTGTYP	0
	Max Cap Change per Cycle		%	HTCAPMAX	45
	St.Ht DB min.dF/PID Rate			HT_MR_DB	0.5
	St.Heat Temp. Dead Band		deltaF	HT_SG_DB	2
	Heat Rise dF/sec Clamp			HTSGRISE	0.06
	LAT Limit Config		deltaF	HTLATLIM	10
	Limit Switch Monitoring?	No/Yes		HTLIMMON	Yes
	Limit Switch High Temp		degF	HT_LIMHI	170
	Limit Switch Low Temp		degF	HT_LIMLO	160
	Heat Control Prop. Gain			HT_PGAIN	1
	Heat Control Derv. Gain			HT_DGAIN	1
	Heat PID Rate Config		secs	HTSGPIDR	90
	Hydronic Ctl.Prop. Gain			HW_PGAIN	0.7
	Hydronic Ctl.Integ. Gain			HW_IGAIN	0.7
	Hydronic Ctl.Derv. Gain			HW_DGAIN	0.5
	Hydronic PID Rate Config		secs	HOTWPIDR	15
	Hydronic Ht.Serial Num.1			HTCL_SN1	0
	Hydronic Ht.Serial Num.2			HTCL_SN2	0
	Hydronic Ht.Serial Num.3			HTCL_SN3	0
	Hydronic Ht.Serial Num.4			HTCL_SN4	0
	Hydr.Ht.Ctl.Ang Lo Limit			HTCLCALM	85

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
HUMD					
	Humidifier Control Cfg.			HUMD_CFG	0
	Humidifier Setpoint		%	HUSP	40
	Humidifier PID Run Rate		secs	HUMDRATE	30
	Humidifier Prop. Gain			HUMID_PG	1
	Humidifier Integral Gain			HUMID_IG	0.3
	Humidifier Deriv. Gain			HUMID_DG	0.3
	Humd Serial Number 1			HUMD_SN1	0
	Humd Serial Number 2			HUMD_SN2	0
	Humd Serial Number 3			HUMD_SN3	0
	Humd Serial Number 4			HUMD_SN4	0
	Humd Ctrl Angle Lo Limit			HUMDCALM	85
IAQ_					
	Economizer Min.Position		%	ECONOMIN	5
	IAQ Demand Vent Min.Pos.		%	IAQMINP	0
	Economizer Min.Flow		CFM	OACFMMAX	2000
	IAQ Demand Vent Min.Flow		CFM	OACFMMIN	0
	Econ.Min.Flow Deadband		CFM	OACFM_DB	400
	IAQ Analog Sensor Config			IAQANCFG	0
	IAQ 4-20 ma Fan Config			IAQANFAN	0
	IAQ Discrete Input Confg			IAQINCFG	0
	IAQ Disc.In. Fan Config			IAQINFAN	0
	OAQ 4-20ma Sensor Config			OAQANCFG	0
	IAQ Econo Override Pos.		%	IAQOVPOS	100
	IAQ Override Flow		CFM	IAQOVCFM	10000
	Diff.Air Quality LoLimit			DAQ_LOW	100
	Diff.Air Quality HiLimit			DAQ_HIGH	700
	DAQ PPM Fan Off Setpoint			DAQFNOFF	200
	DAQ PPM Fan On Setpoint			DAQFNON	400
	Diff. AQ Responsiveness			IAQREACT	0
	OAQ Lockout Value			OAQLOCK	0
	User determined OAQ			OAQ_USER	400
	IAQ Low Reference			IAQREFL	0
	IAQ High Reference			IAQREFH	2000
	OAQ Low Reference			OAQREFL	0
	OAQ High Reference			OAQREFH	2000
	IAQ Purge	No/Yes		IAQPURGE	No
	IAQ Purge Duration		mins	IAQPTIME	15
	IAQ Purge LoTemp Min Pos		%	IAQPLTMP	10
	IAQ Purge HiTemp Min Pos		%	IAQPHTMP	35
	IAQ Purge OAT Lockout		degF	IAQPNTLO	50
MM_CFG					
	High Efficiency OD Fans?	No/Yes		HIGH_EFF	No
	Motor Master Control ?	No/Yes		MOTRMAST	No
	Motor Master Setpoint		degF	MM_SP	105
	MM Setpoint Offset		degF	MMSPOFST	-10
	Motor Master Deriv. Gain			MM_DG	0.3
	Motor Master Prop. Gain			MM_PG	1
	Motor Master Integ. Time			MM_TI	30
	Motor Master PI Run Rate		secs	MM_RATE	5
PROG_CFG					
	Liquid Sensors Installed	No/Yes		LQ_SENS	No
	Prognostics SP Enable	Disable/Enable		PG_SP_EN	Disable
	Prognostics SP Deadband		in H2O	PG_SP_DB	0.25
	Prognostics BP Enable	Disable/Enable		PG_BP_EN	Disable
	Prognostics BP Deadband		in H2O	PG_BP_DB	0.05
SP__					
	Static Pressure Control	Disable/Enable		STATICFG	Disable
	Staged Air Volume Ctrl	Disable/Enable		STGAVCFG	Disable
	Static Pressure Sensor	Disable/Enable		SPSENS	Disable
	Static Press. Low Range			SP_LOW	0
	Static Press. High Range			SP_HIGH	5
	Static Pressure Setpoint		in H2O	SPSP	1.5
	VFD Minimum Speed		%	STATPMIN	20
	VFD Maximum Speed		%	STATPMAX	100
	VFD Fire Speed Override		%	STATPFSO	100
	Stat. Pres. Reset Config			SPRSTCFG	0

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
SP__ (cont)	SP Reset Ratio			SPRRATIO	0.2
	SP Reset Limit			SPRLIMIT	0.75
	SP Reset Econo.Position		%	ECONOSPR	5
	Stat.Pres.PID Run Rate		secs	SPIDRATE	7
	Static Press. Prop. Gain			STATP_PG	0.5
	Static Press. Intg. Gain			STATP_IG	0.5
	Static Press. Derv. Gain			STATP_DG	0.3
SWLG					
	Power Fault Input - Good	Open/Close		PWRFLOGC	Close
	Filter Status Inpt-Clean	Open/Close		FLTSLOGC	Open
	Post Filter Stat. In-Cln	Open/Close		PFLTSLGC	Open
	IGC Feedback - Off	Open/Close		GASFANLG	Open
	RemSw Off-Unoc-Strt-NoOv	Open/Close		RMTINLOG	Open
	Enthalpy Input - Low	Open/Close		ENTHLOGC	Close
	Fan Status Sw. - Off	Open/Close		SFSLOGIC	Open
	Dmd.Lmt.Sw.1 - Off	Open/Close		DMD_SW1L	Open
	Dmd.Lmt.Sw.2 - Off	Open/Close		DMD_SW2L	Open
	IAQ Disc.Input - Low	Open/Close		IAQINLOG	Open
	Fire Shutdown - Off	Open/Close		FSDLOGIC	Open
	Press. Switch - Off	Open/Close		PRESLOGC	Open
	Evacuation Sw. - Off	Open/Close		EVACLOGC	Open
	Smoke Purge Sw. - Off	Open/Close		PURGLOGC	Open
	Dehumidify Sw. - Off	Open/Close		DHDISCLG	Open
	SF Bypass Sw. - Off	Open/Close		SFBYLOGC	Open
	PE Bypass Sw. - Off	Open/Close		PEBYLOGC	Open
TRIM					
	Air Temp Lvg SF Trim		deltaF	SAT_TRIM	0
	RAT Trim		deltaF	RAT_TRIM	0
	OAT Trim		deltaF	OAT_TRIM	0
	SPT Trim		deltaF	SPT_TRIM	0
	Limit Switch Trim		deltaF	LSW_TRIM	0
	Air Tmp Lvg Evap Trim		deltaF	CCT_TRIM	0
	A1 Discharge Temp Trim		deltaF	DTA1TRIM	0
	Suction Gas Temp A Trim		deltaF	RGTATRIM	0
	Cir. A EXV 1 Temp Trim		deltaF	CAX1TRIM	0
	Cir. A EXV 2 Temp Trim		deltaF	CAX2TRIM	0
	Cir. B EXV 1 Temp Trim		deltaF	CBX1TRIM	0
	Cir. B EXV 2 Temp Trim		deltaF	CBX2TRIM	0
	Suct.Press.Circ.A Trim		PSI	SPA_TRIM	0
	Suct.Press.Circ.B Trim		PSI	SPB_TRIM	0
	Dis.Press.Circ.A Trim		PSI	DPA_TRIM	0
	Dis.Press.Circ.B Trim		PSI	DPB_TRIM	0
	Bldg. Pressure Trim (ma)			BPMATRIM	0
	Static Press. Trim (ma)			SPMATRIM	0
	Outside Air CFM Trim(ma)			OAMATRIM	0
	Supply Air CFM Trim (ma)			SAMATRIM	0
	Return Air CFM Trim (ma)			RAMATRIM	0
	Exh. Air CFM Trim (ma)			EAMATRIM	0
UNIT					
	Machine Control Type			CTRLTYPE	3
	Unit Size (75 - 150)			UNITSIZE	150
	Fan Mode (0=auto,1=cont)			FAN_MODE	0
	Remote Switch Config			RMTINCFG	0
	CEM Module installed	No/Yes		CEM_BRD	Yes
	Liquid Sensors Installed	No/Yes		LQ_SENS	Yes
	Power Monitor Installed	No/Yes		PWR_MON	No
	VFD Bypass Enable?	No/Yes		VFD_BYEN	No
	UV-C Lamp Config?			UVCL_CFG	0
	Temp.Cmp.Strt.Cool Factr		mins	TCSTCOOL	0
	Temp.Cmp.Strt.Heat Factr		mins	TCSTHEAT	0
	Fan fail shuts down unit	No/Yes		SFS_SHUT	Yes
	Fan Stat Monitoring Type			SFS_MON	0
	VAV Unocc.Fan Retry Time		mins	SAMPMINS	50
	MAT Calc Config			MAT_SEL	1
	Reset MAT Table Entries?	No/Yes		MATRESET	No
	MAT Outside Air Default		%	MATOAPOS	20
	Altitude........in feet:			ALTITUDE	0

SERVICE-CONFIG TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	DEFAULT
UNIT (cont)	Startup Delay Time		secs	DELAY	0
	Auxiliary Relay Config			AUXRELAY	0
	Space Temp Sensor	Disable/Enable		SPTSENS	Disable
	Space Temp Offset Sensor	Disable/Enable		SPTOSENS	Disable
	Space Temp Offset Range		deltaF	SPTO_RNG	5
	Space Air RH Sensor	Disable/Enable		SPRHSENS	Enable
	Return Air RH Sensor	Disable/Enable		RARHSENS	Enable
	Mixed Air RH Sensor	Disable/Enable		MARHSENS	Disable
	Main Filter Status Cfg.			FLTS_ENA	0
	Post Filter Status Cfg.			PFLS_ENA	0
VFD_CFG					
	VFD1 Nominal Motor Volts		volts	VFD1NVLT	0
	VFD1 Nominal Motor Amps		amps	VFD1NAMP	0
	VFD1 Nominal Motor Freq			VFD1NFRQ	60
	VFD1 Nominal Motor RPM			VFD1NRPM	1750
	VFD1 Nominal Motor HPwr			VFD1NPWR	0
	VFD1 Motor Direction			VFD1MDIR	0
	VFD1 Acceleration Time		secs	VFD1ACCL	30
	VFD1 Deceleration Time		secs	VFD1DECL	30
	VFD1 Switching Frequency			VFD1SWFQ	2
	VFD1 Type			VFD1TYPE	0
	VFD2 Nominal Motor Volts		volts	VFD2NVLT	0
	VFD2 Nominal Motor Amps		amps	VFD2NAMP	0
	VFD2 Nominal Motor Freq			VFD2NFRQ	60
	VFD2 Nominal Motor RPM			VFD2NRPM	1750
	VFD2 Nominal Motor HPwr			VFD2NPWR	0
	VFD2 Motor Direction			VFD2MDIR	0
	VFD2 Acceleration Time		secs	VFD2ACCL	30
	VFD2 Deceleration Time		secs	VFD2DECL	30
	VFD2 Switching Frequency			VFD2SWFQ	2
	VFD2 Type			VFD2TYPE	0
GENERICS					
	Target Point Name	8-char ASCII		POINT_01	SPSP
	Target Point Name	8-char ASCII		POINT_02	BPSP
	Target Point Name	8-char ASCII		POINT_03	SCT_MIN
	Target Point Name	8-char ASCII		POINT_04	SCT_MAX
	Target Point Name	8-char ASCII		POINT_05	HUSP
	Target Point Name	8-char ASCII		POINT_06	
	Target Point Name	8-char ASCII		POINT_07	
	Target Point Name	8-char ASCII		POINT_08	
	Target Point Name	8-char ASCII		POINT_09	
	Target Point Name	8-char ASCII		POINT_10	
	Target Point Name	8-char ASCII		POINT_11	
	Target Point Name	8-char ASCII		POINT_12	
	Target Point Name	8-char ASCII		POINT_13	
	Target Point Name	8-char ASCII		POINT_14	
	Target Point Name	8-char ASCII		POINT_15	
	Target Point Name	8-char ASCII		POINT_16	
	Target Point Name	8-char ASCII		POINT_17	
	Target Point Name	8-char ASCII		POINT_18	
	Target Point Name	8-char ASCII		POINT_19	
	Target Point Name	8-char ASCII		POINT_20	

MAINTENANCE DISPLAY TABLES

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
ACDTRSLT					
	Calc. Cir A Subcool Temp		deltaF	CSC_A	
	Cir A Over/Under Charge		lbs	AC_CHG_A	
	Calc. Cir B Subcool Temp		deltaF	CSC_B	
	Cir B Over/Under Charge		lbs	AC_CHG_B	
	EXV A1 Auto-Test Status			AC_XA1ST	
	EXV A2 Auto-Test Status			AC_XA2ST	
	EXV B1 Auto-Test Status			AC_XB1ST	
	EXV B2 Auto-Test Status			AC_XB2ST	
	Dig Scroll AutoTest Stat			AC_DSST	
	MLV/HGBP AutoTest Result			AC_MLVST	
	SF Auto-Test Result			AC_SF_ST	
	Comp A1 Auto-Test Result			AC_CP_A1	
	Comp A2 Auto-Test Result			AC_CP_A2	
	Comp A3 Auto-Test Result			AC_CP_A3	
	Comp A4 Auto-Test Result			AC_CP_A4	
	Comp B1 Auto-Test Result			AC_CP_B1	
	Comp B2 Auto-Test Result			AC_CP_B2	
	Comp B3 Auto-Test Result			AC_CP_B3	
	Comp B4 Auto-Test Result			AC_CP_B4	
ALARMS_1					
follow same format for… ALARMS_2 to ALARMS_5	Active Alarm	24-char ASCII		ALARM_01	
	-----------------------	24-char ASCII			
	Active Alarm	24-char ASCII		ALARM_02	
	-----------------------	24-char ASCII			
	Active Alarm	24-char ASCII		ALARM_03	
	-----------------------	24-char ASCII			
	Active Alarm	24-char ASCII		ALARM_04	
	-----------------------	24-char ASCII			
BEL_ACTU					
	Econ 1 Out Act.Curr.Pos.		%	ECONOPOS	
	Econ 2 Ret Act.Curr.Pos.		%	ECON2POS	
	Econ 3 Out Act.Curr.Pos.		%	ECON3POS	
	Econ 1 Out Act.Cmd.Pos.		%	ECONOCMD	forcible
	Econ 2 Ret Act Curr Pos		%	ECN2RPOS	
	Econ 2 Ret Cmd Position		%	ECN2CPOS	forcible
	Humidifier Act.Curr.Pos.		%	HUMDRPOS	
	Humidifier Command Pos.		%	HUMDCPOS	
	Ht.Coil Act.Current Pos.		%	HTCLRPOS	
	Ht.Coil Command Position		%	HTCLCPOS	
	Econ 3 Out Act.Curr.Pos.		%	ECN3RPOS	
CIR_EXVS					
	Cir A EXV1 Suction Temp.		degF	CASTEXV1	
	Cir A EXV1 Superheat Tmp		deltaF	SH_A1	
	Circuit A EXV 1 Position		%	XV1APOSP	
	Cir A EXV2 Suction Temp.		degF	CASTEXV2	
	Cir A EXV2 Superheat Tmp		deltaF	SH_A2	
	Circuit A EXV 2 Position		%	XV2APOSP	
	Cir B EXV1 Suction Temp.		degF	CBSTEXV1	
	Cir B EXV1 Superheat Tmp		deltaF	SH_B1	
	Circuit B EXV 1 Position		%	XV1BPOSP	
	Cir B EXV2 Suction Temp.		degF	CBSTEXV2	
	Cir B EXV2 Superheat Tmp		deltaF	SH_B2	
	Circuit B EXV 2 Position		%	XV2BPOSP	
	Cir. EXV Start Algorithm			EXV_STAL	config
	EXV Superheat Setpoint		deltaF	SH_SP	config
	Cir. EXV Startup SH SP		deltaF	SH_STSP	config
	Cir. EXV Start Pos Pct.		%	EXVSTPCT	config
	EXV Superheat Deadband		deltaF	SH_DB	config
	Max Oper. Pressure SP		degF	MOP_SP	config
	EXV Cir Start Delay Secs		secs	EXVCSDLY	config
	EXV Cir PreMove Dly Secs		secs	EXVCPDLY	config
	EXV PID Run Rate		secs	EXV_RATE	config

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
CIR_EXVS (cont)					
	EXV PID Prop. Gain			EXV_PG	config
	EXV Integration Time			EXV_TI	config
COMPRSRA					
	Compressor A1 Relay	Off/On		CMPA1	
	Compressor A1 Capacity		%	CMPA1CAP	
	Circ A High Press.Switch	Low/High		CIRCAHPS	forcible
	Compressor A1 Feedback	Off/On		CSB_A1	
	Curr.Sens.Brd. A1 Status	24-char ASCII		CSBA1ASC	
	CSB A1 Feedback Alarm	Disable/Enable		CSB_A1EN	config
	Comp A1 Locked Out ?	No/Yes		CMPA1LOK	
	Compressor A1 Strikes			CMPA1STR	
	Enable Compressor A1	Disable/Enable		CMPA1ENA	config
	Compressor A2 Relay	Off/On		CMPA2	
	Compressor A2 Feedback	Off/On		CSB_A2	
	Curr.Sens.Brd. A2 Status	24-char ASCII		CSBA2ASC	
	CSB A2 Feedback Alarm	Disable/Enable		CSB_A2EN	config
	Comp A2 Locked Out ?	No/Yes		CMPA2LOK	
	Compressor A2 Strikes			CMPA2STR	
	Enable Compressor A2	Disable/Enable		CMPA2ENA	config
	Compressor A3 Relay	Off/On		CMPA3	
	Compressor A3 Feedback	Off/On		CSB_A3	
	Curr.Sens.Brd. A3 Status	24-char ASCII		CSBA3ASC	
	CSB A3 Feedback Alarm	Disable/Enable		CSB_A3EN	config
	Comp A3 Locked Out ?	No/Yes		CMPA3LOK	
	Compressor A3 Strikes			CMPA3STR	
	Enable Compressor A3	Disable/Enable		CMPA3ENA	config
	Compressor A4 Relay	Off/On		CMPA4	
	Compressor A4 Feedback	Off/On		CSB_A4	
	Curr.Sens.Brd. A4 Status	24-char ASCII		CSBA4ASC	
	CSB A4 Feedback Alarm	Disable/Enable		CSB_A4EN	config
	Comp A4 Locked Out ?	No/Yes		CMPA4LOK	
	Compressor A4 Strikes			CMPA4STR	
	Enable Compressor A4	Disable/Enable		CMPA4ENA	config
COMPRSRB					
	Compressor B1 Relay	Off/On		CMPB1	
	Circ B High Press.Switch	Low/High		CIRCBHPS	forcible
	Compressor B1 Feedback	Off/On		CSB_B1	
	Curr.Sens.Brd. B1 Status	24-char ASCII		CSBB1ASC	
	CSB B1 Feedback Alarm	Disable/Enable		CSB_B1EN	config
	Comp B1 Locked Out ?	No/Yes		CMPB1LOK	
	Compressor B1 Strikes			CMPB1STR	
	Enable Compressor B1	Disable/Enable		CMPB1ENA	config
	Compressor B2 Relay	Off/On		CMPB2	
	Compressor B2 Feedback	Off/On		CSB_B2	
	Curr.Sens.Brd. B2 Status	24-char ASCII		CSBB2ASC	
	CSB B2 Feedback Alarm	Disable/Enable		CSB_B2EN	config
	Comp B2 Locked Out ?	No/Yes		CMPB2LOK	
	Compressor B2 Strikes			CMPB2STR	
	Enable Compressor B2	Disable/Enable		CMPB2ENA	config
	Compressor B3 Relay	Off/On		CMPB3	
	Compressor B3 Feedback	Off/On		CSB_B3	
	Curr.Sens.Brd. B3 Status	24-char ASCII		CSBB3ASC	
	CSB B3 Feedback Alarm	Disable/Enable		CSB_B3EN	config
	Comp B3 Locked Out ?	No/Yes		CMPB3LOK	
	Compressor B3 Strikes			CMPB3STR	
	Enable Compressor B3	Disable/Enable		CMPB3ENA	config
	Compressor B4 Relay	Off/On		CMPB4	
	Compressor B4 Feedback	Off/On		CSB_B4	
	Curr.Sens.Brd. B4 Status	24-char ASCII		CSBB4ASC	
	CSB B4 Feedback Alarm	Disable/Enable		CSB_B4EN	config
	Comp B4 Locked Out ?	No/Yes		CMPB4LOK	
	Compressor B4 Strikes			CMPB4STR	
	Enable Compressor B4	Disable/Enable		CMPB4ENA	config

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
COMPTRIP					
	Comp. Security Password			COMPPASS	config
	Low Suction Trip Level 1		degF	SSTLEV1	
	Low Suction Trip Level 2		degF	SSTLEV2	
	Low Suction Trip Level 3		degF	SSTLEV3	
	Low Suction Trip Level 4		degF	SSTLEV4	
	Low Suction Clear Temp		degF	SSTOK	
	Circuit A HPS Trip Press		PSIG	HPSATRIP	config
	Circuit B HPS Trip Press		PSIG	HPSBTRIP	config
DMANDLIM					
	Active Demand Limit		%	DEM_LIM	forcible
	Current Running Capacity		%	CAPTOTAL	
	Demand Limit Select			DMD_CTRL	config
	Demand Limit Switch 1	Off/On		DMD_SW1	forcible
	Demand Limit Switch 2	Off/On		DMD_SW2	forcible
	Demand Limit Sw.1 Setpt.		%	DLSWSP1	config
	Demand Limit Sw.2 Setpt.		%	DLSWSP2	config
	4-20 ma Demand Signal		milliAmps	DMDLMTMA	forcible
	Demand Limit at 20 ma		%	DMT20MA	config
	CCN Loadshed Signal			DL_STAT	
	Loadshed Group Number			SHED_NUM	config
	Loadshed Demand Delta		%	SHED_DEL	config
	Maximum Loadshed Time		mins	SHED_TIM	config
ECON_MIN					
	Econ 1 Out Act.Cmd.Pos.		%	ECONOCMD	forcible
	Econ 1 Out Act.Curr.Pos.		%	ECONOPOS	
	Econ 2 Ret Act.Curr.Pos.		%	ECON2POS	
	Econ 3 Out Act.Curr.Pos.		%	ECON3POS	
	Econo Current Min. Pos.		%	ECMINPOS	forcible
	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	Low/High		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.Min.Flow Deadband		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			OAQANCFG	config
	IAQ milliamps		milliAmps	IAQ_MA	
	OAQ milliamps		milliAmps	OAQ_MA	
EC_DIAG					
	Economizer Active ?	No/Yes		ECACTIVE	
	Conditions which prevent economizer being active:				
	Econ1 Out Act Unvailabl?	No/Yes		ECONUNAV	
	Econ2 Ret Act Unvailabl?	No/Yes		ECN2UNAV	
	Econ3 Out Act Unvailabl?	No/Yes		ECN3UNAV	
	Enth. Switch Read High ?	No/Yes		ENTH	forcible
	DBC - OAT lockout?	No/Yes		DBC_STAT	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
EC_DIAG (cont)	DEW - OA Dewpt.lockout?	No/Yes		DEW_STAT	
	DDBC- OAT > RAT lockout?	No/Yes		DDBCSTAT	
	OAEC- OA Enth Lockout?	No/Yes		OAECSTAT	
	DEC - Diff.Enth.Lockout?	No/Yes		DEC_STAT	
	EDT Sensor Bad ?	No/Yes		EDT_STAT	
	OAT Sensor Bad ?	No/Yes		OAT_STAT	
	Economizer forced ?	No/Yes		ECONFORC	
	Supply Fan not on 30s ?	No/Yes		SFONSTAT	
	Cool Mode not in effect?	No/Yes		COOL_OFF	
	OAQ lockout in effect ?	No/Yes		OAQLOCKD	
	Econ recovery hold off?	No/Yes		ECONHELD	
	Dehumid. disabled Econ.?	No/Yes		DHDISABL	
	Outside Air Temperature		degF	OAT	forcible
	OutsideAir DewPoint Temp		degF	OADEWTMP	
	Outside Air Rel.Humidity		%	OARH	forcible
	Outdoor Air Enthalpy			OAE	
	Return Air Temperature		degF	RAT	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Return Air Enthalpy			RAE	
	High OAT Lockout Temp		degF	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		degF	OADEWCFG	config
	Supply Fan Bypass Relay	Off/On		SFBYRLY	
	Econ 1 Out Act.Cmd.Pos.		%	ECONOCMD	forcible
	Econ 1 Out Act.Curr.Pos.		%	ECONOPOS	
	Econ 2 Ret Act.Curr.Pos.		%	ECON2POS	
	Evaporator Discharge Tmp		degF	EDT	
	Economizer Control Point		degF	ECONCPNT	
	EDT Trend in degF/minute		deltaF	EDTTREND	
	Economizer Prop.Gain			EC_PGAIN	config
	Economizer Range Adjust		deltaF	EC_RANGE	config
	Economizer Speed Adjust			EC_SPEED	config
	Economizer Deadband		deltaF	EC_DBAND	config
	Economizer Timer		secs	ERATETMR	
ENTHALPY					
	Outdoor Air Enthalpy			OAE	
	Outside Air Temperature		degF	OAT	forcible
	Outside Air Rel.Humidity		%	OARH	forcible
	Outside Air RH Sensor	Disable/Enable		OARHSENS	config
	OA Dewpoint Temp Limit		degF	OADEWCFG	config
	OutsideAir DewPoint Temp		degF	OADEWTMP	
	OutsideAir Humidty Ratio			OA_HUMR	forcible
	OA H2O Vapor Sat.Pressur		in Hg	OA_PWS	forcible
	OA H2O Partial.Press.Vap		in Hg	OA_PW	
	Space Enthalpy			SPE	
	Space Temperature		degF	SPT	forcible
	Controlling Space Temp		degF	SPACE_T	forcible
	Space Relative Humidity		%	SPRH	forcible
	Space Temp Sensor	Disable/Enable		SPTSENS	config
	Space Air RH Sensor	Disable/Enable		SPRHSENS	config
	Return Air Enthalpy			RAE	
	Return Air Temperature		degF	RAT	forcible
	Controlling Return Temp		degF	RETURN_T	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Return Air RH Sensor	Disable/Enable		RARHSENS	config
	Altitude........in feet:			ALTITUDE	config
	Atmospheric Pressure		in Hg	ATMOPRES	forcible
	Mixed Air Rel.Humidity		%	MARH	forcible
	Mixed Air RH Sensor	Disable/Enable		MARHSENS	config

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
HUMIDITY					
	Space Relative Humidity		%	SPRH	forcible
	Return Air Rel.Humidity		%	RARH	forcible
	Mixed Air Rel.Humidity		%	MARH	forcible
	Humidifier Relay	Off/On		HUMIDRLY	
	Humidifier Act.Curr.Pos.		%	HUMDRPOS	
	Humidifier Command Pos.		%	HUMDCPOS	
	Humidifier Setpoint		%	HUSP	config
	Humidifier Control Cfg.			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		secs	HUMDRATE	config
	Space Air RH Sensor	Disable/Enable		SPRHSENS	config
	Return Air RH Sensor	Disable/Enable		RARHSENS	config
	Mixed Air RH Sensor	Disable/Enable		MARHSENS	config
LINKDATA					
	Supervisory Element #			SUPE-ADR	
	Supervisory Bus			SUPE-BUS	
	Supervisory Block Number			BLOCKNUM	
	Average Occup. Heat Stp.		degF	AOHS	
	Average Occup. Cool Stp.		degF	AOCS	
	Average Unocc. Heat Stp.		degF	AUHS	
	Average Unocc. Cool Stp.		degF	AUCS	
	Average Zone Temperature		degF	AZT	
	Average Occup. Zone Temp		degF	AOZT	
	Linkage System Occupied?	No/Yes		LOCC	
	Next Occupied Day	3-char ASCII		LNEXTOCD	
	Next Occupied Time	hh:mm		LNEXTOCC	
	Next Unoccupied Day	3-char ASCII		LNEXTUOD	
	Next Unoccupied Time	hh:mm		LNEXTUNC	
	Last Unoccupied Day	3-char ASCII		LLASTUOD	
	Last Unoccupied Time	hh:mm		LLASTUNC	
MILLIAMP					
	IAQ milliamps		milliAmps	IAQ_MA	
	OAQ milliamps		milliAmps	OAQ_MA	
	SP Reset milliamps		milliAmps	SPRST_MA	
	4-20 ma Demand Signal		milliAmps	DMDLMTMA	forcible
	EDT Reset milliamps		milliAmps	EDTRESMA	
	MARH milliamps		milliAmps	MARH_MA	
	OARH milliamps		milliAmps	OARH_MA	
	SPRH milliamps		milliAmps	SPRH_MA	
	RARH milliamps		milliAmps	RARH_MA	
	SACFM milliamps		milliAmps	SACFM_MA	
	RACFM milliamps		milliAmps	RACFM_MA	
	EACFM milliamps		milliAmps	EACFM_MA	
	OACFM milliamps		milliAmps	OACFM_MA	
	BP milliamps		milliAmps	BP_MA	
	SP milliamps		milliAmps	SP_MA	
	Post Filter DeltaPressMa		milliAmps	PF_DP_MA	forcible
	Post Filter DeltaPressMa		milliAmps	PF_DP_MA	forcible
MODES					
	System Mode............:	24-char ASCII			
	HVAC Mode..............:	16-char ASCII			
	Control Mode...........:	16-char ASCII			
	Currently Occupied	Off/On		MODEOCCP	
	Timed Override in effect	Off/On		MODETOVR	
	DCV resetting min pos	Off/On		MODEADCV	
	Supply Air Reset	Off/On		MODESARS	
	Demand Limit in Effect	Off/On		MODEDMLT	
	Temp.Compensated Start	Off/On		MODETCST	
	IAQ pre-occ purge active	Off/On		MODEIQPG	
	Linkage Active - CCN	Off/On		MODELINK	
	Mech.Cooling Locked Out	Off/On		MODELOCK	
	HVAC Mode Numerical Form			MODEHVAC	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
OCCDEFME					
	Current Day,Time & Date:	24-char ASCII		TIMEDATE	
	Occupancy Controlled By:	24-char ASCII		OCDFTXT1	
		24-char ASCII		OCDFTXT2	
		24-char ASCII		OCDFTXT3	
	Currently Occupied ?	No/Yes		MODE_OCC	
		1-char ASCII			
	Current Occupied Time	hh:mm		STRTTIME	
	Current Unoccupied Time	hh:mm		ENDTIME	
	Next Occupied Day & Time	15-char ASCII		NXTOC_DT	
	Next Unocc. Day & Time	15-char ASCII		NXTUN_DT	
	Last Unocc. Day & Time	15-char ASCII		PRVUN_DT	
	Current Occup. Period #	11001100 (flags)		PER_NO	
	Timed-Override in Effect	No/Yes		OVERLAST	
	Timed-Override Duration		hours	OVR_HRS	
PRESBLDG					
	Building Pressure		in H2O	BP	forcible
	Return Air CFM		CFM	RACFM	
	Exhaust Air CFM		CFM	EACFM	
	Supply Air CFM		CFM	SACFM	
	Outside Air CFM		CFM	OACFM	
	Power Exhaust Bypass Rly	Off/On		PEBYRLY	
	Exhaust Fan Commanded %		%	EFAN_VFD	
	Building Pressure Setp.		in H2O	BPSP	config
	BP Setpoint Offset		in H2O	BPSO	config
	Fan Track Learn Enable	No/Yes		DCFM_CFG	config
	Fan Track Learn Rate		mins	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	No/Yes		DCFMRSET	
	Fan Track Internal RAM		CFM	DCFM_RAM	
	Fan Track Control D.CFM		CFM	DELTACFM	
PRESDUCT					
	Static Pressure		in H2O	SP	forcible
	Supply Fan Commanded %		%	SFAN_VFD	
	Econ 2 Ret Act Curr Pos		%	ECN2RPOS	
	Econ 2 Ret Cmd Position		%	ECN2CPOS	forcible
	Static Pressure Setpoint		in H2O	SPSP	config
	Static Pressure Reset			SPRESET	forcible
STAGEGAS					
	Heating Mode...........:	12-char ASCII			
	Requested Heat Stage			HT_STAGE	
	Heating Control Point		degF	HEATCPNT	
	Staged Heat LAT Sum		degF	LAT_SGAS	
	Staged Heat LAT 1		degF	LAT1SGAS	
	Staged Heat LAT 2		degF	LAT2SGAS	
	Staged Heat LAT 3		degF	LAT3SGAS	
	Staged Gas Limit Sw.Temp		degF	LIMSWTMP	
	Heat PID Timer		secs	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	Off/On		LIMTMODE	
	LAT Cutoff Mode	Off/On		LATCMODE	
	Capacity Clamp Mode	Off/On		CAPMODE	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
STRTHOUR					
	Compressor A1 Run Hours		hours	HR_A1	
	Compressor A2 Run Hours		hours	HR_A2	
	Compressor A3 Run Hours		hours	HR_A3	
	Compressor A4 Run Hours		hours	HR_A4	
	Compressor B1 Run Hours		hours	HR_B1	
	Compressor B2 Run Hours		hours	HR_B2	
	Compressor B3 Run Hours		hours	HR_B3	
	Compressor B4 Run Hours		hours	HR_B4	
	Compressor A1 Starts			CY_A1	config
	Compressor A2 Starts			CY_A2	config
	Compressor A3 Starts			CY_A3	config
	Compressor A4 Starts			CY_A4	config
	Compressor B1 Starts			CY_B1	config
	Compressor B2 Starts			CY_B2	config
	Compressor B3 Starts			CY_B3	config
	Compressor B4 Starts			CY_B4	config
SUMZ					
	Cooling Control Point		degF	COOLCPNT	
	Mixed Air Temperature		degF	MAT	
	Evaporator Discharge Tmp		degF	EDT	
	Return Air Temperature		degF	RAT	forcible
	Outside Air Temperature		degF	OAT	forcible
	Econ 1 Out Act.Curr.Pos.		%	ECONOPOS	
	Econ 2 Ret Act.Curr.Pos.		%	ECON2POS	
	Econ 3 Out Act.Curr.Pos.		%	ECON3POS	
	Capacity Threshold Adjst			Z_GAIN	config
	Capacity Load Factor			SMZ	
	Next Stage EDT Decrease			ADDRISE	
	Next Stage EDT Increase			SUBRISE	
	Rise Per Percent Capacty			RISE_PCT	
	Cap Deadband Subtracting			Y_MINUS	
	Cap Deadband Adding			Y_PLUS	
	Cap Threshold Subracting			Z_MINUS	
	Cap Threshold Adding			Z_PLUS	
	High Temp Cap Override	Off/On		HI_TEMP	
	Low Temp Cap Override	Off/On		LOW_TEMP	
	Pull Down Cap Override	Off/On		PULLDOWN	
	Slow Change Cap Override	Off/On		SLO_CHNG	
SYSTEM					
	Reset All Current Alarms	No/Yes		ALRESET	
	Reset Alarm History	No/Yes		ALHISCLR	
	Reset the Device	No/Yes		RESETDEV	
	Local Machine Disable	No/Yes		UNITSTOP	config
	Soft Stop Request	No/Yes		SOFTSTOP	forcible
	Emergency Stop	Enable/EMStop		EMSTOP	forcible
	CEM AN4 10K temp J5,7-8		degF	CEM10K1	forcible
	CEM AN5 10K temp J5,9-10		degF	CEM10K2	forcible
	CEM AN6 10K tmp J5,11-12		degF	CEM10K3	forcible
	CEM AN1 10K temp J5,1-2		degF	CEM10K4	forcible
	CEM AN4 4-20 ma J5,7-8		milliAmps	CEM4201	forcible
	CEM AN1 4-20 ma J5,1-2		milliAmps	CEM4204	forcible
TESTACTC					
	Econ 1 Out Act.Cmd.Pos.		%	ECON1TST	
	Economizer Calibrate Cmd	No/Yes		ECONOCAL	
	Econ 1 Out Act Ctl Angle			ECONCANG	
	Econ 2 Ret Act.Cmd.Pos.		%	ECON2TST	
	Economzr 2 Calibrate Cmd	No/Yes		ECON2CAL	
	Econ2 Ret Act Ctl Angle			ECN2CANG	
	Econ 3 Out Act.Cmd.Pos.		%	ECON3TST	
	Economzr 3 Calibrate Cmd	No/Yes		ECON3CAL	
	Econ3 Out Act Ctl Angle			ECN3CANG	
	Ht.Coil Command Position		%	HTCLACTS	
	Heating Coil Act.Cal.Cmd	No/Yes		HCOILCAL	
	Heat Coil Act.Ctl.Angle			HTCLCANG	
	Humidifier Command Pos.		%	HUMD_TST	
	Humidifier Act. Cal. Cmd	No/Yes		HUMIDCAL	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
TESTACTC (cont)	Humidifier Act.Ctrl.Ang.			HUMDCANG	
	ERV Exh 2 Calibrate Cmd	No/Yes		MPB6_CAL	
	ERV Exh 2 Act Ctl Angle			ERV6CANG	
TESTCOOL					
	Econ 1 Out Act.Cmd.Pos.		%	ECONCOOL	
	Static Pressure Setpoint		in H2O	SPSPCTST	
	Requested Cool Stage			CLST_TST	
	Compressor A1 Relay	Off/On		CMPA1TST	
	Minimum Load Valve Relay	Off/On		MLV_TST	
	Compressor A1 Capacity		%	A1CAPTST	
	Two Circuit Start A1,B1	Off/On		CMPABTST	
	Compressor A2 Relay	Off/On		CMPA2TST	
	Compressor A3 Relay	Off/On		CMPA3TST	
	Compressor A4 Relay	Off/On		CMPA4TST	
	Compressor B1 Relay	Off/On		CMPB1TST	
	Compressor B2 Relay	Off/On		CMPB2TST	
	Compressor B3 Relay	Off/On		CMPB3TST	
	Compressor B4 Relay	Off/On		CMPB4TST	
	HumidiMizer 3-way Valve	Off/On		RHVC_TST	
	Condenser EXV Position		%	CEXVCTST	
	Bypass EXV Position		%	BEXVCTST	
TESTEXVS					
	Circuit A EXV 1 Position		%	A_X1_TST	
	Circuit A EXV 2 Position		%	A_X2_TST	
	Circuit B EXV 1 Position		%	B_X1_TST	
	Circuit B EXV 2 Position		%	B_X2_TST	
	Cir A EXV 1 Calibrate	Off/On		A_X1_CAL	
	Cir A EXV 2 Calibrate	Off/On		A_X2_CAL	
	Cir B EXV 1 Calibrate	Off/On		B_X1_CAL	
	Cir B EXV 2 Calibrate	Off/On		B_X2_CAL	
TESTHEAT					
	Requested Heat Stage			HTST_TST	
	Heat Relay 1	Off/On		HS1_TST	
	Modulating Heat Capacity		%	MGAS_TST	
	Heat Relay 2	Off/On		HS2_TST	
	Relay 3 W1 Gas Valve 2	Off/On		HS3_TST	
	Relay 4 W2 Gas Valve 2	Off/On		HS4_TST	
	Relay 5 W1 Gas Valve 3	Off/On		HS5_TST	
	Relay 6 W2 Gas Valve 3	Off/On		HS6_TST	
	Relay 7 W1 Gas Valve 4	Off/On		HS7_TST	
	Relay 8 W2 Gas Valve 4	Off/On		HS8_TST	
	Relay 9 W1 Gas Valve 5	Off/On		HS9_TST	
	Relay 10 W2 Gas Valve 5	Off/On		HS10_TST	
	Heat Interlock Relay	Off/On		HIR_TST	
	Ht.Coil Command Position		%	HTCLHEAT	
TESTHMZR					
	HumidiMizer 3-way Valve	Off/On		RHVH_TST	
	Condenser EXV Position		%	CEXVHTST	
	Bypass EXV Position		%	BEXVHTST	
	Condenser EXV calibrate	Off/On		CEXV_CAL	
	Bypass EXV calibrate	Off/On		BEXV_CAL	
TESTINDP					
	Humidifier Relay	Off/On		HUMR_TST	
	Remote Alarm/Aux Relay	Off/On		ALRM_TST	
	OAU 2-Position Damper	Close/Open		S_OADMPR	
	OAU Wheel Test		%	S_WHEEL	
	OAU OA Fan Speed Test		%	S_OAFAN	
	OAU PE Fan Speed Test		%	S_EXFAN	
	OAU Tempring Heater Test		%	S_OAHEAT	
VERSIONS					
	MBB CESR131461-	5-char ASCII		MBB_SW	
	RXB CESR131465-	5-char ASCII		RXB_SW	
	EXB CESR131465-	5-char ASCII		EXB_SW	
	CXB CESR131173-	5-char ASCII		CXB_SW	
	SCB CESR131226-	5-char ASCII		SCB_SW	
	CEM CESR131174-	5-char ASCII		CEM_SW	
	EXV CESR131172-	5-char ASCII		EXV_SW	

MAINTENANCE DISPLAY TABLES (cont)

TABLE	DISPLAY NAME	RANGE	UNITS	POINT NAME	WRITE STATUS
VERSIONS (cont)	EXV CIR A CESR131172-	5-char ASCII		EXV_A_SW	
	EXV CIR B CESR131172-	5-char ASCII		EXV_B_SW	
	VFD1 Firmware Version-	5-char ASCII		VFD1_SW	
	VFD2 Firmware Version-	5-char ASCII		VFD2_SW	
	Econ 1 Out Ser Number-	19-char ASCII		ECONSNUM	
	Econ 2 Ret Ser Number-	19-char ASCII		ECN2SNUM	
	Humidfier Serial Number-	19-char ASCII		HUMDSNUM	
	Heat Coil Serial Number-	19-char ASCII		HTCLSNUM	
	Econ 3 Out Ser Number-	19-char ASCII		ECN3SNUM	
	MARQUEE CESR131171-	5-char ASCII		MARQ_SW	
	NAVIGATOR CESR130227-	5-char ASCII		NAVI_SW	
TESTFANS					
	Fan Test Mode Automatic?	No/Yes		FANAUTO	
	Econ 1 Out Act.Cmd.Pos.		%	ECONFANS	
	Supply Fan Bypass Relay	Off/On		SFBY_TST	
	Supply Fan Commanded %		%	SFVFDTST	
	Power Exhaust Bypass Rly	Off/On		PEBY_TST	
	Exhaust Fan Commanded %		%	EFVFDTST	
	MtrMaster A Commanded %		%	OAVFDTST	
	MtrMaster B Commanded %		%	OBVFDTST	
	Condenser Fan Output 1	Off/On		CDF1_TST	
	Condenser Fan Output 2	Off/On		CDF2_TST	
	Condenser Fan Output 3	Off/On		CDF3_TST	
	Condenser Fan Output 4	Off/On		CDF4_TST	
	Condenser Fan Output 5	Off/On		CDF5_TST	

APPENDIX C — UNIT STAGING TABLES

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

UNIT SIZE N STAGING SEQUENCE WITH MLV (75 TON NOMINAL CAPACITY)

STAGE	SEQUENCE						
	0	1*	1	2	3	4	5
COMP	**Compressor Status**						
A1	OFF	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	OFF	ON	ON	ON
B1	OFF	OFF	OFF	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	OFF	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	**Total Capacity**						
075	0%	18%	23%	41%	65%	82%	100%

*Minimum load valve (MLV). MLV is enabled on Circuit A when decreasing from stage 1 to stage 0 to provide an increased stage of capacity.

UNIT SIZE N STAGING SEQUENCE WITH DIGITAL COMPRESSOR (75 TON NOMINAL CAPACITY)

STAGE	SEQUENCE					
	0	1	2	3	4	5
COMP	**Compressor Status**					
A1	OFF	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	ON	ON	ON
B1	OFF	OFF	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	ON
UNIT	**Total Capacity**					
075	0%	12% to 23%	29% to 41%	53% to 65%	71% to 82%	88% to 100%

UNIT SIZE N STAGING SEQUENCE WITHOUT MLV (75 TON NOMINAL CAPACITY)

STAGE	SEQUENCE						
	0	1	2	3	4	5	6
COMP	**Compressor Status**						
A1	OFF	OFF	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	OFF	ON	ON	ON
B1	OFF	ON	OFF	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	OFF	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	**Total Capacity**						
075	0%	18%	23%	41%	65%	82%	100%

APPENDIX C — UNIT STAGING TABLES (CONT)

UNIT SIZE P, Q STAGING SEQUENCE (90 AND 105 TON NOMINAL CAPACITY)

STAGE	SEQUENCE							
	0	1*	1	2	3	4	5	6
COMP	Compressor Status							
A1	OFF	ON	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	OFF	ON	ON	ON	ON
A3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	OFF	ON	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Total Capacity							
090	0%	11%	15%	33%	49%	67%	82%	100%
105	0%	13%	17%	33%	50%	67%	83%	100%

*Minimum load valve (MLV). MLV is enabled on Circuit A when decreasing from stage 1 to stage 0 to provide an increased stage of capacity.

UNIT SIZE P, Q STAGING SEQUENCEWITH DIGITAL COMPRESSOR (90 AND 105 TON NOMINAL CAPACITY)

STAGE	SEQUENCE						
	0	1	2	3	4	5	6
COMP	Compressor Status						
A1	OFF	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	ON	ON	ON	ON
A3	OFF	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	ON	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Total Capacity						
090	0%	8% to 15%	26% to 33%	41% to 49%	59% to 67%	74% to 82%	92% to 100%
105	0%	8% to 17%	25% to 33%	42% to 50%	58% to 67%	75% to 83%	92% to 100%

UNIT SIZE R, S, T STAGING SEQUENCE (120 to 150 TON NOMINAL CAPACITY)

STAGE	SEQUENCE									
	0	1*	1	2	3	4	5	6	7	8
COMP	Compressor Status									
A1	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
A3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
A4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
B4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Total Capacity									
120	0%	11%	14%	28%	40%	52%	64%	76%	88%	100%
130	0%	8%	11%	22%	35%	48%	61%	74%	87%	100%
150	0%	9%	13%	25%	38%	50%	63%	75%	88%	100%

*Minimum load valve (MLV). MLV is enabled on Circuit A when decreasing from stage 1 to stage 0 to provide an increased stage of capacity.

UNIT SIZE R, S, T STAGING SEQUENCE WITH DIGITAL COMPRESSOR (120 to 150 TON NOMINAL CAPACITY)

STAGE	SEQUENCE								
	0	1	2	3	4	5	6	7	8
COMP	Compressor Status								
A1	OFF	ON	ON	ON	ON	ON	ON	ON	ON
A2	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
A3	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
A4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
B1	OFF	OFF	ON	ON	ON	ON	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
B3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
B4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Total Capacity								
120	0%	7% to 14%	21% to 28%	33% to 40%	45% to 52%	57% to 64%	69% to 76%	81% to 88%	93% to 100%
130	0%	6% to 11%	17% to 22%	30% to 35%	43% to 48%	56% to 61%	69% to 74%	82% to 87%	95% to 100%
150	0%	6% to 13%	19% to 25%	31% to 38%	44% to 50%	56% to 63%	69% to 75%	81% to 88%	94% to 100%

APPENDIX D — VFD INFORMATION

On units equipped with optional supply fan and/or exhaust fan VFDs, the fan speed is controlled by a 3-phase VFD. The supply fan VFD is located in the supply fan section behind an access door. The exhaust fan VFD is located on the back wall of the unit return section.

The N Series units use ABB VFDs. The VFDs communicate to the *Comfort*Link MBB over the local equipment network (LEN). The VFD speed is controlled directly by the *Comfort*Link controls over the LEN. The interface wiring for the VFDs is shown in Fig. A and the terminal designations are shown in Table A. The VFD has a keypad display panel that can be used for Service Diagnostics and setting the initial VFD parameters required to allow the VFD to communicate on the LEN. Additional VFD parameters are set by the *Comfort*Link controls and sent to the VFD over the LEN at power up of the VFD. The VFD faults can be reset with the VFD keypad or through the *Comfort*Link controls (***Alarms→R.CUR*** =Yes).

Table B outlines the VFD parameters required to initialize communication over the *Comfort*Link LEN. These parameters must be set correctly for any communications to occur. These parameters come preset from the factory. If the VFD is replaced, these parameters must be set at the initial power up of the drive. This can be accomplished by running the Carrier Assistant through the VFD keypad (see START-UP WITH THE CARRIER ASSISTANT section) or setting each of the parameters individually.

After the parameters in Table B have been set, the *Comfort*Link controls configure the additional parameters listed in Tables C and D automatically. These parameter configurations are sent to the VFD at every power up. The parameters listed in Table C have corresponding *Comfort*Link configurations (***Configuration→IAQ→S.VFD*** and ***Configuration→IAQ→E.VFD***). The parameters in Table D are hard-coded to be set as listed.

After configuration Tables C and D have been sent to the VFD, the drive continues to send and receive information from the *Comfort*Link controls. This information is outlined in Tables E and F. Table E lists the information the VFD sends to the *Comfort*Link controls, and Table F lists the information the *Comfort*Link controls send to the VFD. These tables are updated at every scan the *Comfort*Link controls perform of the LEN. This occurs approximately once every second.

Table A — VFD Terminal Designations

TERMINAL	FUNCTION
U1 **V1** **W1**	3-Phase Main Circuit Input Power Supply
U2 **V2** **W2**	3-Phase AC Output to Motor, 0 V to Maximum Input Voltage Level
X1-11 (GND) **X1-12 (D-COM)**	Factory-supplied jumper
X1-10 (+24 V) **X1-13 (DI-1)**	Factory-supplied jumper
X1-10 (+24 V) **X1-16 (DI-4)**	Start Enable 1 (Factory-supplied jumper). When opened the drive goes to emergency stop.
X1-28 (SCR) **X1-29 (B+)** **X1-30 (B-)** **X1-31 (AGND)** **X1-32 (SCR)**	Factory wired for local equipment network LEN communication

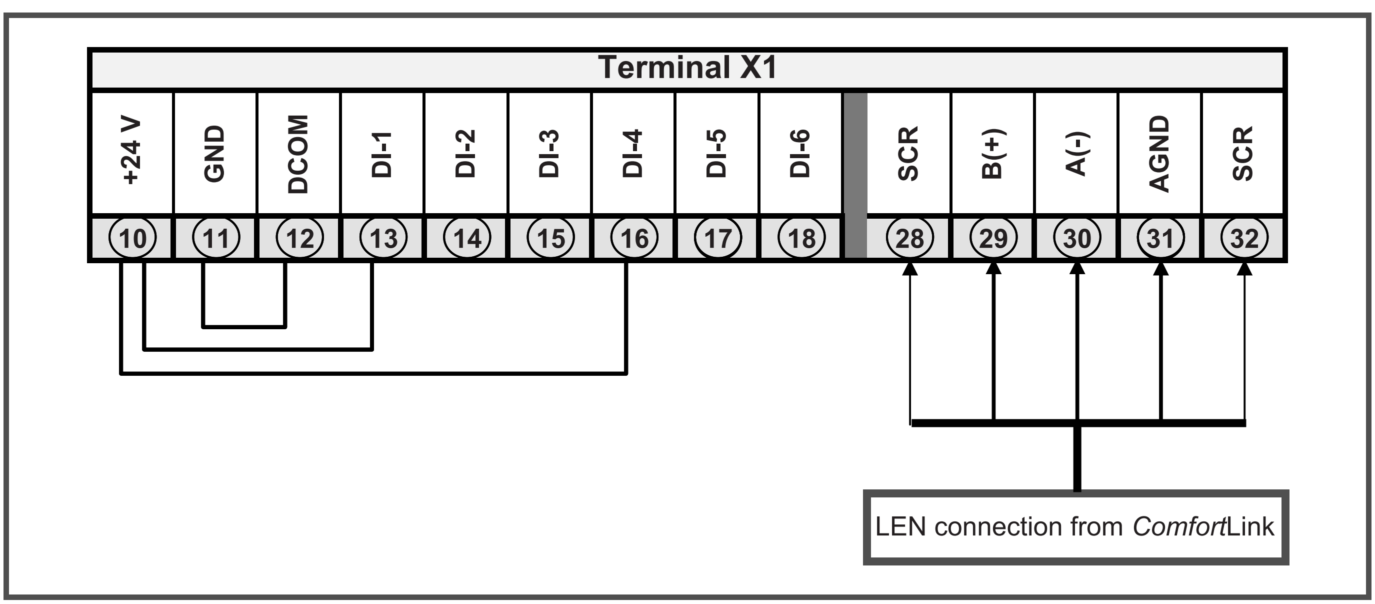


Fig. A VFD Wiring

Table B — VFD Parameters Configured by Carrier Assistant

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	HVAC DEFAULT	CARRIER DEFAULT
Options	COMM PROT SEL	9802	NOT SEL (0)	LEN (6)
EFB Protocol	EFB PROTOCOL ID	5301	0000 hex	0601 hex
	EFB STATION ID	5302	0	41/42*
	EFB BAUD RATE	5303	9.6 kb/s	38.4 kb/s
	EFB PARITY	5304	8 NONE 1	8 NONE 1
	EFB CTRL PROFILE	5305	ABB DRV LIM	DCU PROFILE

* 41 for Supply Fan Motor VFD, 42 for Exhaust Fan Motor VFD.

Table C — VFD Parameters with CCN Points Configured with *Comfort*Link Controls

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	HVAC DEFAULT	CARRIER DEFAULT	CCN POINT SUPPLY FAN VFD	CCN POINT EXHAUST FAN VFD
Start-Up Data	MOTOR NOM VOLT	9905	230V,460V,575V	*	VFD1NVLT	VFD2NVLT
	MOTOR NOM CURR	9906	1.0*In	*	VFD1NAMP	VFD2NAMP
	MOTOR NOM FREQ	9907	60 Hz	60 Hz	VFD1NFRQ	VFD2NFRQ
	MOTOR NOM SPEED	9908	1750 rpm	1750 rpm	VFD1NRPM	VFD2NRPM
	MOTOR NOM POWER	9909	1.0*Pn	*	VFD1NPWR	VFD2NPWR
Start/Stop/Dir	DIRECTION	1003	FORWARD	REQUEST	VFD1MDIR	VFD2MDIR
Accel/Decel	ACCELER TIME 1	2202	30.0s	30.0s	VFD1ACCL	VFD2ACCL
	DECELER TIME 1	2203	30.0s	30.0s	VFD1DECL	VFD2DECL
Motor Control	SWITCHING FREQ	2606	4 kHz	8 kHz	VFD1SWFQ	VFD2SWFQ

* Depends on unit.

Table D — VFD Parameters Configured with *Comfort*Link Controls

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	HVAC DEFAULT	CARRIER DEFAULT
Start/Stop/Dir	EXT1 COMMANDS	1001	DI1	COMM (10)
Reference Select	REF1 SELECT	1103	AI1	COMM (8)
Constant Speeds	CONST SPEED SEL	1201	DI3	NOT SEL (0)
	CONST SPEED 7	1208	60 Hz	0 Hz
System Controls	RUN ENABLE	1601	NOT SEL	NOT SEL (0)
	FAULT RESET SEL	1604	KEYPAD	COMM (8)
	START ENABLE 1	1608	DI4	DI4 (4)
Start/Stop	START FUNCTION	2101	SCALAR FLYSTART	AUTO (1)
	STOP FUNCTION	2102	COAST	RAMP (2)
Fault Functions	COMM FAULT FUNC	3018	NOT SEL	CONST SP 7 (2)
	COMM FAULT TIME	3019	10.0 s	10.0 s
Automatic Reset	AR OVERCURRENT	3104	Disable (0)	Disable (0)
	AR OVERVOLTAGE	3105	Enable (1)	Disable (0)
	AR UNDERVOLTAGE	3106	Enable (1)	Disable (0)
	AR AI<MIN	3107	Enable (1)	Disable (0)
	AR EXTERNAL FAULT	3108	Enable (1)	Disable (0)

Table E — VFD *Comfort*Link Control Variables

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	CCN POINT SUPPLY FAN VFD	CCN POINT EXHAUST FAN VFD
Actual Signals	FB STS WORD 1	303	VFD1STAT	VFD2STAT
Not Available	SPEED (%)	Not Available	VFD1_SPD	VFD2_SPD
Operating Data	SPEED	102	VFD1RPM	VFD2RPM
	OUTPUT FREQ	103	VFD1FREQ	VFD2FREQ
	CURRENT	104	VFD1AMPS	VFD2AMPS
	TORQUE	105	VFD1TORQ	VFD2TORQ
	POWER	106	VFD1PWR	VFD2PWR
	DC BUS VOLTAGE	107	VFD1VDC	VFD2VDC
	OUTPUT VOLTAGE	109	VFD1VOUT	VFD2VOUT
	DRIVE TEMP	110	VFD1TEMP	VFD2TEMP
	RUN TIME (R)	114	VFD1RUNT	VFD2RUNT
	KWH COUNTER (R)	115	VFD1KWH	VFD2KWH
	DI1 STATUS	118	VFD1_DI1	VFD2_DI1
	DI2 STATUS	118	VFD1_DI2	VFD2_DI2
	DI3 STATUS	118	VFD1_DI3	VFD2_DI3
	DI4 STATUS	119	VFD1_DI4	VFD2_DI4
	DI5 STATUS	119	VFD1_DI5	VFD2_DI5
	DI6 STATUS	119	VFD1_DI6	VFD2_DI6
	AI1	120	VFD1_AI1	VFD2_AI1
	AI2	121	VFD1_A12	VFD2_A12
Fault History	LAST FAULT	401	VFD1LFC	VFD2LFC

Table F — VFD *Comfort*Link Command Variables

PARAMETER GROUP	PARAMETER TITLE	PARAMETER INDEX	CCN POINT SUPPLY FAN VFD	CCN POINT EXHAUST FAN VFD
Actual Signals	FB CMD WORD 1	301	Not Available	Not Available
Not Available	SPEED REF (%)	Not Available	SFAN_VFD	EFAN_VFD
Operating Data	COMM RO WORD - (RELAY OUTPUT 1)	134	VFD1REL1	VFD2REL1
	COMM RO WORD - (RELAY OUTPUT 2)	134	VFD1REL2	VFD2REL2
	COMM RO WORD - (RELAY OUTPUT 3)	134	VFD1REL3	VFD2REL3
	COMM VALUE 1 - (AO1)	135	VFD1_AO1	VFD2_AO1
	COMM VALUE 2 - (AO2)	136	VFD1_AO2	VFD2_AO2

VFD Operation

The VFD keypad is shown in Fig. B. The function of SOFT KEYS 1 and 2 change depending on what is displayed on the screen. The function of SOFT KEY 1 matches the word in the lower left-hand box on the display screen. The function of SOFT KEY 2 matches the word in the lower right-hand box on the display screen. If the box is empty, then the SOFT KEY does not have a function on that specific screen. The UP and DOWN keys are used to navigate through the menus. The OFF key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The HAND key is used to change control of the drive to local (hand held) control. The HELP button is used to access the help screens.

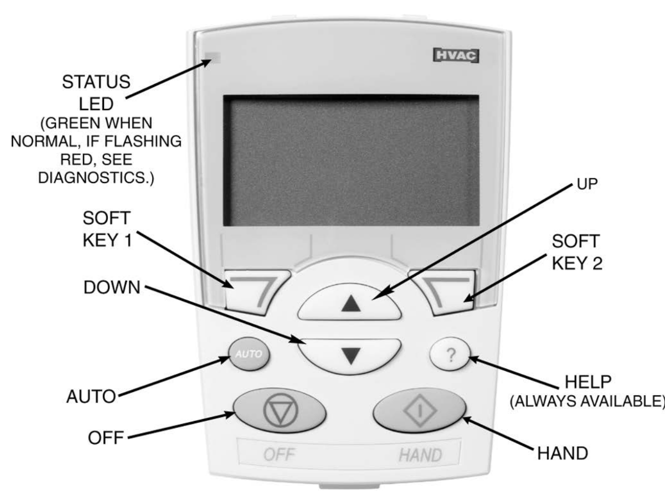


Fig. B — VFD Keypad

START-UP WITH CARRIER ASSISTANT

Initial start-up has been performed at the factory. If a VFD has been replaced, start up the VFD with the Carrier Assistant using the following procedure.

NOTE: To change certain VFD parameters, the VFD must be in the OFF mode. To ensure the VFD is in the OFF mode prior to running the Carrier Assistant, it is recommended that you turn the drive OFF manually by pressing the OFF button on the VFD keypad. After completion of the Carrier Assistant, press the AUTO button on the VFD keypad to return to RUN mode.

1. Place the *Comfort*link controls in Service Test mode (***Service Test→TEST*** = ON).
2. With the VFD in the OFF mode, select MENU (SOFT KEY 2). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight ASSISTANTS on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight Carrier Assistant and press SEL (SOFT KEY 2).
5. The Carrier Assistant will ask questions to determine the correct parameters for the VFD.
   a. The Carrier Assistant will ask, "Select an App 1-3":

      1. Air Handler
      2. Roof Top
      3. Other Application

   b. Use the UP or DOWN keys to highlight Roof Top and press OK (SOFT KEY 2).
   c. The Carrier Assistant will ask "Is this a Hi E or Premium E motor?" :

      Hi E
      Premium E

   d. Use the UP or DOWN keys to highlight the correct motor efficiency and press OK (SOFT KEY 2).
   e. The Carrier Assistant will ask "Is this a Non-LEN VFD or LEN VFD?" :

      Non-LEN VFD
      LEN VFD

   f. Use the UP or DOWN keys to highlight LEN VFD and press OK (SOFT KEY 2).
   g. The Carrier Assistant will ask "Is this an IFM VFD or P.E. motor VFD?" :

      IFM VFD
      P.E. motor VFD

   h. Use the UP or DOWN keys to highlight the correct VFD and press OK (SOFT KEY 2).
6. The keypad will display "Carrier Assistant Complete". The parameters in Table B will now be set correctly. Press OK (SOFT KEY 2) then EXIT (SOFT KEY 1) to return to the Main Menu. Press EXIT (SOFT KEY 1) again to return to the Standard Display mode.
7. To allow the configuration parameters in Tables C and D to be sent to the VFD, power must be cycled to the drive. Cycle power using Service Test mode.
   a. For Supply Fan VFD, set ***Service Test→FANS→ S.FAN*** = OFF. Allow VFD to power down completely (approximately 30 seconds) and then turn back ON.
   b. For Exhaust Fan VFD, set ***Service Test→FANS→ P.E.1*** = OFF. Allow VFD to power down completely (approximately 30 seconds) and then turn back ON.
8. Press the AUTO button on VFD Keypad.
9. Take the *Comfort*link controls out of Service Test mode (***Service Test→TEST*** = OFF).

START-UP BY CHANGING PARAMETERS INDIVIDUALLY

Initial start-up is performed at the factory. To start up the VFD with by changing individual parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (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 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 2 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.

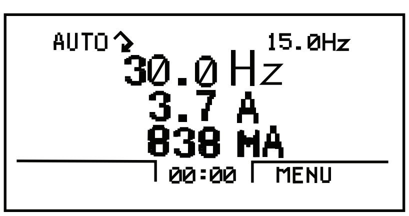


Fig. C — Standard Display Example

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 2 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 control panel with 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 control panel with 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 display.
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 display.
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)

The fault code on the control panel display is temporary. Pressing the MENU, ENTER, UP, or DOWN buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched and the fault is still active.

ALARMS (GREEN LED FLASHING)

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

- flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
- sets an appropriate bit in an Alarm Word parameter (0308 or 0309)
- overrides the control panel display with the display of an alarm code and/or name

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists.

CORRECTING FAULTS

The recommended corrective action for faults is shown in the Fault Codes Table G. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter 1604 (FAULT RESET SELECT), digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

HISTORY

For reference, the last 3 fault codes are stored into parameters 0401, 0412, 0413. For the most recent fault (identified by parameter 0401), the drive stores additional data (in parameters 0402 through 0411) to aid in troubleshooting a problem. For example, a parameter 0404 stores the motor speed at the time of the fault. To clear the fault history (all of Group 04, Fault History parameters), perform the following procedure:

1. In the control panel, Parameters mode, select parameter 0401.
2. Press EDIT.
3. Press the UP and DOWN buttons simultaneously.
4. Press SAVE.

CORRECTING ALARMS

To correct alarms, first determine if the Alarm requires any corrective action (action is not always required). Use Table H to find and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact ABB Automation Inc., at 1-800-435-7365, option 4, option 3. A qualified technician will review the problem with the caller and make a determination regarding how to proceed. This may involve dispatching a designated service station (DSS) representative from an authorized station, dispatching a replacement unit, or advising return for repair.

Table G — Fault Codes

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1	OVERCURRENT	Output current is excessive. Check for excessive motor load, insufficient acceleration time (parameters 2202 ACCELER TIME 1, default 30 seconds), or faulty motor, motor cables or connections.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for static or transient over voltages in the input power supply, insufficient deceleration time (parameters 2203 DECELER TIME 1, default 30 seconds), or undersized brake chopper (if present).
3	DEV OVERTEMP	Drive heat sink is overheated. Temperature is at or above 115°C (239°F). Check for fan failure, obstructions in the airflow, dirt or dust coating on the heat sink, excessive ambient temperature, or excessive motor load.
4	SHORT CIRC	Fault current. Check for short-circuit in the motor cable(s) or motor or supply disturbances.
5	OVERLOAD	Inverter overload condition. The drive output current exceeds the ratings.
6	DC UNDERVOLT	Intermediate circuit DC voltage is not sufficient. Check for missing phase in the input power supply, blown fuse, or under voltage on main circuit.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1 FLT LIMIT (3021). Check source and connection for analog input and parameter settings for AI1 FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2 FLT LIMIT (3022). Check source and connection for analog input and parameter settings for AI2 FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT OVERTEMP	Motor is too hot, as estimated by the drive. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
10	PANEL LOSS	Panel communication is lost and either drive is in local control mode (the control panel displays LOC), or drive is in remote control mode (REM) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check the communication lines and connections. Check parameter 3002 PANEL COMM ERROR, parameters in Group 10: Command Inputs and Group 11:Reference Select (if drive operation is REM).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check motor connections.
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for excessive load or insufficient motor power. Check parameters 3010 through 3012.
13	RESERVED	Not used.
14	EXT FAULT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXT FAULT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 2.
16	EARTH FAULT	The load on the input power system is out of balance. Check for faults in the motor or motor cable. Verify that motor cable does not exceed maximum specified length.
17	UNDERLOAD	Motor load is lower than expected. Check for disconnected load. Check parameters 3013 UNDERLOAD FUNCTION through 3015 UNDERLOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact Carrier.
19	OPEX LINK	Internal fault. A communication-related problem has been detected between the OMIO and OINT boards. Contact Carrier.
20	OPEX PWR	Internal fault. Low voltage condition detected on the OINT board. Contact Carrier.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact Carrier.
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for missing main phase or blown fuse.
23	RESERVED	Not used.
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED parameters. Check parameter settings for 2001 and 2002. Check adequacy of motor braking torque. Check applicability of torque control. Check brake chopper and resistor.
25	RESERVED	Not used.
26	DRIVE ID	Internal fault. Configuration block drive ID is not valid.
27	CONFIG FILE	Internal configuration file has an error. Contact Carrier.
28	SERIAL 1 ERR	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
29	EFB CON FILE	Error in reading the configuration file for the field bus adapter.
30	FORCE TRIP	Fault trip forced by the field bus. See the field bus reference literature.
31	EFB 1	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
32	EFB 2	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
33	EFB 3	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
34	MOTOR PHASE	Fault in the motor circuit. One of the motor phases is lost. Check for motor fault, motor cable fault, thermal relay fault (if used), or internal fault.
35	OUTP WIRING	Error in power wiring suspected. Check that input power wired to drive output. Check for ground faults.
101-105	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.
201-206	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.
1000	PAR HZRPM	Parameter values are inconsistent. Check for any of the following: 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: -128/+128 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: -128/+128 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: -128/+128 2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: -128/+128
1001	PAR PFA REFNG	Parameter values are inconsistent. Check that 2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
1002	PAR PFA IOCNF	Parameter values are inconsistent. The number of programmed PFA relays does not match with Interlock configuration, when 8123 PFA ENABLE is active. Check consistency of RELAY OUTPUT parameters 1401 through 1403, and 1410 through 1412. Check 8117 NR OF AUX MOTORS, 8118 AUTOCHANGE INTERV, and 8120 INTERLOCKS.
1003	PAR AI SCALE	Parameter values are inconsistent. Check that parameter 1301 AI 1 MIN > 1302 AI 1 MAX and that parameter 1304 AI 2 MIN > 1305 AI 2 MAX.
1004	PAR AO SCALE	Parameter values are inconsistent. Check that parameter 1504 AO 1 MIN > 1505 AO 1 MAX and that parameter 1510 AO 2 MIN > 1511 AO 2 MAX.
1005	PAR PCU 2	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check the following parameters: 1.1 < (9906 MOTOR NOM CURR * 9905 MOTOR NOM VOLT * 1.73 / PN) < 2.6 Where: PN = 1000 * 9909 MOTOR NOM POWER (if units are kW) or PN = 746 * 9909 MOTOR NOM POWER (if units are HP, e.g., in US)
1006	PAR EXT RO	Parameter values are inconsistent. Check the extension relay module for connection and 1410 through 1412 RELAY OUTPUTS 4 through 6 have non-zero values.
1007	PAR FBUS	Parameter values are inconsistent. Check that a parameter is set for field bus control (e.g., 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
1008	PAR PFA MODE	Parameter values are inconsistent. The 9904 MOTOR CTRL MODE must be = 3 (SCALAR SPEED), when 8123 PFA ENABLE is activated.
1009	PAR PCU 1	Parameter values for power control are inconsistent or improper motor nominal frequency or speed. Check for both of the following: 1 < (60 * 9907 MOTOR NOM FREQ / 9908 MOTOR NOM SPEED < 16 0.8 < 9908 MOTOR NOM SPEED / (120 * 9907 MOTOR NOM FREQ / Motor poles) < 0.992
1010	OVERRIDE/PFA CONFLICT	Override mode is enabled and PFA is activated at the same time. This cannot be done because PFA interlocks cannot be observed in the override mode.

Table H — Alarm Codes

ALARM CODE	ALARM NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
2001	—	Reserved
2002	—	Reserved
2003	—	Reserved
2004	DIR LOCK	The change in direction being attempted is not allowed. Do not attempt to change the direction of motor rotation, or Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check input source and connections. Check the parameter that sets the minimum (3021) and the parameter that sets the Alarm/Fault operation (3001).
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check input source and connections. Check parameter that sets the minimum (3022) and the parameter that sets the Alarm/Fault operation (3001).
2008	PANEL LOSS	Panel communication is lost and either the VFD is in local control mode (the control panel displays HAND), or the VFD is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct, check the communication lines and connections, Parameter 3002 PANEL LOSS, and parameters in groups 10 COMMAND INPUTS and 11 REFERENCE SELECT (if drive operation is REM).
2009	—	Reserved
2010	MOT OVERTEMP	Motor is hot, based on either the VFD estimate or on temperature feedback. This alarm warns that a Motor Overload fault trip may be near. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check that the motor and drive ratings match (motor is NOT undersized for the drive). Check the settings on parameters 3013 to 3015.
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013*	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. To control automatic reset, use parameter group 31 (AUTOMATIC RESET).
2014*	AUTOCHANGE	This alarm warns that the PFA autochange function is active. To control PFA, use parameter group 81 (PFA) and the Pump Alternation macro.
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start any motor (when Autochange is used), or a speed regulated motor (when Autochange is not used).
2016	—	Reserved
2017*	OFF BUTTON	This alarm indicates that the OFF button has been pressed.
2018*	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. To control PID sleep, use parameters4022 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)].

VFD Maintenance

If installed in an appropriate environment, the VFD requires very little maintenance. Table I lists the routine maintenance intervals recommended by Carrier.

HEAT SINK

The heat sink fins accumulate dust from the cooling air. Since a dusty sink is less efficient at cooling the drive, overtemperature faults become more likely. In a normal environment, check the heat sink annually; in a dusty environment, check more often.

Check the heat sink as follows (when necessary):

1. Remove power from drive.
2. Remove the cooling fan.
3. Blow clean compressed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. If there is 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.

Table I — Maintenance Intervals

MAINTENANCE	INTERVAL
Heat Sink Temperature Check and Cleaning	Every 6 to 12 months (depending on the dustiness of the environment)
Main Cooling Fan Replacement	Every 5 years
Internal Enclosure Cooling Fan Replacement	Every 3 years
Capacitor Change (Frame Size R5 and R6)	Every 10 years
HVAC Control Panel Battery Change	Every 10 years

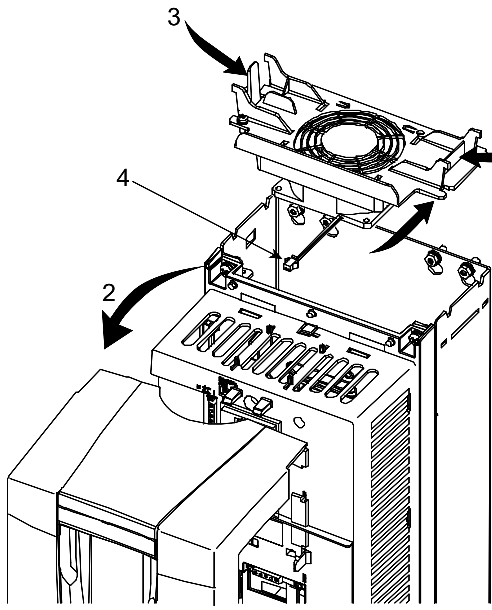


Fig. D — Main Fan Replacement (Frame Sizes R1-R4)

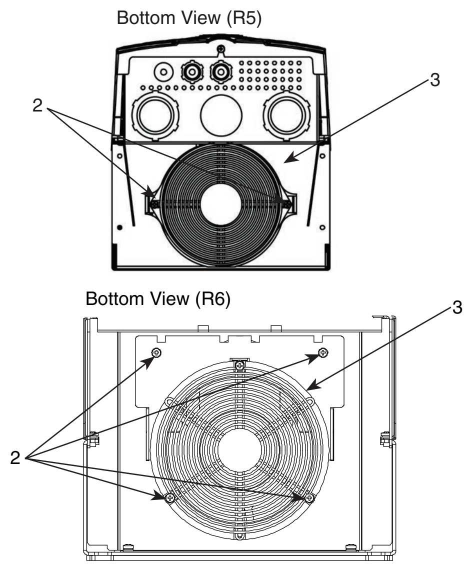


Fig. E — Main Fan Replacement (Frame Sizes R5 and R6)

INTERNAL ENCLOSURE FAN REPLACEMENT

The VFD IP 54 / UL Type 12 enclosures have an additional internal fan to circulate air inside the enclosure.

To replace the internal enclosure fan for frame sizes R1 to R4, perform the following (see Fig. F):

1. Remove power from drive.
2. Remove the front cover.
3. The housing that holds the fan in place has barbed retaining clips at each corner. Press all 4 clips toward the center to release the barbs.
4. When the clips/barbs are free, pull the housing up to remove from the drive.
5. Disconnect the fan cable.
6. Install the fan in reverse order, noting the following: the fan airflow is up (refer to arrow on fan); the fan wire harness is toward the front; the notched housing barb is located in the right-rear corner; and the fan cable connects just forward of the fan at the top of the drive.

To replace the internal enclosure fan for frame sizes R5 or R6, perform the following:

1. Remove power from drive.
2. Remove the front cover.
3. Lift the fan out and disconnect the cable.
4. Install the fan in reverse order.
5. Restore power.

CONTROL PANEL CLEANING

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners, which could scratch the display window.

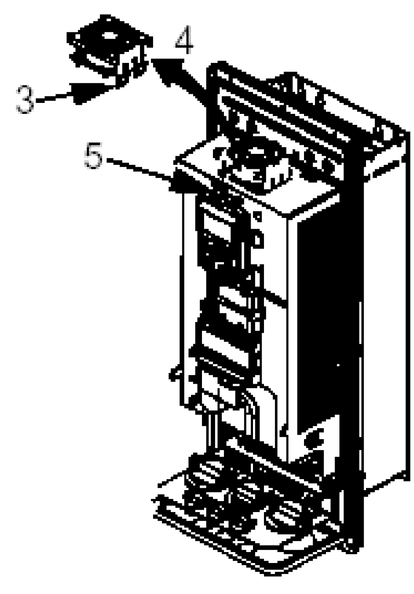
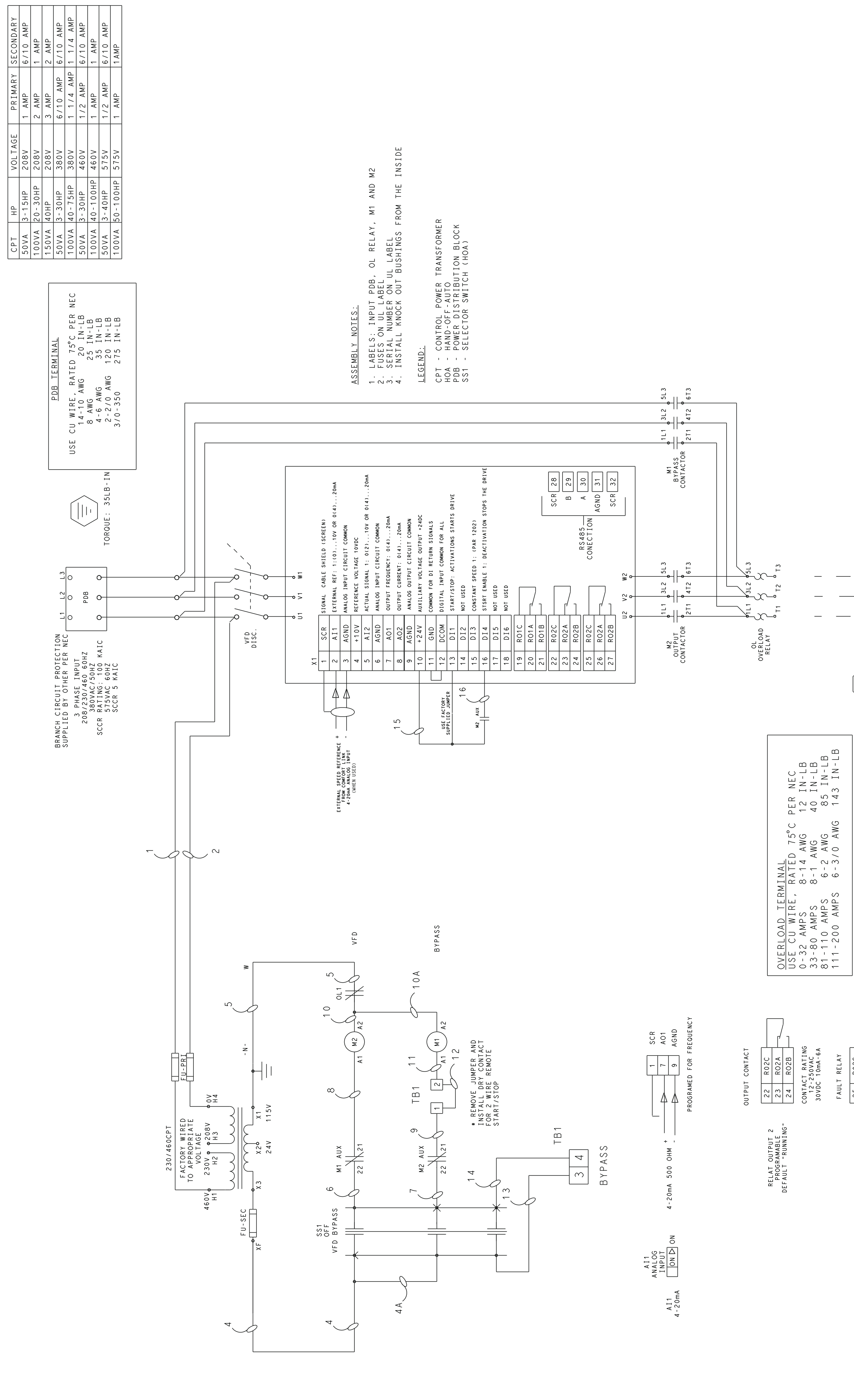


Fig. F — Internal Enclosure Fan Replacement

BATTERY REPLACEMENT

A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than 10 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.



CPT	HP	VOLTAGE	PRIMARY	SECONDARY
50VA	3-15HP	208V	1 AMP	6/10 AMP
100VA	20-30HP	208V	2 AMP	1 AMP
150VA	40HP	208V	3 AMP	2 AMP
50VA	3-30HP	380V	6/10 AMP	6/10 AMP
100VA	40-75HP	380V	1 1/4 AMP	1 1/4 AMP
50VA	3-30HP	460V	1/2 AMP	6/10 AMP
100VA	40-100HP	460V	1 AMP	1 AMP
50VA	3-40HP	575V	1/2 AMP	6/10 AMP
100VA	50-100HP	575V	1 AMP	1AMP

Fig. G — VFD Bypass Wiring Diagram

APPENDIX E — MODE SELECTION PROCESS

The following section is to be used in conjunction with the Mode Selection figure on page 41. 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 configuration (***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) and a fan status failure occurs:

{

HVAC mode: ("Fan Status Fail") OFF

Else If: Configured for return fan tracking (***Configuration→BP→BP.CF =*** 2) and there is a plenum pressure switch error (***Inputs→ GEN.I→PP.SW***=HIGH):

HVAC mode: ("Plen.Press.Fail") OFF

}

Else If: Configured for power monitoring (***Configuration→ UNIT→PW.MN)*** = YES and there is a power error ***(Input→GEN.I→PWR.F***=ALRM):>

{

HVAC mode: ("3-Phase Pwr Fail") OFF

}

Else If: The unit is a VAV unit with a supply duct pressure sensor and measured supply duct static pressure (***Pressures→ AIR.P→ SP***) is above the configurable SP Low Alert Limit (***Configuration→IAQ→ALLM→SP.H***):

{

HVAC mode: ("Duct Static Pres") OFF

}

Else If: There is an air pressure safety switch error (***Inputs→GEN.I→ SP.SS***=HIGH):

{

HVAC mode: ("Air.Pres.Sw.Fail") OFF

}

Else If: There is a VFD1 fault detected (***Run Status→ VFDS→S.VFD***→ LCF≠0) or

There is VFD1 communications failure and the supply fan is not in bypass mode (***Inputs→GEN.I→SF.BY***=OFF):

{

HVAC mode: ("Supply VFD Fault") OFF

}

Else If: There is an RCB1 communications failure:

{

HVAC mode: ("RCB comm failure") 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: ("Venting Dehum")

— The unit is operating in Vent mode and dehumidification is in effect

HVAC mode: ("Cooling Dehum")

— The unit is operating in Cool mode and dehumidification is in effect

HVAC mode: ("Heating Dehum")

— The unit is operating in Heat mode and dehumidification is in effect

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/dew point and dry bulb. See the Economizer section for further details.

}

NOTE: There is also a transitional mode whereby the machine may be waiting for relay timeguards to expire before shutting the machine completely down:

HVAC mode: ("Shutting Down")

APPENDIX F — BACNET COMMUNICATION OPTION

The following section is used to configure the UPC Open controller. The UPC Open controller is mounted in a separate enclosure below the main control box.

To Address the UPC Open Controller

The user must give the UPC Open controller an address that is unique on the BACnet[1] network. Perform the following procedure to assign an address:

1. If the UPC Open controller is powered, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the address each time power is applied to it.
2. Using the rotary switches (see Fig. H and I), set the controller's address. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

As an example, in Fig. H, if the controller's address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

1. BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).

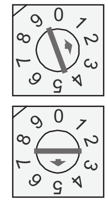


Fig. H — Address Rotary Switches

BACNET DEVICE INSTANCE ADDRESS

The UPC Open controller also has a BACnet Device Instance address. This Device Instance MUST be unique for the complete BACnet system in which the UPC Open controller is installed. The Device Instance is auto generated by default and is derived by adding the MAC address to the end of the Network Number. The Network Number of a new UPC Open controller is 16101, but it can be changed using i-Vu® Tools or BACview[2] device. By default, a MAC address of 20 will result in a Device Instance of 16101 + 20, which would be a Device Instance of 1610120.

2. BACview is a registered trademark of Automated Logic Corporation.

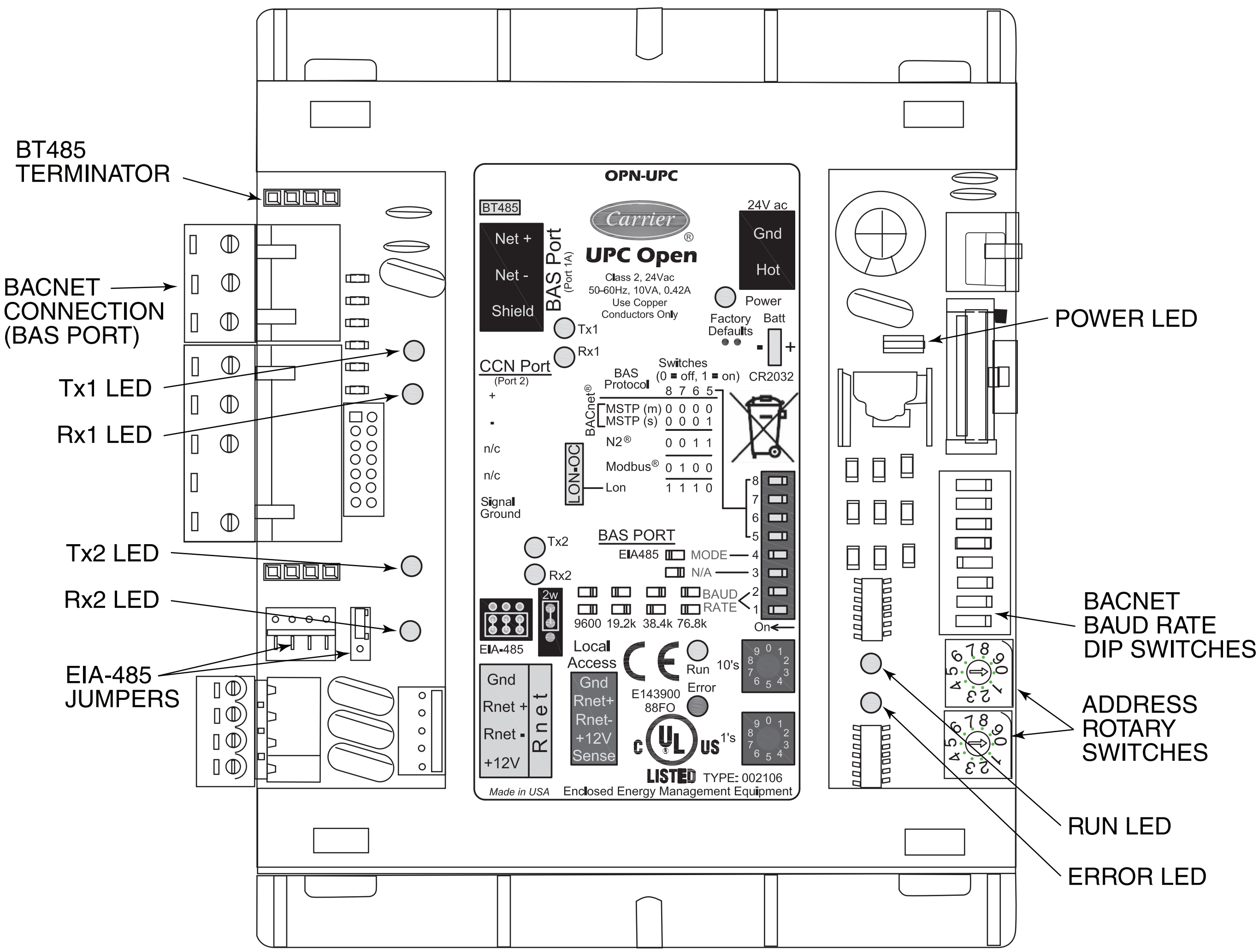


Fig. I — UPC Open Controller

Configuring the BAS Port for BACnet MS/TP

Use the same baud rate and communication settings for all controllers on the network segment. The UPC Open controller is fixed at 8 data bits, No Parity, and 1 Stop bit for this protocol's communications.

If the UPC Open controller has been wired for power, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the DIP Switches and jumpers each time power is applied to it.

Set the BAS Port DIP switch DS3 to "enable." Set the BAS Port DIP switch DS4 to "E1-485." Set the BMS Protocol DIP switches DS8 through DS5 to "MSTP." See Table J.

Table J — SW3 Protocol Switch Settings for MS/TP

DS8	DS7	DS6	DS5	DS4	DS3
Off	Off	Off	Off	On	Off

Verify that the EIA-485 jumpers below the CCN Port are set to EIA-485 and 2W.

The example in Fig. J shows the BAS Port DIP Switches set for 76.8k (Carrier default) and MS/TP.

Set the BAS Port DIP Switches DS2 and DS1 for the appropriate communications speed of the MS/TP network (9600, 19.2k, 38.4k, or 76.8k bps). See Fig. J and Table K.

Table K — Baud Selection Table

BAUD RATE	DS2	DS1
9,600	Off	Off
19,200	On	Off
38,400	Off	On
76,800	On	On

Wiring the UPC Open Controller to the MS/TP Network

The UPC Open controller communicates using BACnet on an MS/TP network segment communications at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

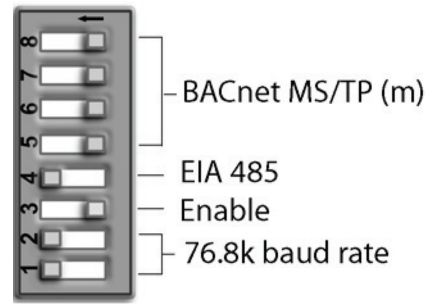


Fig. J — DIP Switches

Wire the controllers on an MS/TP network segment in a daisy-chain configuration. Wire specifications for the cable are 22 AWG (American Wire Gage) or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire. The maximum length is 2000 ft.

Install a BT485 terminator on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing. See Fig. I, K, and L.

To wire the UPC Open controller to the BAS network:

1. Pull the screw terminal connector from the controller's BAS Port.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the BAS port's screw terminals labeled Net +, Net -, and Shield.

NOTE: Use the same polarity throughout the network segment.

4. Insert the power screw terminal connector into the UPC Open controller's power terminals if they are not currently connected.
5. Verify communication with the network by viewing a module status report. To perform a module status report using the BACview keypad/display unit, press and hold the "FN" key, then press the "." key.

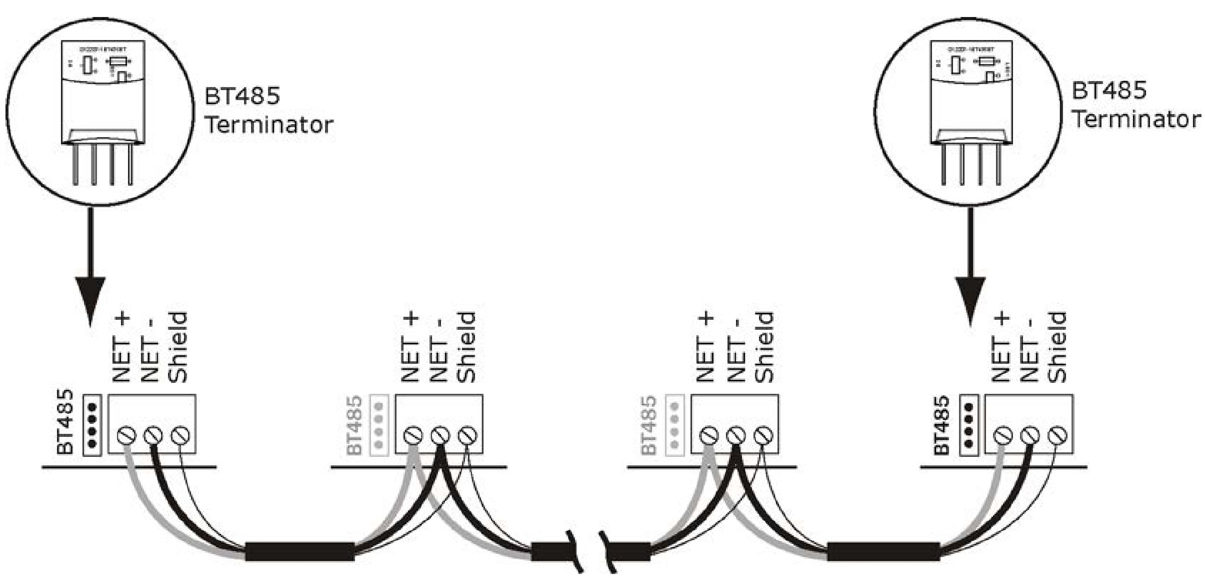


Fig. K — Network Wiring

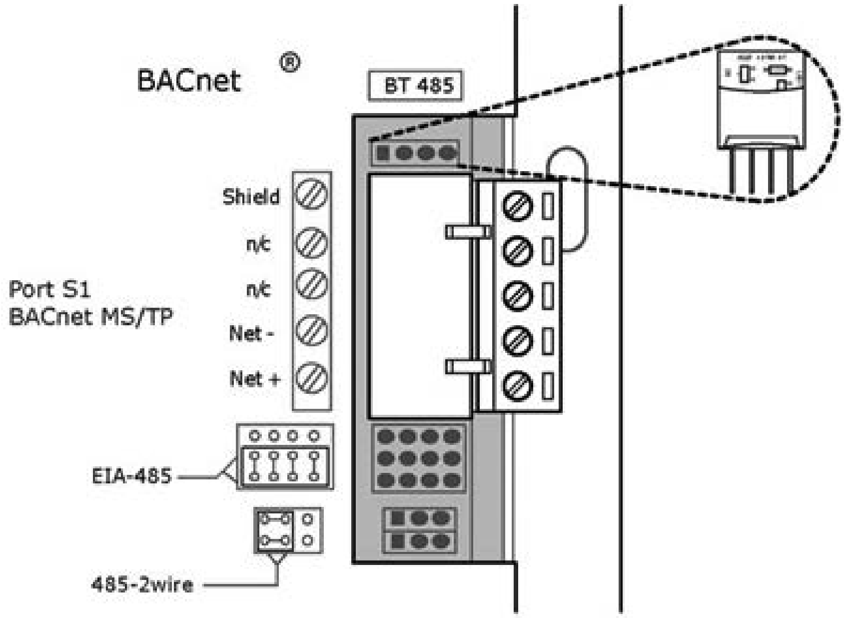


Fig. L — BT485 Terminator Installation

To install a BT485 terminator, push the BT485 terminator on to the BT485 connector located near the BACnet connector.

NOTE: The BT485 terminator has no polarity associated with it.

To order a BT485 terminator, consult Commercial Products i-Vu Open Control System Master Prices.

MS/TP Wiring Recommendations

Recommendations are shown in Tables L and M. The wire jacket and UL temperature rating specifications list two acceptable alternatives. The Halar[1] specification has a higher temperature rating and a tougher outer jacket than the SmokeGard[2] specification, and it is appropriate for use in applications where the user is concerned about abrasion. The Halar jacket is also less likely to crack in extremely low temperatures.

NOTE: Use the specified type of wire and cable for maximum signal integrity.

1. Halar is a trademark of Solvay Plastics.
2. SmokeGard is a trademark of AlphaGary - Mexichem Corp.

Table L — MS/TP Wiring Recommendations

SPECIFICATION	RECOMMMENDATION
Cable	Single twisted pair, low capacitance, CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable
Conductor	22 or 24 AWG stranded copper (tin plated)
Insulation	Foamed FEP 0.015 in. (0.381 mm) wall 0.060 in. (1.524 mm) OD
Color Code	Black/White
Twist Lay	2 in. (50.8 mm) lay on pair 6 twists/foot (20 twists/meter) nominal
Shielding	Aluminum/Mylar shield with 24 AWG TC drain wire
Jacket	SmokeGard Jacket (SmokeGard PVC) 0.021 in. (0.5334 mm) wall 0.175 in. (4.445 mm) OD Halar Jacket (E-CTFE) 0.010 in. (0.254 mm) wall 0.144 in. (3.6576 mm) OD
DC Resistance	15.2 Ohms/1000 feet (50 Ohms/km) nominal
Capacitance	12.5 pF/ft (41 pF/meter) nominal conductor to conductor
Characteristic Impedance	100 Ohms nominal
Weight	12 lb/1000 feet (17.9 kg/km)
UL Temperature Rating	SmokeGard 167°F (75°C) Halar -40 to 302°F (-40 to 150°C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

LEGEND
AWG — American Wire Gage
CL2P — Class 2 Plenum Cable
DC — Direct Current
FEP — Fluorinated Ethylene Polymer
NEC — National Electrical Code
O.D. — Outside Diameter
TC — Tinned Copper
UL — Underwriters Laboratories

Table M — Open System Wiring Specifications and Recommended Vendors

WIRING SPECIFICATIONS		RECOMMENDED VENDORS AND PART NUMBERS			
Wire Type	**Description**	**Connect Air International**	**Belden**	**RMCORP**	**Contractors Wire and Cable**
MS/TP Network (RS-485)	22 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications.	W221P-22227	—	25160PV	CLP0520LC
MS/TP Network (RS-485)	24 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications.	W241P-2000F	82841	25120-OR	—
Rnet	4 conductor, unshielded, CMP, 18 AWG, plenum rated.	W184C-2099BLB	6302UE	21450	CLP0442

LEGEND

AWG — American Wire Gage
CL2P — Class 2 Plenum Cable
CMP — Communications Plenum Rated
FEP — Fluorinated Ethylene Polymer
TC — Tinned Copper

Local Access to the UPC Open Controller

The user can use a BACview6 handheld keypad display unit or the Virtual BACview software as a local user interface to an Open controller. These items let the user access the controller network information. These are accessory items and do not come with the UPC Open controller.

The BACview6 unit connects to the local access port on the UPC Open controller. See Fig. M. The BACview software must be running on a laptop computer that is connected to the local access port on the UPC Open controller. The laptop will require an additional USB link cable for connection.

See the *BACview Installation and User Guide* for instructions on connecting and using the BACview6 device.

To order a BACview6 Handheld (BV6H), consult Commercial Products i-Vu Open Control System Master Prices.

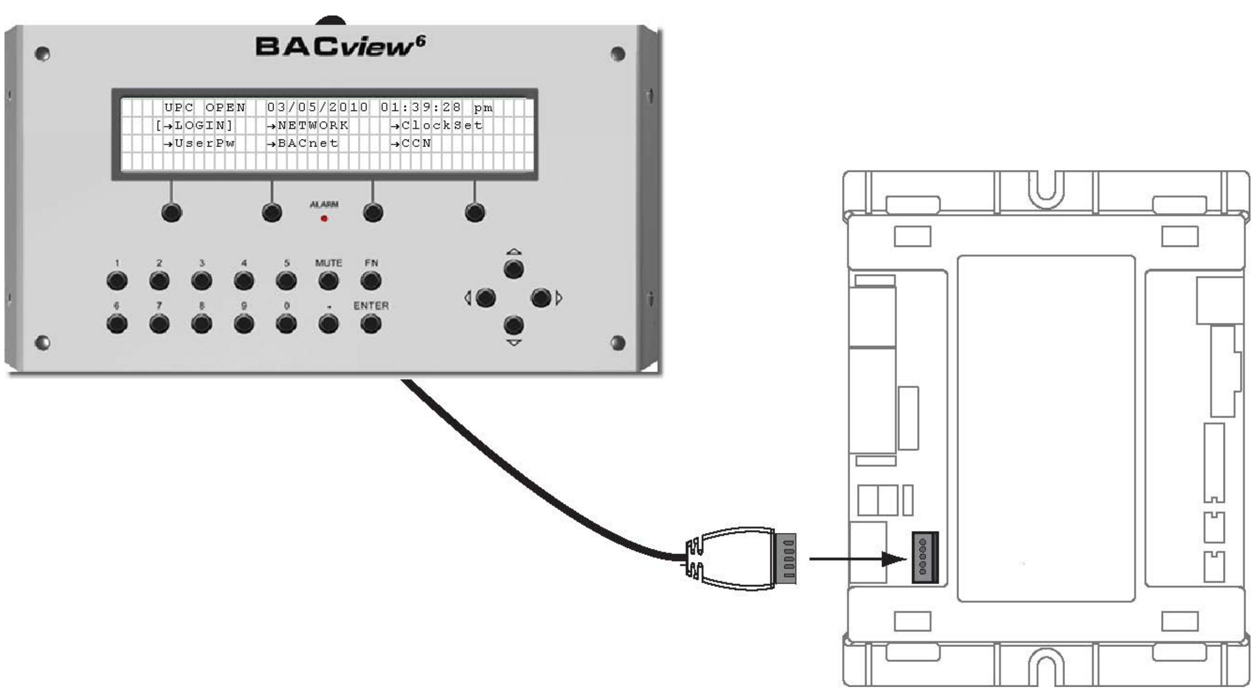


Fig. M — BACview6 Device Connection

Configuring the UPC Open Controller's Properties

The UPC Open Element Comm Stat and *Comfort*Link controls must be set to the same CCN Address (Element) number and CCN Bus number. The factory default settings for CCN Element and CCN Bus number are 1 and 0 respectively.

If modifications to the default Element and Bus number are required, both the *Comfort*Link and UPC Open Element Comm Stat configurations must be changed.

The following configurations are used to set the CCN Address and Bus number in the *Comfort*Link controls. These configurations can be changed using the *Comfort*Link Navigator™ display or handheld device.

Configuration→IAQ→CCN→CCN.A (CCN Address)

Configuration→IAQ→CCN→CCN.B (CCN Bus Number)

The following configurations are used to set the CCN Address and Bus Number in the UPC Open controller. These configurations can be changed using the accessory BACview[6] display.

Navigation: BACview→CCN
Home: Element Comm Stat
Element: 1
Bus: 0

Troubleshooting

If there are problems wiring or addressing the UPC Open controller, contact Carrier Technical Support.

COMMUNICATION LEDS

The LEDs indicate if the controller is communicating with the devices on the network. See Tables N and O. The LEDs should reflect communication traffic based on the baud rate set. The higher the baud rate, the more solid the LEDs become. See Fig. H for location of LEDs on UPC Open module.

REPLACING THE UPC OPEN BATTERY

The UPC Open controller's 10-year lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages.

IMPORTANT: Power must be **ON** to the UPC Open when replacing the battery, or the date, time, and trend data will be lost.

Remove the battery from the controller, making note of the battery's polarity. Insert the new battery, matching the battery's polarity with the polarity indicated on the UPC Open controller.

Table N — LED Status Indicators

LED	STATUS
Power	Lights when power is being supplied to the controller. The UPC Open controller is protected by internal solid-state polyswitches on the incoming power and network connections. These polyswitches are not replaceable and will reset themselves if the condition that caused the fault returns to normal.
Rx	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
Tx	Lights when the controller transmits data to the network segment; there is an Tx LED for Ports 1 and 2.
Run	Lights based on controller status. See Table O.
Error	Lights based on controller status. See Table O.

Table O — Run and Error LEDs Controller and Network Status Indication

RUN LED	ERROR LED	STATUS
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with **Run** LED	5-minute auto-restart delay after system error
2 flashes per second	3 flashes, then off	Controller has just been formatted
2 flashes per second	1 flash per second	Controller is alone on the network
2 flashes per second	On	Exec halted after frequent system errors or control programs halted
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with **Run** LED	10-second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with **Run** LED	Brownout

NETWORK POINTS LIST

POINT DESCRIPTION	TYPE	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Air Temp Lvg Evap Coil	CAP	CCT	R	°F			AV:11	cct_1
Air Temp Lvg Supply Fan	CAP	SAT	R	°F			AV:10	sat_1
Air Temp Lvg Supply Fan Thermistor Failure	CALM		R				BV:88	a700_1
Airside Linkage	BBV		R				BV:2601	a_link_status_1
Airside Linkage Alarm	BALM		R				BV:7030	air_linkage_fail_1
Alarm State	CBP		R				BV:9	alm_1
Building Pressure	CAP	BP	R	“H2O			AV:1070	bldg_static_press_1
Building Pressure Setp.	CAP	BPSP	R/W	H2O	0.05	–0.25 to 0.25	AV:3070	bldg_press_stpt_1
Cir A Discharge Press Transducer Failure	CALM							
Cir A Discharge Pressure	CAP	DP_A	R	PSIG			AV:1601	discharge_press_a_1
Cir A Low Sat Suction Temperature Alarm	CALM							
Cir A Sat. Condensing Temperature	CAP	SCTA	R	°F			AV:1602	sat_cond_temp_a_1
Cir A Sat. Suction Temperature	CAP	SSTA	R	°F			AV:1603	sat_suction_temp_a_1
Cir A Suction Press Transducer Failure	CALM							
Cir A Suction Pressure	CAP	SP_A	R	PSIG			AV:1600	suction_press_a_1
Cir B Discharge Press Transducer Failure	CALM							
Cir B Discharge Pressure	CAP	DP_B	R	PSIG			AV:1605	discharge_press_b_1
Cir B Low Sat Suction Temperature Alarm	CALM							
Cir B Sat. Condensing Temperature	CAP	SCTB	R	°F			AV:1606	sat_cond_temp_b_1
Cir B Sat. Suction Temperature	CAP	SSTB	R	°F			AV:1607	sat_suction_temp_b_1
Cir B Suction Press Transducer Failure	CALM							
Cir B Suction Pressure	CAP	SP_B	R	PSIG			AV:1604	suction_press_b_1
Circuit A Compressor 1 Failure	CALM							
Circuit A Compressor 2 Failure	CALM							
Circuit A Compressor 3 Failure	CALM							
Circuit A High Head Pressure	CALM							
Circuit A High Pressure Switch Failure	CALM							
Circuit A Loss of Charge	CALM							
Circuit B Compressor 1 Failure	CALM							
Circuit B Compressor 2 Failure	CALM							
Circuit B Compressor 3 Failure	CALM							
Circuit B High Head Pressure	CALM							
Circuit B High Pressure Switch Failure	CALM							
Circuit B Loss of Charge	CALM							
Compressor A1 Relay	CBP	CMPA1	R			0 to 1	BV:16	cmpa1_1
Compressor A2 Relay	CBP	CMPA2	R			0 to 1	BV:17	cmpa2_1
Compressor A3 Relay	CBP	CMPA3	R			0 to 1	BV:13	cmpa3_1
Compressor A4 Relay	CBP							
Compressor B1 Relay	CBP	CMPB1	R			0 to 1	BV:18	cmpb1_1
Compressor B2 Relay	CBP	CMPB2	R			0 to 1	BV:19	cmpb2_1
Compressor B3 Relay	CBP	CMPB3	R			0 to 1	BV:14	cmpb3_1
Compressor B4 Relay	CBP							
Compressor Lockout Temp	CAP	OATLCOMP	R/W	°F	40	–20 to 55	AV:40	oatlcomp_1
Controlling Return Air Temp	CAP	RETURN_T	R/W	dF		–40 to 240	AV:1030	re_temp_1
Controlling Space Temp	CAP	SPACE_T	R/W	dF		–40 to 240	AV:2007	space_temp_1
Controlling Static Pressure Setpoint	BAV							
Cooling Control Point	CAP	COOLCPNT	R	dF		–20 to 140	AV:1024	cool_ctrl_point_1
Ctl.Temp RAT,SPT or ZONE	CAP	CTRLTEMP	R	°F		0 to 100	AV:43	ctrltemp_1
Current Running Capacity	CAP							
Current Running Capacity (Heat)	CAP	HTSG_CAP	R	%		0 to 100	AV:44	htsg_cap_1
Dehumidify Cool Setpoint	CAP	DHCOOLSP	R/W	°F		40 to 55	AV:49	dhcoolsp_1
Dehumidify Input	CBP	DHDISCIN	W			0 to 1	BV:30	dhdiscin_1
Dehumidify RH Setpoint	CAP	DHRELHSP	R/W	%	55	10 to 90	AV:50	dhrelhsp_1
Demand Limit Sw.1 Setpt.	CAP	DLSWSP1	R/W	%	80	0 to 100	AV:53	dlswsp1_1
Demand Limit Sw.2 Setpt.	CAP	DLSWSP2	R/W	%	50	0 to 100	AV:54	dlswsp2_1
Dmd Level Map Select	BBV	M684	W				BV:2	m684_1
Econ 1 Out Act.Curr.Pos.	CAP	ECON1POS	R	%			AV:1028	econ1_pos_1
Econ1Out Act. Cmd Pos	CAP	ECONOCMD	R/W	%		0 to 100	AV:67	econocmd_1
Econ2 Ret Cmd Position	CAP	ECN2CPOS	R/W	%		0 to 100	AV:41	ecn2cpos_1
Econ3 Ret Cmd Position	CAP	ECN3CPOS	R/W	%		0 to 100	AV:129	ecn3cpos_1
Econo Current Min. CFM	CAP	ECMINCFM	R	CFM		0 to 20000	AV:42	ecmincfm_1
Econo Current Min. Pos.	CAP	ECMINPOS	R	%		0 to 100	AV:45	ecminpos_1
Economizer Active?	CBP	ECACTIVE	R			0 to 1	BV:36	ecactive_1
Economizer Max.Position	CAP	ECONOMAX	R/W	%	98	0 to 100	AV:70	economax_1
Economizer Min.Flow	CAP	OACFMMAX	R/W	CFM	2000	0 to 20000	AV:46	oacfmmax_1
Economizer Min.Position	CAP	ECONOMIN	W	%	5	0 to 100	AV:4005	econ_min_1

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	TYPE	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Element Comm Status	BBV		R				BV:2999	element_stat_1
Element Communications Alarm	BALM		R				BV:105	comm_lost_alm_1
Emergency Stop	CBP	EMSTOP	W			0 to 1	BV:45	emstop_1
Equipment Alarm	CALM		R				BV:127	element_alarm_1
Equipment Touch reset linkage Alarm	BBV					0 to 1		
Evaporator Discharge Tmp	CAP	EDT	R	°F			AV:76	edt_1
Exhaust Air Temperature	CAP							
Exhaust Fan VFD Speed	CAP	EFAN_VFD	R	%		0 to 100	AV:2075	ef_vfd_output_1
Fan Fail Shuts Down Unit	CBP	SFS_SHUT	W		No	0 to 1	BV:50	sfs_shut_1
Fan Mode	CAP	FAN_MODE	R/W		1	0 to 1	AV:77	fan_mode_1
Filter Status Input	CBP	FLTS	W			0 to 1	BV:1052	filter_status_1
Fire Shut Down Emergency Mode (fire-smoke)	CALM	A404	R				BV:114	a404_1
Fire Shutdown Input	CBP	FSD	W			0 to 1	BV:1005	firedown_status_1
Freeze Status Switch	CBP	FRZ	W			0 to 1	BV:41	frz_1
Heat Interlock Relay	CBP	HIR	W			0 to 1	BV:1026	heat_interlock_relay_1
Heat Relay 1	CBP	HS1	R			0 to 1	BV:52	hs1_1
Heat Relay 2	CBP	HS2	R			0 to 1	BV:53	hs2_1
Heat-Cool Setpoint Gap	CAP	HCSP_GAP	R/W	°^F		2 to 10	AV:83	hcsp_gap_1
Heating Control Point	CAP	HEATCPNT	R			–10 to 140	AV:1025	heat_ctrl_point_1
Heating Supply Air Setpt	CAP	SASPHEAT	R/W	dF	85	80 to 120	AV:85	saspheat_1
High OAT Lockout Temp	CAP	OAT_LOCK	R/W	dF	60	–40 to 120	AV:9008	econ_oat_lockout_1
Hot Water Valve Position	CAP							
Ht.Coil Command Position	CAP	HTCLCPOS	R	%		0 to 100	AV:55	htclcpos_1
HumidiMizer 3-way Valve	CBP	HUM3WVAL	R			0 to 1	BV:47	hum3wval_1
HumidiMizer Capacity	CAP	HMZRCAPC	R	%		0 to 100	AV:57	hmzrcapc_1
HVAC Mode Numerical Form	CAP	MODEHVAC	R			0 to 40	AV:1022	hvac_mode_1
IAQ - Discrete Input	CBP	IAQIN	W			0 to 1	BV:1050	iaq_status_1
IAQ - PPM Indoor CO2	CAP	IAQ	W			0 to 5000	AV:1009	iaq_1
IAQ Demand Vent Min.Flow	CAP	OACFMMIN	R/W	CFM	0	0 to 20000	AV:58	oacfmmin_1
IAQ Demand Vent Min.Pos.	CAP							
Indoor Air CO2	BAV	LINK_IAQ	R				AV:2607	link_iaq_1
Leaving Air Temperature	CAP	LAT	R	dF		–40 to 240	AV:1027	lvg_air_temeprature_1
Linkage Max Damper Position	BAV	LINK_MAX_DMPR	R/W				AV:2611	link_max_dmpr_1
Local Machine Disable	CBP	UNITSTOP	W			0 to 1	BV:59	unitstop_1
Local Schedule	BBV	SCHEDULE	R				BV:5	schedule_1
Maximum Damper Position	BAV							
Maximum Reset	BAV							
Minimum Damper Position	BAV							
Mixed Air Temperature	CAP	MAT	R	dF			AV:1500	ma_temp_1
OAQ - PPM Outdoor CO2	CAP	OAQ	R/W			0 to 5000	AV:113	oaq_1
Occupied Cool Mode End	CAP	OCCL_END	R	°F		0 to 100	AV:114	occl_end_1
Occupied Cool Mode Start	CAP	OCCLSTRT	R	°F		0 to 100	AV:115	occlstrt_1
Occupied Heat Mode End	CAP	OCHT_END	R	°F		0 to 100	AV:116	ocht_end_1
Occupied Heat Mode Start	CAP	OCHTSTRT	R	°F		0 to 100	AV:117	ochtstrt_1
Occupied Heating Enabled	CBP	HTOCCENA	W		No	0 to 1	BV:70	htoccena_1
Occupied?	CBP	OCCUPIED	W			0 to 1	BV:2008	occ_status_1
Outside Air CFM	CAP	OACFM	R	CFM		0 to 50000	AV:66	oacfm_1
Outside Air Relative Humidity	CAP	OARH	R/W	%		0 to 100	AV:119	oarh_1
Outside Air Temperature	CAP	OAT	W	dF		–40 to 240	AV:1003	oat_1
Post Filter Stat. Input	CBP	PFLTS_STATUS	RW			0 to 1	BV:72	pflts_status_1
Relay 3 W1 Gas Valve 2	CBP	HS3	R			0 to 1	BV:76	hs3_1
Relay 4 W2 Gas Valve 2	CBP	HS4	R			0 to 1	BV:77	hs4_1
Relay 5 W1 Gas Valve 3	CBP	HS5	R			0 to 1	BV:78	hs5_1
Relay 6 W2 Gas Valve 3	CBP	HS6	R			0 to 1	BV:79	hs6_1
Remote Alarm/Aux Relay	CBP	ALRM	W			0 to 1	BV:2014	aux_relay_1
Remote Input State	CBP	RMTIN	W			0 to 1	BV:81	rmtin_1
Requested Heat Stage	CAP	HT_STAGE	R			0 to 20	AV:2003	heat_run_1
Reset Limit	CAP	LIMT	R/W	^F	10	0 to 20	AV:131	limt_1
Reset Ratio	CAP	RTIO	R/W		3	0 to 10	AV:132	rtio_1
Return Air CFM	CAP	RACFM	R	CFM		0 to 50000	AV:69	racfm_1
Return Air Enthalpy	CAP	RAE	R				AV:133	rae_1
Return Air Relative Humidity	CAP	RARH	R/W	%		0 to 100	AV:134	rarh_1
Return Air Temperature	CAP	RAT	R/W	°F		–40 to 240	AV:135	rat_1
Return Air Thermistor Failure	CALM							
Setpoint / Cooling Occupied Setpoint	BAV							
Setpoint / Cooling Unoccupied Setpoint	BAV							
Setpoint / Heating Occupied Setpoint	BAV							

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	TYPE	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Setpoint / Heating Unoccupied Setpoint	BAV							
Setpoint Adjustment Enable	BBV	STPT_ADJ_ENABLE	R/W				BV:6	stpt_adj_enable_1
SP High Alert Limit	CAP	SPH	R/W		2	0 to 5	AV:73	sph_1
SP Low Alert Limit	CAP	SPL	R/W		0	–0.5 to 5	AV:74	spl_1
SP Reset Limit	CAP	SPRLIMIT	R/W		0.75	0 to 2	AV:143	sprlimit_1
SP Reset Ratio	CAP	SPRRATIO	R/W		0.2	0 to 2	AV:144	sprratio_1
Space Relative Humidity	BAV							
Space Relative Humidity	CAP	SPRH	R/W	%		0 to 100	AV:72	sprh_1
Space Temp Offset Range	CAP	SPTO_RNG	R/W	°^F	5	0 to 10	AV:139	spto_rng_1
Space Temperature	CAP	SPT	W	°F		–40 to 240	AV:137	spt_1
Space Temperature Offset	CAP	SPTO	R/W	°^F		–10 to 10	AV:138	spto_1
SPT Override Enabled ?	CBP	SPT_OVER	W		Yes	0 to 1	BV:54	spt_over_1
Staged Gas LAT 1	CAP	LAT1SGAS	R	°F			AV:150	lat1sgas_1
Staged Gas LAT 2	CAP	LAT2SGAS	R	°F			AV:151	lat2sgas_1
Staged Gas LAT 3	CAP	LAT3SGAS	R	°F			AV:152	lat3sgas_1
Stat. Pres. Reset Config	CAP	SPRSTCFG	R/W		0	0 to 4	AV:156	sprstcfg_1
Static Pressure	CAP	BP	R	H20			AV:1016	bldg_static_press_1
Static Pressure Reset	CAP	SPRESET	R/W			0 to 15	AV:157	spreset_1
Static Pressure Reset Enable	BBV							
Static Pressure Setpoint	CAP	SPSP	W	“H2O	1.5	0 to 5	AV:3050	sa_static_stpt_1
Static Pressure Transducer Failure	CALM	T211	R				BV:116	t211_1
Supply Air CFM	CAP	SACFM	R	CFM		0 to 50000	AV:78	sacfm_1
Supply Air Reset	CBP	MODESARS	R			0 to 1	BV:93	modesars_1
Supply Air Setpnt. Reset	CAP	SASPRSET	R/W	°^F		0 to 20	AV:158	sasprset_1
Supply Air Setpoint	CAP	SASP	W	°F		45 to 75	AV:3007	sa_temp_stpt_1
Supply Fan Bypass Input	CBP	SFBYIN	R				BV:82	sfbyin_1
Supply Fan Bypass Relay	CBP	SFBYRLY	R				BV:83	sfbyrly_1
Supply Fan Request	CBP	SFANFORC	W			0 to 1	BV:2004	sfan_forc_1
Supply Fan Status Switch	CBP	SFS	W			0 to 1	BV:95	sfs_1
Supply Fan VFD Speed	CAP	SFAN_VFD	R	%		0 to 100	AV:2050	sf_vfd_output_1
System Cooling Demand Level	BAV		R				AV:9006	cool_demand_level_1
System Demand Limiting	BBV		R				BV:7	dem_lmt_act_1
System Heating Demand Level	BAV		R				AV:9036	heat_demand_level_1
System OAT Master	BAV		R	dF			AV:80001	mstr_oa_temp_1
System Space AQ	BAV							
System Space RH	BAV							
System Space Temperature	BAV							
Temper Supply Air Setpt	CAP	SASPTEMP	R/W	°F		35 to 70	AV:15	sasptemp_1
Tempering in Cool SASP	CAP	TEMPCOOL	R/W	°^F		5 to 75	AV:161	tempcool_1
Tempering Vent Occ SASP	CAP	TEMPVOCC	R/W	°^F		–20 to 80	AV:163	tempvocc_1
Thermostat G Input	CBP	G	W			0 to 1	BV:1021	g_input_1
Thermostat W1 Input	CBP	W1	W			0 to 1	BV:1019	w1_input_1
Thermostat W2 Input	CBP	W2	W			0 to 1	BV:1020	w2_input_1
Thermostat Y1 Input	CBP	Y1	W			0 to 1	BV:1017	y1_input_1
Thermostat Y2 Input	CBP	Y2	W			0 to 1	BV:1018	y2_input_1
Un.Ec.Free Cool OAT Lock	CAP	UEFCNTLO	R/W	°F	50	40 to 70	AV:166	uefcntlo_1
Unit Down Due to Failure	CALM	A152	R				BV:117	a152_1
Unoccupied Cool Mode End	CAP	UCCL_END	R	°F		0 to 100	AV:168	uccl_end_1
Unoccupied Cool Mode Start	CAP	UCCLSTRT	R	°F		0 to 100	AV:169	ucclstrt_1
Unoccupied Heat Mode End	CAP	UCHT_END	R	°F		0 to 100	AV:170	ucht_end_1
Unoccupied Heat Mode Start	CAP	UCHTSTRT	R	°F		0 to 100	AV:171	uchtstrt_1
Use Linkage	BBV							
User Defined Analog 10	CAP							
User Defined Analog 11	CAP							
User Defined Analog 12	CAP							
User Defined Analog 13	CAP							
User Defined Analog 14	CAP							
User Defined Analog 15	CAP							
User Defined Analog 16	CAP							
User Defined Analog 17	CAP							
User Defined Analog 18	CAP							
User Defined Analog 19	CAP							
User Defined Analog 2	CAP		W				AV:2902	user_analog_2_1
User Defined Analog 20	CAP							
User Defined Analog 3	CAP		W				AV:2903	user_analog_3_1
User Defined Analog 4	CAP		W				AV:2904	user_analog_4_1
User Defined Analog 5	CAP		W				AV:2905	user_analog_5_1

NETWORK POINTS LIST (cont)

POINT DESCRIPTION	TYPE	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
User Defined Analog 6	CAP							
User Defined Analog 7	CAP							
User Defined Analog 8	CAP							
User Defined Analog 9	CAP							
User Defined Binary 1	CBP		W				BV:2911	user_binary_1_1
User Defined Binary 10	CBP							
User Defined Binary 11	CBP							
User Defined Binary 12	CBP							
User Defined Binary 13	CBP							
User Defined Binary 14	CBP							
User Defined Binary 15	CBP							
User Defined Binary 16	CBP							
User Defined Binary 17	CBP							
User Defined Binary 18	CBP							
User Defined Binary 19	CBP							
User Defined Binary 2	CBP		W				BV:2912	user_binary_2_1
User Defined Binary 20	CBP							
User Defined Binary 3	CBP		W				BV:2913	user_binary_3_1
User Defined Binary 4	CBP		W				BV:2914	user_binary_4_1
User Defined Binary 5	CBP		W				BV:2915	user_binary_5_1
User Defined Binary 6	CBP							
User Defined Binary 7	CBP							
User Defined Binary 8	CBP							
User Defined Binary 9	CBP							
VAV Occ. Cool Off Delta	CAP	VAVOCOFF	R/W	°^F		1 to 25	AV:180	vavocoff_1
VAV Occ. Cool On Delta	CAP	VAVOCON	R/W	°^F		0 to 25	AV:181	vavocon_1
VFD Maximum Speed	CAP	STATPMAX	R/W	%	100	0 to 100	AV:188	statpmax_1
VFD Minimum Speed	CAP	STATPMIN	R/W	%	20	0 to 100	AV:189	statpmin_1
VFD1 Actual Motor Freq	CAP	VFD1FREQ	R			0 to 500	AV:80	vfd1freq_1
VFD1 Actual Motor Power	CAP	VFD1PWR	R	kW			AV:81	vfd1pwr_1
VFD1 Actual Motor RPM	CAP	VFD1RPM	R			0 to 30000	AV:82	vfd1rpm_1
VFD2 Actual Motor Freq	CAP	VFD2FREQ	R			10 to 500	AV:93	vfd2freq_1
VFD2 Actual Motor Power	CAP	VFD2PWR	R				AV:94	vfd2pwr_1
VFD2 Actual Motor RPM	CAP	VFD2RPM	R				AV:95	vfd2rpm_1
ZS CO2 Sensor Valid Status	BBV							
ZS Humidity Sensor Valid Status	BBV							
ZS Temp Sensor Valid Status	BBV							
ZS Thermostat Config Alarm	BBV							

LEGEND

BALM — BACnet Alarm
BAV — BACnet Analog Value (UPC)
BP — Building Pressure
CALM — Carrier Alarm
CAP — Carrier Analog Point (MBB)
CBP — Carrier Binary Point
DBC — Dry Bulb Changeover
DCV — Demand Controlled Ventilation
DDBC — Differential Dry Bulb Changeover
DEC — Differential Enthalpy Changeover
DEW — Dewpoint
EDT — Evaporator Discharge Temperature
EXV — Electronic Expansion Valve
IAQ — Indoor Air Quality
IGC — Integrated Gas Control
LAT — Leaving Air Temperature
OAEC — Outdoor Air Enthalpy Changeover
OAT — Outdoor Air Temperature
OAQ — Outdoor Air Quality
R — Read
RAT — Return Air Temperature
RH — Relative Humidity
SASP — Supply Air Set Point
SP — Setpoint
SPT — Space Temperature
VAV — Variable Air Volume
VFD — Variable Frequency Drive
W — Write

APPENDIX G — OPTIONAL MOTORMASTER® V CONTROL

GENERAL

This appendix contains instructions for the start-up and service of the optional Motormaster V (MMV) control on 48/50N 75 to 150-ton units.

The Motormaster V control is a motor speed control device which adjusts condenser fan motor speed in response to an analog signal from the unit *Comfort*Link controls. A properly applied Motormaster V control extends the operating range of air-conditioning systems and permits operation at lower outdoor ambient temperatures.

Location of Motormaster V device is in the unit power box. See the power box component arrangement for details.

Configure Motormaster® V Control

The Motormaster V control is configured for analog control mode. The Motormaster V varies the condenser with an acceptable head pressure. No additional programming is required. See Table P.

Table P — Configuration Table

NOMINAL VOLTAGE (V-Ph-Hz)	MODE	CONTROL INPUT (Pin 5)	START CONTACTS
230-3-60 **460-3-60** **575-3-60**	**1**	Internal PI control, 0-5V feedback	TB 1,2
208-3-60 **380-3-60**	**2**		TB 13A,2
400-3-50	**4**		TB 13C,2

The following *Comfort*Link control configurations must be set when using a Motormaster V device:

- ***Configuration→COOL→M.M.*** = YES

Test Motormaster V Control

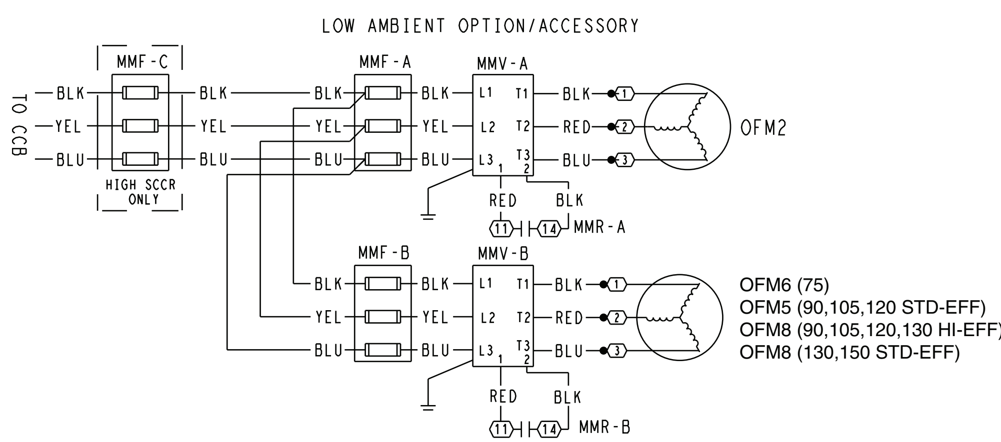
To test the control and motor, see Service Test section.

START-UP

The Motormaster V electronic control will be powered up as long as unit voltage is present. When the system calls for cooling, the Motormaster relay (MMR) will be energized to initiate the start-up sequence for the Motormaster V electronic control. The LED (light-emitting diode) will display the speed of the motor. The display range will be 8 to 60 Hz. The Motormaster V electronic control will start the condenser fan when the compressor engages. The *Comfort*Link controls will adjust the fan speed via the Motormaster V electronic control to maintain approximately 320 psig. Above that pressure, the fan should operate at full speed.

For all units, 2 Motormaster V devices are used, one for each circuit. See Fig. N for typical Motormaster V wiring details. See Static Pressure Control section for details.

No field programming is required. If controller does not function properly, the information provided in the Troubleshooting section can be used to program and troubleshoot the drive.



LEGEND

CCB	—	Control Circuit Breaker
MMF	—	Motormaster V Fuses
MMR	—	Motormaster V Relay
MMV	—	Motormaster V Control
OFM	—	Outdoor-Fan Motor
SCCR	—	Short Circuit Current Rating

Fig. N — Motormaster® V Wiring

Drive Programming

Table Q shows all program parameters for each of the operating modes. Refer to Troubleshooting section before attempting to change programming in the Motormaster V control.

⚠ CAUTION

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

TO ENTER PASSWORD AND CHANGE PROGRAM VALUES:

1. Press MODE.
2. The display will read “00” and the upper right-hand decimal point will be blinking. This will activate the PASSWORD prompt (if the password has not been disabled).
3. Use the UP and DOWN buttons to scroll to the password value (the factory default password is “111”) and press the MODE button. Once the correct password value is entered, the display will read “P01”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

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

4. Press MODE to display present parameter setting. The upper right decimal point blinks. Use UP and DOWN buttons to scroll to the desired parameter number.
5. Once the desired parameter number is found, press the MODE button to display the present parameter setting. The upper right-hand decimal point will begin blinking, indicating that the present parameter setting is being displayed. Use the UP and DOWN buttons to change setting. Press MODE to store new setting.
6. Press MODE to store the new setting and also exit the PROGRAM mode. To change another parameter, press the MODE button again to re-enter the PROGRAM mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting). If the MODE button is pressed within 2 minutes of exiting the PROGRAM mode, the password is not required to access the parameters.
7. After 2 minutes, the password must be entered in order to access the parameters again.

TO CHANGE PASSWORD

Enter the current password, then change P44 to the desired password.

TO RESET FACTORY DEFAULTS

To recognize a factory reset, the MMV controller must see a change in P48.

1. Cycle power from Motormaster® V control.
2. Enter PROGRAM mode by entering password.
3. Scroll to P48 by using UP and DOWN buttons, and then press MODE. One of the 12 mode numbers will appear. (Modes 1, 2, and 4 are used for these units.)
4. Restore factory defaults by changing the value in P48 using UP and DOWN buttons and then storing the value by pressing MODE.
5. Press MODE again to re-display the value of P48.
6. Change the value of P48 to the desired factory default mode (see Table Q) using UP and DOWN buttons, then press MODE. The Motormaster V control is now restored to factory settings.

TROUBLESHOOTING

Troubleshooting the Motormaster V control requires a combination of observing system operation and VFD display information.

If the liquid line pressure is above the set point and the VFD is running at full speed, this is a normal condition. The fan **CANNOT** go any faster to maintain set point.

If the VFD is not slowing down, even though liquid line pressure is below set point, the VFD could be set for manual control or the control may be receiving faulty pressure transducer output. Corrective action would include:

- Check that VDC signal between TB5 and TB2 is between 0.5 v and 4.5 v.
- Restore VFD to automatic control.
- Change parameter P05 back to correct value shown in Table Q.

The MMV control also provides real-time monitoring of key inputs and outputs. The collective group is displayed through parameters P50 to P56 and all values are read only. These values can be accessed without entering a password.

Press MODE twice and P50 will appear.

Press MODE again to display value.

To scroll to P51-P56 from P50, use UP and DOWN buttons then press MODE to display the value.

- **P50: FAULT HISTORY —** Last 8 faults
- P51: SOFTWARE version
- **P52: DC BUS VOLTAGE —** in percent of nominal. Usually rated input voltage x 1.4
- **P53: MOTOR VOLTAGE —** in percent of rated output voltage
- **P54: LOAD —** in percent of drives rated output current
- **P55: VDC INPUT —** in percent of maximum input: 100% will indicate full scale which is 5 v
- **P56: 4-20 mA INPUT —** in percent of maximum input. 20% = 4 mA, 100% = 20 mA

NOTE: The Motormaster V transducer is attached to Circuit A. If Circuit A compressor power is interrupted (overload, high-pressure cutout, etc.) the outdoor fans will operate at a reduced speed resulting from erroneous low pressure readings. This process may cause a high pressure safety cutout on Circuit B compressor. If only Circuit B is capable of operating for a temporary period of time because of a Circuit A problem, the transducer will have to be moved to the Circuit B service port until Circuit A can be repaired. Once the problem is repaired, move the transducer back to Circuit A for proper unit operation.

Table Q — Program Parameters for the Operating Mode

PARAMETERS	DESCRIPTION	MODE 1	MODE 2	MODE 4
P01	Line Voltage: 01 = low line, 02 = high line	01	02	02
P02	Carrier Freq: 01 = 4 kHz, 02 = 6 kHz, 03 = 8 kHz	01	01	01
P03	Startup mode: flying restart	06	06	06
P04	Stop mode: coast to stop	01	01	01
P05	Standard Speed source: 01 = keypad, 04 = 4-20mA (NO PI), 05 = R22 or R410A, 06 = R134a	05	05	05
P06	TB-14 output: 01 = none	01	01	01
P08	TB-30 output: 01 = none	01	01	01
P09	TB-31 Output: 01 = none	01	01	01
P10	TB-13A function sel: 01 = none	01	01	01
P11	TB-13B function sel: 01 = none	01	01	01
P12	TB-13C function sel: 01 = none	01	01	01
P13	TB-15 output: 01 = none	01	01	01
P14	Control: 01 = Terminal strip	01	01	01
P15	Serial link: 02 = enabled 9600,8,N,2 with timer	02	02	02
P16	Units editing: 02 = whole units	02	02	02
P17	Rotation: 01 = forward only, 03 = reverse only	01	01	01
P19	Acceleration time: 20 sec	20	20	20
P20	Deceleration time: 10 sec	10	10	10
P21	DC brake time: 0	0	0	0
P22	DC BRAKE VOLTAGE 0%	0	0	0
P23	Min freq = 8 Hz ~ 100 – 160 rpm	8	8	8
P24	Max freq	60	60	50
P25	Current limit: (%)	125	110	110
P26	Motor overload: 100	100	100	100
P27	Base freq: 60 or 50 Hz	60	60	50
P28	Fixed boost: 0.5% at low frequencies	0.5	0.5	0.5
P29	Accel boost: 0%	0	0	0
P30	Slip compensation: 0%	0	0	0
P31	Preset spd #1: speed if loss of control signal	57	57	47
P32	Preset spd #2: 0	0	0	0
P33	Preset spd #3: 0	0	0	0
P34	Preset spd 4 default — R22 and R410A setpoints. TB12-2 open	24.0	24.0	24.0
P35	Preset spd 5 default — R134a setpoint. TB12-2 closed	12.6	12.6	12.6
P36	Preset spd 6 default	0	0	0
P37	Preset spd 7 default	0	0	0
P38	Skip bandwidth	0	0	0
P39	Speed scaling	0	0	0
P40	Frequency scaling 50 or 60 Hz	60	60	50
P41	Load scaling: default (not used so NA)	200	200	200
P42	Accel/decel #2: default (not used so NA)	60	60	60
P43	Serial address	1	1	1
P44	Password:111	111	111	111
P45	Speed at min signal: 8 Hz; used when PID mode is disabled and 4-20 mA input is at 4 mA	8	8	8
P46	Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20 mA input is at 20 mA	60	60	50
P47	Clear history? 01 = maintain. (set to 02 to clear)	01	01	01
P48	Program selection: Program 1 – 12	01	02	04
P61	PI Mode: 05 = reverse, 0-5V, 01 = no PID	05	05	05
P62	Min feedback = 0 (0V *10)	0	0	0
P63	Max feedback = 50 (5V * 10)	50	50	50
P64	Proportional gain = 3.5%	3.5	3.5	3.5
P65	Integral gain = .2	.2	.2	.2
P66	PI accel/decel (setpoint change filter) = 10	10	10	10
P67	Min alarm	0	0	0
P68	Max alarm	0	0	0

LEGEND
NA — Not Applicable
PI — Proportional Integral
PID — Proportional Integral Derivative

Fault Lockout

If a fault lockout (LC) has occurred, view the fault history in P50 to find the last fault. Once P50 is displayed, use the arrow buttons to scroll through the last 8 faults. Any current faults or fault codes from the fault history can be analyzed using Table R.

TO DISABLE AUTOMATIC CONTROL MODE AND ENTER MANUAL SPEED CONTROL:

1. Change P05 to “01- keypad”.
2. Push UP and DOWN arrow button to set manual speed.
3. Set P05 to proper value to restore automatic control according to Table Q.

TO PROVIDE MANUAL START/STOP CONTROL

With power removed from VFD, remove start command jumper and install a switch between the appropriate start terminals as required in Table P.

EPM Chip

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

Loss of CCN Communications

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

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

Liquid Line Pressure Set Point Adjustment

Adjusting the set point may be necessary to avoid interaction with other head pressure control devices. If adjustment is necessary, use the set point parameter found in P-34 for R-410A. A lower value will result in a lower liquid line set point. As an example for R-410A, decreasing the P-34 from 24 to 23 will decrease the liquid line pressure by approximately 15 psig. It is recommended to adjust R-410A units by 1.

Table R — Fault Codes

CODE	DESCRIPTION	RESET METHOD	PROBABLE CAUSE	CORRECTIVE ACTION
AF	High Temperature Fault	Automatic	Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation.
CF	Control Fault	Manual	A blank EPM, or an EPM with corrupted data has been installed.	Perform a factory reset using Parameter 48 – PROGRAM SELECTION. See Drive Programming section.
cF	Incompatibility Fault	Manual	An EPM with an incompatible parameter version has been installed.	Either remove the EPM or perform a factory reset (Parameter 48) to change the parameter version of the EPM to match the parameter version of the drive.
F1	EPM Fault	Manual	The EPM is missing or damaged.	Install EPM or replace with new EPM.
F2—F9 **Fo**	Internal Faults	Manual	The control board has sensed a problem.	Consult factory.
GF	Data Fault	Manual	User data and Carrier defaults in the EPM are corrupted.	Restore factory defaults by toggling P48 to another mode. Then set P48 to desired mode to restore all defaults for that mode. See Drive Programming section. If that does not work, replace EPM.
HF	High DC Bus Voltage Fault	Automatic	Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately.
JF	Serial Fault	Automatic	The watchdog timer has timed out, indicating that the serial link has been lost.	Check serial connection (computer). Check settings for P15. Check settings in communication software to match P15.
LF	Low DC Bus Voltage Fault	Automatic	Line voltage is too low.	Check line voltage — set P01 appropriately.
OF	Output Transistor Fault	Automatic	Phase to phase or phase to ground short circuit on the output; Failed output transistor; Boost settings are too high; Acceleration rate is too fast.	Reduce boost or increase acceleration values. If unsuccessful, replace drive.
PF	Current Overload Fault	Automatic	VFD is undersized for the application; Mechanical problem with the driven equipment.	Check line voltage – set P01 appropriately. Check for dirty coils. Check for motor bearing failure.
SF	Single-phase Fault	Automatic	Single-phase input power has been applied to a 3-phase drive.	Check input power phasing.
Drive displays “---” even though drive should be running	Start Contact is Not Closed	Automatic	Start contact is missing or not functioning.	Check fan relay.
VFD flashes “---” and LCS	Start Contact is Not Closed	Automatic	Start contact not closed.	Check FR for closed contact.
VFD flashes 57 (or 47) and LCS	Speed Signal Lost	Automatic	Speed signal lost. Drive will operate at 57 (or 47) Hz until reset or loss of start command. Resetting requires cycling start command (or power).	Transducer signal lost. Check VDC signal between TB5 and TB2. Should be in range of 0.5V to 4.5V. 5VDC output should be present between TB6 and TB2.

LEGEND

EPM — Electronic Programming Module
FR — Fan Relay
LCS — Loss of Control Signal
TB — Terminal Block
VFD — Variable Frequency Drive

NOTE: The drive is programmed to automatically restart after a fault and will attempt to restart 3 times after a fault (the drive will not restart after CF, cF, GF, F1, F2-F9, or Fo faults). If all 3 restart attempts are unsuccessful, the drive will trip into FAULT LOCKOUT (LC), which requires a manual reset.

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Pre-Start-Up Checklist for 48/50N-Series Packaged Rooftop
(Remove and use for job file)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Controls, Start-Up, Operation, Service and Troubleshooting document.

I. Project Information

Job Name ______________________________

Address ______________________________

City ____________________ State ____________ Zip ________

Installing Contractor ____________________ Phone ____________

Equipment tag / Mark for ______________________________

Sales Office ______________________________

Pre-Start-up Performed by ____________________ Phone ____________

Unit Model (18 Chars) ____________________ Serial (10 Chars) ____________

Design Information

Supply Airflow (CFM)	External Static Pressure (ESP)	Return Air Temperature (RAT)		Supply Air Temperature	Condenser Entering Air Temperature
		Dry Bulb (DB)	Wet Bulb (WB)		

II. Prestart-Up

Is there any physical damage? ☐ No ☐ Yes If yes, has the trucking company been contacted? ☐ Yes ☐ No

Description ______________________________

____

☐ Verify that all packing materials have been removed from unit
☐ Verify installation of economizer hoods per installation instructions
☐ Verify installation of condensate drains and traps per installation instructions
☐ Verify watertight interface between unit and curb (roof-mounted units)
☐ Verify removal of supply fan shipping brackets per installation instructions
☐ Verify removal of return fan shipping brackets (if equipped) per installation instructions
☐ Verify compressor mounting bolt torque is 7 to 10 ft-lb. (9.5 to 13.5 n-m)
☐ Verify installation of ductwork to unit or curb per installation instructions
☐ Verify clearances around unit per installation instructions
☐ Verify that power supply agrees with the unit nameplate
☐ Verify that electrical power wiring is installed properly per installation instructions
☐ Verify that unit is properly grounded per NEC/ETL
☐ Verify installation of electrical disconnect per installation instructions
☐ Verify that electrical circuit protection has been sized and installed properly per NEC/ETL
☐ Verify that all terminals are tight
☐ Verify that all plug assemblies are tight
☐ Inspect all cables and thermistors for crossed wires and correct as needed

- ☐ Verify routing and installation of field control wiring per installation instructions
- ☐ Verify proper connection of optional CCN or BACnet wiring per installation instructions
  (Temporarily disconnect this wiring for start-up; reconnect once unit is started)
- ☐ Verify proper installation of plenum rated pneumatic pressure tubing to building pressure and supply fan static pressure transducers per installation instructions
- ☐ Verify that all pencil-type thermistors are fully inserted into corresponding wells
- ☐ Check gas piping for leaks (48N only) and correct as needed
- ☐ Verify installation of combustion air inlet hoods and flue outlets per installation instructions
- ☐ Verify installation of supply air thermistors per installation instructions (units with modulating gas, SCR electric or hydronic heat only)
- ☐ Verify that return-air filters and outdoor-air filters are in place and clean
- ☐ Verify that unit is level within specified installation tolerances
- ☐ Verify that fan wheels and propellers are properly positioned in the fan housing/orifice, and that all fan set screws are tight
- ☐ Verify that fan bearing hold-down bolts and bearing race set screws are tight
- ☐ Verify that fan sheaves are aligned and belts are properly tensioned
- ☐ Verify that optional suction, discharge, and liquid service valves on each circuit are open
- ☐ Verify that compressor crankcase heaters have been energized and functioning for 24 hours. (Caution: heaters will be hot to the touch; take precautions to avoid burns.)

Signature ____ Date ____________________

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Start-Up Checklist for 48/50N-Series Packaged Rooftop
(Remove and use for Job File)

I. Project Information

Job Name ______________________________

Address ______________________________

City ______________________ State ______________ Zip ____________

Installing Contractor Name ______________________ Phone ______________

Equipment tag / Mark for ______________________________

Sales Office ______________________________

Prestart-up Performed by (Name) ______________________ Phone ______________

Unit Model (18 Chars) ______________________ Serial (10 Chars) ______________

Design Information

Supply Airflow (CFM)	External Static Pressure (ESP)	Return Air Temperature (RAT)		Supply Air Temperature	Condenser Entering Air Temperature
		Dry Bulb (DB)	Wet Bulb (WB)		

II. Start-Up

Electrical (All readings to be taken at full load

Supply Voltage L1-L2 ____________ L2-L3 ____________ L3-L1 ____________

Check Voltage Imbalance

Average Voltage = (L1-L2 + L2-L3 + L3-Ll)/3

Maximum Deviation from Average Voltage = ____________

Voltage Imbalance = ____________% (max. deviation/average voltage) x 100

Voltage imbalance less than 2%. ☐ Yes ☐ No

(Do not start unit if voltage imbalance is greater than 2%. Contact local utility for assistance.)

Compressor Motor Current (amps):

Compressor A1	L1 ____________	L2 ____________	L3 ____________
Compressor A2	L1 ____________	L2 ____________	L3 ____________
Compressor A3	L1 ____________	L2 ____________	L3 ____________
Compressor A4	L1 ____________	L2 ____________	L3 ____________
Compressor B1	L1 ____________	L2 ____________	L3 ____________
Compressor B2	L1 ____________	L2 ____________	L3 ____________
Compressor B3	L1 ____________	L2 ____________	L3 ____________
Compressor B4	L1 ____________	L2 ____________	L3 ____________

Supply Fan Amps (measured)	L1 ____________	L2 ____________	L3 ____________	ComfortLink ____________
Exhaust Fan Amps	L1 ____________	L2 ____________	L3 ____________	ComfortLink ____________

Fan amp readings must be taken with a true RMS meter for accuracy
Fan amp reading must be taken with the fan running at 60 Hz.

Condenser Fan Motor Current (amps):

Outdoor Fan Motor 1	L1 ____________	L2 ____________	L3 ____________
OFM 2	L1 ____________	L2 ____________	L3 ____________
OFM 3	L1 ____________	L2 ____________	L3 ____________
OFM 4	L1 ____________	L2 ____________	L3 ____________
OFM 5	L1 ____________	L2 ____________	L3 ____________
OFM 6	L1 ____________	L2 ____________	L3 ____________

Temperatures / Pressures

(Record information from the Pressures and Temperatures modes when unit is in a stable operating condition.)

Supply Air Temperature - Cooling	___________ F	
Gas Heating Supply Air Temperature	___________ F (48N only)	
Electric Heating Supply Air Temperature	___________ F (50N only, if equipped)	
Hydronic Heating Supply Air Temperature	___________ F (50N only, if equipped)	
Outdoor-Air Temperature	___________ F	
Return-Air Temperature	___________ F DB (Dry Bulb)	___________ F WB (Wet Bulb)

Gas Inlet Pressure (48N only) ___________ in. wg

Gas Manifold Pressure (48N only) Low Fire ___________ in. wg High Fire ___________ in. wg

		Circuit A		Circuit B
Suction Pressure	SP.A	______________ psig	SP.B	______________ psig
Discharge Pressure	DP.A	______________ psig	DP.B	______________ psig
Liquid Pressure	LP.A	______________ psig	LP.B	______________ psig
Return Gas Temperature	RGT.A	______________ F (Units with digital scroll only)		

Refrigerant Superheat		
Upper Coil	______________ F	______________ F
Lower Coil	______________ F	______________ F

General:

- ☐ Verify refrigerant charge is correct on both circuits per start-up manual
- ☐ Verify compressor oil levels are correct per start-up manual
- ☐ Leak check unit. Locate, repair and report any refrigerant leaks
- ☐ Verify that voltage is within unit nameplate range
- ☐ Verify that control transformer primary connection is set for proper voltage
- ☐ Control transformer secondary voltage = __________
- ☐ Verify that optional CCN or BACnet wiring is temporarily disconnected for start-up (Reconnect once unit is started)
- ☐ Verify completion of all elements of controls 'service test'
- ☐ Record all configuration settings on sheets CL-5 to CL-12
- ☐ Provide operating instructions to owner's personnel. Instruction Time ________ hours.

III. Service Test

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 Navigator display and place the unit into the test mode by changing **Service Test → TEST** from OFF to ON. This ***TEST*** command turns the unit off (hard stop) and allows the unit to be put in a manual control mode. The display will prompt for the password before allowing any change. The default password is 1111. Once the unit enters the Service Test mode, the unit will shut down all current modes.

Operation in the Service Test mode is sub-menu specific except for the **INDP** submenu. 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.

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

Via the Navigator control interface, scroll down to the 'Service Test' mode. Press <Enter> to see 'TEST'. Change 'OFF' to 'ON'. Scroll down to 'INDP' and begin the test procedure. After completing 'INDP', proceed through the tests in the remaining groups; 'FANS', 'ACT.C', 'HMZR', 'EXVS', 'COOL', and 'HEAT'. Note that an 'Auto-Component' automated version of the test procedure is available under 'AC.DT', and may be used as an alternative to the manual procedure. Investigate and resolve as needed any operations found to be not performing as intended.

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CONTROLS SET POINT AND CONFIGURATION LOG

MODEL NUMBER:		**Software Version**	
SERIAL NUMBER:		**MBB**	CESR131461--
DATE:		**RXB**	CESR131465--
TECHNICIAN:		**EXB**	CESR131465--
		NAVI	CESR130227--
		SCB	CESR131226--
		CEM	CESR131174--
		CXB	CESR131173--
		EXV	CESR131172--
		EXVA	CESR131172--
		EXVB	CESR131172--

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
UNIT	UNIT CONFIGURATION			
C.TYP	Machine Control Type	1 to 4 (multi-text strings)	3	
SIZE	Unit Size (75 - 150)	75 to 150	75	
FN.MD	Fan Mode (0=Auto, 1=Cont)	0 to 1 (multi-text strings)	1	
RM.CF	Remote Switch Config	0 to 3 (multi-text strings)	0	
CEM	CEM Module Installed	No/Yes	No	
LQ.SN	Liquid Sensors Installed	No/Yes	No	
PW.MN	Power Monitor Installed	No/Yes	No	
VFD.B	VFD Bypass Enable?	No/Yes	No	
SM.MN	Enable Smart Menus?	Disable/Enable	Enable	
TCS.C	Temp.Cmp.Strt.Cool Factr	0 to 60 min	0	
TCS.H	Temp.Cmp.Strt.Heat Factr	0 to 60 min	0	
SFS.S	Fan fail shuts down unit	No/Yes	No	
SFS.M	Fan Stat Monitoring Type	0 to 2 (multi-text strings)	0	
VAV.S	VAV Unocc.Fan Retry Time	0 to 720 min	50	
MAT.S	MAT Calc Config	0 to 2 (multi-text strings)	1	
MAT.R	Reset MAT Table Entries?	No/Yes	No	
MAT.D	MAT Outside Air Default	0 to 100%	20	
ALTI	Altitude........in feet:	-1000 to 60000	0	
DLAY	Startup Delay Time	0 to 900 sec	0	
AUX.R	Auxiliary Relay Config	0 to 3 (multi-text strings)	0	
SENS	INPUT SENSOR CONFIG			
SPT.S	Space Temp Sensor	Disable/Enable	Disable	
SP.O.S	Space Temp Offset Sensor	Disable/Enable	Disable	
SP.O.R	Space Temp Offset Range	1 to 10	5	
SRH.S	Space Air RH Sensor	Disable/Enable	Disable	
RRH.S	Return Air RH Sensor	Disable/Enable	Disable	
MRH.S	Mixed Air RH Sensor	Disable/Enable	Disable	
FACT	FACTORY CONFIGURATION			
MD.MN	Model Number			
F.RST	Perform Factory Restore?	0 to 1	0	
COOL	COOLING CONFIGURATION			
A1.EN	Enable Compressor A1	Disable/Enable	Enable	
A2.EN	Enable Compressor A2	Disable/Enable	Enable	
A3.EN	Enable Compressor A3	Disable/Enable	Enable	
A4.EN	Enable Compressor A4	Disable/Enable	Enable	
B1.EN	Enable Compressor B1	Disable/Enable	Enable	
B2.EN	Enable Compressor B2	Disable/Enable	Enable	
B3.EN	Enable Compressor B3	Disable/Enable	Enable	
B4.EN	Enable Compressor B4	Disable/Enable	Enable	
CS.A1	CSB A1 Feedback Alarm	Disable/Enable	Enable	
CS.A2	CSB A2 Feedback Alarm	Disable/Enable	Enable	
CS.A3	CSB A3 Feedback Alarm	Disable/Enable	Enable	
CS.A4	CSB A4 Feedback Alarm	Disable/Enable	Enable	
CS.B1	CSB B1 Feedback Alarm	Disable/Enable	Enable	
CS.B2	CSB B2 Feedback Alarm	Disable/Enable	Enable	
CS.B3	CSB B3 Feedback Alarm	Disable/Enable	Enable	
CS.B4	CSB B4 Feedback Alarm	Disable/Enable	Enable	
Z.GN	Capacity Threshold Adjust	0.1 to 10	1.0	
DT.GN	SUMZ EDT Derivative Gain	0.1 to 3	1.5	
MC.LO	Compressor Lockout Temp	-25 to 55 dF	40	
LLAG	Lead/Lag Configuration	0 to 2 (multi-text strings)	0	
HC.EV	High Capacity Evaporator	No/Yes	No	
H.ODF	High Efficiency OD Fans?	No/Yes	No	
M.M	Motor Master Control ?	No/Yes	No	
MM.OF	MM Setpoint Offset	-20 to 20	-10.0	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
M.PID	MOTORMASTER PID CONFIGS			
MM.RR	Motor Master PI Run Rate	5 to 120 sec	5	
MM.PG	Motor Master Prop. Gain	0 to 5	1.0	
MM.PD	Motor Master Deriv. Gain	0 to 5	0.3	
MM.TI	Motor Master Integ. Time	0.5 to 50	30.0	
SCT.H	Maximum Condenser Temp	100 to 150 dF	115	
SCT.L	Minimum Condenser Temp	40 to 90 dF	80	
DG.A1	A1 is a Digital Scroll	No/Yes	No	
MC.A1	A1 Min Digital Capacity	30 to 100 %	50	
DS.AP	Dig Scroll Adjust Delta	0 to 100 %	100	
DS.AD	Dig Scroll Adjust Delay	15 to 60 sec	20	
DS.RP	Dig Scroll Reduce Delta	0 to 100 %	6	
DS.RD	Dig Scroll Reduce Delay	15 to 60 sec	30	
DS.RO	Dig Scroll Reduction OAT	70 to 120 dF	95	
DS.MO	Dig Scroll Max Only OAT	70 to 120 dF	105	
MLV	Min Load Valve Enable	Disable/Enable	Disable	
H.SST	Hi SST Alert Delay Time	5 to 30 min	10	
RR.VF	Rev Rotation Verified ?	No/Yes	No	
CS.HP	Use CSBs for HPS detect?	No/Yes	Yes	
EXV.C	EXV CIRCUIT CONFIGS			
EX.SA	Cir. EXV Start Algorithm	0 to 1	0	
SH.SP	EXV Superheat Setpoint	5 to 40 dF	12.0	
SH.DB	EXV Superheat Deadband	0 to 2 dF	0.5	
MOP.S	Max Oper. Pressure SP	40 to 120 dF	70	
CS.DE	EXV Cir Start Delay Secs	10 to 240 sec	180(75-105T) 240(120-150T)	
CS.PD	EXV Cir PreMove Dly Secs	0 to 30 sec	30	
EX.MN	Comp. Cir. Exv. Min Pos%	0 to 100 %	20.0	
EX.MC	Comp Cir EXV Mn Strt Pos	0 to 100 %	40.0	
EN.SC	Enab Cir Shtdwn w/ flood	No/Yes	Yes	
FL.TM	Flooding Detect Time	15 to 900	120	
E.PID	EXV PID CONFIGS			
EX.RR	EXV PID Run Rate	5 to 120 sec	5	
EX.PG	EXV PID Prop. Gain	0 to 5	0.15(75-105T) 0.5(120-150T)	
EX.TI	EXV Integration Time	0.5 to 60	24(75-105T) 50(120-150T)	
EX.HO	High OAT Lim (EXV Gain)	50 to 95	55(75-105T) 70(120-150T)	
EX.LO	Low OAT Lim (EXV Gain)	40 to 80	54(75-105T) 60(120-150T)	
EX.FG	%EXV Move on Cir. Stg Up	0 to 100 %	15.0(75-105T) 10(120-150T)	
EX.FD	%EXV Move on Cir. Stg Dw	0 to 100 %	15.0	
EX.CF	EXV Pre-Move Config	0 to 3 sec	1	
EX.PM	EXV Pre-Move Delay Secs	0 to 30 sec	10	
FL.SP	EXV SH Flooding Setpoint	0 to 10 ^F	6.0	
FL.OC	Flood Ovrde Press Cutoff	0 to 1000 psig	600.0	
FL.OD	Flooding Override Delay	0 to 255 sec	0	
EX.SL	EXV Init Pos Slope	-100 to 100	-1.0(75-105T) -0.4(120-150T)	
EX.IN	EXV Init Pos Intercept	-200 to 200	110.0(75-105T) 66(120-150T)	
EX.SM	EXV Smoothing Algorithm	0 to 1	0	
EX.EP	SH Error Exponent	1 to 1.5	1	
DP.OC	DP OVERRIDE CONFIGS			
DP.RS	DP Rate of Change Set	2 to 15 °psig	10	
DP.RC	DP Rate of Change Clr	0 to 5 °psig	1	
DP.L1	DP Override Limit 1	400 to 450 psig	400	
DP.L2	DP Override Limit 2	480 to 550 psig	500	
DP.TO	DP Override Timeout	6 to 150 sec	90	
DP.OR	DP Override Percent	0 to 15 %	10	
EDT.R	EVAP.DISCHRGE TEMP RESET			
RS.CF	EDT Reset Configuration	0 to 3 (multi-text strings)	2	
RTIO	Reset Ratio	0 to 10	2	
LIMT	Reset Limit	0 to 20 ^F	10	
RES.S	EDT 4-20 ma Reset Input	Disable/Enable	Disable	
HEAT	HEATING CONFIGURATION			
HT.CF	Heating Control Type	0 to 5	0*	
HT.SP	Heating Supply Air Setpt	65 to 120 dF	85	
OC.EN	Occupied Heating Enabled	No/Yes	No	
LAT.M	MBB Sensor Heat Relocate	No/Yes	No	
SG.CF	STAGED HEAT CONFIGS			
HT.ST	Modulating Gas Type	0 to 3	0*	
CAP.M	Max Cap Change per Cycle	5 to 45	45*	
M.R.DB	St.Ht DB min.dF/PID Rate	0 to 5	0.5	
S.G.DB	St.Heat Temp. Dead Band	0 to 5 ^F	2	
RISE	Heat Rise dF/sec Clamp	0.05 to 0.2	0.06	
LAT.L	LAT Limit Config	0 to 20 ^F	10	
LIM.M	Limit Switch Monitoring?	No/Yes	Yes	

* Some defaults are model-number dependent.

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CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
HEAT (CONT)	HEATING CONFIGURATION			
SG.CF (CONT)	STAGED HEAT CONFIGS			
SW.H.T	Limit Switch High Temp	80 to 210 dF	170*	
SW.L.T	Limit Switch Low Temp	80 to 210 dF	160*	
HT.P	Heat Control Prop. Gain	0 to 1.5	1	
HT.D	Heat Control Derv. Gain	0 to 1.5	1	
HT.TM	Heat PID Rate Config	30 to 300 sec	90	
HH.CF	HYDRONIC HEAT CONFIGS			
HW.P	Hydronic Ctl.Prop. Gain		1	
HW.I	Hydronic Ctl.Integ. Gain	0 to 1.5	1	
HT.D	Hydronic Ctl.Derv. Gain	0 to 1.5	1	
HT.TM	Hydronic PID Rate Config	15 to 300 sec	90	
ACT.C	HYDR. HEAT ACTUATOR CONFIGS			
SN.1.1	Hydronic Ht.Serial Num.1	0 to 9999	0	
SN.1.2	Hydronic Ht.Serial Num.2	0 to 6	0	
SN.1.3	Hydronic Ht.Serial Num.3	0 to 9999	0	
SN.1.4	Hydronic Ht.Serial Num.4	0 to 254	0	
C.A.L1	Hydr.Ht.Ctl.Ang Lo Limit	0 to 90	0	
SN.2.1	Humd/HTC2 Ser Num 1	0 to 9999	0	
SN.2.2	Humd/HTC2 Ser Num 2	0 to 6	0	
SN.2.3	Humd/HTC2 Ser Num 3	0 - 9999	0	
SN.2.4	Humd/HTC2 Ser Num 4	0 - 254	0	
C.A.L2	Humd/HTC2 Ctl Ang Lo Lim	0 - 90	0	
SN.3.1	HTC3 Serial Number 1	0 - 9999	0	
SN.3.2	HTC3 Serial Number 2	0 - 6	0	
SN.3.3	HTC3 Serial Number 3	0 - 9999	0	
SN.3.4	HTC3 Serial Number 4	0 - 254	0	
C.A.L3	HTC3 Ctrl Angle Lo Limit	0 - 90	0	
SN.4.1	HTC4 Serial Number 1	0 - 9999	0	
SN.4.2	HTC4 Serial Number 2	0 - 6	0	
SN.4.3	HTC4 Serial Number 3	0 - 9999	0	
SN.4.4	HTC4 Serial Number 4	0 - 254	0	
C.A.L4	HTC4 Ctrl Angle Lo Limit	0 - 90	0	
SP	SUPPLY STATIC PRESS.CFG.			
SP.CF	Static Pressure Control	Disable/Enable	Disable	
SP.SV	Staged Air Volume Ctrl	Disable/Enable	Disable	
SP.S	Static Pressure Sensor	Disable/Enable	Disable	
SP.LO	Static Press. Low Range	-10 to 0 in. wg	0	
SP.HI	Static Press. High Range	0 to 10 in. wg	5	
SP.SP	Static Pressure Setpoint	0 to 5 in. wg	1.5	
SP.MN	VFD Minimum Speed	0 to 100 %	20	
SP.MX	VFD Maximum Speed	0 to 100 %	100	
SP.FS	VFD Fire Speed Override	0 to 100 %	100	
SP.RS	Stat. Pres. Reset Config	0 to 4	0	
SP.RT	SP Reset Ratio	0 to 2 in.wg	0.2	
SP.LM	SP Reset Limit	0 to 2 in.wg	0.75	
SP.EC	SP Reset Econo.Position	0 to 100 %	5	
S.PID	STAT.PRESS.PID CONFIGS			
SP.TM	Stat.Pres.PID Run Rate	5 to 120 sec	7	
SP.P	Static Press. Prop. Gain	0 to 5	0.5	
SP.I	Static Press. Intg. Gain	0 to 2	0.5	
SP.D	Static Press. Derv. Gain	0 to 5	0.3	
ECON	ECONOMIZER CONFIGURATION			
EC.EN	Economizer Installed?	No/Yes	Yes	
EC.MN	Economizer Min.Position	0 to 100 %	5	
EC.MX	Economizer Max.Position	0 to 100 %	98	
E.TRM	Economzr Trim For SumZ ?	No/Yes	Yes	
E.SEL	Econ ChangeOver Select	0 to 3 (multi-text strings)	0	
DDB.O	Diff Dry Bulb RAT Offset	0, -2, -4, -6	0	
OA.E.C	OA Enthalpy ChgOvr Selct	1 to 5 (multi-text strings)	4	
OA.EN	Outdr.Enth Compare Value	18 to 28	24	
OAT.L	High OAT Lockout Temp	-40 to 120 dF	60	
O.DEW	OA Dewpoint Temp Limit	50 to 62 dF	55	
ORH.S	Outside Air RH Sensor	Disable/Enable	Disable	
CFM.C	OUTDOOR AIR CFM CONTROL			
OCF.S	Outdoor Air CFM Sensor	0 to 2	0	
O.C.MX	Economizer Min.Flow	0 to 20000 cfm	2000	
O.C.MN	IAQ Demand Vent Min.Flow	0 to 20000 cfm	0	
O.C.DB	Econ.Min.Flow Deadband	200 to 1000 cfm	400	
OA.RR	OACFM Econ Ctrl Run Rate	3 to 120 sec	20	
OA.MP	OACFM Econ Ctrl Min Pos	0 to 10 %	0	
EN.DO	Enable DCFM/OACFM Clamp	No/Yes	Yes	
E.SAC	Enable Single Act CFM	No/Yes	No	
S.MX.C	Single Act. Max CFM	0 to 20000 cfm	7500	
S.M.DB	Single Act. Max CFM DB	0 to 5000 cfm	2500	
E.CFG	ECON.OPERATION CONFIGS			
E.P.GN	Economizer Prop.Gain	0.7 to 3	1	
E.RNG	Economizer Range Adjust	0.5 to 5 ^F	2.5	
E.SPD	Economizer Speed Adjust	0.1 to 10	0.75	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
E.CFG (CONT)	ECON.OPERATION CONFIGS			
E.DBD	Economizer Deadband	0.1 to 2 ^F	0.5	
UEFC	UNOCC.ECON.FREE COOLING			
FC.CF	Unoc Econ Free Cool Cfg	0 to 2 (multi-text strings)	0	
FC.TM	Unoc Econ Free Cool Time	0 to 720 min	120	
FC.L.O	Un.Ec.Free Cool OAT Lock	40 to 70 dF	50	
ACT.C	ECON.ACTUATOR CONFIGS			
SN.1.1	Econ Serial Number 1	0 to 9999	0	
SN.1.2	Econ Serial Number 2	0 to 6	0	
SN.1.3	Econ Serial Number 3	0 to 9999	0	
SN.1.4	Econ Serial Number 4	0 to 254	0	
C.A.L1	Econ Ctrl Angle Lo Limit	0 to 90	85	
SN.2.1	Econ 2 Serial Number 1	0 to 9999	0	
SN.2.2	Econ 2 Serial Number 2	0 to 6	0	
SN.2.3	Econ 2 Serial Number 3	0 to 9999	0	
SN.2.4	Econ 2 Serial Number 4	0 to 254	0	
C.A.L2	Ecn2 Ctrl Angle Lo Limit	0 to 90	85	
SN.3.1	Econ 3 Serial Number 1	0 to 9999	0	
SN.3.2	Econ 3 Serial Number 2	0 to 6	0	
SN.3.3	Econ 3 Serial Number 3	0 to 9999	0	
SN.3.4	Econ 3 Serial Number 4	0 to 254	0	
C.A.L3	Ecn3 Ctrl Angle Lo Limit	0 to 90	85	
T.24.C	TITLE 24 CONFIGS			
LOG.F	Log Title 24 Faults	No/Yes	No	
EC.MD	T24 Econ Move Detect	1 - 10	1	
EC.ST	T24 Econ Move SAT Test	10 - 20	10	
S.CHG	T24 Econ Move SAT Change	0 - 5	0.2	
E.SOD	T24 Econ RAT-OAT Diff	5 - 20	15	
E.CHD	T24 Heat/Cool End Delay	0 - 60	25	
ET.MN	T24 Test Minimum Pos.	0 - 50	15	
ET.MX	T24 Test Maximum Pos.	50 - 100	85	
SAT.T	SAT Settling Time	10 - 900	240	
AC.EC	Economizer Deadband Temp	0 - 10	4	
E.GAP	Econ Fault Detect Gap	2 - 100	5	
E.TMR	Econ Fault Detect Timer	10 - 240	20	
X.CFM	Excess Air CFM	400 - 4000	800	
X.TMR	Excess Air Detect Timer	30 - 240	150	
AC.MR	T24 AutoTest SF Run Time	1 - 10	2	
AC.SP	T24 Auto-Test VFD Speed	10 - 50	20	
AC.OP	T24 Auto-Test Econ % Opn	1 - 100	30	
VF.PC	T24 Auto-Test VFD % Chng	1 - 20	10	
EC.DY	T24 Econ Auto-Test Day	0=Never, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday	6=Saturday	
EC.TM	T24 Econ Auto-Test Time	0 - 23	2	
BP	BUILDING PRESS. CONFIGS			
BP.CF	Building Press. Config	0 to 2	0*	
BP.S	Building Pressure Sensor	Disable/Enable	Disable*	
BP.R	Bldg. Press. (+/-) Range	0.1 to 0.25 "H2O	0.25	
BP.SP	Building Pressure Setp.	-0.25 to 0.25 "H2O	0.05	
BP.SO	BP Setpoint Offset	0 to 0.5 "H2O	0.05	
B.V.A	VFD/ACTUATOR CONFIG			
BP.FS	VFD Fire Speed	0 to 100 %	100	
BP.MN	VFD Minimum Speed	0 to 100 %	10	
BP.MX	VFD Maximum Speed	0 to 100 %	100	
FAN.T	FAN TRACKING CONFIG			
FT.CF	Fan Track Learn Enable	No/Yes	No	
FT.TM	Fan Track Learn Rate	5 to 60 min	15	
FT.ST	Fan Track Initial DCFM	-20000 to 20000 cfm	2000	
FT.MX	Fan Track Max Clamp	0 to 20000 cfm	4000	
FT.AD	Fan Track Max Correction	0 to 20000 cfm	1000	
FT.OF	Fan Track Internl EEPROM	-20000 to 20000 cfm	0	
FT.RM	Fan Track Internal RAM	-20000 to 20000 cfm	0	
FT.RS	Fan Track Reset Internal	No/Yes	No	
FAN.C	SUPPLY, RET/EXH FAN CFG			
SCF.C	Supply Air CFM Config	1 to 2 (multi-text strings)	2	
REF.C	Ret/Exh Air CFM Config	1 to 2	2	
SCF.S	Supply Air CFM Sensor	Disable/Enable	Disable*	
RCF.S	Return Air CFM Sensor	Disable/Enable	Disable*	
ECF.S	Exhaust Air CFM Sensor	Disable/Enable	Disable*	
B.PID	BLDG.PRESS.PID CONFIGS			
BP.TM	Bldg.Pres.PID Run Rate	1 to 60 sec	10	
BP.P	Bldg.Press. Prop. Gain	0 to 5	0.5	
BP.I	Bldg.Press. Integ. Gain	0 to 2	0.5	
BP.D	Bldg.Press. Deriv. Gain	0 to 5	0.3	

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CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
D.LV.T	COOL/HEAT SETPT. OFFSETS			
L.H.ON	Dmd Level Lo Heat ON	0 to 2 ^F	1.5	
H.H.ON	Dmd Level(+) Hi Heat ON	0.5 to 20 ^F	0.5	
L.H.OF	Dmd Level(-) Lo Heat OFF	0.5 to 2 ^F	1	
L.C.ON	Dmd Level Lo Cool ON	0 to 2 ^F	1.5	
H.C.ON	Dmd Level(+) Hi Cool ON	0.5 to 20 ^F	0.5	
L.C.OF	Dmd Level(-) Lo Cool OFF	0.5 to 2 ^F	1	
C.T.LV	Cool Trend Demand Level	0.1 to 5 ^F	0.1	
H.T.LV	Heat Trend Demand Level	0.1 to 5 ^F	0.1	
C.T.TM	Cool Trend Time	30 to 600 sec	120	
H.T.TM	Heat Trend Time	30 to 600 sec	120	
DMD.L	DEMAND LIMIT CONFIG.			
DM.L.S	Demand Limit Select	0 to 3 (multi-text strings)	0	
D.L.20	Demand Limit at 20 ma	0 to 100 %	100	
SH.NM	Loadshed Group Number	0 to 99	0	
SH.DL	Loadshed Demand Delta	0 to 60 %	0	
SH.TM	Maximum Loadshed Time	0 to 120 min	6	
D.L.S1	Demand Limit Sw.1 Setpt.	0 to 100 %	80	
D.L.S2	Demand Limit Sw.2 Setpt.	0 to 100 %	50	
IAQ	INDOOR AIR QUALITY CFG.			
DCV.C	DCV ECONOMIZER SETPOINTS			
EC.MN	Economizer Min.Position	0 to 100 %	5	
IAQ.M	IAQ Demand Vent Min.Pos.	0 to 100 %	0	
O.C.MX	Economizer Min.Flow	0 to 20000 cfm	2000	
O.C.MN	IAQ Demand Vent Min.Flow	0 to 20000 cfm	0	
O.C.DB	Econ.Min.Flow Deadband	200 to 1000 cfm	400	
AQ.CF	AIR QUALITY CONFIGS			
IQ.A.C	IAQ Analog Sensor Config	0 to 4 (multi-text strings)	0	
IQ.A.F	IAQ 4-20 ma Fan Config	0 to 2 (multi-text strings)	0	
IQ.I.C	IAQ Discrete Input Confg	0 to 2 (multi-text strings)	0	
IQ.I.F	IAQ Disc.In. Fan Config	0 to 2 (multi-text strings)	0	
OQ.A.C	OAQ 4-20ma Sensor Config	0 to 2 (multi-text strings)	0	
AQ.SP	AIR QUALITY SETPOINTS			
IQ.O.P	IAQ Econo Override Pos.	0 to 100 %	100	
IQ.O.C	IAQ Override Flow	0 to 31000 cfm	10000	
DAQ.L	Diff.Air Quality LoLimit	0 to 1000	100	
DAQ.H	Diff.Air Quality HiLimit	100 to 2000	700	
D.F.OF	DAQ PPM Fan Off Setpoint	0 to 2000	200	
D.F.OM	DAQ PPM Fan On Setpoint	0 to 2000	400	
IAQ.R	Diff. AQ Responsiveness	-5 to 5	0	
OAQ.L	OAQ Lockout Value	0 to 2000	0	
OAQ.U	User determined OAQ	0 to 5000	400	
AQ.SR	AIR QUALITY SENSOR RANGE			
IQ.R.L	IAQ Low Reference	0 to 5000	0	
IQ.R.H	IAQ High Reference	0 to 5000	2000	
OQ.R.L	OAQ Low Reference	0 to 5000	0	
OQ.R.H	OAQ High Reference	0 to 5000	2000	
IAQ.P	IAQ PRE-OCCUPIED PURGE			
IQ.PG	IAQ Purge	No/Yes	No	
IQ.P.T	IAQ Purge Duration	5 to 60 min	15	
IQ.P.L	IAQ Purge LoTemp Min Pos	0 to 100 %	10	
IQ.P.H	IAQ Purge HiTemp Min Pos	0 to 100 %	35	
IQ.L.O	IAQ Purge OAT Lockout	35 to 70 dF	50	
HUMD	HUMIDITY CONFIGURATION			
HM.CF	Humidifier Control Cfg.	0 to 4	0	
HM.SP	Humidifier Setpoint	0 to 100 %	40	
H.PID	HUMIDIFIER PID CONFIGS			
HM.TM	Humidifier PID Run Rate	10 to 120 sec	30	
HM.P	Humidifier Prop. Gain	0 to 5	1	
HM.I	Humidifier Integral Gain	0 to 5	0.3	
HM.D	Humidifier Deriv. Gain	0 to 5	0.3	
ACT.C	HUMIDIFIER ACTUATOR CFGS			
SN.1	Humd Serial Number 1	0 to 9999	0	
SN.2	Humd Serial Number 2	0 to 6	0	
SN.3	Humd Serial Number 3	0 to 9999	0	
SN.4	Humd Serial Number 4	0 to 254	0	
C.A.LM	Humd Ctrl Angle Lo Limit	0 to 90	85	
DEHU	DEHUMIDIFICATION CONFIG.			
D.SEL	Dehumidification Config	0 to 5 (multi-text strings)	0	
D.SEN	Dehumidification Sensor	1 to 3 (multi-text strings)	1	
D.EC.D	Econ disable in DH mode?	No/Yes	Yes	
D.V.CF	Vent Reheat Setpt Select	0 to 1 (multi-text strings)	0	
D.V.RA	Vent Reheat RAT offset	0 to 8 ^F	0	
D.V.HT	Vent Reheat Setpoint	55 to 95 dF	70	
D.C.SP	Dehumidify Cool Setpoint	40 to 55 dF	45	
D.RH.S	Dehumidify RH Setpoint	10 to 90 %	55	
DH.DB	Dehumidify RH Deadband	1-30	5	

CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
DEHU (CONT)	DEHUMIDIFICATION CONFIG.			
DH.TG	Dehum Discrete Timeguard	10-90	30	
HZ.RT	HumidiMizer Adjust Rate	5 to 120 sec	30	
HZ.PG	HumidiMizer Prop. Gain	0 to 10	0.8	
CCN	CCN CONFIGURATION			
CCN.A	CCN Address	1 to 239	1	
CCN.B	CCN Bus Number	0 to 239	0	
BAUD	CCN Baud Rate	1 to 5 (multi-text strings)	3	
BROD	CCN BROADCST DEFINITIONS			
TM.DT	CCN Time/Date Broadcast	Off/On	On	
OAT.B	CCN OAT Broadcast	Off/On	Off	
ORH.B	CCN OARH Broadcast	Off/On	Off	
OAQ.B	CCN OAQ Broadcast	Off/On	Off	
GS.B	Global Schedule Broadcst	Off/On	Off	
B.ACK	CCN Broadcast Ack'er	Off/On	Off	
SC.OV	CCN SCHEDULES-OVERRIDES			
SCH.N	Schedule Number	0 to 99	1	
HOL.T	Accept Global Holidays?	No/Yes	No	
OTL	Override Time Limit	0 to 4 HRS	1	
OV.EX	Timed Override Hours	0 to 4 HRS	0	
SPT.O	SPT Override Enabled ?	No/Yes	Yes	
T58.O	T58 Override Enabled ?	No/Yes	Yes	
GL.OV	Global Sched. Override ?	No/Yes	No	
ALLM	ALERT LIMIT CONFIG.			
SP.L.O	SPT lo alert limit/occ	-10 to 245 dF	60	
SP.H.O	SPT hi alert limit/occ	-10 to 245 dF	85	
SP.L.U	SPT lo alert limit/unocc	-10 to 245 dF	45	
SP.H.U	SPT hi alert limit/unocc	-10 to 245 dF	100	
SA.L.O	EDT lo alert limit/occ	-40 to 245 dF	40	
SA.H.O	EDT hi alert limit/occ	-40 to 245 dF	100	
SA.L.U	EDT lo alert limit/unocc	-40 to 245 dF	40	
SA.H.U	EDT hi alert limit/unocc	-40 to 245 dF	100	
RA.L.O	RAT lo alert limit/occ	-40 to 245 dF	60	
RA.H.O	RAT hi alert limit/occ	-40 to 245 dF	90	
RA.L.U	RAT lo alert limit/unocc	-40 to 245 dF	40	
RA.H.U	RAT hi alert limit/unocc	-40 to 245 dF	100	
OAT.L	OAT low alert limit	-40 to 245 dF	-40	
OAT.H	OAT high alert limit	-40 to 245 dF	150	
R.RH.L	RARH low alert limit	0 to 100 %	0	
R.RH.H	RARH high alert limit	0 to 100 %	100	
O.RH.L	OARH low alert limit	0 to 100 %	0	
O.RH.H	OARH high alert limit	0 to 100 %	100	
SP.L	SP low alert limit	-0.5 to 5 "H2O	0	
SP.H	SP high alert limit	0 to 5 "H2O	2	
BP.L	BP low alert limit	-0.25 to 0.25 "H2O	-0.25	
BP.H	BP high alert limit	-0.5 to 0.5 "H2O	0.25	
IAQ.H	IAQ high alert limit	0 to 5000	1200	
TRIM	SENSOR TRIM CONFIG.			
SAT.T	Air Temp Lvg SF Trim	-10 to 10 ^F	0	
RAT.T	RAT Trim	-10 to 10 ^F	0	
OAT.T	OAT Trim	-10 to 10 ^F	0	
SPT.T	SPT Trim	-10 to 10 ^F	0	
L.SW.T	Limit Switch Trim	-10 to 10 ^F	0	
CCT.T	Air Tmp Lvg Evap Trim	-10 to 10 ^F	0	
DTA.1	A1 Discharge Temp Trim	-10 to 10 ^F	0	
SP.A.T	Suct.Press.Circ.A Trim	-50 to 50 psig	0	
SP.B.T	Suct.Press.Circ.B Trim	-50 to 50 psig	0	
DP.A.T	Dis.Press.Circ.A Trim	-50 to 50 psig	0	
DP.B.T	Dis.Press.Circ.B Trim	-50 to 50 psig	0	
LP.A.T	Lqd.Press.Circ.A Trim	-50 to 50 psig	0	
LP.B.T	Lqd.Press.Circ.B Trim	-50 to 50 psig	0	
SW.LG	SWITCH LOGIC:NO / NC			
PWS.L	Power Fault Input - Good	Open/Close	Close	
MFT.L	Filter Status Inpt-Clean	Open/Close	Open	
PFT.L	Post Filter Stat. In-Cln	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	Press. Switch - Off	Open/Close	Open	
EVC.L	Evacuation Sw. - Off	Open/Close	Open	
PRG.L	Smoke Purge Sw. - Off	Open/Close	Open	

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CONTROLS SET POINT AND CONFIGURATION LOG (cont)

ITEM	EXPANSION	RANGE	DEFAULT	SETTING
SW.LG (CONT)				
DH.LG	Dehumidify Sw. - Off	Open/Close	Open	
SFB.L	SF Bypass Sw. - Off	Open/Close	Open	
PEB.L	PE Bypass Sw. - Off	Open/Close	Open	
DISP	DISPLAY CONFIGURATION			
TEST	Test Display LEDs	Off/On	Off	
METR	Metric Display	Off/On	Off	
LANG	Language Selection	0 to 1 (multi-text strings)	0	
PAS.E	Password Enable	Disable/Enable	Enable	
PASS	Service Password	0000 to 9999	1111	
S.VFD	SUPPLY FAN VFD CONFIG			
N.VLT	VFD1 Nominal Motor Volts	0 to 999 volts	460*	
N.AMP	VFD1 Nominal Motor Amps	0 to 999 amps	55.0*	
N.FRQ	VFD1 Nominal Motor Freq	10 to 500	60	
N.RPM	VFD1 Nominal Motor RPM	50 to 30000	1750	
N.PWR	VFD1 Nominal Motor HPwr	0 to 500	40*	
M.DIR	VFD1 Motor Direction	0 to 1 (multi-text strings)	0	
ACCL	VFD1 Acceleration Time	0 to 1800 sec	30	
DECL	VFD1 Deceleration Time	0 to 1800 sec	30	
SW.FQ	VFD1 Switching Frequency	0 to 3 (multi-text strings)	2	
E.VFD	EXHAUST FAN VFD CONFIG			
N.VLT	VFD2 Nominal Motor Volts	0 to 999 volts	460*	
N.AMP	VFD2 Nominal Motor Amps	0 to 999 amps	28.7*	
N.FRQ	VFD2 Nominal Motor Freq	10 to 500	60	
N.RPM	VFD2 Nominal Motor RPM	50 to 30000	1750	
N.PWR	VFD2 Nominal Motor HPwr	0 to 500	20*	
M.DIR	VFD2 Motor Direction	0 to 1 (multi-text strings)	0	
ACCL	VFD2 Acceleration Time	0 to 1800 sec	30	
DECL	VFD2 Deceleration Time	0 to 1800 sec	30	
SW.FQ	VFD2 Switching Frequency	0 to 3 (multi-text strings)	2	
FLTC	FILTER CONFIGURATION			
FS.FT	Filter Stat. Fault Timer	0 to 10 minutes	2	
F.NOT	Filter Notification Cut	20 to 50	25	
F.ALT	Filter Alert Cutoff	0 to 20	10	
MFL.S	Main Filter Status Cfg.	0 to 5	0	
MF.TY	Main Filter Type	0 to 9	0	
MF.FR	Main Filter Final Resis.	0 to 10	1	
MF.LT	Main Filter Life	0 to 60	12	
MF.RM	Main Filter Reminder	0 to 60	10	
MF.RS	Reset Main Filter Sched.	No/Yes	No	
MF.ST	Main Filter Status	0 to 100 %	0	
MFT.R	Reset MFT Table Entries?	No/Yes	No	
PFL.S	Post Filter Status Cfg.	0 to 5	0	
PF.TY	Post Filter Type	0 to 6	0	
PF.FR	Post Filter Final Resis.	0 to 10	1	
PF.LT	Post Filter Life	0 to 60	12	
PF.RM	Post Filter Reminder	0 to 60	10	
PF.RS	Reset Post Filter Sched.	No/Yes	No	
PF.ST	Post Filter Status	0 to 100 %	0	
PFT.R	Reset PFT Table Entries?	No/Yes	No	
PROG	PROGNOSTICS CONFIG.			
LQ.SN	Liquid Sensors Installed	No/Yes	No	
P.SPE	Prognostics SP Enable	Disable/Enable	Disable	
PG.SP	Prognostics SP Deadband	0 to 5	0.25	
P.BPE	Prognostics BP Enable	Disable/Enable	Disable	
PG.BP	Prognostics BP Deadband	0 to 1	0.05	
AC.DB	EXV Superheat Deadband	0 to 2 ^F	2	
AC.SP	Auto-Comp Suct.Pres Drop	0 to 10 ^F	3	
AC.DS	Auto-Comp DS SP Drop	0 to 10 ^F	2.5	
ML.DR	MLV/HGBP DP Drop	0 to 2 ^F	5	
AC.CL	Low Charge Alert Cutoff	-10 to 0 ^F	-3	
AC.CH	High Charge Alert Cutoff	0 to 10 ^F	1	
AC.MS	Min Charge SST	20 to 100	40	
AC.EC	Economizer Deadband Temp	0 to 10	5.0	

* Model-number dependent.

Signature ______________________________ Date ______________________

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