Carrier®

48/50PG20-28 Single Package Rooftop Units with *COMFORT*LINK™ Controls and PURON® (R-410A) Refrigerant

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

CONTENTS

CONTENTS (cont)

SAFETY CONSIDERATIONS

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

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

⚠ WARNING

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

⚠ CAUTION

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

⚠ WARNING

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

What to do if you smell gas:

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

GENERAL

This publication contains Start-Up, Controls, Operation, Service, and Troubleshooting information for the 48/50PG rooftop units. See Table 1. These units are equipped with *Comfort*Link™ controls and use Puron® refrigerant.

Table 1 — Unit Sizes (48/50PG)

UNIT	NOMINAL TONS
48/50PG20	18
48/50PG24	20
48/50PG28	25

BASIC CONTROL USAGE

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

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

The *Comfort*Link control system is easy to access through the use of a unit-mounted display module. There is no need to bring a separate computer to this unit for start-up. Access to control menus is simplified by the ability to quickly select from 11 menus. A scrolling readout provides detailed explanations of control information. Only four, large, easy-to-use buttons are required to maneuver through the entire controls menu. The display readout is designed to be visible even in bright sunlight.

For added service flexibility, an accessory hand-held Navigator™ module is also available. This portable device has an extended communication cable that can be plugged into the unit's communication network at the main control box. The Navigator display provides the same menu structure, control access and display data as is available at the unit-mounted Scrolling Marquee display.

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

- Run Status
- Service Test
- Temperatures
- Pressures
- Set points
- Inputs
- Outputs
- Configuration
- Timeclock
- Operating Modes
- Alarms

Through the Scrolling Marquee, the user can access all of the inputs and outputs to check on their values and status, configure operating parameters plus evaluate the current decision status for operating modes. The control also includes an alarm history which can be accessed from the display. In addition, through the Scrolling Marquee, the user can access a built-in test routine that can be used at start-up commissioning and to diagnose operational problems with the unit.

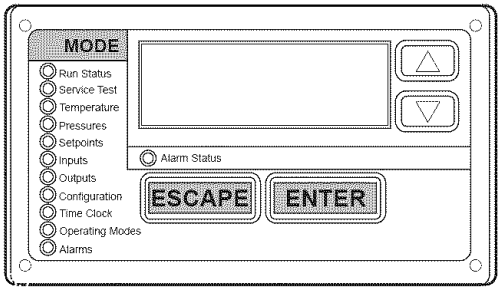


Fig. 1 — Scrolling Marquee

Accessory Navigator™ Display — The accessory hand-held Navigator display can be used with the 48/50PG units. See Fig. 2. The Navigator display operates the same way as the Scrolling Marquee device. The Navigator display is plugged into the LEN port on either TB2 or the ECB board.

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

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

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

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

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

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

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

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

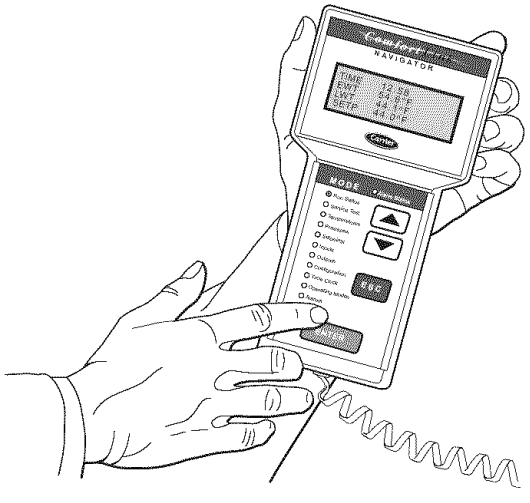


Fig. 2 — Accessory Navigator Display

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

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

CCN Tables and Display — In addition to the unit-mounted Scrolling Marquee display, the user can also access the same information through the CCN tables by using the Service tool or other CCN programs. Details on the CCN tables are summarized in Appendix A. The variable names used for the CCN tables and the Scrolling Marquee tables may be different and more items are displayed in the CCN tables. As a reference, the CCN variable names are included in the Scrolling Marquee tables and the Scrolling Marquee names are included in the local display tables in Appendix A.

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

Point names will be written with the Mode name first, then any submodes, then the point name, each separated by an arrow symbol (→). Names will also be shown in bold and italics. As an example, the Thermostat Control Type which is located in the Configuration mode, and Unit sub-mode would be written as ***Configuration→UNIT→T.CTL.***

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

When a value is included as part of the path name, it will be shown at the end of the path name after an equals sign. If the value represents a configuration setting, an explanation will be shown in parenthesis after the value. As an example, ***Configuration→UNIT→T.CTL*** = **1** (1 Stage Y1).

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

The CCN point names are also referenced in the local display tables for users configuring the unit with CCN software instead of the local display. The CCN tables are located in Appendix A of this manual.

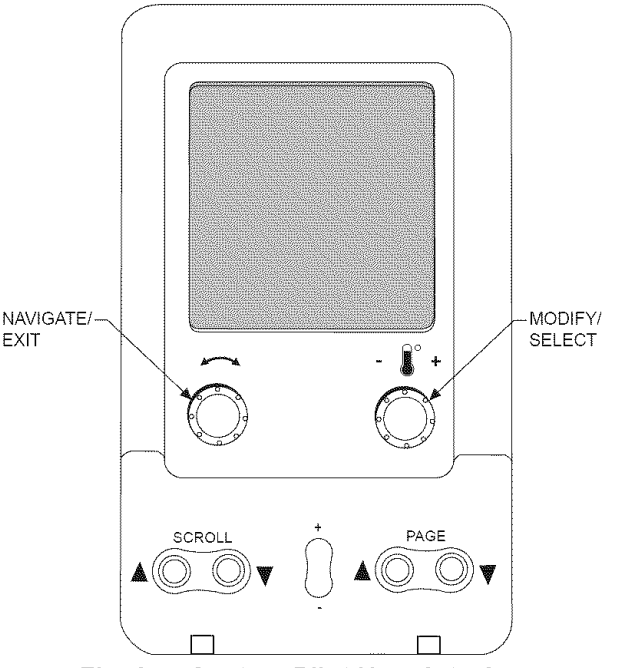


Fig. 3 — System Pilot User Interface

Table 2 — Scrolling Marquee Menu Display Structure

RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SETPOINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
Auto View of Run Status (VIEW)	Service Test Mode (TEST)	Air Temperatures (AIR.T)	Suction Pressure A (SSP.A)	Occupied Cool Setpoint (OCSP)	Thermostat Inputs (STAT)	Fan Outputs (FANS)	Display Configuration (DISP)	Time of Day (TIME)	Control Modes (MODE)	Reset All Current Alarms (R.CURR)
Software Version Numbers (VERS)	Test Independent Outputs (INDP)	Refrigerant Temperatures (REF.T)	Condenser Pressure A (SCP.A)	Unoccupied Cool Setpoint (UCSP)	General Inputs (GEN.I)	Cool Outputs (COOL)	Unit Configuration (UNIT)	Month, Date Day and Year (DATE)	Cool Mode Diagnostic (COOL)	Reset Alarm History (R.HIST)
Component Run Hours (HRS)	Test Fans (FANS)		Suction Pressure B (SSP.B)	Occupied Heat Setpoint (OHSP)	Current Sensor Inputs (CS.IN)	Heat Outputs (HEAT)	Cooling Configuration (COOL)	Daylight Savings Time (DST)	Humidimizer (HMZR)	Currently Active Alarms (CURR)
Component Starts (STRT)	Test Cooling (COOL)		Condenser Pressure B (SCP.B)	Unoccupied Heat Setpoint (UHSP)	Air Quality Inputs (AIR.Q)	Economizer Outputs (ECON)	Humidimizer Config. (HMZR)	Local Time Schedule (SCH.L)	Heat Mode Diagnostic (HEAT)	Alarm HIstory (HIST)
Control Modes (MODE)	Test Humidimizer (HMZR)		Suction Pressure C (SSP.C)	Heat-Cool Setpoint (GAP)		Alarm Relay (ALRM)	Heating Configuration (HEAT)	Local Holiday Schedules (HOL.L)	Economizer Diagnostic (ECON)	
Cooling Status (COOL)	Test Heating (HEAT)		Condenser Pressure C (SCP.C)	SPT Offset Range (±) (STO.R)			Economizer Configuration (ECON)			
Heating Status (HEAT)				Space RH Setpoint (RH.SP)			Air Quality Cfg. (AIR.Q)			
Economizer Status (ECON)				Space RH Deadband (RH.DB)			Alarm Relay Config. (ALM.O)			
				Reheat Heat SP Deadband (RH.HB)			Sensor Calibration (TRIM)			
				Circuit A Lockout Temp (CA.LO)			CCN Configuration (CCN)			
				Circuit B Lockout Temp (CB.LO)						
				Circuit C Lockout Temp (CC.LO)						
				Heating Lockout Temp (HT.LO)						
				Econo Cool Hi Temp Limit (EH.LO)						
				Econo Cool Lo Temp Limit (EL.LO)						
				Free Cool Low Temp Limit (FC.LO)						
				Low Cool SAT Set Point (LCSP)						
				High Cool SAT Set Point (HCSP)						
				Minimum SAT Upper Level (SAT.U)						
				Minimum SAT Lower Level (SAT.L)						

START-UP

Use the following information and Start-Up Checklist on page CL-1 to check out unit PRIOR to start-up.

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

Compressor Mounting — Compressors are internally spring mounted. Do not loosen or remove compressor hold-down bolts.

Refrigerant Service Ports — Each independent refrigerant system has a total of 3 Schrader-type service gage ports per circuit. One port is located on the suction line, one on the compressor discharge line, and one on the liquid line. Be sure that caps on the ports are tight.

Crankcase Heater(s) — Crankcase heaters are energized as long as there is power to the unit and the compressor is not operating.

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

Compressor Rotation

⚠ CAUTION

Improper wiring will cause compressor stoppage and alarm. Correct wiring by switching leads as indicated below.

It is important to be certain the compressors are rotating in the proper direction. To determine whether or not compressors are rotating in the proper direction, use a phase-rotation meter on the unit input power to check for L1-L2-L3 or clockwise rotation or use the Service Test mode to energize a compressor. If the compressor is rotating in the wrong direction, the controls will stop the compressor and display alarm for "Circuit x Failure to Pressurize," where x is the corresponding A or B compressor circuit.

NOTE: Indoor or outdoor fan rotation direction may not indicate proper input power phase sequence, as some 3-phase units use single-phase fan motors.

To correct the wrong compressor rotation direction, perform the following procedure:

1. Turn off power to the unit and lock out the power.
2. Switch any two of the incoming unit power leads.
3. Turn on power to the unit.
4. Verify corrected compressor rotation.

Internal Wiring — Check all electrical connections in unit control boxes; tighten as required.

Subcooler Heat Exchanger (SHX) — The subcooler heat exchanger adds approximately 10 to 15° F of subcooling to the system. Check all valves and TXV.

Evaporator Fan — Fan belt and variable pulleys are factory-installed. See Tables 3-26 for fan performance data. Be sure that fans rotate in the proper direction. See Tables 27 and 28 for air quantity limits. See Tables 29 and 30 for evaporator fan motor specifications. See Tables 31 and 32 for accessory FIOP static pressure. See Tables 33 and 34 for fan rpm at various motor pulley settings. To alter fan performance, see Evaporator Fan Performance Adjustment section on page 87.

Condenser Fans and Motors — Condenser fans and motors are factory set. Refer to Condenser-Fan Adjustment section (page 88) as required.

Return-Air Filters — Check that correct filters are installed in filter tracks (see Physical Data table in Installation Instructions). Do not operate unit without return-air filters.

NOTE: For units with 4-in. filter option, units are shipped with standard 2-in. filters. To install 4-in. filters, the filter spacers must be removed.

Outdoor-Air Inlet Screens — Outdoor-air inlet screens must be in place before operating unit.

Gas Heat (48PG Only) — Verify gas pressures before turning on heat as follows:

1. Turn off field-supplied manual gas stop, located external to unit.
2. Connect pressure gage to supply gas tap, located on field-supplied manual shutoff valve (see Fig. 4).
3. Connect pressure gage to manifold pressure tap.
4. Turn on field-supplied manual gas stop. Enter Service Test mode by setting TEST to "YES" using the Scrolling Marquee display. Temporarily install the jumper wire between "R" and "W1" on TB2. Use the Service Test feature to set HT.1 to ON (first stage of heat) using the Scrolling Marquee.
5. After the unit has run for several minutes, verify the supply gas pressure is between 5.5 in. wg to 13.0 in. wg, and the manifold pressure is 2.95 in. wg on horizontal discharge applications and 3.00 on vertical discharge applications. If manifold pressure must be adjusted, refer to Gas Valve Adjustment section.

   NOTE: Supply gas pressure must not exceed 13.0 in. wg.
6. Set HT.1 to OFF using Scrolling Marquee.
7. Remove jumper wire if the unit will be operating under thermostat mode. The jumper must remain if a space temperature sensor (T-55, T-56, or T-58) will control the unit.
8. Exit Service Test mode by setting TEST to "NO" using the Scrolling Marquee.

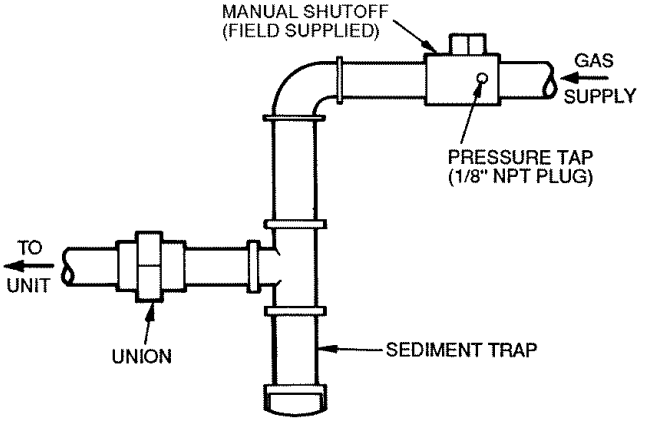


Fig. 4 — Field Gas Piping

Orifice Change (48PG Only) — This unit is factory assembled for heating operation using natural gas at an elevation from sea level to 2000 ft.

Use accessory high altitude kit when installing this unit at an elevation of 2000 to 7000 ft. For elevations above 7000 ft, refer to High Altitude section on page 90 to identify the correct orifice size for the elevation. Purchase these orifices from your local Carrier dealer. Follow instructions in accessory Installation Instructions to install the correct orifices.

Use accessory LP (liquid propane) gas conversion kit when converting this unit for use with LP fuel usage for elevations up to 7000 ft. For elevations above 7000 ft, refer to High Altitude section on page 90 to identify the correct orifice size for the elevation. Purchase these orifices from your local Carrier dealer. Follow instructions in accessory Installation Instructions to install the correct orifices.

Power Supply — All 208/230-v units are factory wired for 230-v power supply. If the 208/230-v unit is to be connected to a 208-v power supply, the transformers (TRAN1, TRAN2 and TRAN3) must be rewired by moving the wire from the 230-volt connection and moving to the 200-volt terminal on the primary side of the transformer. Refer to unit label diagram for additional information.

Air Baffles — The 48/50PG units with Humid-MiZer™ option are equipped with Motormaster® control to maintain adequate discharge pressure for proper unit operation during low ambient operation. Field-fabricated and installed wind baffles may be required. See Optional Humidi-MiZer Dehumidification System section on page 45.

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.

Table 3 — Fan Performance — 48PGD020 — Vertical Supply/Return Units

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
5000	**590**	**1.47**	**663**	**1.74**	727	2.01	786	2.26	840	2.52
5500	**633**	**1.82**	703	2.11	764	2.40	820	2.67	A 872	2.94
6000	**677**	**2.21**	744	2.53	A 803	2.84	A 857	3.13	907	3.42
6500	722	2.67	A 786	3.01	842	3.33	894	3.64	**942**	**3.95**
7000	A 767	3.17	828	3.53	883	3.88	933	4.21	B 979	4.53
7500	813	3.74	871	4.12	**924**	**4.48**	B 972	4.83	1017	5.18
8000	**859**	**4.36**	**915**	**4.77**	B 966	5.15	1012	5.52	1056	5.88
8500	**906**	**5.05**	B 959	5.47	C 1008	5.87	C 1053	6.26	C 1096	6.64
9000	C 952	5.81	C 1004	6.25	1051	6.67	1095	7.07	1136	7.47

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
5000	A 891	2.77	**940**	**3.02**	987	3.27	1032	3.52	1076	3.77
5500	921	3.21	968	3.48	1014	3.74	B 1057	4.01	B 1099	4.27
6000	954	3.70	B 999	3.99	B 1042	4.27	1084	4.55	1125	4.83
6500	B 988	4.25	1032	4.55	1073	4.85	1114	5.14	1153	5.44
7000	1024	4.85	1066	5.17	1106	5.48	C 1145	5.79	1183	6.10
7500	1060	5.51	1101	5.84	C 1140	6.17	1178	6.50	D 1215	6.82
8000	1098	6.23	C 1138	6.58	1176	6.92	D 1213	7.26	1249	7.60
8500	C 1137	7.01	1175	7.38	D 1212	7.74	1248	8.09	1283	8.45
9000	1176	7.86	D 1214	8.24	1250	8.61	1285	8.99	**1319**	**9.36**

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 4 — Fan Performance — 48PGE20 — Vertical Supply/Return Units

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
5000	**607**	**1.53**	**677**	**1.80**	740	2.06	797	2.31	850	2.57
5500	**652**	**1.90**	719	2.19	779	2.47	A 833	2.74	A 884	3.01
6000	699	2.32	A 763	2.63	A 819	2.93	872	3.22	921	3.50
6500	A 746	2.79	807	3.12	861	3.44	911	3.75	958	4.05
7000	794	3.33	851	3.68	904	4.02	952	4.34	B 998	4.66
7500	842	3.93	**897**	**4.30**	**947**	**4.65**	B 994	5.00	1038	5.33
8000	**891**	**4.59**	**943**	**4.98**	B 991	5.35	1036	5.71	1079	6.07
8500	C 940	5.32	B 990	5.72	C 1036	6.11	C 1080	6.49	C 1121	6.87
9000	990	6.12	C 1037	6.54	1082	6.95	1124	7.35	1163	7.73

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
5000	A 900	2.82	949	3.06	995	3.31	1040	3.56	1083	3.81
5500	933	3.27	979	3.54	1023	3.80	B 1066	4.06	B 1108	4.33
6000	967	3.79	B 1011	4.07	B 1054	4.35	1095	4.62	1135	4.90
6500	B 1003	4.35	1046	4.65	1087	4.94	1127	5.24	1165	5.53
7000	1041	4.98	1082	5.29	1122	5.60	C 1160	5.91	1197	6.22
7500	1079	5.67	C 1119	5.99	C 1158	6.32	1195	6.64	D 1231	6.96
8000	C 1119	6.42	1158	6.76	1195	7.10	D 1231	7.44	1267	7.78
8500	1160	7.23	D 1198	7.59	D 1234	7.95	1269	8.30	**1303**	**8.65**
9000	D 1202	8.12	1238	8.49	1273	8.87	**1308**	**9.23**	**1341**	**9.60**

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 5 — Fan Performance — 48PGF20 — Vertical Supply/Return Units

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
5000	**607**	**1.53**	**677**	**1.80**	740	2.06	797	2.31	850	2.57
5500	**652**	**1.90**	719	2.19	779	2.47	833	2.74	A 884	3.01
6000	699	2.32	763	2.63	A 819	2.93	A 872	3.22	921	3.50
6500	A 746	2.79	A 807	3.12	861	3.44	911	3.75	958	4.05
7000	794	3.33	851	3.68	904	4.02	952	4.34	B 998	4.66
7500	842	3.93	**897**	**4.30**	**947**	**4.65**	B 994	5.00	1038	5.33
8000	**891**	**4.59**	**943**	**4.98**	B 991	5.35	1036	5.71	1079	6.07
8500	**940**	**5.32**	B 990	5.72	C 1036	6.11	C 1080	6.49	C 1121	6.87
9000	C 990	6.12	C 1037	6.54	1082	6.95	1124	7.35	1163	7.73

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
5000	A 900	2.82	949	3.06	995	3.31	1040	3.56	1083	3.81
5500	933	3.27	979	3.54	1023	3.80	B 1066	4.06	B 1108	4.33
6000	967	3.79	B 1011	4.07	B 1054	4.35	1095	4.62	1135	4.90
6500	B 1003	4.35	1046	4.65	1087	4.94	1127	5.24	1165	5.53
7000	1041	4.98	1082	5.29	1122	5.60	C 1160	5.91	1197	6.22
7500	1079	5.67	C 1119	5.99	C 1158	6.32	1195	6.64	D 1231	6.96
8000	C 1119	6.42	1158	6.76	1195	7.10	D 1231	7.44	1267	7.78
8500	1160	7.23	D 1198	7.59	D 1234	7.95	1269	8.30	**1303**	**8.65**
9000	D 1202	8.12	1238	8.49	1273	8.87	**1308**	**9.23**	**1341**	**9.60**

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 6 — Fan Performance — 48PGD24 — Vertical Supply/Return Units

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
5,500	**633**	**1.82**	703	2.11	764	2.40	820	2.67	A 872	2.94
6,000	**677**	**2.21**	744	2.53	A 803	2.84	A 857	3.13	907	3.42
6,500	722	2.67	A 786	3.01	842	3.33	894	3.64	**942**	**3.95**
7,000	A 767	3.17	828	3.53	883	3.88	933	4.21	B 979	4.53
7,500	813	3.74	871	4.12	**924**	**4.48**	B 972	4.83	1017	5.18
8,000	**859**	**4.36**	**915**	**4.77**	B 966	5.15	1012	5.52	1056	5.88
8,500	**906**	**5.05**	B 959	5.47	1008	5.87	1053	6.26	C 1096	6.64
9,000	952	5.81	1004	6.25	C 1051	6.67	C 1095	7.07	1136	7.47
9,500	C 999	6.63	C 1049	7.09	1094	7.53	1137	7.95	D 1177	8.36
10,000	1047	7.53	1094	8.00	1138	8.46	D 1180	8.90	1219	9.33

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
5,500	A 921	3.21	968	3.48	1014	3.74	1057	4.01	1099	4.27
6,000	954	3.70	B 999	3.99	B 1042	4.27	B 1084	4.55	B 1125	4.83
6,500	988	4.25	1032	4.55	1073	4.85	1114	5.14	1153	5.44
7,000	B 1024	4.85	1066	5.17	1106	5.48	C 1145	5.79	1183	6.10
7,500	1060	5.51	1101	5.84	C 1140	6.17	1178	6.50	D 1215	6.82
8,000	1098	6.23	C 1138	6.58	1176	6.92	D 1213	7.26	1249	7.60
8,500	C 1137	7.01	1175	7.38	1212	7.74	1248	8.09	1283	8.45
9,000	1176	7.86	1214	8.24	D 1250	8.61	1285	8.99	**1319**	**9.36**
9,500	D 1216	8.77	D 1253	9.17	1288	9.56	**1322**	**9.95**	**1355**	**10.33**
10,000	1256	9.75	1292	10.16	**1327**	**10.57**	**1360**	**10.98**	**1393**	**11.38**

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 7 — Fan Performance — 48PGE24 — Vertical Supply/Return Units

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
5,500	**652**	**1.90**	719	2.19	779	2.47	833	2.74	A 884	3.01
6,000	699	2.32	A 763	2.63	A 819	2.93	A 872	3.22	921	3.50
6,500	A 746	2.79	807	3.12	861	3.44	911	3.75	958	4.05
7,000	794	3.33	851	3.68	904	4.02	952	4.34	B 998	4.66
7,500	842	3.93	**897**	**4.30**	**947**	**4.65**	B 994	5.00	1038	5.33
8,000	**891**	**4.59**	**943**	**4.98**	B 991	5.35	1036	5.71	1079	6.07
8,500	940	5.32	B 990	5.72	1036	6.11	1080	6.49	C 1121	6.87
9,000	C 990	6.12	1037	6.54	C 1082	6.95	C 1124	7.35	1163	7.73
9,500	1039	7.00	C 1085	7.43	1128	7.85	1168	8.27	D 1207	8.67
10,000	1089	7.95	1133	8.40	D 1174	8.83	D 1213	9.26	1251	9.69

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
5,500	A 933	3.27	979	3.54	1023	3.80	1066	4.06	1108	4.33
6,000	967	3.79	B 1011	4.07	B 1054	4.35	B 1095	4.62	B 1135	4.90
6,500	B 1003	4.35	1046	4.65	1087	4.94	1127	5.24	1165	5.53
7,000	1041	4.98	1082	5.29	1122	5.60	C 1160	5.91	1197	6.22
7,500	1079	5.67	C 1119	5.99	C 1158	6.32	1195	6.64	D 1231	6.96
8,000	C 1119	6.42	1158	6.76	1195	7.10	D 1231	7.44	1267	7.78
8,500	1160	7.23	1198	7.59	D 1234	7.95	1269	8.30	**1303**	**8.65**
9,000	1202	8.12	D 1238	8.49	1273	8.87	**1308**	**9.23**	**1341**	**9.60**
9,500	D 1244	9.07	1279	9.46	**1314**	**9.85**	**1347**	**10.24**	**1379**	**10.62**
10,000	1287	10.10	**1321**	**10.51**	**1355**	**10.91**	**1387**	**11.31**	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 8 — Fan Performance — 48PGF24 — Vertical Supply/Return Units

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
5,500	**652**	**1.90**	719	2.19	779	2.47	833	2.74	A 884	3.01
6,000	699	2.32	A 763	2.63	A 819	2.93	A 872	3.22	921	3.50
6,500	A 746	2.79	807	3.12	861	3.44	911	3.75	958	4.05
7,000	794	3.33	851	3.68	904	4.02	952	4.34	B 998	4.66
7,500	842	3.93	**897**	**4.30**	**947**	**4.65**	B 994	5.00	1038	5.33
8,000	**891**	**4.59**	**943**	**4.98**	B 991	5.35	1036	5.71	1079	6.07
8,500	**940**	**5.32**	B 990	5.72	1036	6.11	1080	6.49	C 1121	6.87
9,000	990	6.12	1037	6.54	C 1082	6.95	C 1124	7.35	1163	7.73
9,500	C 1039	7.00	C 1085	7.43	1128	7.85	1168	8.27	D 1207	8.67
10,000	1089	7.95	1133	8.40	D 1174	8.83	D 1213	9.26	1251	9.69

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
5,500	A 933	3.27	979	3.54	1023	3.80	1066	4.06	1108	4.33
6,000	967	3.79	B 1011	4.07	B 1054	4.35	B 1095	4.62	B 1135	4.90
6,500	B 1003	4.35	1046	4.65	1087	4.94	1127	5.24	1165	5.53
7,000	1041	4.98	1082	5.29	1122	5.60	C 1160	5.91	1197	6.22
7,500	1079	5.67	C 1119	5.99	C 1158	6.32	1195	6.64	D 1231	6.96
8,000	C 1119	6.42	1158	6.76	1195	7.10	D 1231	7.44	1267	7.78
8,500	1160	7.23	1198	7.59	D 1234	7.95	1269	8.30	**1303**	**8.65**
9,000	1202	8.12	D 1238	8.49	1273	8.87	**1308**	**9.23**	**1341**	**9.60**
9,500	D 1244	9.07	1279	9.46	**1314**	**9.85**	**1347**	**10.24**	**1379**	**10.62**
10,000	1287	10.10	**1321**	**10.51**	**1355**	**10.91**	**1387**	**11.31**	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 9 — Fan Performance — 48PGD28 — Vertical Supply/Return Units

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
6,500	750	2.84	A 806	3.18	A 854	3.49	898	3.79	B 943	4.12
7,000	A 797	3.38	853	3.77	899	4.09	B 941	4.41	982	4.74
7,500	845	3.99	B 900	4.42	B 945	4.76	985	5.09	1024	5.43
8,000	B 892	4.65	948	5.13	991	5.51	1030	5.86	C 1067	6.20
8,500	939	5.38	995	5.91	1038	6.32	C 1076	6.69	1112	7.05
9,000	986	6.17	C 1042	6.76	C 1085	7.21	1122	7.60	1157	7.98
9,500	C 1033	7.03	1090	7.69	1132	8.17	1169	8.59	1203	8.99
10,000	1079	7.95	1137	8.68	D 1180	9.21	D 1216	9.66	D 1249	10.08
10,500	1126	8.94	D 1184	9.75	1227	10.33	1263	10.81	1296	11.25
11,000	D 1172	10.00	1232	10.90	**1274**	**11.52**	**1310**	**12.04**	**1342**	**12.51**
11,500	1219	11.13	**1279**	**12.12**	**1322**	**12.80**	**1357**	**13.35**	—	—
12,000	**1265**	**12.34**	**1326**	**13.42**	—	—	—	—	—	—
12,500	**1311**	**13.63**	—	—	—	—	—	—	—	—

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
6,500	B 988	4.49	1035	4.89	1082	5.33	C 1130	5.81	1177	6.32
7,000	1024	5.09	C 1066	5.48	C 1109	5.90	1153	6.35	D 1197	6.85
7,500	C 1063	5.78	1101	6.15	1141	6.56	1181	6.99	1222	7.46
8,000	1104	6.55	1140	6.92	1176	7.32	D 1213	7.74	1251	8.19
8,500	1146	7.41	1180	7.78	1214	8.17	1249	8.58	**1283**	**9.01**
9,000	1190	8.35	D 1222	8.73	D 1255	9.11	1287	9.52	**1319**	**9.94**
9,500	D 1235	9.37	1266	9.76	1296	10.15	**1327**	**10.55**	**1357**	**10.97**
10,000	1280	10.48	**1310**	**10.88**	**1340**	**11.28**	**1369**	**11.68**	**1398**	**12.10**
10,500	**1326**	**11.67**	**1355**	**12.08**	**1384**	**12.49**	—	—	—	—
11,000	**1372**	**12.95**	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 687-873, 5.75 Bhp
   (B) Mid-Low Range: 805-1007, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 10 — Fan Performance — 48PGE28 — Vertical Supply/Return Units

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
6,500	A 775	2.99	A 825	3.30	A 871	3.60	915	3.91	B 959	4.25
7,000	A 826	3.58	875	3.92	B 918	4.23	B 959	4.55	1000	4.88
7,500	B 878	4.24	B 925	4.61	B 966	4.94	1005	5.26	1043	5.60
8,000	B 929	4.98	975	5.37	1015	5.72	1052	6.06	C 1088	6.40
8,500	981	5.78	1026	6.20	C 1064	6.58	C 1100	6.93	1134	7.28
9,000	C 1033	6.67	C 1076	7.12	C 1114	7.51	1148	7.89	1181	8.25
9,500	1085	7.64	1128	8.12	1164	8.54	1198	8.93	D 1229	9.31
10,000	1137	8.69	D 1179	9.20	D 1214	9.64	D 1247	10.05	1278	10.45
10,500	D 1190	9.82	1230	10.37	1265	10.84	1297	11.27	**1327**	**11.68**
11,000	1242	11.05	**1282**	**11.63**	**1316**	**12.12**	**1347**	**12.58**	**1376**	**13.01**
11,500	**1294**	**12.37**	**1333**	**12.98**	**1367**	**13.50**	—	—	—	—
12,000	**1347**	**13.78**	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

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
6,500	B 1004	4.62	1050	5.03	1098	5.48	C 1145	5.97	1192	6.49
7,000	1041	5.24	C 1083	5.64	C 1126	6.07	1170	6.54	D 1214	7.04
7,500	C 1081	5.96	1120	6.34	1159	6.75	1199	7.20	1240	7.68
8,000	C 1124	6.76	1160	7.13	1196	7.54	D 1233	7.97	1270	8.43
8,500	1168	7.64	1202	8.02	D 1235	8.42	1269	8.84	**1304**	**9.28**
9,000	D 1214	8.62	D 1245	9.00	1277	9.39	**1309**	**9.81**	**1341**	**10.24**
9,500	D 1260	9.69	1290	10.07	**1320**	**10.47**	**1351**	**10.88**	**1381**	**11.31**
10,000	**1308**	**10.84**	**1337**	**11.23**	**1365**	**11.63**	**1394**	**12.05**	—	—
10,500	**1356**	**12.09**	**1384**	**12.49**	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 687-873, 5.75 Bhp
   (B) Mid-Low Range: 805-1007, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 11 — Fan Performance — 48PGF28 — Vertical Supply/Return Units

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
6,500	A 775	2.99	A 825	3.30	A 871	3.60	915	3.91	B 959	4.25
7,000	A 826	3.58	875	3.92	B 918	4.23	B 959	4.55	B 1000	4.88
7,500	B 878	4.24	B 925	4.61	B 966	4.94	1005	5.26	1043	5.60
8,000	B 929	4.98	975	5.37	1015	5.72	1052	6.06	C 1088	6.40
8,500	981	5.78	1026	6.20	C 1064	6.58	C 1100	6.93	1134	7.28
9,000	C 1033	6.67	C 1076	7.12	C 1114	7.51	1148	7.89	1181	8.25
9,500	1085	7.64	1128	8.12	1164	8.54	1198	8.93	D 1229	9.31
10,000	1137	8.69	D 1179	9.20	D 1214	9.64	D 1247	10.05	1278	10.45
10,500	D 1190	9.82	D 1230	10.37	D 1265	10.84	1297	11.27	**1327**	**11.68**
11,000	1242	11.05	**1282**	**11.63**	**1316**	**12.12**	**1347**	**12.58**	**1376**	**13.01**
11,500	**1294**	**12.37**	**1333**	**12.98**	**1367**	**13.50**	—	—	—	—
12,000	**1347**	**13.78**	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

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
6,500	B 1004	4.62	1050	5.03	1098	5.48	C 1145	5.97	1192	6.49
7,000	1041	5.24	C 1083	5.64	C 1126	6.07	C 1170	6.54	D 1214	7.04
7,500	C 1081	5.96	C 1120	6.34	1159	6.75	1199	7.20	D 1240	7.68
8,000	C 1124	6.76	1160	7.13	1196	7.54	D 1233	7.97	1270	8.43
8,500	1168	7.64	1202	8.02	D 1235	8.42	1269	8.84	**1304**	**9.28**
9,000	1214	8.62	D 1245	9.00	1277	9.39	**1309**	**9.81**	**1341**	**10.24**
9,500	D 1260	9.69	1290	10.07	**1320**	**10.47**	**1351**	**10.88**	**1381**	**11.31**
10,000	**1308**	**10.84**	**1337**	**11.23**	**1365**	**11.63**	**1394**	**12.05**	—	—
10,500	**1356**	**12.09**	**1384**	**12.49**	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 687-873, 5.75 Bhp
   (B) Mid-Low Range: 805-1007, 5.75 Bhp
   (C) Mid High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 12 — Fan Performance — 50PG20 — Vertical Supply/Return Units

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
5000	**533**	**1.27**	**611**	**1.54**	**682**	**1.82**	748	2.10	808	2.37
5500	**571**	**1.57**	**643**	**1.86**	711	2.15	773	2.44	832	2.73
6000	**610**	**1.92**	**676**	**2.21**	740	2.52	A 800	2.82	A 857	3.13
6500	**650**	**2.31**	712	2.61	A 772	2.93	829	3.25	883	3.58
7000	691	2.75	A 748	3.06	805	3.39	859	3.73	911	4.07
7500	A 732	3.24	786	3.57	839	3.91	891	4.25	**941**	**4.61**
8000	775	3.79	824	4.12	**874**	**4.47**	**924**	**4.83**	B 972	5.19
8500	**817**	**4.40**	**863**	**4.74**	**911**	**5.09**	B 958	5.46	C 1003	5.84
9000	**860**	**5.06**	**904**	**5.41**	C 948	5.77	C 993	6.15	1036	6.54

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
5000	865	2.64	A 918	2.91	969	3.17	1018	3.44	1065	3.70
5500	A 886	3.02	938	3.31	988	3.59	1035	3.87	1081	4.16
6000	910	3.44	960	3.74	B 1008	4.05	B 1054	4.35	B 1099	4.65
6500	935	3.90	B 984	4.22	1030	4.54	1075	4.86	1118	5.18
7000	961	4.40	1008	4.74	1054	5.08	1098	5.41	1140	5.75
7500	B 989	4.96	1035	5.31	1079	5.66	1122	6.01	C 1163	6.36
8000	1018	5.56	1062	5.93	C 1105	6.29	C 1147	6.66	1187	7.02
8500	C 1048	6.22	C 1091	6.60	1133	6.98	1173	7.36	D 1212	7.73
9000	1079	6.93	1121	7.32	1161	7.71	D 1201	8.11	1239	8.50

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp 4 (575-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid-High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied drive.
2. See page 30 for general fan performance notes.

Table 13 — Fan Performance — 50PG24 — Vertical Supply/Return Units

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
5,500	**571**	**1.57**	**643**	**1.86**	711	2.15	773	2.44	832	2.73
6,000	**610**	**1.92**	**676**	**2.21**	740	2.52	800	2.82	A 857	3.13
6,500	**650**	**2.31**	712	2.61	A 772	2.93	A 829	3.25	883	3.58
7,000	691	2.75	A 748	3.06	805	3.39	859	3.73	911	4.07
7,500	A 732	3.24	786	3.57	839	3.91	891	4.25	**941**	**4.61**
8,000	775	3.79	824	4.12	**874**	**4.47**	**924**	**4.83**	B 972	5.19
8,500	**817**	**4.40**	**863**	**4.74**	**911**	**5.09**	B 958	5.46	1003	5.84
9,000	**860**	**5.06**	**904**	**5.41**	948	5.77	993	6.15	C 1036	6.54
9,500	**903**	**5.79**	C 944	6.14	C 986	6.51	C 1028	6.90	1070	7.29
10,000	C 947	6.57	985	6.93	1025	7.32	1065	7.71	1105	8.11

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
5,500	886	3.02	A 938	3.31	988	3.59	1035	3.87	1081	4.16
6,000	A 910	3.44	960	3.74	B 1008	4.05	B 1054	4.35	B 1099	4.65
6,500	935	3.90	B 984	4.22	1030	4.54	1075	4.86	1118	5.18
7,000	961	4.40	1008	4.74	1054	5.08	1098	5.41	1140	5.75
7,500	B 989	4.96	1035	5.31	1079	5.66	1122	6.01	C 1163	6.36
8,000	1018	5.56	1062	5.93	C 1105	6.29	C 1147	6.66	1187	7.02
8,500	1048	6.22	C 1091	6.60	1133	6.98	1173	7.36	1212	7.73
9,000	C 1079	6.93	1121	7.32	1161	7.71	1201	8.11	D 1239	8.50
9,500	1112	7.70	1152	8.10	D 1191	8.51	D 1229	8.91	1266	9.32
10,000	1145	8.52	D 1184	8.94	1222	9.36	1259	9.78	1295	10.20

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (5.75-v)
   (B) Mid-Low Range: 949-1206, 5.75 Bhp
   (C) Mid-High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied drive.
2. See page 30 for general fan performance notes.

Table 14 — Fan Performance — 50PG28 — Vertical Supply/Return Units

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
6,500	734	2.74	752	2.85	A 803	3.16	A 848	3.45	891	3.74
7,000	728	2.88	A 792	3.35	844	3.70	887	4.01	B 928	4.30
7,500	A 746	3.15	831	3.88	884	4.29	B 927	4.63	966	4.94
8,000	786	3.62	869	4.45	B 925	4.94	968	5.30	1006	5.64
8,500	827	4.15	B 905	5.04	964	5.63	1008	6.04	1046	6.40
9,000	870	4.74	940	5.66	1003	6.36	C 1049	6.83	C 1086	7.22
9,500	B 913	5.40	975	6.30	C 1042	7.13	1089	7.68	1127	8.11
10,000	957	6.11	C 1010	6.98	1079	7.94	1128	8.57	1167	9.06
10,500	C 1002	6.89	1047	7.72	1115	8.78	D 1167	9.52	D 1207	10.06
11,000	1047	7.73	1086	8.53	D 1150	9.65	1205	10.50	1247	11.13
11,500	1092	8.63	1126	9.41	1185	10.54	**1242**	**11.53**	**1286**	**12.24**
12,000	D 1137	9.61	D 1168	10.36	1220	11.47	**1278**	**12.59**	**1325**	**13.40**
12,500	1182	10.65	1210	11.39	**1256**	**12.46**	**1314**	**13.68**	—	—

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
6,500	934	4.05	B 978	4.40	1023	4.78	1071	5.22	1119	5.71
7,000	B 967	4.61	1007	4.94	1048	5.30	C 1090	5.70	C 1134	6.15
7,500	1003	5.25	1040	5.57	C 1078	5.92	1116	6.30	1155	6.71
8,000	1041	5.96	C 1076	6.29	1111	6.63	1146	6.99	1181	7.37
8,500	C 1081	6.74	1114	7.07	1147	7.42	1179	7.77	D 1212	8.14
9,000	1121	7.59	1153	7.93	1184	8.28	D 1215	8.64	1246	9.01
9,500	1161	8.50	1193	8.87	D 1223	9.23	1253	9.59	**1282**	**9.96**
10,000	D 1202	9.48	D 1233	9.87	1263	10.25	1291	10.62	**1319**	**11.00**
10,500	1242	10.53	1273	10.95	**1303**	**11.35**	**1331**	**11.73**	**1358**	**12.12**
11,000	**1282**	**11.64**	**1314**	**12.09**	**1343**	**12.52**	**1371**	**12.92**	**1397**	**13.32**
11,500	**1322**	**12.81**	**1354**	**13.30**	**1384**	**13.76**	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor and drive required.

NOTES:
1. Motor drive ranges:
   (A) Low Range: 687-873, 5.75 Bhp
   (B) Mid-Low Range: 805-1007, 5.75 Bhp
   (C) Mid-High Range: 941-1176, 8.63 Bhp
   (D) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor/drive.
2. See page 30 for general fan performance notes.

Table 15 — Fan Performance — 48PGD20 — Horizontal Supply and Return Units

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
5000	**862**	**2.65**	917	2.93	969	3.21	1019	3.17	F 1066	3.52
5500	F 937	3.26	F 988	3.56	F 1036	3.53	F 1083	3.90	1127	4.28
6000	1013	3.58	1060	3.96	1105	4.35	1149	4.75	G 1191	5.16
6500	**1089**	**4.48**	G 1133	4.89	G **1175**	**5.31**	G 1216	5.73	1256	6.17
7000	G 1166	5.52	1207	5.96	1247	6.41	H 1285	6.86	H 1323	7.32
7500	H 1243	6.71	H 1282	7.18	H 1319	7.66	**1355**	**8.14**	**1391**	**8.63**
8000	1320	8.07	**1356**	**8.57**	**1392**	**9.08**	—	—	—	—
8500	**1398**	**9.60**	—	—	—	—	—	—	—	—
9000	—	—	—	—	—	—	—	—	—	—

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
5000	F 1112	3.88	F 1156	4.25	1199	4.63	G 1240	5.02	G 1280	5.42
5500	G 1171	4.67	G 1212	5.06	G 1253	5.47	H 1292	5.88	H 1331	6.30
6000	1232	5.57	H 1271	6.00	H 1310	6.43	**1348**	**6.87**	**1384**	**7.31**
6500	H 1295	6.61	1333	7.06	**1369**	**7.52**	—	—	—	—
7000	**1360**	**7.80**	**1396**	**8.27**	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—
8000	—	—	—	—	—	—	—	—	—	—
8500	—	—	—	—	—	—	—	—	—	—
9000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: Not Used
   (F) Mid-Low Range: 896-1227, 4.26 Bhp (208/230 and 460-v), 873-1108, 5.75 Bhp (575-v)
   (G) Mid-High Range: 1113-1414, 5.75 Bhp
   (H) High Range: 1096-1339, 8.63 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 16 — Fan Performance — 48PGE20 — Horizontal Supply and Return Units

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
5000	**875**	**2.74**	931	3.04	F 984	3.34	F 1035	3.33	F 1083	3.69
5500	F 952	3.38	F 1003	3.32	1053	3.70	1100	4.09	G 1145	4.49
6000	1029	3.74	1077	4.15	G 1123	4.56	G 1167	4.98	1210	5.41
6500	**1106**	**4.67**	G 1151	5.11	1194	5.56	H 1236	6.01	H 1276	6.47
7000	G 1184	5.75	H 1226	6.23	H 1266	6.71	1306	7.19	**1344**	**7.68**
7500	H 1262	7.00	1302	7.50	**1340**	**8.01**	**1377**	**8.53**	—	—
8000	**1341**	**8.41**	**1378**	**8.95**	—	—	—	—	—	—
8500	—	—	—	—	—	—	—	—	—	—
9000	—	—	—	—	—	—	—	—	—	—

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
5000	F 1130	4.07	G 1174	4.45	G 1218	4.84	G 1259	5.23	G 1300	5.63
5500	G 1189	4.90	1232	5.31	1273	5.72	H 1313	6.15	**1352**	**6.58**
6000	H 1251	5.85	H 1292	6.29	H 1331	6.74	**1369**	**7.19**	—	—
6500	1315	6.94	**1354**	**7.41**	**1391**	**7.89**	—	—	—	—
7000	**1381**	**8.18**	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—
8000	—	—	—	—	—	—	—	—	—	—
8500	—	—	—	—	—	—	—	—	—	—
9000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: Not Used
   (F) Mid-Low Range: 896-1227, 4.26 Bhp (208/230 and 460-v), 873-1108, 5.75 Bhp (575-v)
   (G) Mid-High Range: 1113-1414, 5.75 Bhp
   (H) High Range: 1096-1339, 8.63 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 17 — Fan Performance — 48PGF20 — Horizontal Supply and Return Units

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
5000	**875**	**2.74**	931	3.04	984	3.34	1035	3.33	F 1083	3.69
5500	F 952	3.38	F 1003	3.32	F 1053	3.70	F 1100	4.09	G 1145	4.49
6000	1029	3.74	1077	4.15	1123	4.56	G 1167	4.98	1210	5.41
6500	**1106**	**4.67**	G 1151	5.11	G 1194	5.56	1236	6.01	H 1276	6.47
7000	G 1184	5.75	H 1226	6.23	H 1266	6.71	H 1306	7.19	**1344**	**7.68**
7500	H 1262	7.00	1302	7.50	**1340**	**8.01**	**1377**	**8.53**	—	—
8000	**1341**	**8.41**	**1378**	**8.95**	—	—	—	—	—	—
8500	—	—	—	—	—	—	—	—	—	—
9000	—	—	—	—	—	—	—	—	—	—

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
5000	F 1130	4.07	G 1174	4.45	G 1218	4.84	G 1259	5.23	G 1300	5.63
5500	G 1189	4.90	1232	5.31	1273	5.72	H 1313	6.15	**1352**	**6.58**
6000	H 1251	5.85	H 1292	6.29	H 1331	6.74	**1369**	**7.19**	—	—
6500	1315	6.94	**1354**	**7.41**	**1391**	**7.89**	—	—	—	—
7000	**1381**	**8.18**	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—
8000	—	—	—	—	—	—	—	—	—	—
8500	—	—	—	—	—	—	—	—	—	—
9000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: Not Used
   (F) Mid-Low Range: 896-1227, 4.26 Bhp (208/230 and 460-v), 873-1108, 5.75 Bhp (575-v)
   (G) Mid-High Range: 1113-1414, 5.75 Bhp
   (H) High Range: 1096-1339, 8.63 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 18 — Fan Performance — 48PGD24 — Horizontal Supply and Return Units

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
5,500	F 937	3.26	F 988	3.56	F 1036	3.53	F 1083	3.90	G 1127	4.28
6,000	1013	3.58	1060	3.96	**1105**	**4.35**	G 1149	4.75	1191	5.16
6,500	**1089**	**4.48**	G 1133	4.89	G 1175	5.31	1216	5.73	H 1256	6.17
7,000	G 1166	5.52	H 1207	5.96	H 1247	6.41	H 1285	6.86	1323	7.32
7,500	H 1243	6.71	1282	7.18	1319	7.66	**1355**	**8.14**	**1391**	**8.63**
8,000	1320	8.07	**1356**	**8.57**	**1392**	**9.08**	—	—	—	—
8,500	**1398**	**9.60**	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

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
5,500	G 1171	4.67	G 1212	5.06	G 1253	5.47	H 1292	5.88	H 1331	6.30
6,000	1232	5.57	H 1271	6.00	H 1310	6.43	**1348**	**6.87**	**1384**	**7.31**
6,500	H 1295	6.61	1333	7.06	**1369**	**7.52**	—	—	—	—
7,000	**1360**	**7.80**	**1396**	**8.27**	—	—	—	—	—	—
7,500	—	—	—	—	—	—	—	—	—	—
8,000	—	—	—	—	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: Not Used
   (F) Mid-Low Range: 896-1227, 4.26 Bhp (208/230 and 460-v), 873-1108, 5.75 Bhp (575-v)
   (G) Mid-High Range: 1113-1414, 5.75 Bhp
   (H) High Range: 1096-1339, 8.63 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 19 — Fan Performance — 48PGE24 — Horizontal Supply and Return Units

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
5,500	F 952	3.38	F 1003	3.32	F 1053	3.70	F 1100	4.09	G 1145	4.49
6,000	F 1029	3.74	F 1077	4.15	G 1123	4.56	G 1167	4.98	G 1210	5.41
6,500	**1106**	**4.67**	G 1151	5.11	G 1194	5.56	H 1236	6.01	H 1276	6.47
7,000	G 1184	5.75	H 1226	6.23	H 1266	6.71	H 1306	7.19	**1344**	**7.68**
7,500	H 1262	7.00	H 1302	7.50	**1340**	**8.01**	**1377**	**8.53**	—	—
8,000	**1341**	**8.41**	**1378**	**8.95**	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

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
5,500	G 1189	4.90	G 1232	5.31	G 1273	5.72	H 1313	6.15	**1352**	**6.58**
6,000	H 1251	5.85	H 1292	6.29	H 1331	6.74	**1369**	**7.19**	—	—
6,500	H 1315	6.94	**1354**	**7.41**	**1391**	**7.89**	—	—	—	—
7,000	**1381**	**8.18**	—	—	—	—	—	—	—	—
7,500	—	—	—	—	—	—	—	—	—	—
8,000	—	—	—	—	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: Not Used
   (F) Mid-Low Range: 896-1227, 4.26 Bhp (208/230 and 460-v), 873-1108, 5.75 Bhp (575-v)
   (G) Mid-High Range: 1113-1414, 5.75 Bhp
   (H) High Range: 1096-1339, 8.63 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 20 — Fan Performance — 48PGF24 — Horizontal Supply and Return Units

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
5,500	F 952	3.38	F 1003	3.32	F 1053	3.70	F 1100	4.09	G 1145	4.49
6,000	1029	3.74	1077	4.15	G 1123	4.56	G 1167	4.98	1210	5.41
6,500	**1106**	**4.67**	G 1151	5.11	1194	5.56	H 1236	6.01	H 1276	6.47
7,000	G 1184	5.75	H 1226	6.23	H 1266	6.71	1306	7.19	**1344**	**7.68**
7,500	H 1262	7.00	1302	7.50	**1340**	**8.01**	**1377**	**8.53**	—	—
8,000	**1341**	**8.41**	**1378**	**8.95**	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

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
5,500	G 1189	4.90	G 1232	5.31	G 1273	5.72	H 1313	6.15	**1352**	**6.58**
6,000	H 1251	5.85	H 1292	6.29	H 1331	6.74	**1369**	**7.19**	—	—
6,500	1315	6.94	**1354**	**7.41**	**1391**	**7.89**	—	—	—	—
7,000	**1381**	**8.18**	—	—	—	—	—	—	—	—
7,500	—	—	—	—	—	—	—	—	—	—
8,000	—	—	—	—	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: Not Used
   (F) Mid-Low Range: 896-1227, 4.26 Bhp (208/230 and 460-v), 873-1108, 5.75 Bhp (575-v)
   (G) Mid-High Range: 1113-1414, 5.75 Bhp
   (H) High Range: 1096-1339, 8.63 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 21 — Fan Performance — 48PGD28 — Horizontal Supply and Return Units

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
6,500	E 786	3.06	E 819	3.26	E 857	3.51	899	3.80	F 943	4.12
7,000	E 842	3.69	E 871	3.89	905	4.14	F 943	4.42	F 983	4.74
7,500	F 898	4.40	F 925	4.61	F 955	4.85	989	5.13	1026	5.44
8,000	F 955	5.20	F 979	5.40	1007	5.65	1037	5.92	G 1070	6.23
8,500	1012	6.08	1034	6.29	1059	6.53	G 1087	6.80	G 1117	7.10
9,000	G 1069	7.05	G 1090	7.26	G 1113	7.50	1138	7.77	1165	8.07
9,500	1127	8.11	1146	8.32	1167	8.57	1190	8.84	H 1215	9.13
10,000	H 1184	9.27	H 1202	9.49	H 1221	9.73	H 1243	10.00	H 1266	10.29
10,500	H 1242	10.52	H 1258	10.75	H 1276	10.99	1296	11.26	**1318**	**11.55**
11,000	**1299**	**11.88**	**1315**	**12.11**	**1332**	**12.36**	**1350**	**12.63**	**1370**	**12.92**
11,500	**1357**	**13.35**	**1372**	**13.58**	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

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
6,500	F 988	4.49	1035	4.89	1082	5.33	G 1129	5.81	1177	6.32
7,000	1024	5.09	G 1066	5.48	G 1109	5.89	G 1153	6.35	1197	6.84
7,500	G 1063	5.79	G 1102	6.16	G 1141	6.56	1181	6.99	H 1221	7.46
8,000	G 1105	6.57	1140	6.93	1176	7.32	H 1213	7.74	1250	8.18
8,500	1149	7.44	1181	7.79	H 1215	8.18	H 1249	8.58	1283	9.02
9,000	1194	8.40	H 1225	8.75	H 1256	9.13	1287	9.53	**1319**	**9.95**
9,500	H 1242	9.46	1270	9.80	**1298**	**10.17**	**1328**	**10.57**	**1358**	**10.98**
10,000	1290	10.61	**1316**	**10.96**	**1343**	**11.32**	**1370**	**11.71**	**1399**	**12.12**
10,500	**1340**	**11.87**	**1364**	**12.21**	**1389**	**12.57**	—	—	—	—
11,000	**1391**	**13.23**	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: 687-873, 5.75 Bhp
   (F) Mid-Low Range: 805-1007, 5.75 Bhp
   (G) Mid-High Range: 941-1176, 8.63 Bhp
   (H) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 22 — Fan Performance — 48PGE28 — Horizontal Supply and Return Units

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
6,500	E 799	3.14	E 833	3.35	E 872	3.61	914	3.90	F 958	4.24
7,000	E 856	3.79	887	4.00	F 921	4.25	F 958	4.54	F 999	4.87
7,500	F 913	4.52	F 941	4.74	F 972	4.99	1006	5.27	1042	5.59
8,000	F 971	5.33	996	5.55	1024	5.80	1055	6.08	G 1088	6.40
8,500	1029	6.24	1052	6.46	G 1078	6.71	G 1106	6.99	1136	7.30
9,000	G 1087	7.23	G 1108	7.46	1132	7.71	1158	7.99	1185	8.29
9,500	1145	8.32	1165	8.55	1187	8.80	1211	9.08	H 1236	9.39
10,000	H 1203	9.50	H 1222	9.74	H 1243	10.00	H 1265	10.28	1288	10.58
10,500	H 1261	10.79	H 1279	11.03	**1299**	**11.29**	**1319**	**11.58**	**1341**	**11.88**
11,000	**1320**	**12.18**	**1337**	**12.43**	**1355**	**12.70**	**1374**	**12.98**	**1394**	**13.28**
11,500	**1378**	**13.68**	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

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
6,500	F 1005	4.62	1052	5.05	1100	5.51	G 1148	6.00	1195	6.52
7,000	1041	5.24	G 1084	5.64	G 1128	6.09	1172	6.57	H 1217	7.08
7,500	G 1080	5.94	1119	6.33	1160	6.76	1201	7.22	1242	7.71
8,000	1122	6.74	1158	7.12	1195	7.53	H 1233	7.97	1272	8.45
8,500	1167	7.63	1200	8.00	H 1234	8.40	1269	8.83	**1304**	**9.29**
9,000	H 1214	8.63	H 1244	8.99	1275	9.37	**1308**	**9.79**	**1340**	**10.23**
9,500	H 1262	9.72	1290	10.07	**1319**	**10.45**	**1349**	**10.85**	**1379**	**11.28**
10,000	**1312**	**10.91**	**1338**	**11.25**	**1365**	**11.63**	**1392**	**12.02**	—	—
10,500	**1363**	**12.20**	**1387**	**12.55**	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: 687-873, 5.75 Bhp
   (F) Mid-Low Range: 805-1007, 5.75 Bhp
   (G) Mid-High Range: 941-1176, 8.63 Bhp
   (H) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 23 — Fan Performance — 48PGF28 — Horizontal Supply and Return Units

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
6,500	E 799	3.14	E 833	3.35	E 872	3.61	914	3.90	F 958	4.24
7,000	E 856	3.79	887	4.00	F 921	4.25	F 958	4.54	999	4.87
7,500	F 913	4.52	F 941	4.74	972	4.99	1006	5.27	1042	5.59
8,000	F 971	5.33	996	5.55	1024	5.80	1055	6.08	G 1088	6.40
8,500	1029	6.24	1052	6.46	G 1078	6.71	G 1106	6.99	1136	7.30
9,000	G 1087	7.23	G 1108	7.46	1132	7.71	1158	7.99	1185	8.29
9,500	1145	8.32	1165	8.55	H 1187	8.80	H 1211	9.08	H 1236	9.39
10,000	H 1203	9.50	H 1222	9.74	1243	10.00	1265	10.28	1288	10.58
10,500	H 1261	10.79	1279	11.03	**1299**	**11.29**	**1319**	**11.58**	**1341**	**11.88**
11,000	**1320**	**12.18**	**1337**	**12.43**	**1355**	**12.70**	**1374**	**12.98**	**1394**	**13.28**
11,500	**1378**	**13.68**	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

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
6,500	F 1005	4.62	1052	5.05	1100	5.51	G 1148	6.00	1195	6.52
7,000	1041	5.24	G 1084	5.64	G 1128	6.09	1172	6.57	H 1217	7.08
7,500	G 1080	5.94	1119	6.33	1160	6.76	1201	7.22	1242	7.71
8,000	G 1122	6.74	1158	7.12	1195	7.53	H 1233	7.97	1272	8.45
8,500	1167	7.63	1200	8.00	H 1234	8.40	1269	8.83	**1304**	**9.29**
9,000	H 1214	8.63	H 1244	8.99	1275	9.37	**1308**	**9.79**	**1340**	**10.23**
9,500	H 1262	9.72	1290	10.07	**1319**	**10.45**	**1349**	**10.85**	**1379**	**11.28**
10,000	**1312**	**10.91**	**1338**	**11.25**	**1365**	**11.63**	**1392**	**12.02**	—	—
10,500	**1363**	**12.20**	**1387**	**12.55**	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: 687-873, 5.75 Bhp
   (F) Mid-Low Range: 805-1007, 5.75 Bhp
   (G) Mid-High Range: 941-1176, 8.63 Bhp
   (H) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 24 — Fan Performance — 50PG20 — Horizontal Supply/Return Units

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
5000	**575**	**1.37**	**642**	**1.61**	700	1.84	754	2.08	808	2.33
5500	**619**	**1.71**	**682**	**1.96**	737	2.21	788	2.45	E 837	2.71
6000	**663**	**2.09**	723	2.35	E 776	2.62	E 825	2.88	871	3.14
6500	708	2.53	E 765	2.80	816	3.08	863	3.35	906	3.63
7000	E 753	3.02	807	3.30	857	3.59	902	3.88	**944**	**4.17**
7500	800	3.58	850	3.86	898	4.16	**942**	**4.47**	F 982	4.77
8000	847	4.20	**894**	**4.48**	**940**	**4.80**	F 982	5.11	1022	5.43
8500	**894**	**4.88**	**939**	**5.17**	F 982	5.49	G 1024	5.82	G 1062	6.14
9000	G 941	5.63	G 983	5.92	G 1025	6.24	1065	6.58	1103	6.92

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
5000	862	2.60	E 917	2.89	972	3.20	1028	3.53	1084	3.89
5500	E 886	2.97	935	3.25	985	3.55	1035	3.87	1086	4.21
6000	916	3.41	960	3.69	F 1005	3.98	F 1050	4.29	F 1096	4.61
6500	949	3.90	F 990	4.19	1032	4.48	1073	4.78	1114	5.10
7000	F 984	4.46	1023	4.75	1062	5.04	1100	5.34	1139	5.66
7500	1021	5.07	1059	5.37	1095	5.67	G 1131	5.98	G 1167	6.29
8000	1059	5.74	1095	6.05	G 1130	6.36	1165	6.67	1199	6.99
8500	G 1099	6.47	G 1133	6.79	1167	7.11	H 1200	7.43	H 1232	7.76
9000	1138	7.26	1172	7.59	H 1205	7.93	1237	8.26	1268	8.59

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (F) Mid-Low Range: 949-1206, 5.75 Bhp
   (G) Mid-High Range: 941-1176 8.63 Bhp
   (H) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied drive.
2. See page 30 for general fan performance notes.

Table 25 — Fan Performance — 50PG24 — Horizontal Supply/Return Units

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
5,500	**619**	**1.71**	**682**	**1.96**	737	2.21	788	2.45	837	2.71
6,000	**663**	**2.09**	723	2.35	776	2.62	E 825	2.88	E 871	3.14
6,500	708	2.53	E 765	2.80	E 816	3.08	863	3.35	906	3.63
7,000	E 753	3.02	807	3.30	857	3.59	902	3.88	**944**	**4.17**
7,500	800	3.58	850	3.86	898	4.16	**942**	**4.47**	F 982	4.77
8,000	847	4.20	**894**	**4.48**	**940**	**4.80**	F 982	5.11	1022	5.43
8,500	**894**	**4.88**	**939**	**5.17**	F 982	5.49	1024	5.82	1062	6.14
9,000	941	5.63	983	5.92	1025	6.24	G 1065	6.58	G 1103	6.92
9,500	G 989	6.45	G 1029	6.74	G 1069	7.07	1108	7.41	1144	7.77
10,000	1037	7.34	1075	7.63	1113	7.96	1150	8.32	H 1186	8.68

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
5,500	E 886	2.97	E 935	3.25	985	3.55	1035	3.87	1086	4.21
6,000	916	3.41	960	3.69	1005	3.98	F 1050	4.29	F 1096	4.61
6,500	949	3.90	F 990	4.19	F 1032	4.48	1073	4.78	1114	5.10
7,000	F 984	4.46	1023	4.75	1062	5.04	1100	5.34	1139	5.66
7,500	1021	5.07	1059	5.37	1095	5.67	G 1131	5.98	G 1167	6.29
8,000	1059	5.74	1095	6.05	G 1130	6.36	1165	6.67	1199	6.99
8,500	G 1099	6.47	G 1133	6.79	1167	7.11	1200	7.43	H 1232	7.76
9,000	1138	7.26	1172	7.59	1205	7.93	H 1237	8.26	1268	8.59
9,500	H 1179	8.12	H 1212	8.46	H 1244	8.81	1275	9.15	**1305**	**9.50**
10,000	1220	9.04	1252	9.40	1283	9.76	**1313**	**10.11**	**1342**	**10.47**

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: 685-939, 4.26 Bhp (208/230 and 460-v), 751-954, 5.75 Bhp (575-v)
   (F) Mid-Low Range: 949-1206, 5.75 Bhp
   (G) Mid-High Range: 941-1176, 8.63 Bhp
   (H) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See page 30 for general fan performance notes.

Table 26 — Fan Performance — 50PG28 — Horizontal Supply/Return Units

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
6,500	759	2.89	E 804	3.17	E 844	3.42	883	3.68	F 922	3.96
7,000	E 810	3.47	853	3.77	891	4.04	F 928	4.30	964	4.58
7,500	862	4.12	F 903	4.43	F 939	4.72	974	5.00	1008	5.29
8,000	F 913	4.84	953	5.18	988	5.48	1021	5.77	G 1053	6.07
8,500	965	5.63	1003	5.99	1037	6.32	G 1069	6.62	1100	6.93
9,000	1017	6.50	G 1054	6.89	G 1087	7.23	1118	7.55	1147	7.87
9,500	G 1069	7.45	1105	7.86	1137	8.22	1167	8.56	1195	8.89
10,000	1121	8.48	1156	8.92	H 1187	9.30	H 1216	9.66	H 1243	10.01
10,500	H 1173	9.60	H 1207	10.06	1238	10.47	1266	10.85	1292	11.21
11,000	1226	10.81	1259	11.30	**1288**	**11.72**	**1316**	**12.12**	**1342**	**12.50**
11,500	**1278**	**12.11**	**1310**	**12.62**	**1339**	**13.07**	**1366**	**13.49**	—	—
12,000	**1331**	**13.51**	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

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
6,500	F 962	4.27	F 1003	4.61	1045	4.98	1090	5.41	G 1135	5.87
7,000	1000	4.88	1037	5.21	G 1075	5.56	G 1115	5.95	1155	6.38
7,500	1041	5.58	G 1075	5.90	1110	6.24	1145	6.61	1182	7.01
8,000	G 1085	6.37	1116	6.68	1148	7.01	1180	7.36	H 1214	7.74
8,500	1129	7.23	1159	7.55	1189	7.88	H 1219	8.22	1249	8.59
9,000	1175	8.18	1204	8.50	H 1232	8.83	1260	9.18	1288	9.53
9,500	H 1222	9.22	H 1249	9.55	1276	9.88	**1302**	**10.22**	**1329**	**10.58**
10,000	1270	10.34	1296	10.68	**1321**	**11.02**	**1346**	**11.37**	**1371**	**11.72**
10,500	**1318**	**11.56**	**1343**	**11.90**	**1367**	**12.25**	**1391**	**12.61**	—	—
11,000	**1366**	**12.86**	**1390**	**13.22**	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan

Boldface indicates field-supplied motor/drive required.

NOTES:
1. Motor drive ranges:
   (E) Low Range: 687-873, 5.75 Bhp
   (F) Mid-Low Range: 805-1007, 5,75 Bhp
   (G) Mid-High Range: 941-1176, 8.63 Bhp
   (H) High Range: 1014-1297, 11.50 Bhp
   All other rpms require field-supplied motor or drive.
2. See below for general fan performance notes.

GENERAL NOTES FOR FAN PERFORMANCE DATA TABLES

1. Static pressure losses from accessories and options (Humidi-MiZer™, economizer, etc.) must be added to external static pressure before entering Fan Performance table. Refer to Tables 31 and 32 for Accessory/FIOP Static Pressure information.
2. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the bhp ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected. See Tables 29 and 30 (Evaporator-Fan Motor Specifications) on page 31 and 32 for additional information.
3. Use of a field-supplied motor may affect wire sizing. Contact your local Carrier representative for details.
4. Interpolation is permissible. Do not extrapolate.

Table 27 — Air Quantity Limits (48PG20-28 Units)

48PG	COOLING		GAS HEAT	HEATING (NAT. GAS, VERTICAL) MINIMUM CFM	HEATING (NAT. GAS, HORIZONTAL) MINIMUM CFM	HEATING (PROPANE, VERTICAL) MINIMUM CFM	HEATING (PROPANE, HORIZONTAL) MINIMUM CFM
	Minimum Cfm	Maximum Cfm					
20	5000	9,000	High Heat (8 Cell)	5522	5522	5522	4920
			Medium Heat (8 Cell)	4977	4977	4480	4480
			Low Heat (5 Cell)	4218	4218	4218	3796
24	5500	10,000	High Heat (8 Cell)	5522	5522	5522	4920
			Medium Heat (8 Cell)	4977	4977	4480	4480
			Low Heat (5 Cell)	4218	4218	4218	3796
28	6500	12,000	High Heat (8 Cell)	5522	5470*	5522	4920*
			Medium Heat (8 Cell)	4977	4977*	4480	4480*
			Low Heat (5 Cell)	4218	4218	4218	3796

*7000 cfm minimum recommended above 1.0 in. wg external static pressure.

Table 28 — Air Quantity Limits (50PG20-28 Units)

50PG	COOLING		ELECTRIC HEAT	ELECTRIC HEAT (Vertical) MINIMUM CFM	ELECTRIC HEAT (Horizontal) MINIMUM CFM
	Minimum Cfm	Maximum Cfm			
20	5000	9,000	High Heat (75 kW)	4,500	5,400
			Medium Heat (50 kW)	3,750	4,800
			Low Heat (25 kW)	3,750	3,750
24	5500	10,000	High Heat (75 kW)	4,500	5,400
			Medium Heat (50 kW)	3,750	4,800
			Low Heat (25 kW)	3,750	3,750
28	6500	12,000	High Heat (75 kW)	4,500	5,400
			Medium Heat (50 kW)	3,750	4,800
			Low Heat (25 kW)	3,750	3,750

Table 29 — Evaporator Fan Motor Specifications — 48PG20-28 Units

UNIT 48PG	DRIVE	ORIENTATION	NOMINAL HP	VOLTAGE	MAX WATTS	EFFICIENCY %	MAX BHP	MAX BkW	MAX AMPS
20	Low	Vertical	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Vertical	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Vertical	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
	Low	Horizontal	N/A	208	N/A	N/A	N/A	N/A	N/A
			N/A	230	N/A	N/A	N/A	N/A	N/A
			N/A	460	N/A	N/A	N/A	N/A	N/A
			N/A	575	N/A	N/A	N/A	N/A	N/A
	Mid-Low	Horizontal	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	High	Horizontal	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
24	Low	Vertical	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Vertical	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Vertical	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
	Low	Horizontal	N/A	208	N/A	N/A	N/A	N/A	N/A
			N/A	230	N/A	N/A	N/A	N/A	N/A
			N/A	460	N/A	N/A	N/A	N/A	N/A
			N/A	575	N/A	N/A	N/A	N/A	N/A
	Mid-Low	Horizontal	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	High	Horizontal	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4

Table 29 — Evaporator Fan Motor Specifications — 48PG20-28 Units (cont)

UNIT 48PG	DRIVE	ORIENTATION	NOMINAL HP	VOLTAGE	MAX WATTS	EFFICIENCY %	MAX BHP	MAX BkW	MAX AMPS
28	Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Vertical	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Vertical	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
	Low	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Horizontal	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Horizontal	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0

NOTES:
1. Extensive motor and electrical testing ensures that the motors can be utilized with confidence up to the maximum applied bhp, watts, and amps. Using the fan motor up to the maximum ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.
3. Convert bhp to watts using the following formula:

$$\text{watts} = \frac{\text{bhp (746)}}{\text{motor efficiency}}$$

Table 30 — Evaporator Fan Motor Specifications — 50PG20-28 Units

UNIT 50PG	DRIVE	ORIENTATION	NOMINAL HP	VOLTAGE	MAX WATTS	EFFICIENCY %	MAX BHP	MAX BkW	MAX AMPS
20	Low	Vertical	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Vertical	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Vertical	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
	Low	Horizontal	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Horizontal	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Horizontal	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0

NOTES:
1. Extensive motor and electrical testing ensures that the motors can be utilized with confidence up to the maximum applied bhp, watts, and amps. Using the fan motor up to the maximum ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.
3. Convert bhp to watts using the following formula:

$$\text{watts} = \frac{\text{bhp (746)}}{\text{motor efficiency}}$$

Table 30 — Evaporator Fan Motor Specifications — 50PG20-28 Units (cont)

UNIT 50PG	DRIVE	ORIENTATION	NOMINAL HP	VOLTAGE	MAX WATTS	EFFICIENCY %	MAX BHP	MAX BkW	MAX AMPS
24	Low	Vertical	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Vertical	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Vertical	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
	Low	Horizontal	3.7	208	3700	85.8	4.26	3.17	10.6
			3.7	230	3700	85.8	4.26	3.17	9.6
			3.7	460	3700	85.8	4.26	3.17	4.8
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Horizontal	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Horizontal	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
28	Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Vertical	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Vertical	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Vertical	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0
	Low	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-Low	Horizontal	5	208	4578	87.5	5.37	4.01	15.8
			5	230	5115	87.5	6.00	4.48	15.4
			5	460	5115	87.5	6.00	4.48	7.7
			5	575	5015	87.5	5.88	4.39	6.0
	Mid-High	Horizontal	7.5	208	6458	88.5	7.66	5.71	22.0
			7.5	230	7169	88.5	8.51	6.34	22.0
			7.5	460	7586	88.5	9.00	6.71	11.6
			7.5	575	7586	88.5	9.00	6.71	9.4
	High	Horizontal	10	208	8284	89.5	9.94	7.41	28.0
			10	230	8708	89.5	10.45	7.79	28.0
			10	460	9330	89.5	11.19	8.35	15.0
			10	575	9711	89.5	11.65	8.69	12.0

NOTES:

1. Extensive motor and electrical testing ensures that the motors can be utilized with confidence up to the maximum applied bhp, watts, and amps. Using the fan motor up to the maximum ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.
3. Convert bhp to watts using the following formula:

$$\text{watts} = \frac{\text{bhp (746)}}{\text{motor efficiency}}$$

Table 31 — Accessory/FIOP Static Pressure (in. wg)* — 48/50PG20-28 Units

COMPONENT	CFM								
	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000
Economizer	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10
Humidi-MiZer™ (20, 24)	—	—	—	0.10	0.17	0.25	0.32	0.40	0.47
Humidi-MiZer (28)	—	—	—	—	—	0.05	0.13	0.21	0.29

COMPONENT	CFM							
	8,500	9,000	9,500	10,000	10,500	11,000	11,500	12,000
Economizer	0.11	0.12	0.13	0.15	0.16	0.17	0.19	0.20
Humidi-MiZer (20, 24)	0.54	0.60	0.68	0.74	—	—	—	—
Humidi-MiZer (28)	0.38	0.44	0.51	0.59	0.66	0.72	0.80	0.86

LEGEND

FIOP — Factory-Installed Option

*The static pressure must be added to the external static pressure. The sum and the evaporator entering-air cfm should then be used in conjunction with the Fan Performance tables to determine blower rpm and watts.

Table 32 — Accessory/FIOP Electric Heat Static Pressure (in. wg) — 50PG20-28 Units

UNIT 50PG	Unit Voltages 208/240	Cfm	ELECTRIC HEATERS					
			Nominal Heater Size (kW)	Pressure Drop (in. wg)	Nominal Heater Size (kW)	Pressure Drop (in. wg)	Nominal Heater Size (kW)	Pressure Drop (in. wg)
20, 24, 28	208/240-3-60	4,800	25	0.01	50	0.02	75	0.03
		5,000		0.01		0.02		0.04
		6,000		0.02		0.04		0.06
		7,000		0.03		0.06		0.08
		8,000		0.04		0.08		0.12
		9,000		0.05		0.10		0.15
		10,000		0.06		0.13		0.20
		11,500		0.09		0.18		0.27
	480-3-60	4,800		0.01		0.02		0.03
		5,000		0.01		0.02		0.04
		6,000		0.02		0.04		0.06
		7,000		0.03		0.06		0.08
		8,000		0.04		0.08		0.12
		9,000		0.05		0.10		0.15
		10,000		0.06		0.13		0.20
		11,500		0.09		0.18		0.27
	575-3-60	4,800		0.01		0.02		0.03
		5,000		0.01		0.02		0.04
		6,000		0.02		0.04		0.06
		7,000		0.03		0.06		0.08
		8,000		0.04		0.08		0.12
		9,000		0.05		0.10		0.15
		10,000		0.06		0.13		0.20
		11,500		0.09		0.18		0.27

LEGEND

FIOP — Factory-Installed Option

NOTES:
1. Heaters are rated at 240 v, 480 v, and 600 v.
2. The static pressure must be added to external static pressure. The sum and the evaporator entering-air cfm should then be used in conjunction with the Fan Performance table to determine blower rpm, bhp, and watts.

Table 33 — Fan RPM At Motor Pulley Settings* — 48PG20-28 Units

UNIT 48PG		DRIVE	MOTOR PULLEY TURNS OPEN												
			0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
20 and 24 (230 and 460 volt)	Vertical	Low	685	706	727	749	770	791	812	833	854	876	897	918	939
		Mid-Low	949	970	992	1013	1035	1056	1078	1099	1120	1142	1163	1185	1206
		Mid-High	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
		High	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
	Horizontal	Low	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Mid-Low	896	924	951	979	1006	1034	1062	1089	1117	1144	1172	1199	1227
		Mid-High	1113	1138	1163	1188	1213	1238	1264	1289	1314	1339	1364	1389	1414
		High	1096	1116	1137	1157	1177	1197	1218	1238	1258	1278	1299	1319	1339
20 and 24 (575 volt)	Vertical	Low	751	768	785	802	819	836	853	869	886	903	920	937	954
		Mid-Low	949	970	992	1013	1035	1056	1078	1099	1120	1142	1163	1185	1206
		Mid-High	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
		High	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
	Horizontal	Low	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Mid-Low	873	893	912	932	951	971	991	1010	1030	1049	1069	1088	1108
		Mid-High	1113	1138	1163	1188	1213	1238	1264	1289	1314	1339	1364	1389	1414
		High	1096	1116	1137	1157	1177	1197	1218	1238	1258	1278	1299	1319	1339
28 (all voltages)	Vertical	Low	687	703	718	734	749	765	780	796	811	827	842	858	873
		Mid-Low	805	822	839	856	872	889	906	923	940	957	973	990	1007
		Mid-High	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
		High	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
	Horizontal	Low	687	703	718	734	749	765	780	796	811	827	842	858	873
		Mid-Low	805	822	839	856	872	889	906	923	940	957	973	990	1007
		Mid-High	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
		High	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297

*Approximate fan rpm shown.

NOTE: Factory pulley speed setting is at 3 turns open.

Table 34 — Fan Rpm At Motor Pulley Settings* — 50PG20-28

50PG	DRIVE	MOTOR PULLEY TURNS OPEN												
		0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
20 and 24 (230 and 460 volt)	Low Range Vertical	685	706	727	749	770	791	812	833	854	876	897	918	939
	Mid-Low Range Vertical	949	970	992	1013	1035	1056	1078	1099	1120	1142	1163	1185	1206
	Mid-High Range Vertical	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
	High Range Vertical	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
	Low Range Horizontal	685	706	727	749	770	791	812	833	854	876	897	918	939
	Mid-Low Range Horizontal	949	970	992	1013	1035	1056	1078	1099	1120	1142	1163	1185	1206
	Mid-High Range Horizontal	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
	High Range Horizontal	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
20 and 24 (575 Volt)	Low Range Vertical	751	768	785	802	819	836	853	869	886	903	920	937	954
	Mid-Low Range Vertical	949	970	992	1013	1035	1056	1078	1099	1120	1142	1163	1185	1206
	Mid-High Range Vertical	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
	High Range Vertical	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
	Low Range Horizontal	751	768	785	802	819	836	853	869	886	903	920	937	954
	Mid-Low Range Horizontal	949	970	992	1013	1035	1056	1078	1099	1120	1142	1163	1185	1206
	Mid-High Range Horizontal	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
	High Range Horizontal	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
28 (all voltages)	Low Range Vertical	687	703	718	734	749	765	780	796	811	827	842	858	873
	Mid-Low Range Vertical	805	822	839	856	872	889	906	923	940	957	973	990	1007
	Mid-High Range Vertical	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
	High Range Vertical	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297
	Low Range Horizontal	687	703	718	734	749	765	780	796	811	827	842	858	873
	Mid-Low Range Horizontal	805	822	839	856	872	889	906	923	940	957	973	990	1007
	Mid-High Range Horizontal	941	961	980	1000	1019	1039	1059	1078	1098	1117	1137	1156	1176
	High Range Horizontal	1014	1038	1061	1085	1108	1132	1156	1179	1203	1226	1250	1273	1297

*Approximate fan rpm shown.
NOTE: Factory pulley speed setting is at 3 turns open.

CONTROLS QUICK START

The following information will provide a quick guide to setting up and configuring the 48/50PG series units with *Comfort*Link™ controls. Unit controls are pre-configured at the factory for factory-installed options. Field-installed accessories will require configuration at start-up. Additionally, specific job requirements may require changes to default configuration values. See the CCN and Display parameter tables and other sections of these instructions for more details.

Thermostat Control — Wire accessory thermostat to the corresponding R, Y1, Y2, W1, W2, and G terminals on the field connection terminal board located at the unit control box.

The Unit Control Type configuration, ***Configuration →UNIT→U.CTL,*** default value is for Thermostat (2) so there is no need to configure this item.

Space Temperature Sensor Control — Direct Wired (T-55 or T-56) — Wire accessory space temperature sensor(s) to the T-55 terminals on the field connection terminal board located at the unit control box. Refer to Field-Installed Accessories section.

The Unit Control Type configuration, ***Configuration →UNIT→U.CTL***, must be set to Space Sensor (3). The jumper wire in the installer's packet must be connected between R and W1 for heating mode to operate.

Space Temperature Sensor Control — CCN (T-58) — Install the T-58 communicating thermostat. Connect the CCN communication bus from the T-58 to the CCN terminals on the field connection terminal board located at the unit control box. Configure the 48/50PG unit CCN communication element number, bus number, and baud rate. Configure the T-58 thermostat CCN communication element number and also configure the T-58 with the 48/50PG unit element number.

The Unit Control Type configuration, ***Configuration →UNIT→U.CTL***, must be set to Space Sensor (3). The jumper wire in the installer's packet must be connected between R and W1 for heating mode to operate.

Space Temperature Control — CCN Linkage — The CCN communication must be properly configured for the 48/50PG unit and all devices. Linkage configuration is automatically done by the supervisory CCN Linkage device.

The Unit Control Type configuration, ***Configuration →UNIT→U.CTL*** must be set to Space Sensor (3). The jumper wire in the installer's packet must be connected between R and W1 for heating mode to operate.

Installation of an accessory supply air temperature (SAT) sensor in the supply duct is recommended for Linkage applications. A supply duct SAT measurement is valid for heating mode display, while the factory-standard internal SAT is not valid for heating due to its location upstream of the heating section. When installing the supply duct SAT, the heating mode display is enabled by setting ***Configuration→HEAT→SAT.H*** to ENBL.

Space Humidity Control — Humidistat — Wire the Humidistat accessory to terminals Humidistat 1 and 2 located on the field connection terminal strip in the bottom of the control box. The Space Humidity Switch setting is located at ***Configuration→Unit→RH.SW***. The factory default for units with Humidi-MiZer™ system is 1 (normally open).

Space Humidity Control — Thermidistat™ — Wire the Thermidistat accessory Dehum output to terminal Humidistat1 located on the field connection terminal strip in the bottom of the control box. The Space Humidity Switch setting is located at ***Configuration→Unit→RH.SW***. The factory default for units with Humidi-MiZer system is 1 (normally open).

Space Humidity Control — Relative Humidity Sensor — Wire the humidity sensor to terminals 3 (–) and 4 (+) located on the field connection terminal strip in the bottom of the control box. The RH Sensor on OAQ Input setting is located at ***Configuration→Unit→RH.S***. The setting must be configured to YES to use the relative humidity sensor.

CCN Communication — Configure ***Configuration→ CCN→CCN.A*** to desired element number. (Default is 1.) Configure ***Configuration→CCN→CCN.B*** to desired bus number. (Default is 0.) Configure ***Configuration→CCN→BAUD*** to desired code number for baud rate. (Default is 3 = 9600 baud.)

Accessories — See the Field-Installed Accessories section, control connection tables, and CCN or Display parameter tables for required connections and configurations.

Service Test — The Service Test function can be used to verify proper operation of compressors, heating stages, indoor fan, outdoor fans, power exhaust fans, economizer, Humidi-MiZer system, and alarm relay. Use of Service Test is recommended at initial system start-up and during troubleshooting.

Control Configuration Checklist — Refer to checklist CL-1 for recording site specific unit control configurations.

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

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

To create a schedule, perform the following procedure:

1. Scroll to the Configuration mode, and select CCN CONFIGURATION (CCN). Scroll down to the Schedule Number (***Configuration→CCN→SCH.O=SCH.N***). If password protection has been enabled, the user will be prompted to enter the password before any new data is accepted. ***SCH.N*** has a range of 0 to 99. The default value is 1. A value of 0 is always occupied, and the unit will control to its occupied set points. A value of 1 means the unit will follow a local schedule, and a value of 65 to 99 means it will follow a CCN schedule. Schedules 2-64 are not used as the control only supports one internal/local schedule. If one of the 2-64 schedules is configured, then the control will force the number back to 1. Make sure the value is set to 1 to use a local schedule.
2. Enter the Time Clock mode. Scroll down to the LOCAL TIME SCHEDULE (***SCH.L***) sub-mode, and press ENTER. Period 1 (***PER.1***) will be displayed.
3. Scroll down to the MON point. This point indicates if schedule 1 applies to Monday. Use the ENTER command to go into Edit mode, and use the ▲ or ▼ key to change the display to YES or NO. Scroll down through the rest of the days and apply schedule 1 where desired. The schedule can also be applied to a holiday.
4. Configure the beginning of the occupied time period for Period 1 (OCC). Press ENTER to go into Edit mode, and the first two digits of the 00.00 will start flashing. Use the ▲ or ▼ key to display the correct value for hours, in 24-hour (military) time. Press ENTER and hour value is saved and the minutes digits will start flashing. Use the same procedure to display and save the desired minutes value.
5. Configure the unoccupied time for period 1 (***UNC***). Press ENTER to go into Edit mode, and the first two digits of the 00.00 will start flashing. Use the ▲ or ▼ key to display the correct value for hours, in 24-hour (military) time. Press ENTER and hour value is saved and the minutes digits will start flashing. Use the same procedure to display and save the desired minutes value.
6. The first schedule is now complete. If a second schedule is needed, such as for weekends or holidays, scroll down and repeat the entire procedure for period 2 (***PER.2***). If additional schedules are needed, repeat the process for as many as are needed. Eight schedules are provided. See Table 35 for an example of setting the schedule.

SERVICE TEST

The Service Test function can be used to verify proper operation of compressors, heating stages, indoor fan, outdoor fans, power exhaust fans, economizer, and alarm relay. Use of Service Test is recommended at initial system start up and during troubleshooting. See Table 36.

Service Test mode has the following changes from normal operation:

- Normal compressor timeguards and other staging delays are reduced to 30 seconds or less.
- Circuit alerts are limited to 1 strike (versus 3) before changing to alarm shut down state.
- The status of ***ALM.N*** is ignored so all alerts and alarms are broadcast on CCN.
- The words "SERVICE TEST" are inserted into every alarm message.

Service test can only be turned ON/OFF at the unit display. Once turned ON, other entries may be made with the display or through CCN.

NOTE: Service Test mode may be password protected. Refer to Scrolling Marquee section on page 3 for more information.

To turn Service Test on, change the value of TEST to ON. To turn service test off, change the value of TEST to OFF.

The independent (***INDP***) submenu is used to change output status for the economizer, power exhaust stages, and the alarm relay. These independent outputs can operate simultaneously with other Service Test modes. All outputs return to normal operation when Service Test is turned off. When the economizer is using the factory default Digital Control Type (***Configuration→ECON→E.CTL*** is 1 or 2) then the Economizer Calibration feature may be used to automatically check and reset the economizer actuator range of motion.

The fans (***FANS***) submenu is used to change output status for the indoor fan and outdoor fan stages.

The cooling (***COOL***) submenu is used to change output status for the individual compressors. Compressor starts are staggered by 15 seconds. The fans (***FANS***) and heating (***HEAT***) service test outputs are reset to OFF for the cooling service test. Indoor fans and outdoor fans are controlled normally to maintain proper unit operation. All normal cooling alarms and alerts are functional.

When charging unit, all outdoor fans may be forced on in cooling service test modes by setting the Outdoor Fan Override (***OF.OV***) to on.

NOTE: Circuit A is always operated with Circuit B in Humidi-MiZer™ system equipped units.

For units with the factory Humidi-MiZer option, the Humidi-MiZer (***HZMR***) submenu is used to change the output status to operate the circuits in different Humidi-MiZer modes or to separately test the Humidi-MiZer valve operations. The fans (***FANS***), cooling (***COOL***), and heating (***HEAT***) service test outputs are reset to OFF for the Humdi-MiZer service test. Indoor and outdoor fans are controlled normally to maintain proper unit operation. All normal cooling alarms and alerts are functional.

The heating (***HEAT***) submenu is used to change output status for the individual heat stages, gas or electric. The fans (***FANS***) and cooling (***COOL***) service test outputs are reset to OFF for the heating service test. Indoor and outdoor fans are controlled normally to maintain proper unit operation. All normal heating alarms and alerts are functional.

NOTE: Field terminal strip terminal R must be connected to W1 for the heat to operate in service test. Alert number T410 will occur as a reminder if not done. If the normal unit control mode is thermostat mode, then remove the R-W1 jumper after completing service test.

Table 35 — Setting an Occupied Time Schedule — Weekdays Only for 7:30 to 22:30

DISPLAY MENU	SUB-SUB MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
TIMECLOCK SCH.L		ENTER			Local Occupancy Schedule	
	PER.1	ENTER	OCC.1		Period Occupied Time	
		ENTER		00.00		Scrolling stops
		ENTER		00.00		Hours Flash
		▲		07.00		Select 7
		ENTER		07.00		Change accepted, minutes flash
		▲		07.30		Select 30
		ENTER		07.30		Change accepted
		ESCAPE	OCC.1	07.30	Period Occupied Time	Item/Value/Units scrolls again
		▼	UNC.1	00.00	Period Unoccupied Time	
		ENTER		00.00		Scrolling stops
		ENTER		00.00		Hours Flash
		▲		22.00		Select 22
		ENTER		22.00		Change accepted, minutes flash
		▲		22.30		Select 30
		ENTER		22.30		Change accepted
		ESCAPE	UNC.1	22.30	Period Unoccupied Time	Item/Value/Units scrolls again
		▼	MON.1	NO	Monday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	MON.1	YES	Monday In Period	Item/Value/Units scrolls again
		▼	TUE.1	NO	Tuesday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	TUE.1	YES	Tuesday In Period	Item/Value/Units scrolls again
		▼	WED.1	NO	Wednesday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	WED.1	YES	Wednesday In Period	Item/Value/Units scrolls again
		▼	THU.1	NO	Thursday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	THU.1	YES	Thursday In Period	Item/Value/Units scrolls again
		▼	FRI.1	NO	Friday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	FRI.1	YES	Friday In Period	Item/Value/Units scrolls again
		ESCAPE				
		ESCAPE				

Table 36 — Service Test Modes and Submodes Directory

DISPLAY MENU/ SUB-MENU/NAME	EXPANDED NAME	VALUES	UNITS	DEFAULT	CCN TABLE/ SUB-TABLE	CCN NAME
SERVICE TEST					MAINTENANCE DISPLAY	
TEST	Field Service Test Mode	On/Off		Off		(TEST = display only)
INDP	Test Independent Outputs				TESTINDP	
ECON	Economizer Position Test	0 to 100	%	0		S_ECONO
E.CAL	Calibrate Economizer	On/Off		Off		S_ECOCAL
PE.1	Power Exhaust 1 Test	On/Off		Off		S_PE_1
PE.2	Power Exhaust 2 Test	On/Off		Off		S_PE_2
ALRM	Alarm Relay Test	On/Off		Off		S_ALMOUT
CCH	Crankcase Heat Test	On/Off		Off		S_CCH
FANS	Test Fans				TESTFANS	
IDF	Indoor Fan Test	On/Off		Off		S_IDF
OFC.1	Outdoor Fan 1 Test	On/Off		Off		S_OFC_1
OFC.2	Outdoor Fan 2 Test	On/Off		Off		S_OFC_2
OFC.3	Outdoor Fan 3 Test	On/Off		Off		S_OFC_3
COOL	Test Cooling				TESTCOOL	
CMP.A	Cool A Test	On/Off		Off		S_COMP_A
CMP.B	Cool B Test	On/Off		Off		S_COMP_B
CMP.C	Cool C Test	On/Off		Off		S_COMP_C
OF.OV	Outdoor Fan Override	On/Off		Off		S_OFC_OV
HMZR	Test Humidimizer				TESTHMZR	
RH1.A	Reheat1 A Test	On/Off		Off		S_RH1_A
RH1.B	Reheat1 B Test	On/Off		Off		S_RH1_B
RH1.C	Reheat1 C Test	On/Off		Off		S_RH1_C
RH2.A	Reheat2 A Test	On/Off		Off		S2_RH2_A
RH2.B	Reheat2 B Test	On/Off		Off		S2_RH2_B
RH2.C	Reheat2 C Test	On/Off		Off		S2_RH2_C
CRC	Cool->Reheat1 Valve Test	On/Off		Off		S_CRC
RHV.A	Reheat2 Valve A Test	On/Off		Off		S_RH2_A
RHV.B	Reheat2 Valve B Test	On/Off		Off		S_RH2_B
HEAT	Test Heating				TESTHEAT	
HT.1	Heat Stage 1 Test	On/Off		Off		S_HEAT_1
HT.2	Heat Stage 2 Test	On/Off		Off		S_HEAT_2

THIRD PARTY CONTROL

Third party controls may interface with the unit *Comfort*Link™ controls through the connections described below. See other sections of these instructions for more information on the related unit control configurations.

Thermostat — The thermostat inputs are provided on the field connection terminal board (TB2). The Thermostat Control Type configuration, ***Configuration→UNIT→T.CTL,*** selects the unit response to these inputs.

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

Humidistat — For units with the factory Humidi-MiZer™ option, the humidistat input is provided on the field connection terminal board (TB2). The Space Humidity Switch configuration, ***Configuration→UNIT→RH.SW,*** identifies the normally open or normally closed status of this input at high humidity.

Humidistat 1 = 24 VAC signal input
Humidistat 2 = 24 VAC source for dry contact

Humidity Sensor — For units with the factory Humidi-MiZer option and the economizer option with the ECB (economizer control board), the humidity sensor input is provided on the field connection terminal board (TB2). The sensor can be used instead of a humidistat. The RH Sensor on OAQ Input configuration, ***Configuration→UNIT→RH.S*=YES**, identifies the sensor use. Default conversion to 0 to 100% relative humidity can be changed in the configurations.

4 = 4-20 mA + signal input
3 = 4-20 mA – common

Remote Occupancy — The remote occupancy input is provided on the field connection terminal board (TB2). The Remote Occupancy Switch configuration, ***Configuration →UNIT→RM.SW,*** identifies the normally open or normally closed status of this input when unoccupied.

5 = 24 VAC signal input
6 = 24 VAC source for dry contact

Fire Shutdown — The fire shutdown input is provided for unit shutdown in response to a fire alarm or smoke detector. The Fire Shutdown Switch configuration, ***Configuration →UNIT→FS.SW,*** identifies the normally open or normally closed status of this input when there is no fire alarm.

For 48/50 units without Humidi-MiZer system, input at field connection terminal board (TB2)

Fire Shutdown 1 = 24 VAC source for dry contact
Fire Shutdown 2 = 24 VAC signal input

For 50 series units with Humidi-MiZer system, input at wire harness plug 19 (PL 19)

PL 19-3 = 24 VAC source for dry contact
PL 19-5 = 24 VAC signal input for fire shutdown

For 48 series units with Humidi-MiZer system, input at wire harness plug 19 (PL 19)

PL 19-3 = 24 VAC source for dry contact
PL 19-5 = 24 VAC signal for Fire Shutdown
PL 19-4 = 24 VAC power for indoor fan contactor control circuit

NOTE: For 48 series units with Humidi-MiZer system, if the indoor fan must be shut down without any delay upon Fire Shutdown input, then the factory jumper between PL19-3 and PL19-4 must be replaced with a normally closed contact when there is no alarm (open with alarm).

Alarm Output — The alarm output is provided on the field connection terminal board (TB2) to indicate a current alarm status. The output will be 24VAC if a current alarm exists.

C = 24 VAC common
X = 24 VAC signal output

Outdoor Enthalpy — For units with the economizer option or accessory and the ECB control board, the outdoor enthalpy input is provided on the field connection terminal board (TB2). The Enthalpy Switch configuration, ***Configuration→ECON→EN.SW,*** identifies the normally open or normally closed status of this input when the outdoor enthalpy is low.

6 = 24 VAC source for dry contact
7 = 24 VAC signal input

IAQ Switch — For units with the economizer option or accessory and the ECB control board, the IAQ switch input is provided on the field connection terminal board (TB2). The IAQ Switch Input configuration, ***Configuration→AIR.Q →II.CF,*** identifies the normally open or normally closed status of this input when the indoor air quality value is low (good) and also selects the unit response to this input.

6 = 24 VAC source for dry contact

7 = 24 VAC signal input

NOTE: An IAQ switch cannot be used if an enthalpy switch is already on this input.

IAQ Sensor — For units with the economizer option or accessory and the ECB control board, the IAQ sensor input is provided on the field connection terminal board (TB2). The IAQ Analog Input configuration, ***Configuration→AIR.Q →IA.CF*** selects the unit response to this input. Default conversion to 0 to 2000 ppm can be changed in the configurations.

2 = 4-20 mA + signal

3 = 4-20 mA – common

OAQ Sensor — For units with the economizer option or accessory and the ECB control board, the OAQ sensor input is provided on the field connection terminal board (TB2). The OAQ Analog Input configuration, ***Configuration→AIR.Q →OA.CF*** selects the unit response to this input. Default conversion to 0 to 2000 ppm can be changed in the configurations.

3 = 4-20 mA – common

4 = 4-20 mA + signal

NOTE: An OAQ sensor cannot be used if a humidity sensor is used.

CONTROLS OPERATION

Display Configuration — The ***Configuration→DISP*** submenu is used to configure the local display settings.

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 (***PROT***) — 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 (***PSWD***) — This variable is the 4-digit numeric password that is required if enabled.

Test Display LEDs (***TEST***) — This is used to test the operation of the *Comfort*Link display.

Modes — The *Comfort*Link controls operate under a hierarchy of command structure as defined by four main elements: the System Mode, the HVAC Mode, the Occupied status, and the Unit Control Type.

The System Mode is the top level that defines three main states of the control system: Disabled, Enabled, or Test.

The HVAC Mode is the next level that defines four main states of functional operation: Disabled, Fan Only, Cool, and Heat.

The Occupied status affects set points for cooling and heating in Space Sensor control mode and operation of the economizer for indoor air quality ventilation and free cooling.

The Unit Control Type (***Configuration→UNIT→U.CTL***) defines if temperature control is based on thermostat inputs or space temperature sensor input.

The general operating mode of the control and the status of some related operation lockouts are located on the display at two locations: ***Run Status→ MODE*** and ***Operating Modes→ MODE***.

System Mode (***SYS***) — In Run Status, the current system mode is displayed as a number with expandable text. In Operating Modes, system mode is displayed as expandable text.

NUMBER	RUN STATUS EXPANDED TEXT	OPERATING MODES EXPANDED TEXT
1	Disabled	Unit Operation Disabled
2	Enabled	Unit Operation Enabled
3	Test	Service Test Enabled

HVAC Mode (***HVAC***) — In Run Status, the current allowed HVAC mode is displayed as a number with expandable text. In Operating Modes, HVAC mode is displayed as expandable text.

NUMBER	RUN STATUS EXPANDED TEXT	OPERATING MODES EXPANDED TEXT
1	Disabled	HVAC Operation Disabled
2	Fan Only	Ventilation (Fan Only)
3	Cool	Cooling or Free Cooling
4	Heat	Heating

NOTE: Optional Humidi-MiZer™ operation is included within Cooling mode.

Currently Occupied (***OCC***) — Displays the current state of assumed space occupancy based on unit configuration and inputs.

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

Linkage Active (***LINK***) — Displays if a linkage master in a zoning system has established "linkage" with this unit.

Circuit OAT Lockout (***C.LOC***) — Displays if one or more refrigerant circuits operation is prevented due to outdoor temperature limit lockout.

Heat OAT Lockout (***H.LOC***) — Displays if heating operation is prevented due to outdoor temperature limit lockout.

Econo Cool OAT Lockout (***E.LOC***) — Displays if economizer operation for cooling is prevented due to outdoor temperature limit lockout.

Unit Configuration — Many configurations that indicate what factory options and/or field accessories are installed and other common operation variables are included in Unit Configuration (***Configuration→UNIT***). Configuration will be done at the factory for any factory-installed option (FIOP).

Start-Up Delay (***S.DLY***) — This configuration sets the control start-up delay after the power is interrupted. This can be used to stagger the start-up of multiple units.

Unit Control Type (***U.CTL***) — This configuration defines if temperature control is based on thermostat inputs or space temperature sensor input.

- ***U.CTL = 2*** (Thermostat) – The unit determines cooling and heating demand by the state of G, Y1, Y2, W1, and W2 inputs from a space thermostat. This value is the factory default.
- ***U.CTL = 3*** (Space Sensor) – The unit determines cooling and heating demand based on the space temperature and the appropriate set point.

Thermostat Control Type (***T.CTL***) — This configuration applies only if Unit Control Type is Thermostat (***Configuration →Unit→U.CTL = 2***). The value determines alternative cooling and Humidi-MiZer circuit staging. See the Cooling and Humidi-MiZer sections for more information. The factory default value is ***T.CTL = 0*** (Adaptive).

Fan On When Occupied (***OC.FN***) — This configuration applies only if Unit Control Type is Space Sensor (***Configuration →Unit→U.CTL = 3***). A YES value will operate the indoor fan whenever the unit is in the Occupied mode. A NO value will operate the indoor fan only when heating or cooling is necessary. The factory default value is YES.

Shut Down on IDF Failure (***IDF.F***) — This configuration applies only if a fan switch is installed and configured. A YES value will enable diagnostic Alert T409 to shut down the unit when incorrect fan status is sensed. A NO value will still permit Alert T409 but will not cause unit shutdown. The factory default value is YES.

Economizer Installed (***EC.EN***) — This configuration identifies if an economizer is installed. A YES value enables economizer operation. A NO value disables economizer operation. This point is repeated in the Economizer Configuration menu (***Configuration→ECON→EC.EN***).

Fan Status Switch (***FN.SW***) — This configuration identifies if a fan status switch is installed, and what status (normally open, normally closed) the input is when the indoor fan is OFF.

Filter Status Switch (***FL.SW***) — This configuration identifies if a filter status switch is installed, and what status (normally open, normally closed) the input is when the filter is CLEAN.

Fire Shutdown Switch (***FS.SW***) — This configuration identifies if a fire shutdown switch is installed, and what status (normally open, normally closed) the input is when the fire or smoke alarm is OFF (no alarm).

Remote Occupancy Switch (***RM.SW***) — This configuration identifies if a remote occupancy switch is installed, and what status (normally open, normally closed) the input is when UNOCCUPIED.

SAT Settling Time (***SAT.T***) — This configuration sets a supply air temperature settling time before using the reading for compressor staging in some units with multiple circuits. See Adaptive Thermostat Control (***U.CTL*** = **2**, ***T.CTL*** = **0**) and Space Sensor Control (***U.CTL*** = **3**) within the Cooling operation section for more information. The factory default value is 240 seconds.

SAT Heat Mode Sensing (***SAT.H***) — This configuration controls the display of the supply-air temperature during heating operation. A DISABLE value will force the displayed supply-air temperature (SAT) to zero when heat is ON and for 5 minutes after. A ENABLE value will display the temperature at all times. See the Heating sections for more information. The factory default is DISABLE due to the factory SAT sensor location. This point is repeated in the Heating Configuration menu.

RAT Sensor On SPTO Input (***RAT.S***) — This configuration identifies if a return air temperature (RAT) sensor is installed on the space temperature offset (SPTO) input. A YES value enables RAT display. A NO value disables RAT display.

RH Sensor On OAQ Input (***RH.S***) — This configuration identifies if a space relative humidity sensor is installed on the outdoor air quality (OAQ) input. A YES value enables ***SP.RH*** display. If a Humdi-MiZer™ unit, then the unit determines dehumidification demand based on this input and the appropriate set point. A NO value disables SP.RH display and use.

Space Humidity Switch (***RH.SW***) — This configuration identifies if a space relative humidity switch is installed on the ENTHALPY input, and what status (normally open, normally closed) the input is when the space humidity is LOW.

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

Occupancy Determination — Many factors determine whether the unit considers the building occupied or unoccupied. If the unit is operating with a space temperature sensor (T-55, T-56 or T-58), occupancy affects the unit set points and the operation of the economizer. If the unit is operating under thermostat control, occupancy only affects the operation of the economizer. The factors affecting occupancy are listed below from highest to lowest priority.

1. The CCN point OCCUPIED is forced via an external device such as a ComfortID™ controller: When OCCUPIED is forced to YES, the unit is considered occupied. When OCCUPIED is forced to NO, the unit is considered unoccupied. If OCCUPIED is not being forced, proceed to the level 2 priority.
2. Remote Occupancy Switch should be configured to either Normally Open or Normally Closed when the user would like to control the occupancy with an external switch. This switch is field-supplied (24-v, single pole, single throw [SPST]). There are three possible configurations for the remote occupancy switch: No Switch (0), Normally Open (1) or Normally Closed (2). This configuration is accessible on the display at ***Configuration→UNIT→RM.SW***. If the switch is configured to No Switch (0), the switch input value will be ignored and software will proceed to the level 3 priority. For each type of switch, the appropriate configuration and states are listed in the table below.

TYPE OF SWITCH	SWITCH CONFIGURATION	STATE OF SWITCH AND STATE OF OCCUPANCY
Occupied when closed or Unoccupied when open	Normal Open (1)	Open and Unoccupied
		Closed and Occupied
Occupied when open or Unoccupied when closed	Normal Close (2)	Open and Occupied
		Closed and Unoccupied

NOTE: To perform remote occupancy, an Economizer Control Board must be installed in the unit.

3. The following occupancy options are determined by the state of Occupancy Schedule Number (***Configuration→CCN→SCH.O→SCH.N***) and the Global Schedule Broadcast (***Configuration→CCN→BROD→B.GS***).
   a. ***SCH.N*** = **0**: The unit is always considered occupied and the programmed schedule is ignored. This is the factory default.
   b. ***SCH.N*** = **1-64**: Follow the local programmed schedule. Schedules 1 to 64 are local within the controller. The 48/50PG unit can only store one local schedule and therefore changing this number only changes the title of the schedule table.
   c. ***SCH.N*** = **65-99**: Follow the global programmed schedule. If the 48/50PG unit is configured as a Global Schedule broadcaster (***Configuration→CCN→BROD→B.GS*** = **YES**), the unit will follow the unit's programmed schedule and broadcast the schedule so that other devices programmed to follow this schedule number can receive the schedule. If the 48/50PG unit is not programmed as a Global Schedule broadcaster (***Configuration→CCN→BROD→B.GS*** = **NO**), the unit will receive its information from the unit programmed to broadcast this schedule number.

   While using a programmed schedule, occupancy can be temporarily switched from unoccupied to occupied by pressing the override button for approximately 3 seconds on a T-55, T-56, or T-58 device. Override will only occur if ***Configuration→CCN→SCH.O→OV.SP*** is set to YES. The length of the override period is determined by the setting of ***Configuration→CCN→SCH.O→OV.EX***.

Indoor Fan — The indoor fan is controlled by the indoor fan relay output (***Outputs→FANS→IDF***) on the MBB (main base board) control, which then operates the indoor fan contactor. The indoor fan may operate during cooling with compressors mode, free cooling with outdoor air mode, heating mode, or for ventilation with outdoor air mode.

The indoor fan operation can be affected by configurations for thermostat control type (***Configuration→UNIT→T.CTL***), the occupancy fan configuration (***Configuration→UNIT→OC.FN***), the indoor air quality sensor fan configuration (***Configuration→AIR.Q→IA.FN***), the indoor air quality switch fan configuration (***Configuration→AIR.Q→II.FN***), and the fan status switch configuration (***Configuration→UNIT→ FN.SW***). For 48PG gas heating units without Humidi-MiZer device, the IGC control fan output is also monitored by the MBB control. This can result in additional modification of fan delays or other operation due to safety functions of the IGC control. See the Indoor Air Quality section if using IAQ (indoor air quality) accessory sensors.

THERMOSTAT CONTROL — In thermostat mode, the IDF relay will be on in the following situations:

- If fan request G in ON, the ***IDF*** will be ON.
- If cooling request Y1 or Y2 is ON, the ***IDF*** will be ON.
- If heating request W1 or W2 is ON, the ***IDF*** will be ON.

SPACE SENSOR CONTROL — In Space Sensor Control mode, the IDF (indoor fan) relay will be on in the following situations. If the unit is in Occupied mode and the indoor fan is configured to always run while occupied (***Configuration→ UNIT →OC.FN*** = **YES**), the indoor fan will be ON. If ***OC.FN*** equals NO or the unit is unoccupied, the indoor fan will operate only when heating or cooling is necessary.

Cooling — Compressors will not operate if the outdoor temperature is less than the value configured for the circuit lockout temperatures (***Configuration→COOL→CA.LO; Configuration→COOL→CB.LO;*** and ***Configuration→ COOL→CC.LO;***). The Minimum On Time (***Configuration→ COOL→MRT.C***), and Minimum Off Time (***Configuration→ COOL→MOT.C***) time guards apply to all compressors. Factory default values are 3 minutes for Minimum On Time and 5 minutes for Minimum Off Time.

If the indoor fan control is configured to cycle with the cooling demand (***Configuration→UNIT→OC.FN*** = **No**), the fan will stop after a configured delay (***Configuration →COOL→FOD.C***). Factory default value is 60 seconds.

THERMOSTAT CONTROL — To operate the unit in Thermostat mode, the Unit Control Type (***Configuration →UNIT→U.CTL***) configuration must be set to 2 (Thermostat). There are up to four types of thermostat control depending on model size. These are configured with the Thermostat Control Type (***Configuration→UNIT→T.CTL***).

For economizer equipped units (***Configuration →UNIT→EC.EN*** = **Yes**), the Adaptive control algorithm is used whenever the economizer can provide cooling. This will ensure proper time delays and SAT control when the economizer is cooling. Cooling begins when the Y1 input is energized. The economizer will try to provide cooling as described in the Economizer section. If the economizer is not available for cooling or the economizer has been at 100% for 5 minutes, compressor staging will begin.

Configuration→UNIT→T.CTL = **0** (Adaptive) — When ***T.CTL*** = **0**, additional timers and supply air temperature limits apply to control the compressor staging. In Adaptive mode, a stage of compression will be turned off if the Supply-Air Temperature (***Temperatures→AIR.T→SAT***) is less than Minimum Supply Air Temperature Lower Level (***Setpoints→SAT.L***). In addition, a stage of compression will be turned on if the ***SAT*** is greater than the Minimum Supply Air Temperature Upper Level (***Setpoints→SAT.U***). If ***SAT.L*** and ***SAT.U*** are configured so that they are close together, the last stage of compressor might cycle rapidly, slowed only by its minimum on and off-time requirements. Configurable time delays also apply when adding stages (***Configuration→COOL→C.INC***) or removing stages (***Configuration→COOL→C.DEC***). ***C.INC*** and ***C.DEC*** are accessible via the Scrolling Marquee at ***Configuration→COOL***. Compressor minimum on-time (***Configuration→COOL→MRT.C***) and compressor minimum off-time (***Configuration→COOL→MOT.C***) do apply.

T.CTL = 1 (1 Stage Y1) — When ***T.CTL*** = 1, no additional compressor staging timers or supply air temperature limits apply. Compressor staging will follow the thermostat inputs directly. Y1 will turn on refrigerant circuit A. Y2 will add refrigerant circuit B. Compressor minimum on-time (***MRT.C***) and compressor minimum off-time (***MOT.C***) do apply.

SPACE SENSOR CONTROL — To operate the unit in Space Sensor mode, set the Unit Control Type to 3 (***Configuration→UNIT→U.CTL*=3**). To enable heating during space temperature control, a jumper wire must be added between R and W1 on the field connection terminal strip (see Major System Components section for wiring diagrams).

Because Space Sensor mode is an "Auto" mode, the control will switch between cooling and heating to maintain space temperature. However, to minimize unnecessary changes, there is a 10-minute mode select timeguard (***Operating Modes→ COOL→MS.TG***), after the last stage of heat turns off before cooling is allowed.

The unit tries to maintain the space temperature at the Occupied Cool Set Point (***Setpoints→OCSP***) or the Unoccupied Cool Set Point (***Setpoints→UCSP***). See the Occupancy Determination section for factors that affect the Occupied status (***Run Status→VIEW→OCC***). The Cooling Demand (***Operating Modes→COOL→SPT→DMD.C***) is equal to Space Temperature (***Operating Modes→COOL→SPT→SPT***) minus the occupied or unoccupied set point (***DMD.C*** = SPT – set point). See Table 37 for an example of reading and changing the occupied set point (OCSP).

Table 37 — Reading and Changing Cooling Occupied Set Point

DISPLAY MENU	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
SETPOINTS	ENTER	OCSP	78	Occupied Cool Set point	Default: 78
	ENTER		78		Scrolling Stops
	ENTER		78		Value flashes
	▼				Select 75
	ENTER		75		Change accepted
	ESCAPE	OCSP	75	Occupied Cool Set point	Item/Value/Units scroll again

Two methods are used to add and remove stages of cooling for units with more than one compressor. The first method causes the unit to operate around its steady-state number of stages. For example, if the correct number of stages is between 0 and 1, this method will cause the first stage to cycle. If the correct number of stages is between 1 and 2, this method will cause the second stage to cycle. The second method causes the unit to find the steady-state number of stages. Details of these methods are provided below.

The control uses two methods to add a stage of compressor cooling. The first method will add a stage of cooling when the Cooling Demand (*Operating Modes→COOL→SPT→DMD.C*) plus the change in cool demand (*Operating Modes→COOL→SPT→TRD.C*) times the Cool Thermal Lag Factor (*Operating Modes→COOL→SPT→C.LAG*) is greater than the SPT Cool Demand (+) Level (*Operating Modes→COOL→SPT→CL.PD*).

*DMD.C + TRD.C * C.LAG > CL.PD*

This method is only used after the Compressor Settling Time (*Configuration→UNIT→SAT.T*), has been exceeded and the supply-air temperature is slowly increasing. The second method will add a stage of cooling when Cool Demand is greater than the SPT Cool Demand (+) Level plus 0.5° F (*DMD.C > CL.PD* + 0.5) and the supply-air temperature (*Operating Modes→COOL→SAT→SAT*) is changing at a rate greater than –0.3° F per minute.

The control uses two methods to remove a stage of compressor cooling. The first method will remove a stage of cooling when the Cooling Demand (*Operating Modes→COOL→SPT→DMD.C*) plus the change in cool demand (*Operating Modes→COOL→SPT→TRD.C*) times the Cool Thermal Lag Factor (*Operating Modes→COOL→SPT→C.LAG*) is less than the SPT Cool Demand (–) Level (*Operating Modes→COOL→SPT→CL.ND*).

*DMD.C + TRD.C * C.LAG < CL.ND*

This method is only used after the Compressor Settling Time (*SAT.T*), has been exceeded and the supply air temperature is slowly decreasing. The second method will remove a stage of cooling when Cool Demand is less than the SPT Cool Demand (–) Level minus 0.5° F (*DMD.C < CL.ND* – 0.5) and the supply air temperature (*SAT*) is changing at a rate less than 0.2° F per minute.

Configurable delays also apply when adding stages (*Configuration→COOL→C.INC*) or removing stages (*Configuration→COOL→C.DEC*). Compressor minimum on-time (*Configuration→COOL→MRT.C*) and minimum off-time (*Configuration→COOL→MOT.C*) also apply.

OUTDOOR FANS — Each unit has a means for variable outdoor airflow to control condenser pressure control within an acceptable range by responding to varied operating modes and ambient temperatures. This is implemented differently on different units using multi-speed motors, multiple outdoor fans, or variable-speed motor controllers.

NOTE: Factory default configurations account for these model differences and should not be changed. The default configurations have been qualified over a large range of conditions and are provided in case a field replacement of a control board occurs and the settings need to be checked or manually configured. Outdoor fan operation is further described below to assist in troubleshooting.

Units Without Humidi-MiZer™ System — The outdoor fan speed, number, and location for each of three levels is defined for each cooling circuit in the Circuit submenus (*Configuration→COOL→CIR.x*). Results of the factory configurations are shown in Tables 38A-39B. The fan level selected during operation is based on factory configurations of outdoor temperature limits and condenser pressure limits. These are in the Outdoor Fan Control submenu (*Configuration→COOL→OFC*). Initial fan level starts at zero and increments to level 1 when Fan LEV0 Max Pressure limit is reached. Changes between levels 1 to 3 are initially selected based on outdoor air temperature (OAT) input and the level On and Off temperature limits. The levels may be further adjusted based on the circuit saturated condensing temperatures (*Temperatures→REF.T→SCT.x*) and the level Max and Min pressure limits.

Units With Humidi-MiZer System — Outdoor fan control for Humidi-MiZer units includes a Motormaster® variable-speed control for OFM1 and OFM4. Contactor OFC1 controls power to the Motormaster control. The Motormaster control automatically adjusts the outdoor fan speed to maintain approximately 80 to 100 F condenser temperature for circuit A at all outdoor ambient temperatures. Contactor OFC2 controls the remaining two fans (48/50PG20) or remaining 4 fans (48/50PG24 and 28). The fan level operation is determined by some or all outdoor fan control configurations described above, plus additional Humidimizer configurations (*Configuration→HZMR*).

Table 38A — Outdoor Fan Level Transitions without Humidi-MiZer System

FAN LEVEL	OUTDOOR TEMPERATURE (F)
Level 2 On	55 (size 20), 45 (sizes 24, 28)
Level 2 Off	50 (size 20), 40 (sizes 24, 28)
Level 3 On	65
Level 3 Off	55

Table 38B — Outdoor Fan Level Transitions with Humidi-Mizer System

FAN LEVEL	OUTDOOR TEMPERATURE (F)
Level 2 On	68 (size 20), 61 (size 24 and 28)
Level 2 Off	57
Level 3 On	88 (size 20), 68 (size 24 and 28)
Level 3 Off	78 (size 20), 62 (size 24 and 28)

Table 39A — Fan Level Control of Outdoor Fan Contactors (1, 2, 3) without Humidi-MiZer System

FAN LEVEL	CIRCUIT	
	A	B
0	—	—
1	1 (20, 24) 1, 3 (28)	3
2	1, 2 (20) 2 (24, 28)	2, 3(20) 2 (24, 28)
3	1, 2 (20, 24) 1, 2, 3 (28)	2, 3

Table 39B — Fan Level Control of Outdoor Fan Contactors (1 and 2) with Humidi-Mizer System

FAN LEVEL	CIRCUITS A and B
0	—
1	1
2	1, 2 (20) 2 (24-28)
3	1, 2

Gas Heating (48PG Units) — For 48PG units, the heat type configuration *Configuration→HEAT→HT.TY* will be factory set to a value of 1.

Heat will not operate if the outdoor temperature is greater than the value configured for the heat lockout temperature, *Configuration→HEAT→HT.LO*. Minimum on-time, *Configuration→HEAT→MRT.H*, and minimum off-time, *Configuration→HEAT→MOT.H*, timeguards apply to both stages of heating. Factory default values are 2 minutes On and 2 minutes Off. The IGC minimum on-time of 1 minute will be followed even if *MRT.H* is lower and during Service Test.

If the indoor fan control is configured to cycle with the heating demand (***Configuration→UNIT→OC.FN*** = **No**) the fan will stop after a configured delay, ***Configuration→HEAT→FOD.G***. Factory default value is 45 seconds. If the IGC temperature limit switch opens within 10 minutes of the end of the gas heating, the next fan off delay will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified by the IGC, the fan off delay will not change back to ***FOD.G*** unless power is reset to the control.

A light-emitting-diode (LED) is provided on the IGC (integrated gas controller) to indicate its status. During normal operation the LED is continuously on. See the Troubleshooting section if the LED is off or flashing. The IGC is located behind gas section access panel. See Fig. 5 for location.

THERMOSTAT CONTROL — When the thermostat calls for heating, the MBB senses that W1 is On and closes the HT.1 relay. When the relay is closed, it sends power to W on the IGC (integrated gas unit controller) board. An LED (light-emitting diode) on the IGC board will be on during normal operation. A check is made to ensure that the rollout switch and limit switch are closed. The induced-draft motor is then energized. When speed is proven with the Hall Effect sensor on the motor, the ignition activation period begins.

The burners will ignite within 5 seconds. If the burners do not light, there is a 22-second delay before another 5-second attempt. If the burners still do not light, this sequence is repeated for 15 minutes. After the 15 minutes have elapsed, if the burners still have not ignited, heating is locked out. The control will reset when the request for heat is temporarily removed.

When ignition occurs, the IGC board will continue to monitor the condition of the rollout switch, limit switches, Hall Effect sensor, and the flame sensor. If the unit is controlled through a room thermostat set for fan auto, 45 seconds after ignition occurs the indoor-fan motor will be energized (and the outdoor-air dampers will open to their minimum position). If for some reason the overtemperature limit opens prior to the start of the indoor fan blower, on the next attempt, the 45-second delay will be shortened to 5 seconds less than the time from initiation of heat to when the limit tripped. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan on delay will not change back to 45 seconds unless power is reset to the control.

When additional heat is required and the MBB senses that W2 is On, the MBB will turn on the HT.2 relay which sends power to the second stage of the main gas valve. If the thermostat removes the call for W2, the unit will turn off HT.2. If W1 is satisfied, the MBB will turn off HT.1 which will turn off gas to the main burners.

If the user has selected Adaptive (see Cooling section) for its thermostat mode, the algorithm will follow the configurable delays for adding and removing stages. When adding additional heat stages, the delay is measured from when the last stage was added (***Configuration→HEAT→H.INC***). When removing stages, the delay is measured from when the last stage was removed (***Configuration→HEAT→H.DEC***). Therefore, if W1 and W2 turn on simultaneously, the second stage will turn on after a ***H.INC*** delay.

NOTE: If the mode is not Adaptive, then there are no delays for adding and removing stages.

SPACE SENSOR CONTROL — To operate the unit in Space Sensor mode, set the Unit Control Type to 3 (***Configuration→UNIT→U.CTL***=3). To enable heating during space temperature control, a jumper wire must be added between R and W1 on the field connection terminal strip (see Major System Components section for wiring diagrams).

Because Space Sensor mode is an "Auto" mode, the control will switch between cooling and heating to maintain space temperature. However, to minimize unnecessary changes, there is a 10-minute mode select timeguard (***Operating Modes→HEAT→MS.TG***) after the last stage of cool turns off before heating is allowed.

The unit tries to maintain the space temperature at the Occupied Heat Set Point (***Setpoints→OHSP***) or the Unoccupied Heat Set Point (***Setpoints→UHSP***). See the Occupancy Determination section for factors that affect the Occupied status (***Run Status→VIEW→OCC***). Heating Demand (***Operating Modes→HEAT→SPT→DMD.H***) is equal to the occupied or unoccupied set point minus the Space Temperature (***Operating Modes→HEAT→SPT→SPT***).

DMD.H = setpoint – ***SPT***

Two methods are used to add and remove stages of heating for units with more than one heat stage. The first method causes the unit to operate around its steady-state number of stages.

For example, if the correct number of stages is between 0 and 1, this method will cause the first stage to cycle. If the correct number of stages is between 1 and 2, this method will cause the second stage to cycle. The second method causes the unit to find the steady-state number of stages. Details of these methods are provided below.

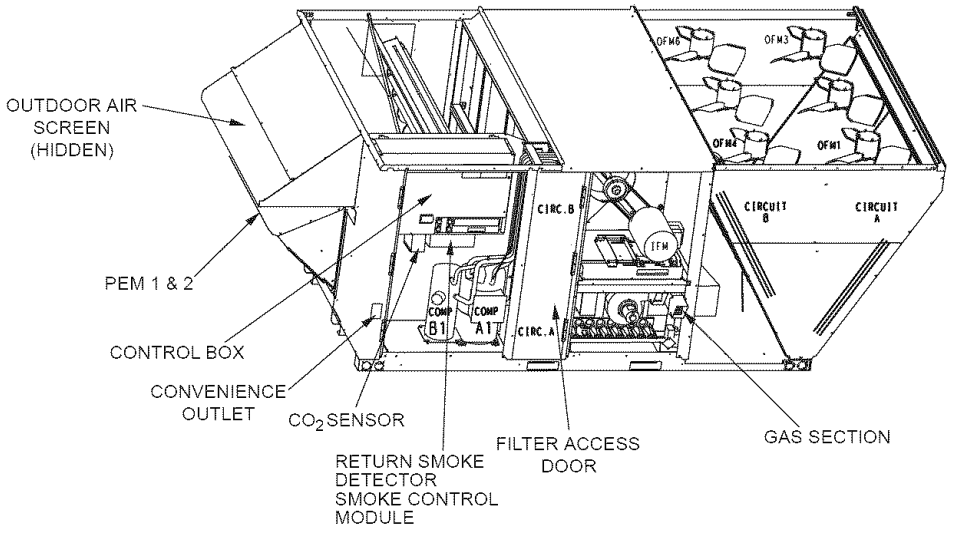


Fig. 5 — Panel and Filter Locations (48PG Unit Shown)

The control uses two methods to add a stage of heating. The first method will add a stage of heating when the Heating Demand (*Operating Modes→HEAT→SPT→DMD.H*) plus the change in heat demand (*Operating Modes→HEAT→SPT→TRD.H*) times the Heat Thermal Lag Factor (*Operating Modes→HEAT→SPT→H.LAG*) is greater than the SPT Heat Demand (+) Level (*Operating Modes→HEAT→SPT→HT.PD*).

DMD.H + *TRD.H* * *H.LAG* > *HT.PD*

The second method will add a stage of heating when Heat Demand is greater than the SPT Heat Demand (+) Level plus 0.5° F (*DMD.H* > *HT.PD* + 0.5) and the heat demand is changing at a rate greater than 0.3° F per minute.

The control uses two methods to remove a stage of heating. The first method will remove a stage of heating when the Heating Demand (*Operating Modes→HEAT→SPT→DMD.H*) plus the change in heat demand (*Operating Modes→HEAT→SPT→TRD.H*) times the Heat Thermal Lag Factor (*Operating Modes→HEAT→SPT→H.LAG*) is less than the SPT Heat Demand (–) Level (*Operating Modes→HEAT→SPT→HT.ND*).

DMD.H + change *TRD.H* * *H.LAG* < *HT.ND*

The second method will remove a stage of heating when Heat Demand is less than the SPT Heat Demand (–) Level minus 0.5° F (*DMD.H* < *HL.ND* – 0.5) and the heat demand is changing at a rate less than 0.3° F per minute.

Configurable delays also apply when adding stages (*Configuration→HEAT→H.INC*) or removing stages (*Configuration→HEAT→H.DEC*). Heat stage minimum on-time (*Configuration→HEAT→MRT.H*) and minimum off-time (*Configuration→HEAT→MOT.H*) also apply.

SUPPLY-AIR TEMPERATURE (SAT) SENSOR — The SAT Heat Sensing Configuration affects the SAT value displayed. The configuration is accessible via the Scrolling Marquee at *Configuration→Unit→SAT.H*.

Configuration→HEAT→SAT.H = **DSBL** — When *SAT.H* = **DSBL**, the SAT value on the Scrolling Marquee and CCN tables will be forced to zero when heat outputs come ON and for 5 minutes after. The default SAT sensor location is at the fan inlet, upstream of the heat section.

Configuration→HEAT→SAT.H = **ENBL** — When *SAT.H* = **ENBL**, the supply-air temperature measured by the SAT sensor is displayed at the scrolling marquee and the CCN tables during heating mode. This setting should only be used if the original SAT sensor is replaced by an accessory SAT sensor located in the supply duct, downstream of the heat section.

Electric Heat (50PG Units) — For 50PG units with factory-installed electric heat, the heat type configuration *Configuration→HEAT→HT.TY* will be factory set to a value of 2 and the number of heat stages configuration *Configuration→HEAT→N.HTR* will be factory set to match the installed heater. If electric heat is installed in the field, the value of *HT.TY* must be changed.

Heat will not operate if the outdoor temperature is greater than the value configured for the heat lockout temperature, *Configuration→HEAT→HT.LO*. Minimum on-time, *Configuration→HEAT→MRT.H*, and minimum off-time, *Configuration→HEAT→MOT.H*, timeguards apply to both stages of heating. Factory default values are 2 minutes On and 2 minutes Off.

If the indoor fan control is configured to cycle with the heating demand (*Configuration→UNIT→OC.FN* = **No**) the fan will stop after a configured delay (*Configuration→HEAT→FOD.E*). The factory default value is 30 seconds.

THERMOSTAT CONTROL — The first stage of electric heat (HT.1) will follow the W1 input and the second stage (HT.2) of heat will follow the W2 input. During auto fan, the indoor fan will follow the HT.1 output. During continuous fan, the indoor fan will follow the G input.

If the user has selected Adaptive (see Cooling section) for thermostat mode, the algorithm will follow the configurable delays for adding and removing stages. When adding additional heat stages, the delay is measured from when the last stage was added (*Configuration→HEAT→H.INC*). When removing stages, the delay is measured from when the last stage was removed (*Configuration→HEAT→H.DEC*). Therefore, if W1 and W2 turn on simultaneously, the second stage will turn on after a *H.INC* delay.

NOTE: If the mode is not Adaptive, then there are no delays for adding and removing stages.

SPACE SENSOR CONTROL — During Space Sensor control, the electronic control uses information from the space sensor to determine the number of heat stages. Once the number of stages needed for heating is determined, either HT.1 or HT.1 and HT.2 outputs will be turned on. See Space Sensor Control section for gas heat units for more information.

NOTE: The jumper wire in the installer's packer must be connected between R and W1 when using a T-55, T-56, or T-58 device. See Major System Components section.

SUPPLY-AIR TEMPERATURE (SAT) SENSOR — The SAT Heat Sensing Configuration affects the SAT value displayed. SAT Heat Sensing (*SAT.H*) Configuration is accessible via the Scrolling Marquee at *Configuration→Unit→SAT.H*.

Configuration→HEAT→SAT.H = **DSBL** — When *SAT.H* = *DSBL*, the SAT value on the Scrolling Marquee and CCN tables will be forced to zero when heat outputs come ON and for 5 minutes after. The default SAT sensor location is at the fan inlet, upstream of the heat section.

Configuration→HEAT→SAT.H = **ENBL** — When *SAT.H* = *ENBL*, the supply-air temperature measured by the SAT sensor is displayed at the scrolling marquee and the CCN tables during heating mode. This setting should only be used if the original SAT sensor is replaced by an accessory SAT sensor located in the supply duct, downstream of the heat section.

Economizer — If an economizer is installed, then Economizer Installed configuration (*Configuration→UNIT→EC.EN*) should be set to YES. The economizer is controlled by the economizer output signal (*Outputs→ECON→EC.CP*) on the ECB control. If the indoor fan is off or the building is unoccupied, the economizer position is zero. If in Occupied mode and the unit is heating or cooling and the economizer cannot provide free cooling, the economizer position is the configured economizer minimum position (*Configuration→ECON→EC.MN*) or the position specified by the IAQ algorithm. If in Unoccupied mode, the position is 0% open.

The economizer will be allowed to help with cooling if the outdoor-air temperature (*Temperature→AIR.T→OAT*) is less than the configured economizer high temperature lockout (*Setpoints→EH.LO*) and greater than the configured economizer low temperature lockout (*Setpoints→EL.LO*). If an enthalpy sensor is installed, the outdoor temperature must be below the economizer high temperature lockout and the enthalpy (*Inputs→GEN.I→ENTH*) must be LOW. For cooling, the economizer position can vary between the configured economizer minimum position (*Configuration→ECON→EC.MN*) and the economizer maximum cooling position (*Configuration→ECON→EC.MX*).

THERMOSTAT CONTROL — If the unit is in cooling, operating under thermostat control, Y1 = ON, and the economizer is available for cooling, the economizer will control the supply-air temperature to the low cool set point (*Setpoints→LCSP*). When Y2 = ON, the economizer will control the supply-air temperature to high cool set point (*Setpoints→HCSP*).

SPACE SENSOR CONTROL — If the unit is in cooling, operating under space temperature control, the economizer is available for cooling, and no compressors are operating, the economizer will control the SAT to either ***Setpoints→LCSP*** or ***Setpoints→HCSP*** (see Table 40). If a compressor is ON, the economizer will try to position itself at the economizer maximum cooling position (***Configuration→ECON→EC.MX***).

If the control senses low suction pressure for any active refrigerant circuit when the economizer is also providing cooling, the maximum allowable economizer position will be reduced. Factory default configurations have been qualified over a large range of conditions and should only be changed with care. For unit troubleshooting, factory default maximum economizer limits for this condition are provided in Table 41.

Table 40 — LCSP and HCSP Transitions for Space Temperature Mode

CURRENT SAT SET POINT	COOL DEMAND (ΔF)	NEXT SAT SET POINT
LCSP	>0.5	HCSP
HCSP	<0	LCSP
LCSP	<–0.5	Exit Cooling

LEGEND

HCSP — High Cool Set Point
LCSP — Low Cool Set Point
SAT — Supply-Air Temperature

Table 41 — Maximum Economizer Limits During Low Suction Pressure

COOLING STAGE	LIMIT (%)
Bottom	50
Middle	50
Top	0

ECONOMIZER ACTUATOR COMMUNICATIONS — The configuration Economizer Control Type determines the communication method, either digital or analog, used to communicate between the ECB and the economizer actuator. Economizer Control Type is accessible via the Scrolling Marquee at ***Configurations→ECON→E.CTL***. The power to the unit must be cycled after ***E.CTL*** is changed.

E.CTL = **1** (Digital/Position) — When ***E.CTL*** is set to 1, the ECB will communicate with the economizer actuator using the digital protocol. The ECB 4 to 20 mA output will represent the actuator's actual position. Because the wiring has a built-in 500-ohm resistor, the 4 to 20 mA signal is converted to a 2 to 10-v signal that is accessible via field connection terminal board TB2-8 and TB2-9. However, before this signal can be read, the violet wire that connects the actuator to field connection terminal board TB2-J10-8 must be removed or cut.

E.CTL = **2** (Digital/Command) — When ***E.CTL*** is set to 2, the ECB will communicate with the economizer actuator using the digital protocol. The ECB 4 to 20 mA output will represent the actuator's commanded position. Because the wiring has a built-in 500-ohm resistor, the 4 to 20 mA signal is converted to a 2 to 10-v signal that is accessible via field connection terminal board TB2-8 and TB2-9. However, before this signal can be read, the violet wire that connects the actuator to field connection terminal board TB2-J10-8 must be removed or cut.

E.CTL = **3** (Analog Control) — When ***E.CTL*** is set to 3, the ECB will communicate with the economizer actuator using the 4 to 20 mA analog signal wired to TB2-8 and TB2-9 along with the 500-ohm resistor producing a 2 to 10-v signal for the actuator. While in this mode, the actuator's built-in 2 to 10-v feedback signal is accessible via TB2-9 and TB2-10.

UNOCCUPIED FREE COOLING — The unoccupied free cooling algorithm attempts to maintain the building space at the occupied cooling set point during unoccupied periods if the conditions in the building and the outdoors are suitable. Three different configurations define this algorithm: Unoccupied Free Cooling (***Configuration→ECON→UEFC***), Free Cooling Preoccupancy Time (***Configuration→ECON→FC.TM***) and Free Cool Low Temp Limit (***Configuration→ECON→FC.LO***).

Configuration→ECON→UEFC = **0** (Disabled) — When ***UEFC*** = **0**, unoccupied free cooling is disabled.

Configuration→ECON→UEFC = **1** (Unoccupied) — When ***UEFC*** = **1**, unoccupied free cooling can occur whenever the building is unoccupied.

Configuration→ECON→UEFC = **2** (Preoccupancy) — When ***UEFC*** = **2**, unoccupied free cooling can only occur when the time to the next occupied period is less than ***Configuration→ECON→FC.TM*** minutes.

Configuration→ECON→FC.TM — ***FC.TM*** is the configuration that determines how many minutes before occupancy that free cooling can occur.

Configuration→ECON→FC.LO — Unoccupied free cooling cannot occur if the Outdoor Air Temperature (***Temperature→AIR.T→OAT***) is less than ***FC.LO***.

POWER EXHAUST — To enable power exhaust, ***Configuration→ECON→PE.EN*** must be set to ***ENBL***. If power exhaust is enabled, Power Exhaust 1 will turn on when the economizer position is greater than the value of ***Configuration→ECON→PE.1***. If power exhaust is enabled, Power Exhaust 2 will turn on when the economizer position is greater than the value of ***Configuration→ECON→PE.2***. There are small time delays to ensure that rapid cycling does not occur.

Optional Humidi-MiZer™ 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 Humidi-MiZer option includes additional valves in the liquid line and discharge line of each refrigerant circuit, a small reheat condenser coil downstream of the evaporator, and Motormaster® variable-speed control of some or all outdoor fans. Operation of the revised refrigerant circuit for each mode is described below.

NOTE: x = refrigerant circuit A or B.

Normal Cooling — Refrigerant flows from the outdoor condenser through the de-energized 3-way valve (RH1.x) to the expansion device. Reheat2 Valve (RH2.x) is closed. See Fig. 6.

Reheat 1 (Subcooling Mode) — This mode increases latent cooling and decreases sensible cooling compared to normal cooling. Refrigerant flows from the outdoor condenser, through the energized 3-way Valve (RH1.x), and through the reheat condenser coil to the expansion device. Reheat2 Valve (RH2.x) is closed. See Fig. 7.

Reheat 2 (Hot Gas Reheat Mode) — This mode provides maximum latent cooling with little to no sensible capacity. This mode can operate to provide dehumidification when there is no cooling demand. Like Reheat 1 mode, refrigerant flows from the outdoor condenser, through the energized 3-way valve (RH1.x), and through the reheat condenser coil to the expansion device. Reheat2 Valve (RH2.x) is open which provides some compressor discharge gas to the reheat condenser to further increase the reheat of the evaporator air stream. See Fig. 8.

Units with multiple circuits can operate with additional staging of the cooling and dehumidification capacity. When there is only cooling demand, based on a space temperature sensor or thermostat, one or more circuits will operate in normal cooling mode. When there is only dehumidification demand, based on a space humidity sensor or switch, all circuits will operate in reheat2 mode. When there is both cooling demand and dehumidification demand, all circuits will operate in either reheat1 or reheat2 mode, with the portion of reheat1 circuits determined from the cooling demand.

Outdoor fan control for Humidi-MiZer system units includes a Motormaster® variable-speed control of some or all outdoor fans, depending on unit model size. The Motormaster control automatically adjusts the outdoor fan speed to maintain approximately 80 to 100 F condenser temperature for circuit A at all outdoor ambient temperatures. Some model sizes have additional on/off staging of some outdoor fans. This staging is controlled by both outdoor temperature and condenser coil temperature.

Compressor staging control for Humid-MiZer units requires that circuit A always operate when circuit B is on. This applies to normal operation, service test, and for control alarm responses. This operation difference is required due to the fact that the Motormaster outdoor fan control senses circuit A only.

SETTING UP THE SYSTEM — The system requires installation and configuration of either a space relative humidity sensor or a relative humidity switch input.

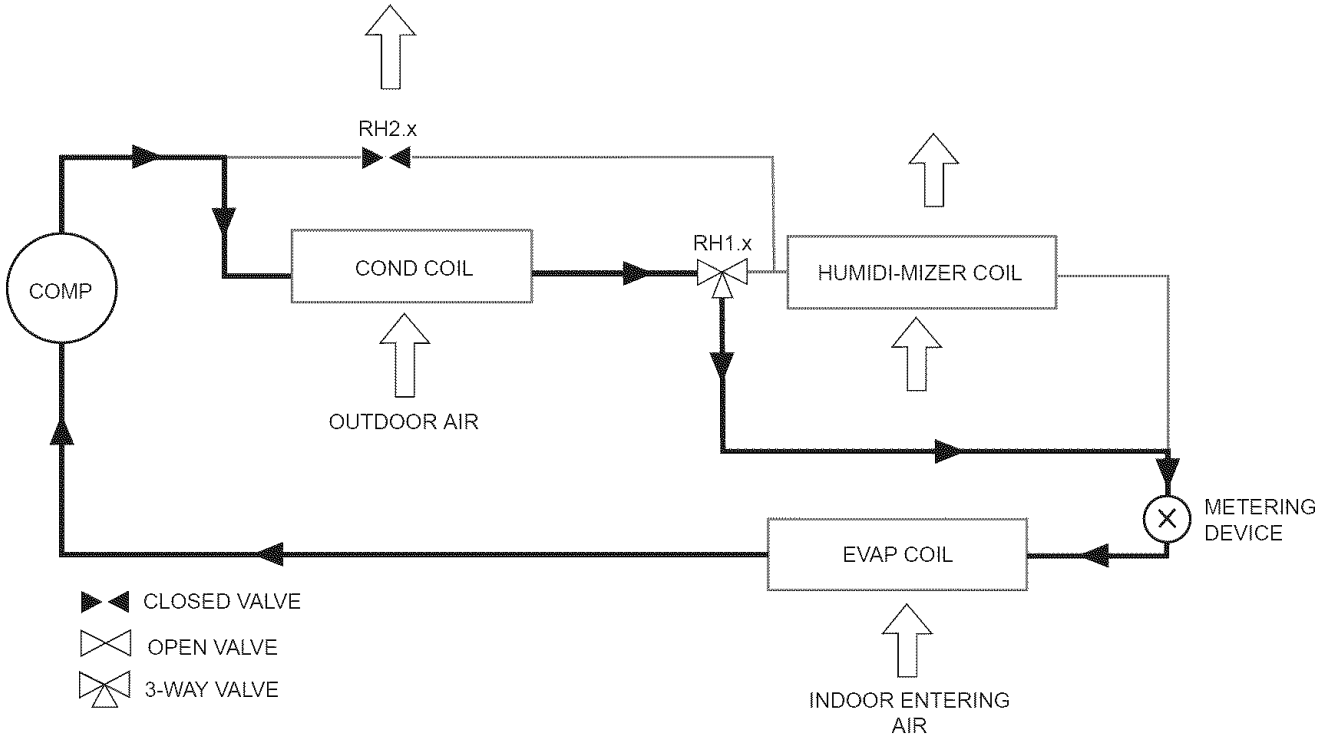


Fig. 6 — Normal Cooling Mode — Humidi-MiZer™ System

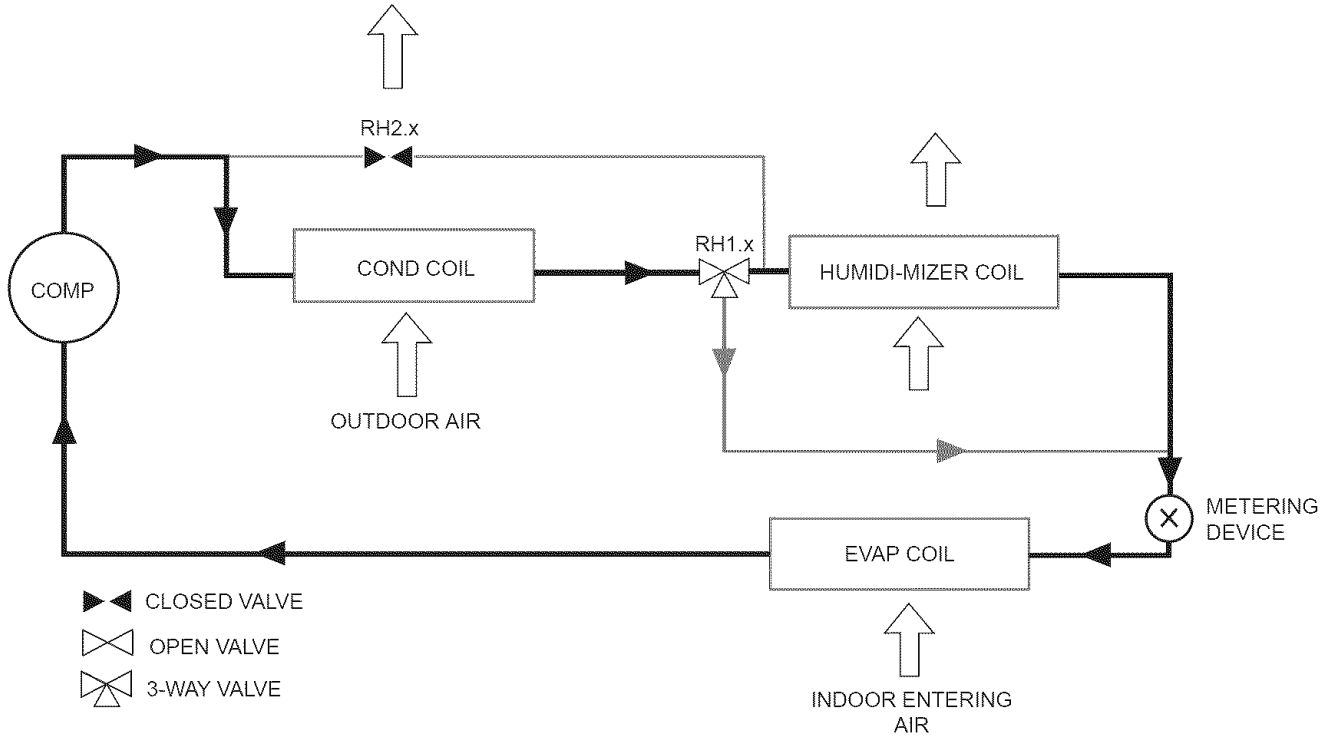


Fig. 7 — Subcooling Mode (Reheat1) — Humidi-MiZer System

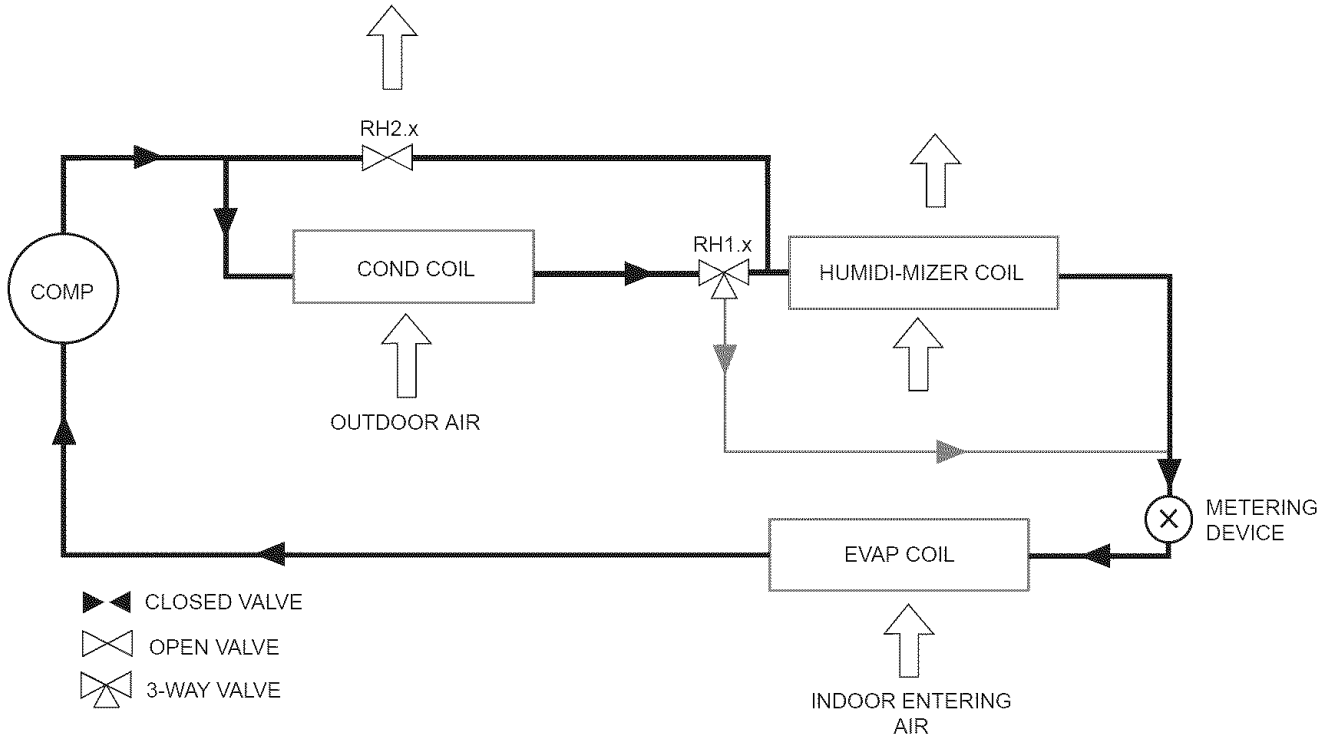


Fig. 8 — Hot Gas Reheat Mode (Reheat2) — Humidi-MiZer™ System

Space Humidity Switch (***Configuration→UNIT→RH.SW***) — Set to 1 for use of a normally open switch, or 2 for normally closed switch. The switch is wired to field connection terminal board terminals labeled HUMDISTAT.

RH Sensor on OAQ Input (***Configuration→UNIT→RH.S***) — Set to Yes for use of a 4 to 20 mA output RH sensor wired to field connection terminal board terminals 3 and 4. If using an RH sensor, the following configurations also apply:

Space RH Setpoint (***Setpoints→RH.SP***) — This sets the target % relative humidity.

Space RH Deadband (***Setpoints→RH.DB***) — This sets the control ± deadband for % relative humidity.

RH Sensor Value at 4ma (***Configuration→AIR.Q→H.4M***) — This sets the % display for a 4mA input from the relative humidity sensor.

RH Sensor Value at 20ma (***Configuration→AIR.Q→H.20M***) — This sets the % display for a 20mA input from the relative humidity sensor.

Reheat Heat SP Deadband (***Setpoints→RH.HB***) — If the unit is configured for use of a space temperature sensor instead of a thermostat (***Configuration→UNIT→U.CTL*** = **Yes**), then this configuration applies. This configuration sets the offset above the heating set point at which a unit in Reheat2 mode will turn off. This is a protection against over cooling the space and causing a heat demand.

Other configurations affecting the Humidi-MiZer operation are located at ***Configuration→HMZR***. See Appendix A.

NOTE: These configurations are dependent on the specific unit and should not be changed. The configurations are provided in case a field replacement of a control board occurs and the settings need to be checked or manually configured.

Humidimizer Equipped (***REHT***) — Set to Yes for Humidi-MiZer equipped units. Enables Humidi-MiZer operating modes and service test.

Reheat2 Stage Decr. Time (***R.DEC***) — If using adaptive control mode, then this is a time delay in staged decrease of multiple circuits in Reheat2 mode. This delay is overridden by a zero demand for dehumidification or a positive demand for cooling.

Reheat2 Stage Incr. Time (***R.INC***) — If using adaptive control mode, then this is a time delay in staged increase of multiple circuits in Reheat2 mode.

Reheat Fan Control (***RH.FN***) — Enables model specific outdoor fan control for certain models equipped with Humidi-MiZer system.

Reheat ODF Fan On Level (***RF.LV***) — Sets the Reheat2 mode outdoor fan level in some model specific fan control.

Reheat2 ODF Fan On Temp (***RF.ON***) — Sets the Reheat2 mode change temperature to increased outdoor fan level.

Reheat2 ODF Fan Off Temp (***RF.OF***) — Sets the Reheat2 mode change temperature to decrease outdoor fan level.

Reheat2 OAT Limit A (***RA.LO***) — This configuration is the low outdoor air temperature limit for Reheat2 mode for circuit A. It will disable or enable circuit A.

Reheat2 SSP Lo Limit A (***RA.LP***) — This configuration is the low pressure limit for Reheat2 mode for circuit A. It will turn valve RH2.A off.

Reheat2 SSP Hi Limit A (***RA.HP***) — This configuration is the high pressure limit for Reheat2 mode for circuit A. If low pressure limit previously occurred, this limit will turn valve RH2.A back on after 2-minute delay.

Reheat2 OAT Limit B,C (***RB.LO***) — This configuration is the low outdoor air temperature limit for Reheat2 mode for circuit B. It will disable or enable circuit B.

Reheat2 SSP Lo Limit B,C (***RB.LP***) — This configuration is the low pressure limit for Reheat2 mode for circuit B. It will turn valve RH2.B off.

Reheat2 SSP Hi Limit B,C (***RB.HP***) — This configuration is the high pressure limit for Reheat2 mode for circuit B. If low pressure limit previously occurred, this limit will turn valve RH2.B back on after 2-minute delay.

REHEAT MODE SELECTION PROCESS — Selection of the reheat mode for each refrigerant circuit is determined from the space humidity (from RH sensor or switch input) and the circuit cooling demand (from space temperature sensor or thermostat input). Table 42 shows the corresponding circuit mode and output status for the different demand combinations.

Figure 9 shows the valve locations of Humidi-MiZer™ equipped units. Units with multiple circuits can operate with a combination of Reheat1 and Reheat2 circuits, as determined by the amount of space cooling demand. See Appendix B for complete tables of unit operation response to thermostat and humidity inputs.

REHEAT MODE DIAGNOSTIC HELP — The status of reheat mode sensor inputs may be viewed within the display Inputs menu. The status of reheat mode outputs may be viewed within the display Outputs or ***Run Status→COOL*** menus. Additional diagnostic help, including status of circuit reheat temperature limit lockouts may be viewed within the Humidi-MiZer sub-menu of the cooling mode diagnostic table at ***Operating Modes→COOL→HMZR***.

The Service Test mode may be used to force the system to operate in various stages of Reheat1 or Reheat2 mode, or to independently operate the reheat valve control outputs.

The following forced operating states are changed or added to the available service test operation for a Humidi-MiZer equipped unit:

Service Test→COOL→CMP.A (Cool A Test) — A value of On will turn on circuit A in Normal Cooling mode.

Service Test→COOL→CMP.B (Cool B Test) — A value of On will turn on circuits A and B in Normal Cooling mode.

Service Test→COOL→CMP.C (Cool C Test) — Not used.

Service Test→HMZR→RH1.A (Reheat1 A Test) — A value of On will turn on circuit A in Reheat1 mode.

Service Test→HMZR→RH1.B (Reheat1 B Test) — A value of On will turn on circuits A and B in Reheat1 mode.

Service Test→HMZR→RH1.C (Reheat1 C Test) — Not used.

Service Test→HMZR→RH2.A (Reheat2 A Test) — A value of On will turn on circuit A in Reheat2 mode.

Service Test→HMZR→RH2.B (Reheat2 B,C Test) — A value of On will turn on circuits A and B in Reheat2 mode.

Service Test→HMZR→CRC (Cool-Reheat1 Valve Test) — A value of On will turn on the CRC relay. This will energize RH1.A and RH1.B.

Service Test→HMZR→RHV.A (Reheat2 Valve A Test) — A value of On will turn on the RH2.A valve.

Service Test→HMZR→RHV.B (Reheat2 Valve B,C Test) — A value of On will turn on the RH2.B valve.

Service Test→Fans→OFC.1 (Outdoor Fan 1 Test) — Turn on OFC1, providing power to the Motormaster® controller. Outdoor fans 1 and 4 will operate under the control of the Motormaster controller.

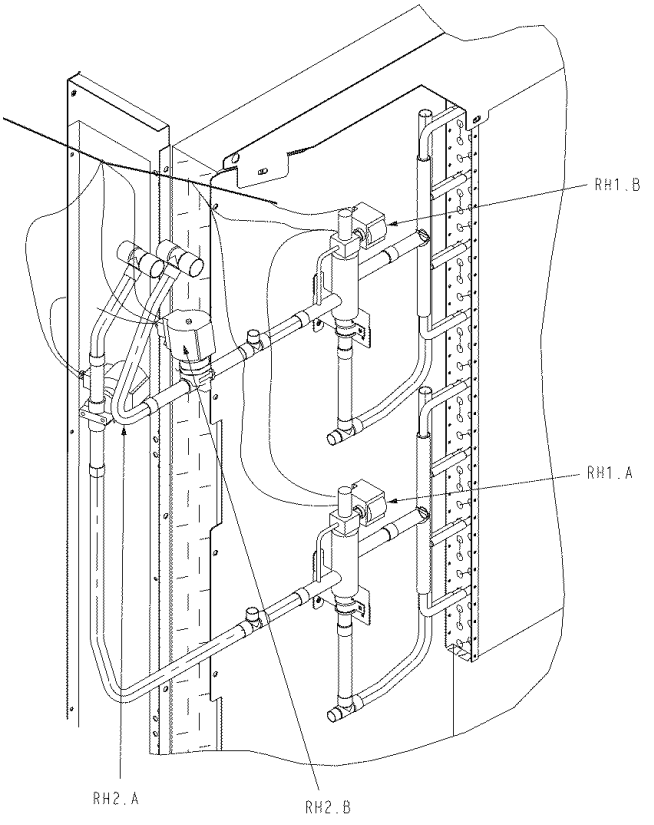


Fig. 9 — Humidi-MiZer System Valve Locations

Service Test→Fans→OFC.2 (Outdoor Fan 2 Test) — Turn on OFC2. Outdoor fans 2, 3, 5, and 6 will operate.

Service Test→Fans→OFC.3 (Outdoor Fan 1 Test) — Not used.

Service Test→INDP→CCH (Crankcase Heat Test) — Not used. Compressor crankcase heaters are wired directly to line power.

AIR BAFFLES — The 48/50PG units with Humidi-MiZer option are equipped with Motormaster® control to maintain adequate discharge pressure for proper unit operation during low ambient operation. This becomes especially critical in the Reheat2 mode of operation. Wind could have a detrimental effect depending on the orientation and the expected design latent load of the space. If the unit is oriented with the vertical condenser coil toward the prevailing wind, then the field-fabricated wind baffles are required. If the unit is not oriented as described above, but there is expected long operational periods in the Reheat2 mode, then the field-fabricated wind baffles are recommended. See Fig. 10 for dimensions of the field-fabricated wind baffles.

Table 42 — Control Modes with Humidi-MiZer System

Output and Valve States versus Circuit Mode .x = Circuit A or B identifier

DEMAND AND MODE			OUTPUTS				VALVES	
Space Humidity	Circuit Cooling Demand	Circuit Mode	Indoor Fan (IDF)	Circuit Compressor (CMP.x)	Cooling-Reheat Control (CRC)*	Reheat2 Valve (RH2.x)	RH1.x Valve 3-way	RH2.x Valve 2-way
—	—	No power	OFF	OFF	OFF	OFF	Off	Off (closed)
Low	No	Off	Per ventilation control	OFF	OFF	OFF	Off	Off (closed)
Low	Yes	Cool	ON	ON	OFF	OFF	Off	Off (closed)
High	Yes	Reheat1	ON	ON	ON	OFF	On	Off (closed)
High	No	Reheat2	ON	ON	ON	ON	On	On (open)

*NOTE: One CRC state for all circuits per space humidity.

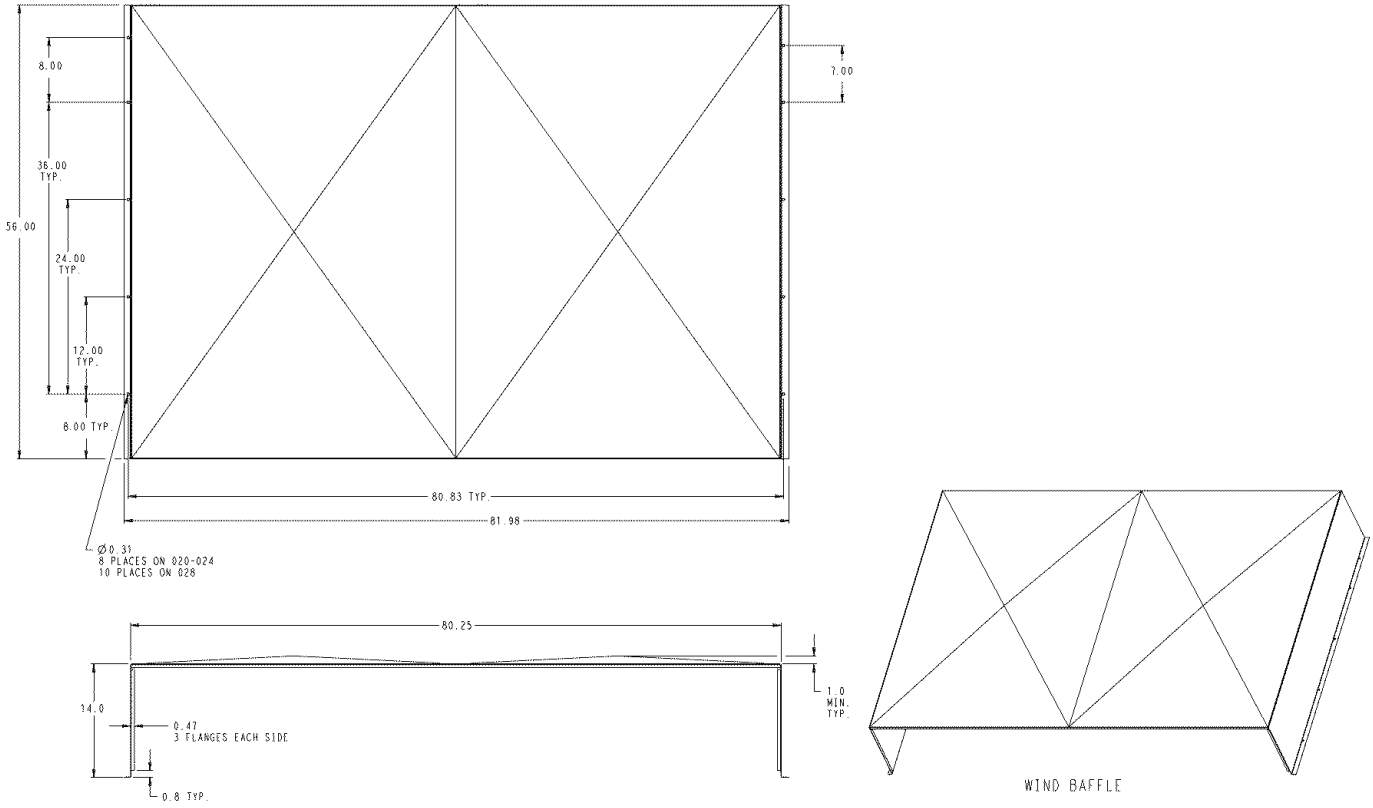


Fig. 10 — Wind Baffle Dimensions

Indoor Air Quality (IAQ) — The *Comfort*Link™ control has the capability for several methods of demand ventilation control. Indoor air quality is typically measured using a CO_2 sensor whose measurements are displayed in parts per million (ppm). Outdoor air quality may be measured with a CO_2 sensor for indoor-outdoor differential demand ventilation control, or with other sensor types for the outdoor air lockout function. The factory-installed indoor air quality CO_2 sensor is mounted in the return section. A field-installed indoor air quality CO_2 sensor may be mounted in the return or directly in the occupied space, per job requirements. The indoor air quality modes of operation can be affected by configurations for indoor air quality sensor (***Configuration→AIR.Q→IA.CF***), indoor air quality switch (***Configuration→AIR.Q→II.CF***), outdoor air quality sensor (***Configuration→AIR.Q→OA.CF***) and other related fan and limit configurations as described below.

IAQ (Analog Input) — The *Comfort*Link™ control is configured for indoor air quality sensors which provide 4 to 20 mA for 0 to 2000 ppm. If a sensor has a different range, the ppm display range must be reconfigured by entering new values for ***Configuration→AIR.Q→I.4M*** and ***Configuration→AIR.Q→I.20M***.

IA.CF* = 0** (No IAQ) — ***IA.CF* = 0** signifies that there is no IAQ sensor installed. The damper will operate at the ***Configuration→AIR.Q→EC.MN position when the space is occupied and the indoor fan is on.

IA.CF* = 1** (DCV) — When ***IA.CF* = 1**, the IAQ algorithm is set for Demand Control Ventilation (DCV). During DCV, the damper modulates between two user configurations depending upon the relationship between the IAQ and the Outdoor Air Quality (OAQ). The lower of these two positions is referred to as the Minimum IAQ Damper Position (Configuration→AIR.Q→AQ.MN***) while the higher is referred to as Economizer Minimum Position (***EC.MN***). The ***AQ.MN*** 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*** 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 *Comfort*Link control will begin to open the damper from the ***AQ.MN*** position when the IAQ level begins to exceed the Outdoor Air Quality (OAQ) level by a configurable amount. This amount is referred to as AQ Differential Low (***Configuration→AIR.Q→AQD.L***). When the differential between IAQ and OAQ reaches AQ Differential High (***Configuration→AIR.Q→AQD.H***), the economizer position will be ***EC.MN***. When the IAQ/OAQ differential is between ***AQD.L*** and ***AQD.H***, the control will modulate the damper between **AQ.MN** and **EC.MN** in a linear manner as shown in Fig. 11. The damper position will never exceed the bounds specified by ***AQ.MN*** and ***EC.MN*** during IAQ control.

IA.CF* = 2** (Override IAQ) — When ***IA.CF* = 2**, the IAQ algorithm maintains the damper at ***Configuration→AIR.Q→EC.MN until the override condition triggers. The override triggers when the IAQ/OAQ differential is greater than ***Configuration→AIR.Q→AQD.H***. The override position is ***Configuration→AIR.Q→OVR.P*** (Economizer Override Position). The economizer position will return to ***EC.MN*** when the IAQ/OAQ differential is less than ***Configuration→AIR.Q→AQD.L***.

The Override algorithm will operate whenever the building is occupied and the indoor fan is operating or whenever the IAQ algorithm has caused the indoor fan to operate. The configuration ***IA.FN*** determines whether or not the IAQ algorithm can turn on the indoor fan.

If the indoor fan is not operating, the economizer position will be zero. If the override is not active and the building is unoccupied, the economizer position will be zero. The damper position may exceed ***Configuration→AIR.Q***

→*EC.MN* or *Configuration*→*AIR.Q*→*OVR.P* to provide economizer cooling.

IA.CF = **3** (Control Minimum Position) — When *IA.CF* = **3**, an external 4 to 20 mA source is used to set the minimum position. The 4 mA signal corresponds to 0% and the 20 mA signal corresponds to 100%. In this mode, configurations such as *Configuration*→*AIR.Q*→*EC.MN* and *Configuration*→*AIR.Q*→*AQ.MN* are not used.

If the indoor fan is not operating, the economizer position will be zero. The damper position may exceed the economizer minimum position to provide economizer cooling.

IAQ (Switch Input) — Indoor air quality can also be measured using a switch input. For the purpose of specifying the type of switch input, low CO_2 levels are considered normal. The IAQ switch input is defined by the configuration by *Configuration*→*AIR.Q*→*II.CF* IAQ Level (Switch Input). Enthalpy and IAQ are controlled by the same switch input and therefore they cannot be used simultaneously.

Configuration→*AIR.Q*→*II.CF* = **0** (No IAQ) — The *II.CF* = **0** configuration signifies that there is no IAQ switch input. The damper will operate at the *EC.MN* position when the space is occupied and the indoor fan is on.

Configuration→*AIR.Q*→*II.CF* = **1** (DCV NO) or *II.CF* = **2** (DCV NC) — The Demand Control Ventilation (DCV) allows the economizer minimum position to be decreased when there is no IAQ problem. If IAQ is low, the economizer minimum position is Minimum IAQ Damper Position (*Configuration*→*AIR.Q*→*AQ.MN*). If IAQ is high, the economizer minimum position is the Economizer Minimum Position (*Configuration*→*AIR.Q*→*EC.MN*).

Configuration→*AIR.Q*→*II.CF* = **3** (Override NO) or *II.CF* = **4** (Override NC) — The damper override function permits absolute positioning of the economizer damper for ventilation purposes. The override is active when IAQ is high and inactive when IAQ is low. The override position is configurable by the configuration by *Configuration*→*AIR.Q*→*OVR.P* (Economizer Override Position).

OUTDOOR AIR QUALITY (Analog Input) — The *Comfort*Link control is configured for outdoor air quality sensors which provide 4 to 20 mA for 0 to 2000 ppm. If a sensor has a different range, the ppm display range must be reconfigured by entering new values for *Configuration*→*AIR.Q*→*O.4M* and *Configuration*→*AIR.Q*→*O.20M*.

Configuration→*AIR.Q*→*OA.CF* = **0** (No OAQ) — This signifies there is no outdoor air sensor installed. The default value of *OAQ* is 400 ppm.

Configuration→*AIR.Q*→*OA.CF* = **1** (DCV) — The outdoor air quality sensor analog input is for the value of *OAQ*.

Configuration→*AIR.Q*→*OA.CF* = **2** (OAQ Lockout) — The outdoor air quality sensor analog input is only used to lock out the outdoor ventilation. The economizer commanded position is set to 0% when the ppm exceeds the OAQ lockout value configured for *Configuration*→*AIR.Q*→*OAQ.L*. The default value of *OAQ.L* is 600 ppm.

FAN ENABLE (Analog IAQ Sensor) — The DCV algorithm will operate whenever the building is occupied and the indoor fan is operating or whenever the IAQ algorithm has caused the indoor fan to operate. The configuration *Configuration*→*AIR.Q*→*IA.FN* (Fan Enable for IAQ), determines whether or not the IAQ algorithm can turn on the indoor fan. If the indoor fan is not operating, the economizer position will be zero. The damper position may exceed *Configuration*→*AIR.Q*→*EC.MN* to provide economizer cooling.

Configuration→*AIR.Q*→*IA.FN* = **0** (Never) — When *IA.FN* = *0*, the IAQ algorithm can never turn on the fan.

Configuration→*AIR.Q*→*IA.FN* = **1** (Occupied) — When *IA.FN* = **1**, the IAQ algorithm will turn on the indoor fan whenever the building is occupied and IAQ/OAQ differential is greater than the configuration *Configuration*→*AIR.Q*→*DF.ON* (Fan On AQ Differential). The indoor fan will turn off when the IAQ/OAQ differential is less than the configuration *Configuration*→*AIR.Q*→*DF.OF* (Fan Off AQ Differential).

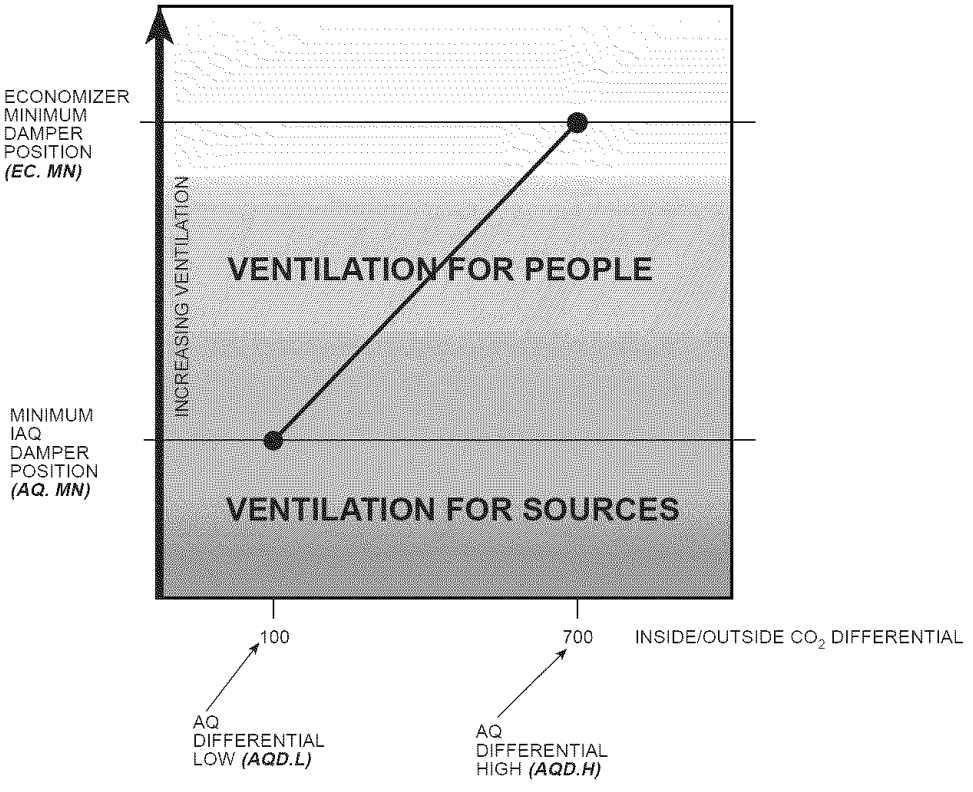


Fig. 11 — IAQ Control

Configuration→AIR.Q→IA.FN = **2** (Always) — The indoor fan performance for *IA.FN* = **2** is the same as the performance when *IA.FN* = **1** except the algorithm is not limited to occupied periods only. The fan can be triggered on when the space is occupied or unoccupied.

FAN ENABLE (IAQ Switch Input) — The DCV algorithm will operate whenever the building is occupied and the indoor fan is operating or the whenever the IAQ algorithm has caused the indoor fan to operate. The configuration *Configuration →AIR.Q→II.FN* (IAQ Switch Input Fan CFG) determines whether or not the IAQ algorithm can turn on the indoor fan. If the indoor fan is not operating, the economizer position will be zero. The damper position may exceed *Configuration →AIR.Q→EC.MN* to provide economizer cooling.

Configuration→AIR.Q→II.FN = **0** (Never) — When *II.FN* = **0**, the IAQ algorithm can never turn on the fan.

Configuration→AIR.Q→II.FN = **1** (Occupied) — When *II.FN* = **1**, the IAQ algorithm will turn on the indoor fan whenever the building is occupied and IAQ is high. The indoor fan will turn off if IAQ returns to normal.

Configuration→AIR.Q→II.FN = **2** (Always) — The indoor fan performance for *II.FN* = **2** is the same as the performance when *II.FN* = **1** except the algorithm is not limited to occupied periods only. The fan can be triggered on when the space is occupied or unoccupied.

Temperature Compensated Start — This logic is used when the unit is in the unoccupied state. The control will calculate early Start Bias time based on Space Temperature deviation from the occupied cooling and heating set points. This will allow the control to start the unit so that the space is at conditioned levels when the occupied period starts. This is required for ASHRAE 90.1 compliance. This control function requires a valid occupancy schedule. A space sensor is required for non-linkage applications.

SETTING UP THE SYSTEM — The settings for temperature compensated start can be found in the local display under *Configuration→UNIT*.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
TCS.C	Temp.Cmp.Strt.Cool Factr	0 - 60	min	TCSTCOOL
TCS.H	Temp.Cmp.Strt.Heat Factr	0 - 60	min	TCSTHEAT

Temp Comp Strt Cool Factr (*TCS.C*) — This is the factor for the start time bias equation for cooling.

Temp Lamp Strt Heat Factr (*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 CCN network).

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, 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 when temperature compensated start begins, the Unoccupied Free Cool mode will be stopped.

Carrier Comfort Network® (CCN) Configuration — It is possible to configure the *Comfort*Link™ control to participate as an element of the Carrier Comfort Network (CCN) system directly from the local display. This section will deal with explaining the various programmable options which are found under the CCN sub-menu in the Configuration mode.

The major configurations for CCN programming are located in the local displays at *Configuration→CCN*. See Appendix A.

CCN Address (*CCN.A*) — This configuration is the CCN address the rooftop is assigned.

CCN Bus Number (*CCN.B*) — 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 (*BROD→B.TIM*) — If this configuration is set to ON, the control will periodically send the time and date out onto the CCN bus once a minute. If this device is on a CCN network then it will be important to make sure that only one device on the bus has this configuration set to ON. If more than one time broadcaster is present, problems with the time will occur.

NOTE: Only the time and date broadcaster can perform daylight savings time adjustments. Even if the rooftop is stand alone, the user may want to set this to ON to accomplish the daylight/savings function.

CCN OAT Broadcast (*BROD→B.OAT*) — If this configuration is set to ON, the control will periodically broadcast its outside-air temperature at a rate of once every 30 minutes.

Global Schedule Broadcast (*BROD→B.GS*) — 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 (*BROD→B.ACK*) — If this configuration is set to ON, then when any broadcasting is done on the bus, this device will respond to and acknowledge. Only one device per bus can be configured for this option.

Schedule Number (*SCH.O→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 (*B.GS*) 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? (*SCH.O→HOL.G*) — 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 (*SCH.O→OV.TL*) — 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 (***SCH.O→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? (***SCH.O→OV.SP***) — 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.

Alarm Handling — There are a variety of different alerts and alarms in the system. Alerts are indicated by Tnnn (where nnn is the alert number) on the display and generally signify that the improperly functioning circuit can restart without human interaction. If an alarm occurs, indicated by Annn (where nnn is the alarm number), the damaged circuit will generally not restart without an alarm reset via the Scrolling Marquee display or CCN.

The response of the control system to various alerts and alarms depends on the seriousness of the particular alert or alarm. In the mildest case, an alert does not affect the operation of the unit in any manner. An alert can also cause a "strike." A "striking" alert will cause the circuit to shut down for 15 minutes. This feature reduces the likelihood of false alarms causing a properly working system to be shut down incorrectly. If three strikes occur before the circuit has an opportunity to show that it can function properly, the circuit will be deactivated, causing the shutdown alarm for that particular circuit. Once activated, the shutdown alarm can only be cleared via an alarm reset.

However, circuits with strikes will be 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 a user defined time (***Configuration→COOL→RST.C***) with no detectable problems before the strike counter will be reset to zero. Default value is 5 minutes.

CCN ALARM BROADCAST — Operators of CCN networks might not want to be notified of "striking" alerts for refrigerant circuits until the circuit has been shut down due to 3 strikes. Set the cooling configuration of Alert Each Strike (***Configuration→COOL→ALM.N*** on display, ALM_NOW on CCN) to YES to broadcast each circuit strike alert. Set Alert Each Strike to NO to broadcast only circuit shut down. Alert Each Strike configuration is ignored during Service Test and all alerts are broadcast. The default is YES.

ALARM RELAY OUTPUT — The alarm relay output is a normally open 24 vac output between field connection terminal board terminals C and X. Selection of which alerts and alarms will result in closing of the alarm relay may be set in the Alarm Relay Configuration (***Configuration→ALM.O***). Setting a configuration to YES will result in the alarm output relay, ***ALRM***, status of ON and 24 vac between C and X when that particular condition is in an alarm state. Setting a configuration to NO will result in no action by the alarm output relay for that particular condition.

NOTE: An accessory filter switch can be used along with the alarm relay output function to indicate dirty filter service need.

See the Troubleshooting section for more information on viewing, diagnosing, and clearing alerts and alarms.

TROUBLESHOOTING

The Scrolling Marquee display shows the actual operating conditions of the unit while it is running. If there are alarms or there have been alarms, they will be displayed in either the current alarm list or the history alarm list. See Table 43. The Service Test mode allows proper operation of the compressors, fans, and other components to be checked while the unit is not operating. See Service Test on page 36.

Complete Unit Stoppage — There are several conditions that can cause the unit not to provide heating or cooling:

- If an alarm is active which causes the unit to shut down, diagnose the problem using the information provided in Alarms and Alerts section below.
- Cooling and heating loads are satisfied.
- Programmed occupancy schedule.
- General power failure.
- Tripped CB1, CB2, or CB3 (24-volt transformer circuit breakers).
- Blown fuse (FU1 or FU2)
- Unit is turned off through the CCN network.
- If supply-air temperature is less than the Minimum SAT Lower Level (***SAT.L***) configuration value, unit cannot cool.
- If outdoor-air temperature is less than the Compressor Lockout Temperature (***CA.LO, CB.LO, CC.LO***) configuration value, unit cannot cool.
- If outdoor-air temperature is greater than the Heating Lockout Temperature (***HT.LO***) configuration value, unit cannot heat.

Table 43 — *Comfort*Link™ Alarm Codes

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
T051	Compressor A1 Safety Trip	Add Strike for Circuit A	Automatic	High-pressure switch open. Compressor internal protection open. Wiring error
	Compressor A1 Current Detected After Turnoff	Turn off all compressors	Automatic	Welded contactor
T052	Compressor A2 Safety Trip	Add Strike for Circuit A	Automatic	High pressure switch open. Compressor internal protection open. Wiring error.
	Compressor A2 Current Detect After Turnoff	Turn off all compressors	Automatic	Welded contactor
T055	Compressor B1 Safety Trip	Add Strike for Circuit B	Automatic	High-pressure switch open. Compressor internal protection open. Wiring error
	Compressor B1 Current Detected After Turnoff	Turn off all compressors	Automatic	Welded contactor
T059	Compressor C1 Safety Trip	Add Strike for Circuit C	Automatic	High-pressure switch open. Compressor internal protection open. Wiring error
	Compressor C1 Current Detected After Turnoff	Turn off all compressors	Automatic	Welded contactor
T064	Circuit A Saturated Condensing Temp Thermistor Failure	Use OAT to control Outdoor fans	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T065	Circuit B Saturated Condensing Temp Thermistor Failure	Use OAT to control Outdoor fans	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T073	Outdoor Air Temperature Thermistor Failure	No cooling with economizer	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T074	Space Temperature Thermistor Failure	If U.CTL = 3, then no heating or cooling	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T075	Supply Air Temperature Thermistor Failure	No cooling with economizer and No adaptive compressor staging	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T076	Return Air Thermistor Failure	If RAT.S = Yes, then no return air display	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T077	Space Relative Humidity Sensor Failure	If RH.S = Yes, then no indoor humidity control	Automatic	Faulty sensor or wiring error
T080	Circuit C Saturated Condensing Temp Thermistor Failure	Use OAT to control Outdoor fans	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T092	Circuit A Suction Pressure Transducer Failure	Shutdown Circuit A	Manual	Faulty transducer, faulty 5-V power supply, or loose connection
T093	Circuit B Suction Pressure Transducer Failure	Shutdown Circuit B	Manual	Faulty transducer, faulty 5-V power supply, or loose connection
T101	Circuit C Suction Pressure Transducer Failure	Shutdown Circuit C	Manual	Faulty transducer, faulty 5-V power supply, or loose connection
T102	Compressor A1 Current Sensor Failure	If CS.A1 = Enable, then no T051 current alarm	Automatic	Faulty current sensor caused by wiring error or loose connection
	Compressor A2 Current Sensor Failure	If CS.A2 = Enable, then no T052 current alarm	Automatic	Faulty current sensor caused by wiring error or loose connection
T103	Compressor B1 Current Sensor Failure	If CS.B1 = Enable, then no T055 current alarm	Automatic	Faulty current sensor caused by wiring error or loose connection
T104	Compressor C1 Current Sensor Failure	If CS.C1 = Enable, then no T059 current alarm	Automatic	Faulty current sensor caused by wiring error or loose connection
T110	Circuit A Loss of Charge	Shutdown Circuit A	Manual	Low refrigerant or faulty suction pressure transducer
T111	Circuit B Loss of Charge	Shutdown Circuit B	Manual	Low refrigerant or faulty suction pressure transducer
T126	Circuit A High Refrigerant Pressure	Shutdown Circuit A	Automatic	An overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high-pressure switch.
T127	Circuit B High Refrigerant Pressure	Shutdown Circuit B	Automatic	An overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high-pressure switch.
T133	Circuit A Low Refrigerant Pressure	Add Strike for Circuit A	Automatic	Low refrigerant charge, dirty filters, evaporator fan turning backwards, loose or broken fan belt, plugged filter drier, faulty transducer, excessively cold return air, or stuck open economizer when the ambient temperature is low.
T134	Circuit B Low Refrigerant Pressure	Add Strike for Circuit B	Automatic	Low refrigerant charge, dirty filters, evaporator fan turning backwards, loose or broken fan belt, plugged filter drier, faulty transducer, excessively cold return air, or stuck open economizer when the ambient temperature is low.
T140	Circuit C Loss of Charge	Shutdown Circuit C	Manual	Low refrigerant or faulty suction pressure transducer
T141	Circuit C Low Refrigerant Pressure	Add Strike for Circuit C	Automatic	Low refrigerant charge, dirty filters, evaporator fan turning backwards, loose or broken fan belt, plugged filter drier, faulty transducer, excessively cold return air, or stuck open economizer when the ambient temperature is low.
T142	Circuit C High Refrigerant Pressure	Shutdown Circuit C	Automatic	An overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high-pressure switch.
T143	Circuit A Failure To Pressurize	Add Strike for Circuit A	Automatic	Wiring causing reverse rotation or faulty compressor
T144	Circuit B Failure To Pressurize	Add Strike for Circuit B	Automatic	Wiring causing reverse rotation or faulty compressor
T145	Circuit C Failure To Pressurize	Add Strike for Circuit C	Automatic	Wiring causing reverse rotation or faulty compressor
T153	Real Timeclock Hardware Failure	No time and date schedule operation	Automatic	No time/date configured, software failure, or MBB failure
A154	Serial EEPROM Hardware Failure	Unit Shutdown	Automatic	Software failure or MBB failure
T155	Serial EEPROM Storage Failure Error	Unit operation errors	Automatic	Software failure or MBB failure
A156	Critical Serial EEPROM Storage Fail Error	Unit Shutdown	Automatic	Software failure or MBB failure
A157	A/D Hardware Failure	Unit Shutdown	Automatic	Software failure or MBB failure
A163	Circuit A Down Due to Failure	Shutdown Circuit A	Manual	Circuit has 3 strikes or has been locked out by another alarm
A164	Circuit B Down Due to Failure	Shutdown Circuit B	Manual	Circuit has 3 strikes or has been locked out by another alarm
A165	Circuit C Down Due to Failure	Shutdown Circuit C	Manual	Circuit has 3 strikes or has been locked out by another alarm
T179	Loss of communication with the Economizer Control Board	No economizer operation	Automatic	Communication wiring problem with ECB or faulty MBB or ECB
T180	Loss of communication with the Economizer Actuator	No economizer operation	Automatic	Communication wiring problem with actuator.
A404	Fire Shutdown	Unit Shutdown	Automatic	Smoke detected by smoke detector
T408	Dirty Filter	—	Automatic	Dirty Filter
T409	Fan Status Switch ON, Contactor OFF	If IDF.F = Yes, then Unit Shutdown	If IDF.F = YES, then Manual, otherwise automatic	Bad Fan Status Switch. Configuration incorrect.
	Fan Status Switch OFF, Contactor ON	If IDF.F = Yes, then Unit Shutdown	If IDF.F = YES, then Manual, otherwise automatic	Tripped Circuit Breaker. Broken belt. Bad indoor fan motor. Configuration incorrect. Bad fan status switch.

LEGEND

ECB — Economizer Control Board
IGC — Integrated Gas Controller
MBB — Main Base Board
OAT — Outdoor-Air Thermistor

Table 43 — *Comfort*Link™ Alarm Codes (cont)

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
T410	R-W1 Jumper Not Installed in Space Temp Mode	Unable to run heat	Automatic	Missing jumper wire
	R-W1 Jumper Must Be Installed to Run Heat In Service Test	Unable to Test Heat Outputs	Automatic	Missing jumper wire.
T411	Thermostat Y2 Input Activated without Y1 Activated	Run unit as if Y2 and Y1 are On	Automatic	Bad Thermostat or Thermostat Wiring
T412	Thermostat W2 Input Activated without W1 Activated	Run unit as if W2 and W1 are On	Automatic	Bad Thermostat or Thermostat Wiring
T413	Thermostat Y and W Inputs Activated Simultaneously	Run unit in mode activated first	Automatic	Bad Thermostat or Thermostat Wiring
T414	Economizer Damper Actuator Out of Calibration	Alert Generated	Automatic	Calibrate economizer (E.CAL). If problem still exist then determine what is limiting economizer rotation.
	Economizer Damper Actuator Torque Above Load Limit	Alert Generated	Automatic	Actuator load too high. Check damper load.
	Economizer Damper Actuator Hunting Excessively	Alert Generated	Automatic	Damper position changing too quickly.
	Economizer Damper Stuck or Jammed	Alert Generated	Automatic	No economizer motion. Check damper blades, gears, and actuator.
	Economizer Damper Actuator Mechanical Failure	Alert Generated	Automatic	Check actuator and replace if necessary.
	Economizer Damper Actuator Direction Switch Wrong	Alert Generated	Automatic	Actuator direction control switch (CCW, CW) wrong.
T415	IAQ Input Out of Range	No IAQ Operations	Automatic	Bad sensor, bad wiring, or sensor configured incorrectly.
T416	OAQ Input Out of Range	No OAQ Operations	Automatic	Bad sensor, bad wiring, or sensor configured incorrectly.

LEGEND

ECB — Economizer Control Board
IGC — Integrated Gas Controller
MBB — Main Base Board
OAT — Outdoor-Air Thermistor

Restart Procedure — Before attempting to restart the machine, check the alarm list to determine the cause of the shut down. If the shutdown alarm for a particular control function has occurred, determine and correct the cause before allowing the unit to run under its own control again. When there is problem, the unit should be diagnosed in Service Test mode. The alarms must be reset before the control function can operate in either Normal mode or Service Test mode.

Control Module Communication

RED LED — Proper operation of the MBB and ECB control boards can be visually checked by looking at the red status LEDs. When operating correctly, the red status LEDs should blink in unison at a rate of once every 2 seconds. If the red LED on the ECB is not blinking, check the DIP switch positions on the board. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Also, be sure that the board is supplied with the current software. If necessary, reload current software. 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 MBB and ECB each have one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. If LEN LED is not blinking, check LEN connections for potential communication errors (J3 and J4 connectors). Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB also provides both power and communication directly to the Scrolling Marquee display.

YELLOW LED — The MBB has one yellow LED which is used to indicate CCN communication activity. The Carrier Comfort Network® (CCN) LED will blink during times of network communication.

Alarms and Alerts

VIEWING AND CLEARING UNIT ALARMS — Presence of active alarms will be indicated on the Scrolling Marquee display by the Alarm Status light turning on and by the number of active alarms being displayed in the automatic View of Run Status. Presence of active alarms may also be signaled on the Alarm Output terminals. Each alarm may also be broadcast on the CCN network. Active alarms and past alarm history can be reviewed and cleared via the local display or a CCN device. The following menu locations are used for the local display:

Alarms→R.CURR (Reset All Current Alarms) — Change to YES to reset all active alarms. Turning unit power off will also reset all current alarms.

Alarms→R.HIST (Reset Alarm History) — Change to YES to reset the alarm history. Turning unit power off will not reset the alarm history.

Alarms→CURR (Currently Active Alarms) — Use the ENTER key, then scroll through any alarm numbers using the up and down arrow keys. Alarms are displayed in numerical order.

Alarms→HIST (Alarm History) — Use the ENTER key, then scroll through any alarm numbers using the up and down arrow keys. Up to 20 alarms are displayed in order of occurrence, with time and date.

The description for an alarm can be viewed on the Scrolling Marquee display by pressing ESCAPE and ENTER keys simultaneously while displaying the alarm code number. Be sure to expand description for each code, because in some cases there are different possible descriptions and causes for the same code number.

DIAGNOSTIC ALARM CODES AND POSSIBLE CAUSES

Alert Codes T051, T052, T055 and T059 (Compressor Safety) — Alert codes T051, T052, T055, and T059 are for compressors A1, A2, B1, and C1, respectively. These alerts occur when the Current Sensor (CS) does not detect compressor current during compressor operation. When this occurs, the control turns off the compressor and logs a strike for the respective circuit. These alerts reset automatically.

The possible causes are:

1. High-pressure switch (HPS) open. The HPS is wired in series with compressor relays on the MBB. If the high-pressure switch opens during compressor operation, the compressor stops, and the CS no longer detects current, causing the control to activate this alert.
2. Compressor internal protection is open.
3. Wiring error. A wiring error might not allow the compressor to start.

To check out alerts T051, T052, T055, and T059:

1. Turn on the compressor in question using Service Test mode. If the compressor does not start, then most likely the problem is one of the following: HPS open, open internal protection, incorrect safety wiring, or incorrect compressor wiring.
2. If the compressor starts, verify that the indoor and outdoor fans are operating properly.
3. If the CS is always detecting current, then verify that the compressor is on. If the compressor is on, check the contactor and the relay on the MBB. If the compressor is off

and there is no current, verify CS wiring and replace if necessary.

4. Return to Normal mode and observe compressor operation to verify that compressor current sensor is working and condenser fans are energized after compressor starts.

Alert Codes T051, T052, T055 and T059 (Current Detected After Turnoff) — Alert codes T051, T052, T055, and T059 are for compressors A1, A2, B1, and C1, respectively. These alerts occur when the Current Sensor (CS) detects current when the compressor should be off. When this occurs, the control turns off all of the compressors. Use the Scrolling Marquee to reset the alert.

The possible causes are

1. Welded contactor.
2. Frozen compressor relay on MBB.

To check out alerts T051, T052, T055, and T059:

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

Alert Codes T064, T065 and T080 (Condensing Temp. Failure) — Alert codes T064, T065, and T080 are for circuits A, B and C, respectively. These alerts occur when the temperature is outside the range –40 to 240 F (–40 to 116 C). When this occurs, the control will use only the outdoor temperature to control the outdoor fans. If both the SCT and OAT fail, then circuit shutdown alarm will occur also. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T073 (Outdoor Air Temp. Failure) — This alert occurs when the temperature is outside the range –40 to 240 F (–40 to 116 C). For all units, all ambient temperature lockout limits for cooling and heating are ignored. For all units, if both SCT and OAT fail, then circuit shutdown alarm will also occur. For economizer equipped units, the economizer will not operate to provide cooling. The economizer will still operate for ventilation. For units without Humidi-MiZer™ system, the control will use condenser temperatures for outdoor fan control. For Humidi-MiZer system equipped units, the Reheat2 mode will operate at fan level 1. For units with CCH crankcase heat relay control, the crankcase heat relay will be turned on if any compressor is off. This alert resets automatically. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T074 (Space Temp. Failure) — This alert occurs when the temperature is outside the range –40 to 240 F (–40 to 116 C). This alert will only occur if the unit control type is configured for Space Sensor (versus Thermostat). Cooling and heating will not operate. For economizer equipped units, the economizer will still operate for ventilation. This alert resets automatically. The cause of the alert is usually a faulty thermistor in the T-55, T-56, or T-58 device, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T075 (Supply Air Temp. Failure) — This alert occurs when the temperature is outside the range –40 to 240 F (–40 to 116 C). Economizer cooling and adaptive compressor staging cannot occur while this alarm is active. This alert resets automatically. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T076 (Return Air Thermistor Failure) — This alert occurs when the temperature is outside the range –40 to 240 F (–40 to 116 C). This alert will only occur if the unit is configured for a return air sensor. There is no control action as a result of this alert. This alert resets automatically. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T077 (Space Relative Humidity Sensor Failure) — This alert occurs when the input is less than 3.5 mA and the sensor is configured as installed. Check sensor and wiring. This alert clears automatically.

Alert Code T080 (Condensing Temp. Failure) — See Alert T064.

Alert Codes T092, T093, T101 (Suction Pressure Transducer Failure) — Alert codes T092, T093, and T101 are for circuits A, B and C, respectively. These alerts occur when the pressure is outside the range 0.5 to 134.5 psig. A circuit cannot run when this alert is active. Use the Scrolling Marquee to reset the alarm. The cause of the alert is usually a faulty transducer, faulty 5-v power supply, or a loose connection.

Alert Codes T102, T103, and T104 (Current Sensor Failure) — Alert codes T102, T103, and T104 are for compressors A1 and A2, B1, and C1, respectively. These alerts occur when the output of the current sensor (CS) is a constant high value. These alerts reset automatically. The cause of the alert is a wiring error or a loose connection. If the problem cannot be resolved and the CS board must be replaced, the CS board can be temporarily disabled while securing a replaced board. A CS board is disabled by setting the corresponding configuration to DISABLE (***Configuration→COOL→CIR.A→CS.A1***, ***CS.B1*** or ***CS.C1***).

Alert Codes T110, T111, T140 (Loss of Charge) — Alert codes T110, T111, and T140 are for circuits A, B and C, respectively. These alerts occur when the compressor is OFF and the suction pressure is less than 5 psig and OAT is greater than –5 F for 1 continuous minute. Use the Scrolling Marquee to reset the alert. The cause of the alert is usually low refrigerant pressure or a faulty suction pressure. These alerts only occur when the compressor is OFF because the low refrigerant pressure alarms (alerts T133, T134 and T141) handle this situation when the compressor is operating.

Alert Codes T126, T127, T142 (High Refrigerant Pressure) — Alert codes T126, T127, and T142 are for circuits A, B, and C, respectively. These alerts occur when alerts T051, T055, or T059 are active while the appropriate condensing temperature is greater than 150 F. These alerts reset automatically. The cause of the alert is usually an overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high-pressure switch. See Alerts T051, T055 and T059 for diagnostic procedure.

Alert Codes T133, T134, T141 (Low Refrigerant Pressure) — Alert codes T133, T134, and T141 are for circuits A, B and C, respectively. These alerts occur when the compressor is operating and the evaporating temperature (converted from the suction pressure) is less than configured low suction control levels, ***Configuration→COOL→SST→SST.1*** (Low Suction — Level 1) or ***SST.2*** (Low Suction — Level 2) or ***SST.3*** (Low Suction Level 3). The circuit SST value must be less than SST.1 for 5 minutes, SST.2 for 3 minutes, or SST.3 for 1.5 minutes for the alert to occur. When the outdoor temperature is less than 40 F, the above values are reduced by an offset that scales between 0 and 20 as the outdoor temperature goes from 40 to 0° F. An alert will also occur if the circuit SST value is less than ***SST.3*** –5 F for 20 seconds. These alerts cause a strike for the respective circuit. These alerts will activate when the coil becomes frosted. However, during the 15-minute reset period, the coils will thaw and strike should clear at restart if there is nothing else wrong with the circuit. The alert resets automatically. The cause of the alert is usually low refrigerant charge, dirty filters, evaporator fan operating backwards, loose or broken belt, plugged filter drier, faulty transducer, excessively cold

return air, or stuck open economizer when the ambient temperature is low.

Alert Code T140 (Loss of Charge) — See Alert T110.

Alert Code T141 (Low Refrigerant Pressure) — See Alert T133.

Alert Code T142 (High Refrigerant Pressure) — See Alert T126.

Alert Codes T143, T144, T145 (Failure to Pressurize) — Alert codes T143, T144, and T145 are for circuits A, B, and C, respectively. These alerts occur when the compressor turns on and the suction pressure does not drop 5 psig during the first 15 seconds and the condensing temperature does not rise 5 F during the first minute. These alerts cause a strike for the respective circuit. The alert resets automatically. The cause of the alert is usually compressor wiring causing reverse rotation or a faulty compressor.

Alert Code T153 (Real Time Clock Hardware Failure) — Time and date functions will not operate, such as local occupancy schedules. The RTC clock chip on the MBB is not responding. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control and reconfiguring the time and date should be tried before board replacement.

Alarm Code A154 (Serial EEPROM Hardware Failure) — The unit will completely shut down. The serial EEPROM chip on the MBB which stores the unit's configuration is not responding. Recovery is automatic but MBB board replacement may be necessary. Cycling the power to the control should be tried before board replacement.

Alert Code T155 (Serial EEPROM Storage Failure Error) — Configuration data in the serial EEPROM chip can not be verified. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control and reconfiguring the control points should be tried before board replacement.

Alarm Code A156 (Critical Serial EEPROM Storage Fail Error) — The unit will completely shut down. Critical configuration data in the serial EEPROM chip can not be verified. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control and reconfiguring the critical control points should be tried before board replacement. Check the configurations for the following critical points:

Configuration→COOL→N.CIR (Number of Circuits)

Configuration→COOL→N.A (Compressors on Circuit A)

Configuration→COOL→OFC→OFC.3 (OFC.3 Enable, CCH Disable)

Configuration→HMZR→REHT (Humidimizer Equipped)

Configuration→HMZR→RH.FN (Reheat Fan Control)

Alarm Code A157 (A/D Hardware Failure) — The unit will completely shut down. The analog to digital conversion chip on the MBB has failed. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control should be tried before board replacement.

Alarm Codes A163, A164, A165 (Circuit Failure) — Alarm codes A163, A164, and A165 are for circuits A, B, and C, respectively. These alarms occur when a circuit has 3 strikes. Use the Scrolling Marquee display to reset the alarm. Investigate the alarm that caused the strikes to occur.

Alert Code T179 (Com. Failure with ECB) — This alert occurs when the MBB cannot communicate with the ECB. This is usually caused by a wiring problem. Investigate using the Low Voltage Schematic.

Alert Code T180 (Com. Failure with Economizer Actuator) — This alert occurs when the MBB cannot communicate with the Belimo Actuator. This is usually caused by a wiring problem. Investigate using the Low Voltage Schematic.

Alarm Code A404 (Fire Shutdown) — This alarm occurs when the shutdown input is either open or closed depending upon its configuration. This alarm is usually caused by an auxiliary device that is trying to shut down the unit, e.g., smoke detector. The configuration for this switch input can be found at variable ***Configuration→UNIT→FS.SW***. Verify that the configuration is set correct, verify the wiring and auxiliary device. This alarm resets automatically.

Alert Code T408 (Dirty Air Filter) — This alert occurs when the Filter Status switch senses a plugged filter for 120 continuous seconds after the indoor fan has been running for 10 seconds. Because the Dirty Air Filter switch can be configured normally opened or closed, the switch might be open or closed. The configuration for this switch input can be found at variable ***Configuration→UNIT→FL.SW***. Verify that the configuration is set correct, verify the wiring and filter status switch. The hose should be connected to the low side of the switch. This alert resets automatically.

Alert Code T409 (Fan Status Switch On, Fan Contactor Off) — This alarm occurs when the fan status switch has sensed that the indoor fan has been on for 10 seconds and the indoor fan feedback has determined that the indoor fan should be off. Because the Fan Status switch can be configured normally opened or closed, the switch might be open or closed. The configuration for this switch input can be found at ***Configuration→UNIT→FN.SW***. Verify that the configuration is set correctly. Verify the wiring and fan status switch. The hose should be connected to the high side of the switch. If the IDF is configured to shut down the unit when this alarm occurs (***Configuration→UNIT→IDF.F*** = **YES**), then this alarm can only be reset manually and the unit is shut down. If the IDF is not configured to shut the unit down when this alarm occurs (***Configuration→UNIT→IDF.F*** = **NO**), then this alarm resets automatically and no specific control action is taken.

Alert Code T409 (Fan Status Switch Off, Fan Contactor On) — This alert occurs when the fan status switch has sensed that the indoor fan has been off for 10 seconds and the indoor fan feedback has determined that the indoor fan should be on. Because the Fan Status switch can be configured normally opened or closed, the switch might be open or closed. The configuration for this switch input can be found at ***Configuration→UNIT→FN.SW***. Verify that the configuration is set correctly. Verify the wiring and fan status switch. The hose should be connected to the high side of the switch. If the IDF is configured to shut down the unit down when this alert occurs (***Configuration→UNIT→IDF.F*** = **YES**), then this alarm can only be reset manually and the unit is shut down. If the IDF is not configured to shut the unit down when this alert occurs (***Configuration→UNIT→IDF.F*** = **NO**), then this alert resets automatically and no specific control action is taken.

Alert Code T410 (R-W1 Jumper Not Installed in Spare Temp Mode) — This alert occurs when the control mode is Space Temperature mode via Auto Select or Space Temp Select yet there is no power to W1. Verify that space temperature mode is the desired mode or add jumper between R and W1. This alert resets automatically.

Alert Code T410 (R-W1 Jumper Must be Installed to Run Heat in Service Test) — This alert occurs when a request for a heat output has occurred yet the W1 input is not high. A jumper must be installed between R and W1 when trying to test heat in Service Test. The alert will clear when Service Test is exited or if another Service Test mode is selected. Remove jumper when done using Service Test if the unit is operating with a thermostat. The jumper should only be left in place if the unit is operating with a space temperature probe.

Alert Code T411 (Y2 without Y1) — This alert occurs in Thermostat mode when Y2 is energized and Y1 is not. Verify thermostat and thermostat wiring. When Y2 turns On, the software will behave as if Y1 and Y2 are both On. When Y2 turns Off, the software will behave as if Y1 and Y2 are both Off. This alert resets automatically when Y1 is turned On.

Alert Code T412 (W2 without W1) — This alert occurs in Thermostat mode when W2 is energized and W1 is not. Verify thermostat and thermostat wiring. When W2 turns On, the software will behave as if W1 and W2 are both On. When W2 turns Off, the software will behave as if W1 and W2 are both Off. This alert resets automatically when W1 is turned On.

Alert Code T413 (Y and W Simultaneously) — This alert occurs in Thermostat mode when Y1 or Y2 is energized simultaneously with W1 or W2. Verify thermostat and thermostat wiring. The software will enter either the cooling or heating mode depending upon which input turned on first. This alert resets automatically when Y1 and Y2 are not on simultaneously with W1 and W2.

Alert Code T414 (Economizer Damper Actuator Out of Calibration) — This alert occurs when the economizer range of motion is less than 90 degrees. Initiate economizer calibration (***Service Test→INDP→E.CAL***) using the Service Test menu. The economizer calibration procedure will try to find new maximum open and closed positions. If the alert does not clear automatically after the calibration procedure is complete, investigate what is limiting economizer rotation. This alert resets automatically.

Alert Code T414 (Economizer Damper Actuator Torque Above Load Limit) — This alert occurs when the actuator load is too high. Investigate to determine what is increasing damper load. This alert resets automatically.

Alert Code T414 (Economizer Damper Actuator Hunting Excessively) — This alert occurs when the commanded damper position is changing too rapidly. This alert resets automatically.

Alert Code T414 (Economizer Damper Stuck or Jammed) — This alarm occurs when the actuator senses it can no longer move. Investigate what is stopping the rotation of the actuator and fix. This alert resets automatically.

Alert Code T414 (Economizer Damper Actuator Mechanical Failure) — This alert occurs when the actuator senses a catastrophic failure. Investigate actuator and replace if necessary. This alert resets automatically.

Alert Code T414 (Economizer Damper Actuator Direction Switch Wrong Position) — This alert occurs when the economizer damper direction switch is in the wrong position. The direction switch should be in the clockwise position and the actuator should be mounted so that the CW face of the actuator is accessible. Correct if necessary. This alert clears automatically.

Alert Code T415 (IAQ Input Out of Range) — This alert occurs when the IAQ input is less than 3.5 mA and the sensor is configured as installed. Check sensor and wiring. This alert clears automatically.

Alert Code T416 (OAQ Input Out of Range) — This alert occurs when the OAQ input is less than 3.5 mA and the sensor is configured as installed. Check sensor and wiring. This alert clears automatically.

Cooling Troubleshooting — Use the Scrolling Marquee display or a CCN device to view the cooling status display and the cooling diagnostic display (see Appendix A) for information on the cooling operation. Check the current alarms and alarm history for any cooling alarm codes and correct any causes (see Table 43). Verify any unique control configurations per installed site requirements or accessories. If alarms conditions are corrected and cleared, operation of the compressors and fans may be verified by using the Service Test mode (see page 36 and Table 36). See Table 44 for general cooling service analysis.

Humidi-MiZer™ Troubleshooting — Use the unit Scrolling Marquee display or a CCN device to view the cooling status display and the cooling diagnostic display (see Appendix A) for information on the cooling operation and the related Humidi-MiZer operation. Check the current alarms and alarm history for any cooling alarm codes and correct any causes (see Table 43). Verify any unique control configurations per installed site requirements or accessories. If alarm conditions are corrected and cleared, operation of the compressors, fans, and Humidi-Mizer valves may be verified by using the Service Test mode (see page 36 and Table 36). In addition to general cooling service analysis Table 44, see Table 45 for general Humidi-MiZer service analysis.

Economizer Troubleshooting — Use the unit Scrolling Marquee display or a CCN device to view the economizer status display and the economizer diagnostic display (see Appendix A) for information on the economizer operation. Check the current alarms and alarm history for any economizer alarm codes and correct any causes (see Table 43). Verify any unique control configurations per installed site requirements or accessories. If alarms conditions are corrected and cleared, operation of the economizer may be verified by using the Service Test mode (see Service Test section on page 36 and Table 36). The following steps specify how to test the economizer using the Scrolling Marquee display. See Table 46 for general economizer service analysis.

1. Enter the ***Service Test*** main menu on the display.
2. Enter ***TEST*** and turn ON test mode. A password may be needed in order to turn ON the Service Test. The default password is 1111.
3. Return to the main level of ***Service Test***.
4. Enter the ***INDP*** submenu and enter an initial value for ***ECON***. This will drive the economizer damper to the specified position. Continue to adjust the ***ECON*** value to make sure the economizer opens and closes.
5. Because of a mechanical problem with the economizer, the actuator might acquire a new degree of rotation which is less than 90 degrees. If this occurs, a "T414 Economizer Damper Actuator Out of Calibration" alert will be generated. This alert can only occur if the economizer is using digital communications (***Configuration →ECON→E.CTL* = 1 or 2**). The economizer calibration procedure (***Service Test→IND.P→E.CAL***) will reconfigure the actuator to the new fully closed and fully open positions. To implement the calibration procedure, change ***E.CAL*** from OFF to ON. ***E.CAL*** will remain ON as long as the calibration procedure is being implemented (as long as 5 minutes). During the calibration procedure the actuator will close fully and then open fully. After the calibration is complete, the degree of rotation should be greater than 90 degrees, causing the T414 alert to clear. If the T414 alert does not clear, check the economizer damper for other mechanical problems.
6. Return to ***Service Test→TEST*** and turn OFF test mode. This will cause the unit to return to normal operation.

Table 44 — Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and Fan Will Not Start.	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped. Check CB1, CB2, and CB3.	Replace fuse or reset circuit breaker.
	Disconnect off.	Power disconnect.
	Compressor time guard to prevent short cycling.	Check using *Comfort*Link™ Scrolling Marquee.
	Thermostat or occupancy schedule set point not calling for Cooling.	Check using *Comfort*Link Scrolling Marquee.
	Outdoor temperature too low.	Check Compressor Lockout Temperature using *Comfort*Link Scrolling Marquee.
	Active alarm.	Check active alarms using *Comfort*Link Scrolling Marquee.
Compressor Cycles (other than normally satisfying thermostat).	Insufficient line voltage.	Determine cause and correct.
	Active alarm.	Check active alarms using *Comfort*Link Scrolling Marquee.
Compressor Operates Continuously.	Unit undersized for load.	Decrease load or increase 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 Condenser Pressures.	Loose condenser thermistors.	Tighten thermistors.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharge.	Recover excess refrigerant.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line and insulate. 2. Replace TXV (and filter drier) if stuck open or closed.
	Condenser air restricted or air short cycling.	Determine cause and correct.
	Restriction in liquid tube.	Remove restriction.
Condenser Fans Not Operating.	No Power to contactors.	Fuse blown or plug at motor loose.
Excessive Suction Pressure.	High heat load.	Check for sources and eliminate
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line and insulate. 2. Replace TXV (and filter drier) if stuck open or closed.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction Pressure Too Low.	Dirty air filters.	Replace air filters.
	Low refrigerant charge.	Check pressure, locate leak, repair, evacuate, and recharge.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line and insulate. 2. Replace TXV (and filter drier) if stuck open or closed.
	Insufficient evaporator airflow.	Check belt tension. Check for other restrictions.
	Temperature too low in conditioned area (low return-air temperature).	Reset thermostat or occupancy schedule.

LEGEND

CB — Circuit Breaker
TXV — Thermostatic Expansion Valve

Table 45 — Humidi-MiZer™ Service Analysis

PROBLEM	CAUSE	REMEDY
Subcooling Reheat Mode Will Not Activate.	General cooling mode problem.	See Cooling Service Analysis (Table 44).
	No dehumidification demand.	See No Dehumidification Demand, below.
	Circuit RH1 valve is not open.	See RH1 Valve Operation, below.
Hot Gas Reheat Mode Will Not Activate.	General cooling mode problem.	See Cooling Service Analysis (Table 44).
	No dehumidification demand.	See No Dehumidification Demand, below.
	Circuit RH1 valve is not open.	See RH1 Valve Operation, below.
	Circuit RH2 valve is not open.	See RH2 Valve Operation, below.
	Outdoor temperature too low.	Check Reheat2 Circuit Limit Temperatures (Configuration→ HMZR→RA.LO and RB.LO) using *Comfort*Link™ Scrolling Marquee.
No Dehumidification Demand.	Relative humidity setpoint is too low — Humidistat	Check/reduce setting on accessory humidistat.
	Relative humidity setpoint is too low — RH sensor.	Check Space RH Setpoint (Setpoints→RH.SP) using *Comfort*Link Scrolling Marquee.
	Software configuration error for accessory humidistat.	Check Space Humidity Switch (Configuration→UNIT→RH.SW) using *Comfort*Link Scrolling Marquee.
	Software configuration error for accessory humidity sensor.	Check RH Sensor on OAQ Input (Configuration→UNIT→RH.S) using *Comfort*Link Scrolling Marquee.
	No humidity signal.	Check wiring. Check humidistat or humidity sensor.
RH1 Valve Operation.	No 24V signal to input terminals.	Check using Cool→Reheat1 Valve Test (Service Test→HMZR→CRC) using *Comfort*Link Scrolling Marquee.
		Check Wiring.
		Check transformer and circuit beaker or fuses.
	Solenoid coil burnout.	Check continuous over-voltage is less than 10%.
		Check under-voltage is less than 15%.
		Check for missing coil assembly parts.
		Check for damaged valve enclosing tube.
	Stuck valve.	Replace valve. Replace filter drier.
RH2 Valve Operation. (NOTE: Normally Closed When Deenergized)	No 24V signal to input terminals.	Check using Cool→Reheat1 Valve Test (Service Test→HMZR →RHV.A or RHV.B) using *Comfort*Link Scrolling Marquee.
		Check MBB relay output.
		Check wiring.
		Check transformer and circuit breaker or fuses.
	Solenoid coil burnout.	Check continuous over-voltage is less than 10%.
		Check under-voltage is less than 15%.
		Check for missing coil assembly parts.
		Check for damaged valve enclosing tube.
	Stuck valve.	Replace valve. Replace filter drier.
Low Latent Capacity in Subcooling or Hot Gas Reheat Modes.	RH1 valve open or leaking.	See RH1 Valve Operation, above.
Low Sensible Capacity in Normal Cool or Subcooling Reheat Modes.	RH2 valve open or leaking.	See RH2 Valve Operation, above.
Low Suction Pressure and High Superheat During Normal Cool Mode.	General cooling mode problem.	See Cooling Service Analysis (Table 44).
	RH2 valve open or leaking.	See RH2 Valve Operation, above.
Low Suction Pressure	General cooling mode problem.	See Cooling Service Analysis (Table 44).
RH2 Valve Cycling On/Off.	Hot Gas Reheat mode low suction pressure limit.	Normal Operation During Mixed Circuit Subcooling and Hot Gas Reheat Modes at Lower Outdoor Temperatures.
Circuit B Will Not Operate With Circuit A Off.	Normal operation. Motormaster outdoor fan control requires operation of circuit A.	None

LEGEND

CV — Cooling Valve
RH — Relative Humidity

Table 46 — Economizer Service Analysis

PROBLEM	POSSIBLE CAUSE	REMEDY
Damper Does Not Move.	Indoor Fan is off.	Check for proper thermostat connection.
		Unit is not configured for continuous fan operation and the thermostat is not calling for heating or cooling.
		Unit is in Unoccupied mode and there is no call for heating or cooling.
		Tripped circuit breaker.
		No power to the unit.
		Unit is off via CCN command.
	Actuator is unplugged at motor or at economizer board.	Check wiring connections.
	Unit is not configured for economizer.	Configure unit for economizer per the instructions.
	Outdoor-air temperature is above economizer high temperature lockout.	Adjust the high temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Outdoor-air temperature is below economizer low temperature lockout.	Adjust the low temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Communication loss to economizer board.	Check wiring connections.
	Damper is jammed.	Identify the obstruction and safely remove.
Economizer Operation is Limited to Minimum Position.	Minimum position is set incorrectly.	Adjust minimum position setting.
	Outdoor-air temperature is above economizer high temperature lockout.	Adjust the high temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Outdoor-air temperature is below economizer low temperature lockout.	Adjust the low temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Outdoor-air thermistor is faulty.	Replace outdoor-air thermistor.
	Low suction pressure problem with a compressor.	Economizer is operating correctly, identify compressor problem.
Economizer Position is Less Than Minimum Position.	IAQ is controlling minimum damper position.	Adjust the IAQ settings if incorrect, otherwise, the economizer is operating correctly.
	Unit is in Unoccupied mode.	Adjust unit occupied schedule if incorrect, otherwise, economizer is operating correctly.
Economizer Does Not Return to Minimum Position.	Unit is operating under free cooling.	Economizer is operating correctly.
Damper Does Not Close on Power Loss.	Damper is jammed.	Identify the obstruction and safely remove.
Outdoor Damper Does Not Fully Close at 0% or Fully Open at 100%.	Economizer actuator is out of calibration.	Enter Service Test mode and run the Calibrate Economizer (E.CAL) procedure.

LEGEND

CCN — Carrier Comfort Network®
IAQ — Indoor Air Quality

Heating Troubleshooting — Use the unit Scrolling Marquee display or a CCN device to view the heating status display and the heating diagnostic display (see Appendix A) for information on the heating operation. Check the current alarms and alarm history for any heating alarm codes and correct any causes (see Table 44). Verify any unique control configurations per installed site requirements or accessories. If alarms conditions are corrected and cleared, operation of the heat stages and indoor fan may be verified by using the Service Test mode (see page 36 and Table 36).

GAS HEAT (48PG UNITS) — See Table 47 for general gas heating service analysis. See Fig. 12 for service analysis of the IGC board logic. Check the status LED on the IGC board for any flashing alarm codes and correct any causes (see Table 48).

ELECTRIC HEAT (50PG UNITS) — See Table 49 for electric heating service analysis.

Phase Loss Protection — The phase loss protection option will monitor the three-phase electrical system to provide phase reversal and phase loss protection.

PHASE REVERSAL PROTECTION — If the control senses an incorrect phase relationship, the relay (K1) will be de-energized (opening its contact). If the phase relationship is correct, the relay will be energized. The control has a self-bypass function after a pre-set time. If the control determines that the three phases stay in a correct relationship for 10 consecutive minutes, the relay will stay energized regardless of the phase sequence of three inputs as long as 24-vac control voltage is applied. This self-bypass function will be reset if all three phases are restored in a phase loss event.

PHASE LOSS PROTECTION — If the reverse rotation board senses any one of the three phase inputs has no AC voltage, the relay will be deenergized (opening its contact). This protection is always active as long as 24-vac control voltage is applied, and is not affected by the self by-pass function of the phase sequence monitoring function. However, in the event of phase loss, the relay will be re-energized only if all three phases are restored and the three phases are in the correct sequence.

A red LED is provided to indicate the function of the board. See the table below.

LED STATUS	FUNCTION
On Continuously	Relay contact closed (normal operation).
Blinking	Relay contact open (phase loss or phase reversal has occurred) — No power will be supplied to the control system.
Off	24 vac control power not present (off).

Thermistor Troubleshooting — The electronic control uses thermistors to sense temperatures used to control operation of the unit. Resistances at various temperatures are listed in Tables 50 and 51. Thermistor pin connection points are shown in the Major System Components section. The general locations of the thermistors are shown the Major System Components section.

AIR TEMPERATURES — Air temperatures are measured with 10 kilo-ohm thermistors. This includes supply-air temperature (SAT), outdoor-air temperature (OAT), space temperature sensors (T55, T56, T58), and return air temperature (RAT).

The supply air temperature (SAT) and outdoor air temperature (OAT) thermistors use a snap-mount to attach through the unit sheet metal panels. The snap-mount tabs must be flattened on the tip end of the sensor to release for removal from the panel. See Fig. 13. To reinstall, make sure the snap-mount tabs extend out.

REFRIGERANT TEMPERATURES — Condenser coil temperatures are measured with 5 kilo-ohm thermistors. These measurements provide an approximate saturated condensing temperature for each circuit (SCT.A, SCT.B). Ensure that thermistors are placed at the correct location and are snapped securely over the return bend so that contact is made between the thermistor and the tube.

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

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the Main Base Board (see Major System Components section).
2. Using the voltage reading obtained, read the sensor temperature from Tables 50 and 51.
3. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature-measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, within 5° F if care was taken in applying thermocouple and taking readings.

Table 47 — Gas Heating Service Analysis

PROBLEM	CAUSE	REMEDY
Burners Will Not Ignite.	Active alarm.	Check active alarms using *Comfort*Link™ Scrolling Marquee.
	No power to unit.	Check power supply, fuses, wiring, and circuit breakers.
	No power to IGC (Integrated Gas Control).	Check fuses and plugs.
	Heaters off due to time guard to prevent short cycling.	Check using *Comfort*Link Scrolling Marquee.
	Thermostat or occupancy schedule set point not calling for Cooling.	Check using *Comfort*Link Scrolling Marquee.
	No gas at main burners.	Check gas line for air and purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before attempting to re-light unit.
	Water in gas line.	Drain water and install drip.
Inadequate Heating.	Dirty air filters.	Replace air filters.
	Gas input too low.	Check gas pressure at manifold. Refer to gas valve adjustment on page 90.
	Thermostat or occupancy schedule set point only calling for W1.	Allow time for W2 to energize.
	Unit undersized for load.	Decrease load or increase of size of unit.
	Restricted airflow.	Remove restriction.
	Too much outdoor air.	Check economizer position and configuration. Adjust minimum position using *Comfort*Link Scrolling Marquee.
	Limit switch cycles main burners.	Check rotation of blower, thermostat heat anticipator settings, and temperature rise of unit. Adjust as needed.
Poor Flame Characteristics.	Incomplete combustion (lack of combustion air) results in: Aldehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary.
		Cracked heat exchanger, replace.
		Unit is over-fired, reduce input. Adjust gas line or manifold pressure.
		Check vent for restriction. Clean as necessary.
		Check orifice to burner alignment.
Burners Will Not Turn Off.	Unit is in Minimum on-time.	Check using *Comfort*Link Scrolling Marquee.
	Unit running in Service Test mode.	Check using *Comfort*Link Scrolling Marquee.
	Main gas valve stuck.	Turn off gas supply and unit power. Replace gas valve.

Table 48 — IGC Board LED Alarm Codes

LED FLASH CODE	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
On	Normal Operation	—	—	—
Off	Hardware Failure	No gas heating.	—	Loss of power to the IGC. Check 5 amp fuse on IGC, power to unit, 24V circuit breaker, transformer, and wiring to the IGC.
1 Flash	Indoor Fan On/Off Delay Modified	5 seconds subtracted from On delay. 5 seconds added to Off delay (3 min max).	Power reset.	High temperature limit switch opens during heat exchanger warm-up period before fan-on delay expires. High temperature limit switch opens within 10 minutes of heat call (W) Off. See Limit Switch Fault.
2 Flashes	Limit Switch Fault	Gas valve and igniter Off. Indoor fan and inducer On.	Limit switch closed, or heat call (W) Off.	High temperature limit switch is open. Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is within the range on the unit nameplate. Check wiring and limit switch operation.
3 Flashes	Flame Sense Fault	Indoor fan and inducer On.	Flame sense normal. Power reset for LED reset.	The IGC sensed a flame when the gas valve should be closed. Check wiring, flame sensor, and gas valve operation.
4 Flashes	Four Consecutive Limit Switch Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	4 consecutive limit switch faults within a single call for heat. See Limit Switch Fault.
5 Flashes	Ignition Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	Unit unsuccessfully attempted ignition for 15 minutes. Check igniter and flame sensor electrode spacing, gaps, etc. Check flame sense and igniter wiring. Check gas valve operation and gas supply.
6 Flashes	Induced Draft Motor Fault	If heat off: no gas heating. If heat on: gas valve Off and inducer On.	Inducer sense normal, or heat call (W) Off.	Inducer sense On when heat call Off, or inducer sense Off when heat call On. Check wiring, voltage, and operation of IGC motor. Check speed sensor wiring to IGC.
7 Flashes	Rollout Switch Lockout	Gas valve and igniter Off. Indoor fan and inducer On.	Power reset.	Rollout switch has opened. Check gas valve operation. Check induced-draft blower wheel is properly secured to motor shaft.
8 Flashes	Internal Control Lockout	No gas heating.	Power reset.	IGC has sensed internal hardware or software error. If fault is not cleared by resetting 24 v power, replace the IGC.
9 Flashes	Temporary Software Lockout	No gas heating.	1 hour auto reset, or power reset.	Electrical interference is disrupting the IGC software.

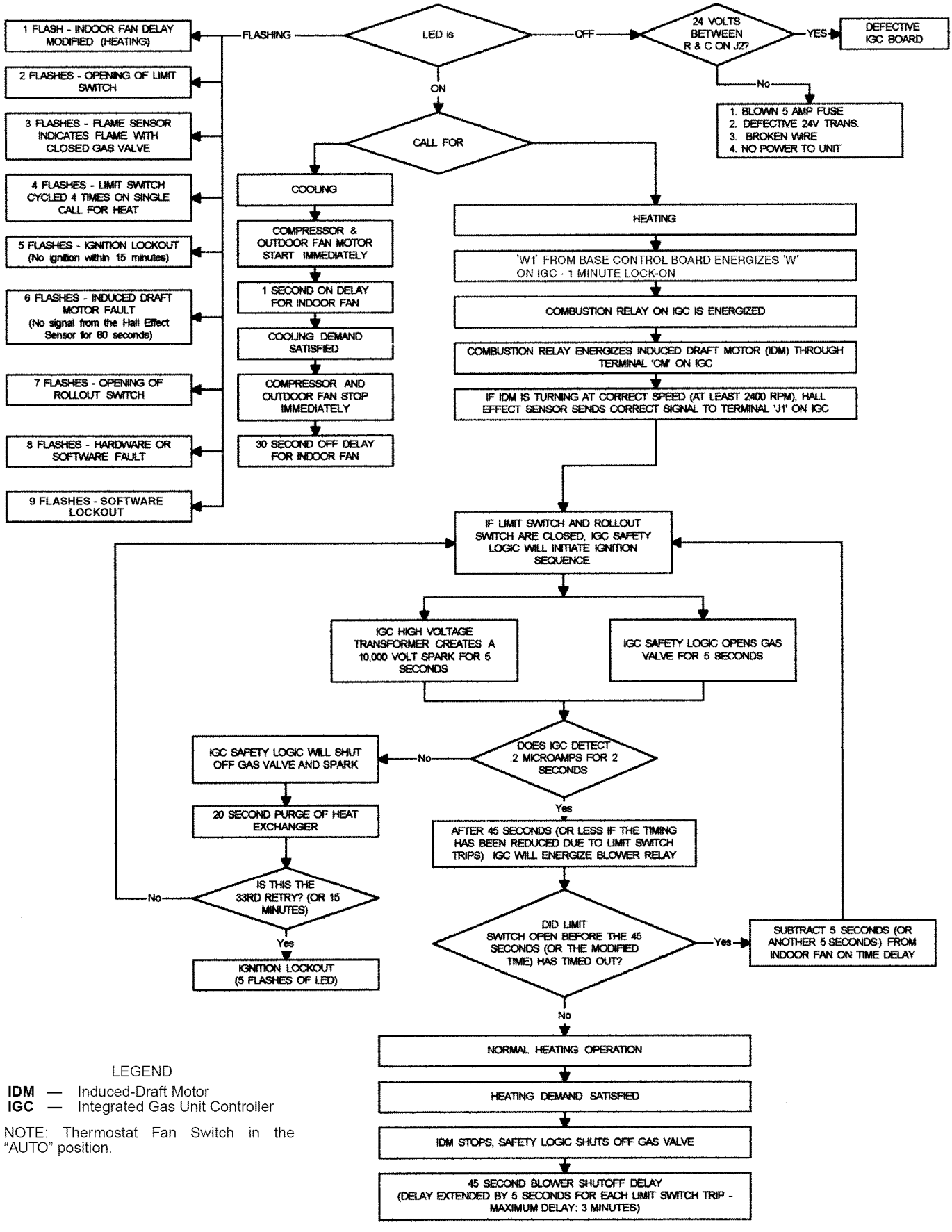
LEGEND

IGC — Integrated Gas Unit Control
LED — Light-Emitting Diode

NOTES:
1. There is a 3-second pause between alarm code displays.
2. If more than one alarm code exists, all applicable alarm codes will be displayed in numerical sequence.
3. Alarm codes on the IGC will be lost if power to the unit is interrupted.

Table 49 — Electric Heat Service Analysis

PROBLEM	CAUSE	REMEDY
Heat Will Not Turn On.	Active alarm.	Check active alarms using *Comfort*Link™ Scrolling Marquee.
	No power to unit.	Check power supply, fuses, wiring, and circuit breakers.
	Unit is in minimum heat off-time, or minimum cool-heat changeover time.	Check using *Comfort*Link Scrolling Marquee.
	Thermostat or occupancy schedule setpoint not calling for heating.	Check using *Comfort*Link Scrolling Marquee.
	Heat forced off in Service Test mode.	Check using *Comfort*Link Scrolling Marquee. Turn Service Test mode off.
	No 24 vac at heater contactor.	Check transformer and circuit breaker.
		Check auto-reset limit switches on heater.
		Check manual-reset limit switch (LS) on heater.
	Open temperature limit switch on heater.	Check minimum airflow. Check limit switch when it is cool, replace if open.
Inadequate Heating.	Dirty air filters.	Replace air filters.
	Thermostat or occupancy schedule setpoint only calling for W1.	Allow time for W2 to energize.
	Heat undersized for load.	Decrease load or increase size of heater.
	Restricted airflow	Remove restriction.
	Too much outdoor air.	Check economizer position and configuration. Adjust minimum position.
	Limit switch cycles heaters.	Check rotation of blower and minimum airflow.
	Bad heater elements.	Power off unit and remove high voltage wires. Check resistance of element, replace if open.
Heat Will Not Turn Off.	Unit is in minimum heat on-time.	Check using *Comfort*Link Scrolling Marquee.
	Thermostat or occupancy schedule setpoint still calling for heating.	Check using *Comfort*Link Scrolling Marquee.
	Heat forced on in Service Test mode.	Check using *Comfort*Link Scrolling Marquee. Turn Service Test mode off.
	Heater contactor failed.	Power off unit. Check contactor and replace if closed.



LEGEND

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

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

Fig. 12 — IGC Service Analysis Logic

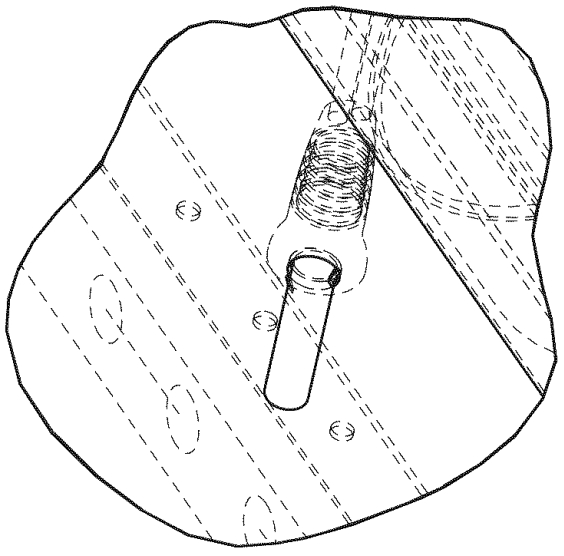


Fig. 13 — SAT and OAT Thermistor Mounting

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

SENSOR TRIM — Corrective offsets can be applied to the space temperature and the supply air temperature sensor readings. These corrections are set in the ***Configuration→ TRIM*** menu for the display, or in the ***Maintenance→TRIM*** table for CCN. See the Indoor Air Quality section for available adjustments to IAQ and OAQ sensor readings. The space temperature may be corrected by entering either a calibration temperature value in ***SPT.C***, or an offset temperature value in ***SPT.T***. The supply-air temperature may be corrected by entering either a calibration temperature value in ***SAT.C***, or an offset temperature value in ***SAT.T***. Temperature corrections should only be made if sensor readings are compared to an accurate reference temperature measurement device.

Transducer Troubleshooting — The electronic control uses suction pressure transducers to measure the suction pressure of the refrigerant circuits. The pressure/voltage characteristics of these transducers are in shown in Table 52. 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 have their value forced through CCN or 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. Input and output points that may be forced are indicated as 'forcible' in the write status column of the display and CCN tables.

If the user needs to force a variable, follow the same process as when editing a configuration parameter. A forced variable will be displayed on the Scrolling Marquee with a blinking period "." following its value. A forced value on Navigator™ accessory is indicated with a blinking "f". A forced value on CCN devices is indicated with "Control" if forced at the unit display, or "Supervisor" if forced via CCN. To remove a local force with the Scrolling Marquee, select the point with the ENTER key and then press the up-arrow and down-arrow keys simultaneously.

NOTE: In the case of a control power reset, any force in effect at the time of power reset will be cleared.

Table 50 — Temperature (°F) vs Resistance/Voltage Drop Values for OAT, SAT, and SPT Thermistors (10K at 25 C Resistors)

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

Table 51 — Temperature (°F) vs. Resistance/Voltage Drop Values for SCT Sensors (5K at 25 C Resistors)

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	3.699	98,010
–24	3.689	94,707
–23	3.679	91,522
–22	3.668	88,449
–21	3.658	85,486
–20	3.647	82,627
–19	3.636	79,871
–18	3.624	77,212
–17	3.613	74,648
–16	3.601	72,175
–15	3.588	69,790
–14	3.576	67,490
–13	3.563	65,272
–12	3.550	63,133
–11	3.536	61,070
–10	3.523	59,081
–9	3.509	57,162
–8	3.494	55,311
–7	3.480	53,526
–6	3.465	51,804
–5	3.450	50,143
–4	3.434	48,541
–3	3.418	46,996
–2	3.402	45,505
–1	3.386	44,066
0	3.369	42,679
1	3.352	41,339
2	3.335	40,047
3	3.317	38,800
4	3.299	37,596
5	3.281	36,435
6	3.262	35,313
7	3.243	34,231
8	3.224	33,185
9	3.205	32,176
10	3.185	31,202
11	3.165	30,260
12	3.145	29,351
13	3.124	28,473
14	3.103	27,624
15	3.082	26,804
16	3.060	26,011
17	3.038	25,245
18	3.016	24,505
19	2.994	23,789
20	2.972	23,096
21	2.949	22,427
22	2.926	21,779
23	2.903	21,153
24	2.879	20,547
25	2.856	19,960
26	2.832	19,393
27	2.808	18,843
28	2.784	18,311
29	2.759	17,796
30	2.735	17,297
31	2.710	16,814
32	2.685	16,346
33	2.660	15,892
34	2.634	15,453
35	2.609	15,027
36	2.583	14,614
37	2.558	14,214
38	2.532	13,826
39	2.506	13,449
40	2.480	13,084
41	2.454	12,730
42	2.428	12,387
43	2.402	12,053
44	2.376	11,730
45	2.349	11,416
46	2.323	11,112
47	2.296	10,816
48	2.270	10,529
49	2.244	10,250
50	2.217	9,979
51	2.191	9,717
52	2.165	9,461
53	2.138	9,213
54	2.112	8,973
55	2.086	8,739
56	2.060	8,511
57	2.034	8,291
58	2.008	8,076
59	1.982	7,866
60	1.956	7,665
61	1.930	7,468
62	1.905	7,277
63	1.879	7,091
64	1.854	6,911
65	1.829	6,735
66	1.804	6,564
67	1.779	6,399
68	1.754	6,238
69	1.729	6,081
70	1.705	5,929
71	1.681	5,781
72	1.656	5,637
73	1.632	5,497
74	1.609	5,361
75	1.585	5,229
76	1.562	5,101
77	1.538	4,976
78	1.516	4,855
79	1.493	4,737
80	1.470	4,622
81	1.448	4,511
82	1.426	4,403
83	1.404	4,298
84	1.382	4,196
85	1.361	4,096
86	1.340	4,000
87	1.319	3,906
88	1.298	3,814
89	1.278	3,726
90	1.257	3,640
91	1.237	3,556
92	1.217	3,474
93	1.198	3,395
94	1.179	3,318
95	1.160	3,243
96	1.141	3,170
97	1.122	3,099
98	1.104	3,031
99	1.086	2,964
100	1.068	2,898
101	1.051	2,835
102	1.033	2,773
103	1.016	2,713
104	0.999	2,655
105	0.983	2,597
106	0.966	2,542
107	0.950	2,488
108	0.934	2,436
109	0.918	2,385
110	0.903	2,335
111	0.888	2,286
112	0.873	2,239
113	0.858	2,192
114	0.843	2,147
115	0.829	2,103
116	0.815	2,060
117	0.801	2,018
118	0.787	1,977
119	0.774	1,937
120	0.761	1,898
121	0.748	1,860
122	0.735	1,822
123	0.723	1,786
124	0.710	1,750
125	0.698	1,715
126	0.686	1,680
127	0.674	1,647
128	0.663	1,614
129	0.651	1,582
130	0.640	1,550
131	0.629	1,519
132	0.618	1,489
133	0.608	1,459
134	0.597	1,430
135	0.587	1,401
136	0.577	1,373
137	0.567	1,345
138	0.557	1,318
139	0.548	1,291
140	0.538	1,265
141	0.529	1,240
142	0.520	1,214
143	0.511	1,190
144	0.502	1,165
145	0.494	1,141
146	0.485	1,118
147	0.477	1,095
148	0.469	1,072
149	0.461	1,050
150	0.453	1,029
151	0.445	1,007
152	0.438	986
153	0.430	965
154	0.423	945
155	0.416	925
156	0.408	906
157	0.402	887
158	0.395	868
159	0.388	850
160	0.381	832
161	0.375	815
162	0.369	798
163	0.362	782
164	0.356	765
165	0.350	750
166	0.344	734
167	0.339	719
168	0.333	705
169	0.327	690
170	0.322	677
171	0.317	663
172	0.311	650
173	0.306	638
174	0.301	626
175	0.296	614
176	0.291	602
177	0.286	591
178	0.282	581
179	0.277	570
180	0.272	561
181	0.268	551
182	0.264	542
183	0.259	533
184	0.255	524
185	0.251	516
186	0.247	508
187	0.243	501
188	0.239	494
189	0.235	487
190	0.231	480
191	0.228	473
192	0.224	467
193	0.220	461
194	0.217	456
195	0.213	450
196	0.210	445
197	0.206	439
198	0.203	434
199	0.200	429
200	0.197	424
201	0.194	419
202	0.191	415
203	0.188	410
204	0.185	405
205	0.182	401
206	0.179	396
207	0.176	391
208	0.173	386
209	0.171	382
210	0.168	377
211	0.165	372
212	0.163	367
213	0.160	361
214	0.158	356
215	0.155	350
216	0.153	344
217	0.151	338
218	0.148	332
219	0.146	325
220	0.144	318
221	0.142	311
222	0.140	304
223	0.138	297
224	0.135	289
225	0.133	282

Table 52 — Pressure (psig) vs. Voltage Drop Values for Suction Pressure Transducers

PRESSURE (psig)	VOLTAGE DROP (V)	PRESSURE (psig)	VOLTAGE DROP (V)	PRESSURE (psig)	VOLTAGE DROP (V)	PRESSURE (psig)	VOLTAGE DROP (V)
0	0.465	68	1.135	136	1.804	204	2.474
2	0.485	70	1.154	138	1.824	206	2.493
4	0.505	72	1.174	140	1.844	208	2.513
6	0.524	74	1.194	142	1.863	210	2.533
8	0.544	76	1.214	144	1.883	212	2.553
10	0.564	78	1.233	146	1.903	214	2.572
12	0.583	80	1.253	148	1.922	216	2.592
14	0.603	82	1.273	150	1.942	218	2.612
16	0.623	84	1.292	152	1.962	220	2.631
18	0.642	86	1.312	154	1.982	222	2.651
20	0.662	88	1.332	156	2.001	224	2.671
22	0.682	90	1.351	158	2.021	226	2.690
24	0.702	92	1.371	160	2.041	228	2.710
26	0.721	94	1.391	162	2.060	230	2.730
28	0.741	96	1.410	164	2.080	232	2.749
30	0.761	98	1.430	166	2.100	234	2.769
32	0.780	100	1.450	168	2.119	236	2.789
34	0.800	102	1.470	170	2.139	238	2.809
36	0.820	104	1.489	172	2.159	240	2.828
38	0.839	106	1.509	174	2.178	242	2.848
40	0.859	108	1.529	176	2.198	244	2.868
42	0.879	110	1.548	178	2.218	246	2.887
44	0.898	112	1.568	180	2.237	248	2.907
46	0.918	114	1.588	182	2.257	250	2.927
48	0.938	116	1.607	184	2.277	252	2.946
50	0.958	118	1.627	186	2.297	254	2.966
52	0.977	120	1.647	188	2.316	256	2.986
54	0.997	122	1.666	190	2.336	258	3.005
56	1.017	124	1.686	192	2.356	260	3.025
58	1.036	126	1.706	194	2.375	262	3.045
60	1.056	128	1.726	196	2.395	264	3.065
62	1.076	130	1.745	198	2.415	266	3.084
64	1.095	132	1.765	200	2.434	268	3.104
66	1.115	134	1.785	202	2.454	270	3.124

MAJOR SYSTEM COMPONENTS

General — The 48/50PG single-package rooftop units contain the *Comfort*Link™ electronic control system that monitors all operations of the rooftop. The control system is composed of several main control components and available factory-installed options or field-installed accessories as listed in sections below. See Fig. 14-19 for the control and power schematics. Figures 20 and 21 show the layout of the control box, unit, and thermistor and transducer locations.

Main Base Board (MBB) — See Fig. 22 and Table 53. The MBB is the center of the *Comfort*Link control system. It contains the major portion of the operating software and controls the operation of the unit. The MBB continuously monitors input/output channel information received from its inputs and from the Economizer Control Board (ECB). The MBB receives inputs from thermistors and transducers. The MBB also receives the Current Sensor inputs for compressors and other discrete or digital inputs. The MBB reads space temperature (SPT) from either a T-55, T-56 or T-58 device and space temperature offset (SPTO) from a T-56 device. See Field-Installed Accessories section on page 82. The MBB controls 9 relays.

NOTE: The Main Base Board (MBB) has a 3-position instance jumper that is factory set to '1'. **Do not change this setting.**

Economizer Control Board (ECB) — The ECB controls the economizer actuator. See Fig. 23 and Table 54. The control signal from the ECB uses either the MFT (Multi-Function Technology) communication protocol or a 4 to 20 mA output signal as defined by the configuration ***Configuration→ECON→E.CTL***. The ECB has inputs for Indoor Air Quality (IAQ), Outdoor Air Quality (OAQ), and enthalpy. It also controls two power exhaust outputs.

By digitally communicating with the ECB, the economizer actuator is able to provide the damper position and diagnostic information to the *Comfort*Link controller. The damper position is displayed at ***Outputs→ECON→EC.AP***. Diagnostic information is displayed via Alert T414. More information about these alarms is contained in the Alarms and Alerts section.

NOTE: The Economizer Control Board (ECB) has a 4-position DIP switch that is factory set to ON (towards the center of the board). **Do not change this setting.**

Integrated Gas Control (IGC) Board — The IGC is provided on gas heat units. See Table 55 and Fig. 24. The IGC controls the direct spark ignition system and monitors the rollout switch, limit switch, and induced-draft motor Hall Effect switch. The IGC is equipped with an LED (light-emitting diode) for diagnostics. See the Troubleshooting section for more information.

Low Voltage Terminal Strip (TB2) — This circuit board provides a connection point between the major control boards and a majority of the field-installed accessories. See Fig. 25 and Table 56. The interface connection for the Carrier Comfort Network® (CCN) communication and interface connection for the Local Equipment Network (LEN) communications are also located on the low voltage terminal strip.

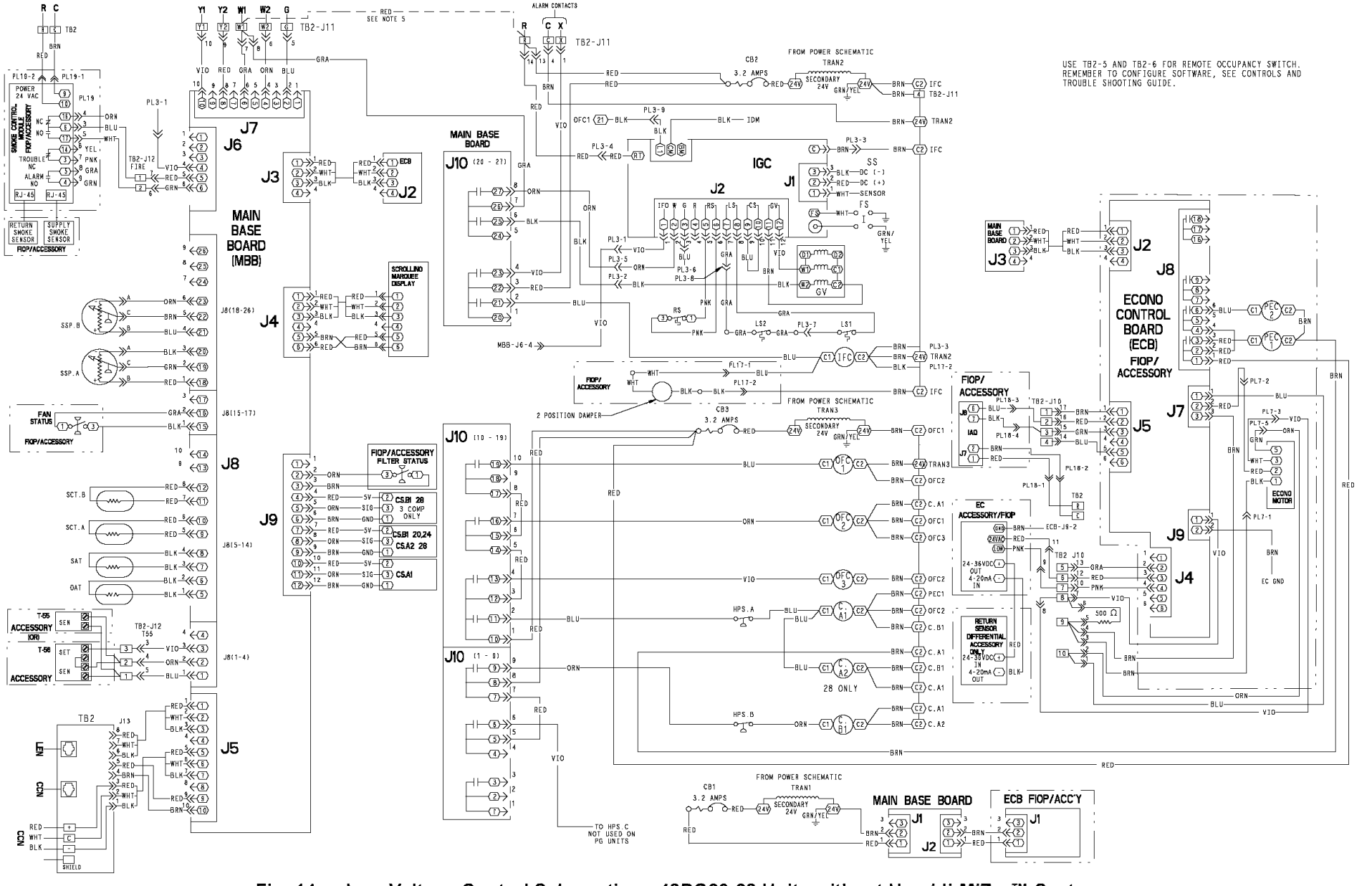


Fig. 14 — Low Voltage Control Schematic — 48PG20-28 Units without Humidi-MiZer™ System

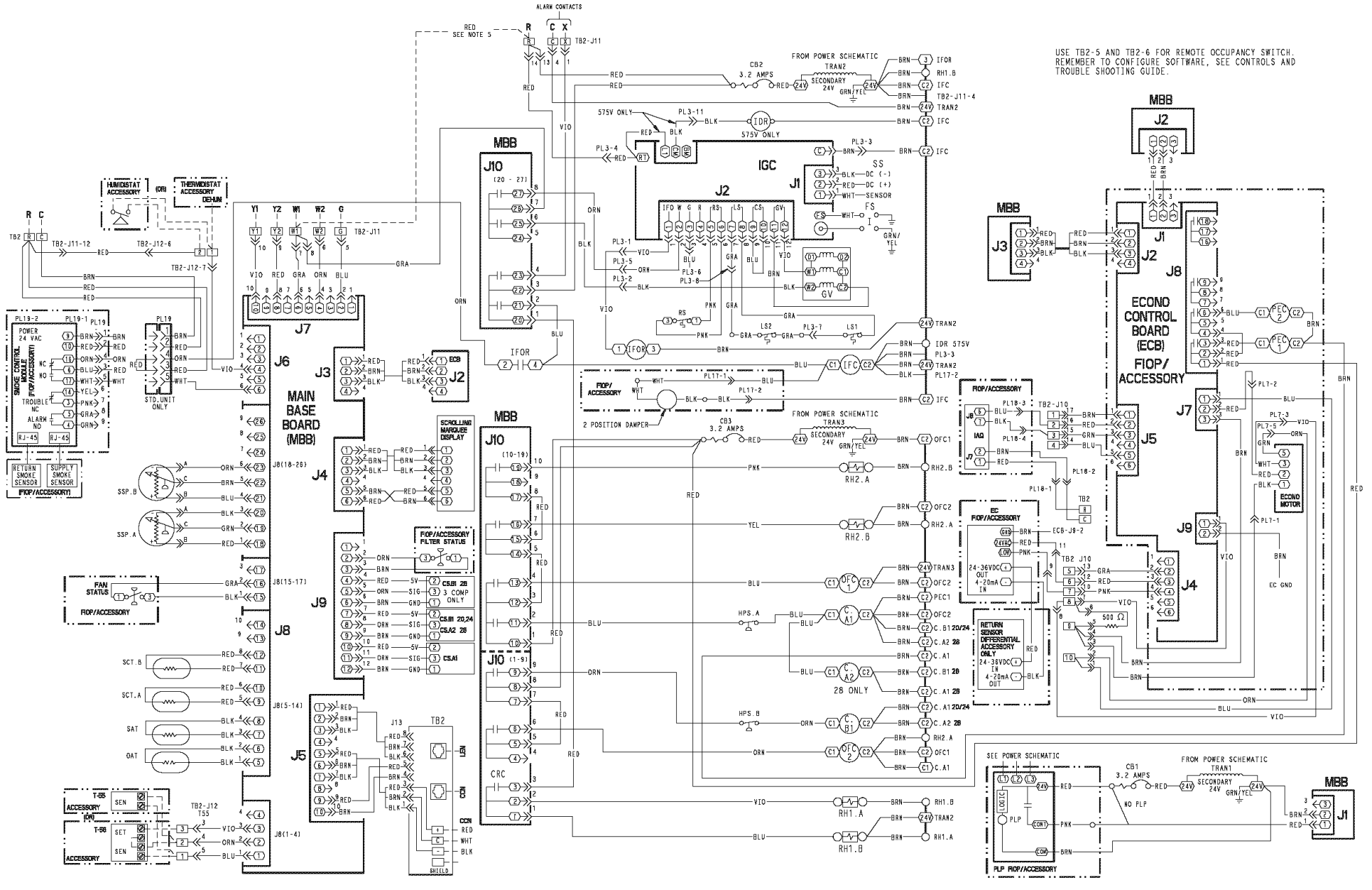


Fig. 15 — Low Voltage Control Schematic — 48PG20-28 Units with Humidi-MiZer™ System

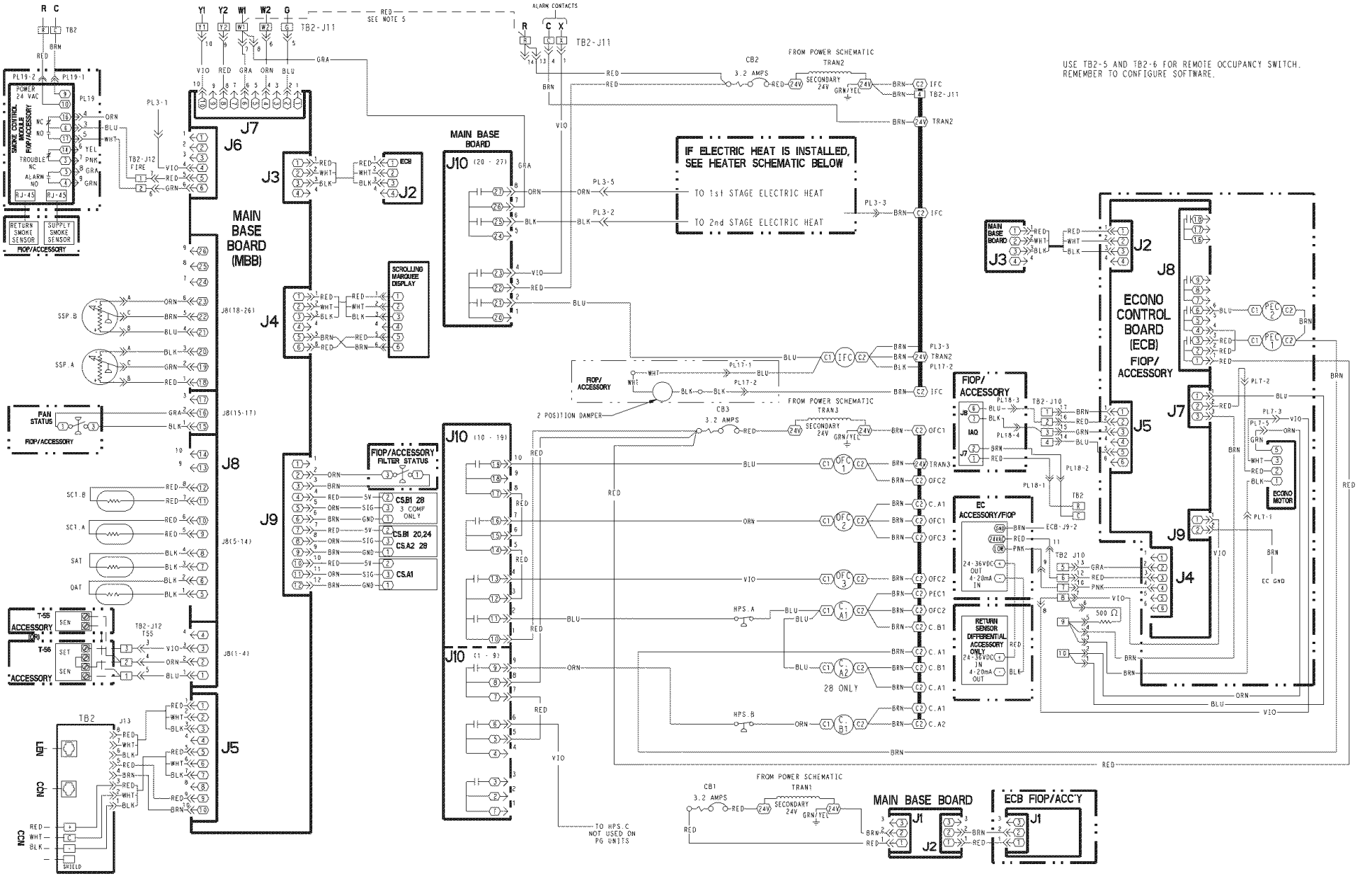


Fig. 16 — Low Voltage Control Schematic — 50PG20-28 Units without Humidi-MiZer™ System

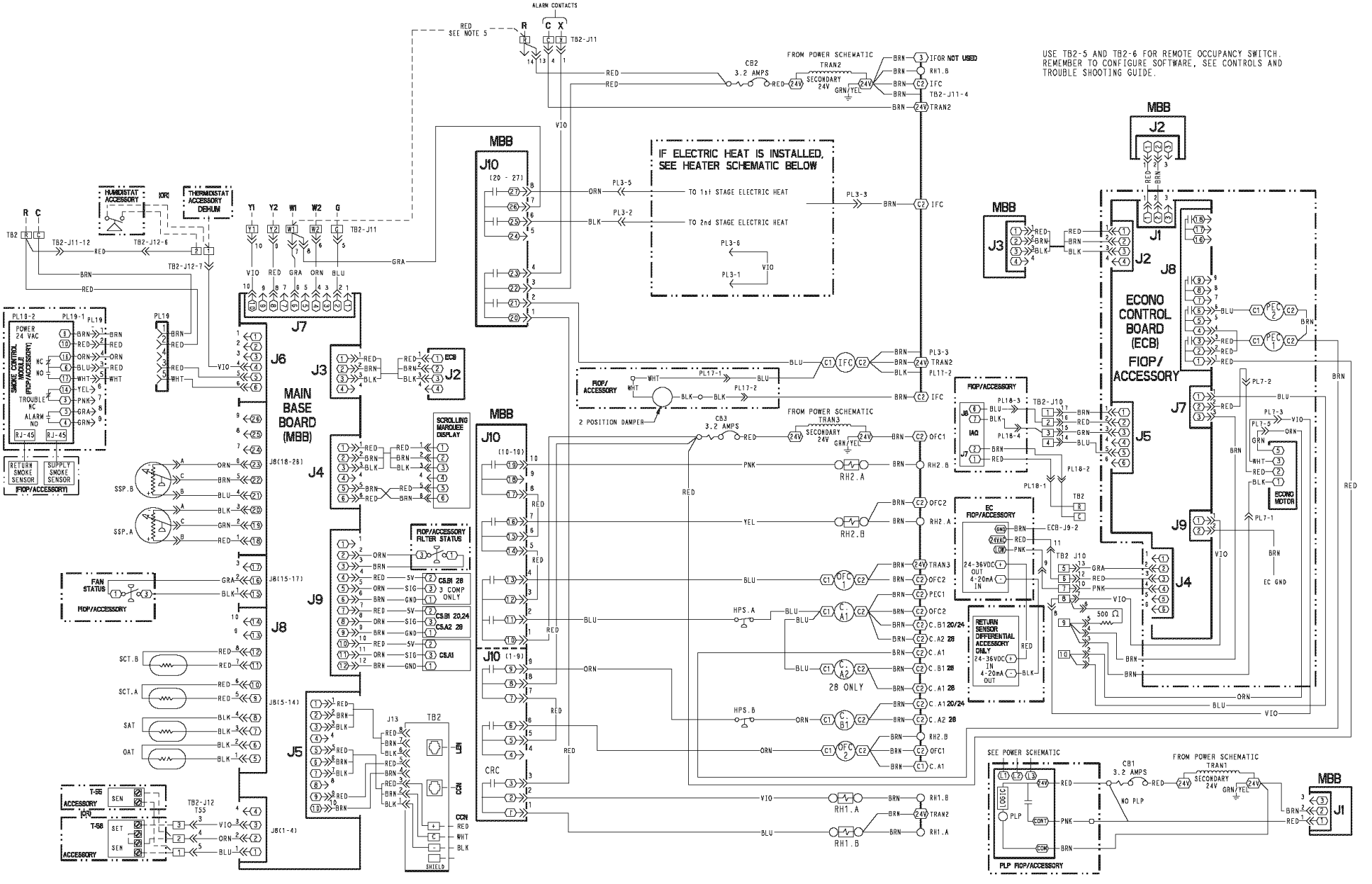


Fig. 17 — Low Voltage Control Schematic — 50PG20-28 Units with Humidi-MiZer™ System

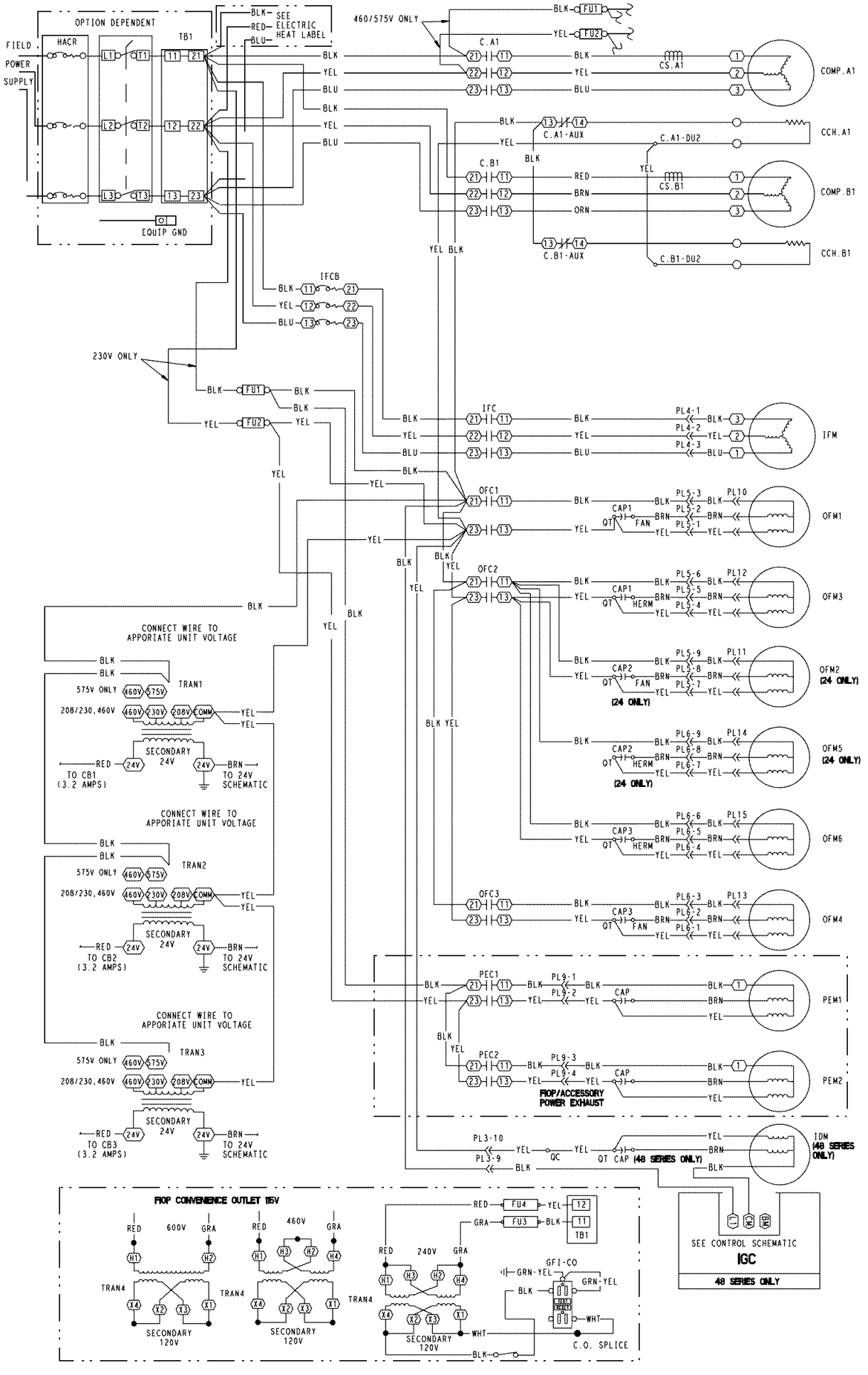


Fig. 18 — Power Schematic — Units without Humidi-MiZer™ System

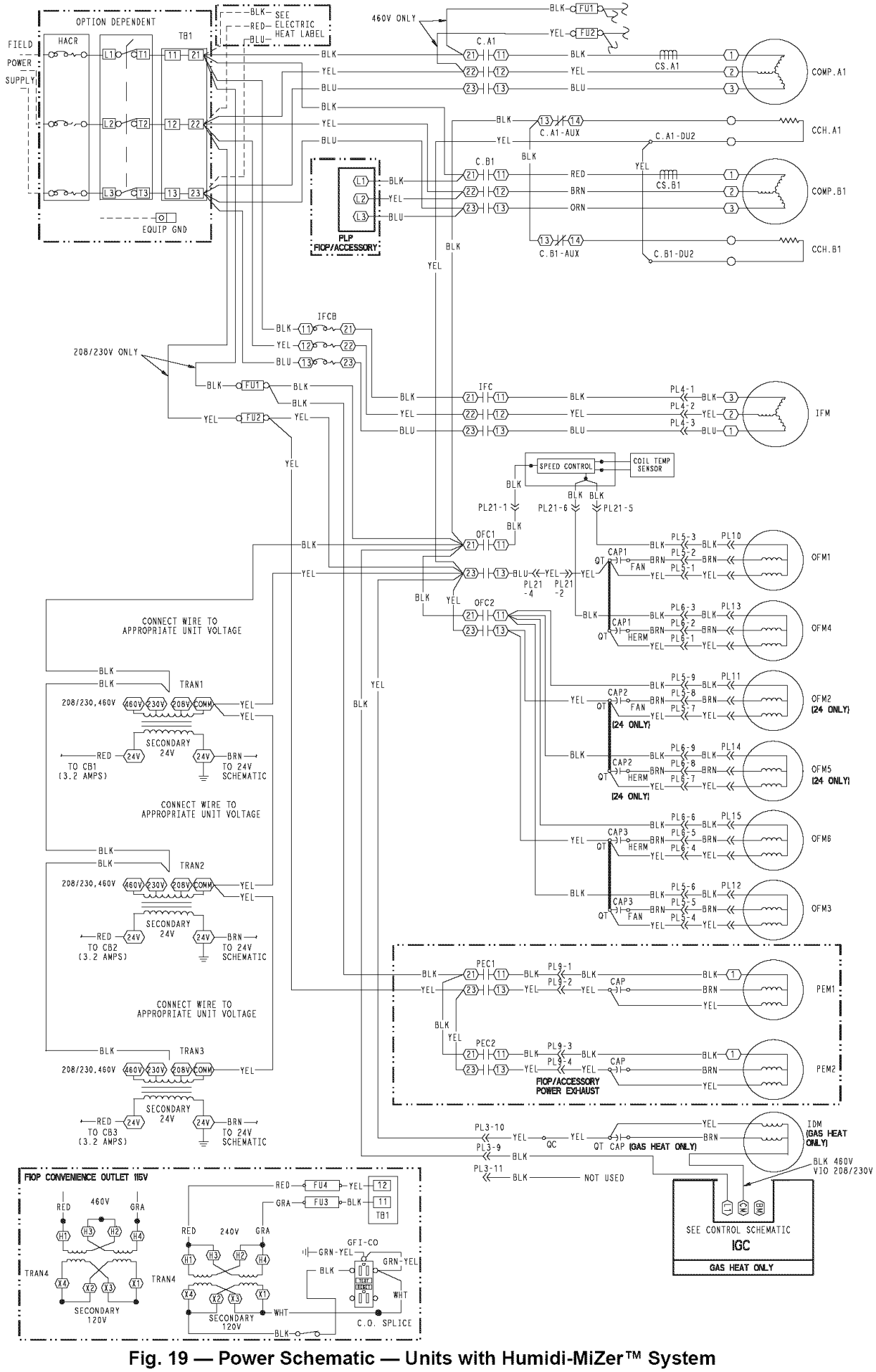
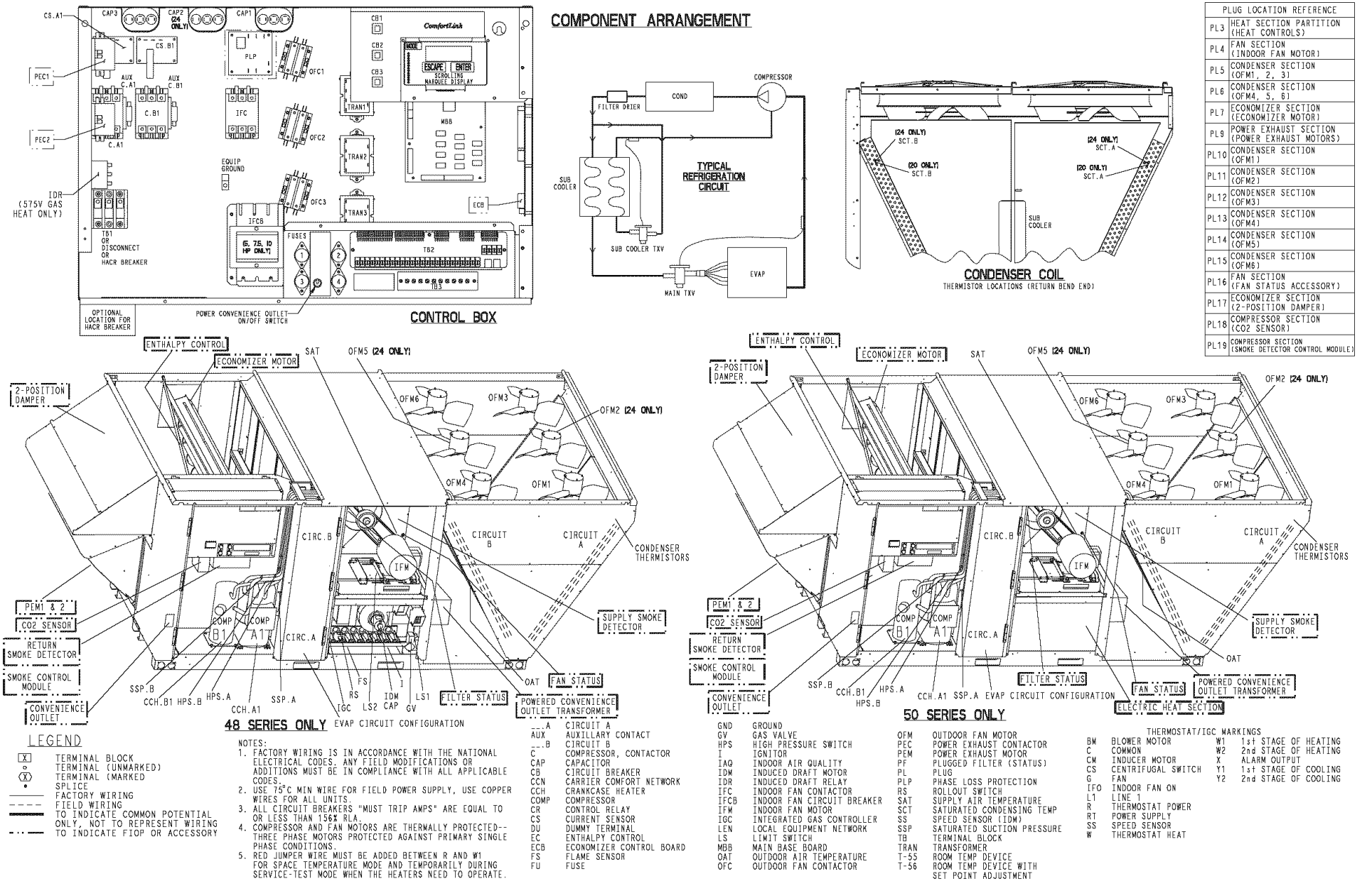


Fig. 19 — Power Schematic — Units with Humidi-MiZer™ System



PLUG LOCATION REFERENCE	
PL3	HEAT SECTION PARTITION (HEAT CONTROLS)
PL4	FAN SECTION (INDOOR FAN MOTOR)
PL5	CONDENSER SECTION (OFM1, 2, 3)
PL6	CONDENSER SECTION (OFM4, 5, 6)
PL7	ECONOMIZER SECTION (ECONOMIZER MOTOR)
PL9	POWER EXHAUST SECTION (POWER EXHAUST MOTORS)
PL10	CONDENSER SECTION (OFM1)
PL11	CONDENSER SECTION (OFM2)
PL12	CONDENSER SECTION (OFM3)
PL13	CONDENSER SECTION (OFM4)
PL14	CONDENSER SECTION (OFM5)
PL15	CONDENSER SECTION (OFM6)
PL16	FAN SECTION (FAN STATUS ACCESSORY)
PL17	ECONOMIZER SECTION (2-POSITION DAMPER)
PL18	COMPRESSOR SECTION (CO2 SENSOR)
PL19	COMPRESSOR SECTION (SMOKE DETECTOR CONTROL MODULE)

__.A	CIRCUIT A
AUX	AUXILLARY CONTACT
__.B	CIRCUIT B
C	COMPRESSOR, CONTACTOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CCN	CARRIER COMFORT NETWORK
CCH	CRANKCASE HEATER
COMP	COMPRESSOR
CR	CONTROL RELAY
CS	CURRENT SENSOR
DU	DUMMY TERMINAL
EC	ENTHALPY CONTROL
ECB	ECONOMIZER CONTROL BOARD
FS	FLAME SENSOR
FU	FUSE
GND	GROUND
GV	GAS VALVE
HPS	HIGH PRESSURE SWITCH
I	IGNITOR
IAQ	INDOOR AIR QUALITY
IDM	INDUCED DRAFT MOTOR
IDR	INDUCED DRAFT RELAY
IFC	INDOOR FAN CONTACTOR
IFCB	INDOOR FAN CIRCUIT BREAKER
IFM	INDOOR FAN MOTOR
IGC	INTEGRATED GAS CONTROLLER
LEN	LOCAL EQUIPMENT NETWORK
LS	LIMIT SWITCH
MBB	MAIN BASE BOARD
OAT	OUTDOOR AIR TEMPERATURE
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
PEC	POWER EXHAUST CONTACTOR
PEM	POWER EXHAUST MOTOR
PF	PLUGGED FILTER (STATUS)
PL	PLUG
PLP	PHASE LOSS PROTECTION
RS	ROLLOUT SWITCH
SAT	SUPPLY AIR TEMPERATURE
SCT	SATURATED CONDENSING TEMP
SS	SPEED SENSOR (IDM)
SSP	SATURATED SUCTION PRESSURE
TB	TERMINAL BLOCK
TRAN	TRANSFORMER
T-55	ROOM TEMP DEVICE
T-56	ROOM TEMP DEVICE WITH SET POINT ADJUSTMENT

THERMOSTAT/IGC MARKINGS

BM	BLOWER MOTOR
C	COMMON
CM	INDUCER MOTOR
CS	CENTRIFUGAL SWITCH
G	FAN
IFO	INDOOR FAN ON
L1	LINE 1
R	THERMOSTAT POWER
RT	POWER SUPPLY
SS	SPEED SENSOR
W	THERMOSTAT HEAT
W1	1st STAGE OF HEATING
W2	2nd STAGE OF HEATING
X	ALARM OUTPUT
Y1	1st STAGE OF COOLING
Y2	2nd STAGE OF COOLING

Fig. 20 — Component Arrangement — Units without Humidi-MiZer™ System

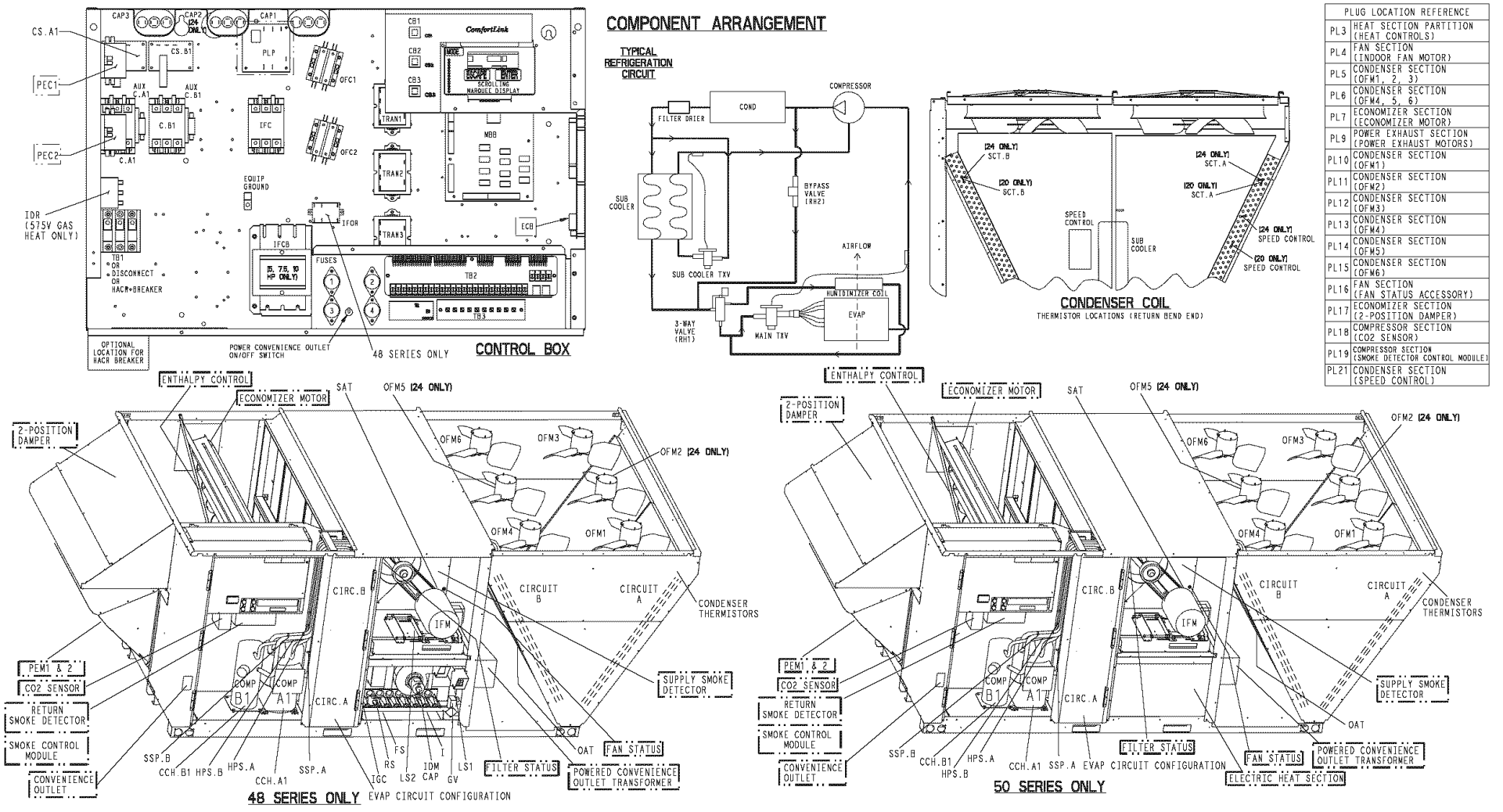


Fig. 21 — Component Arrangement — Units with Humidi-MiZer™ System

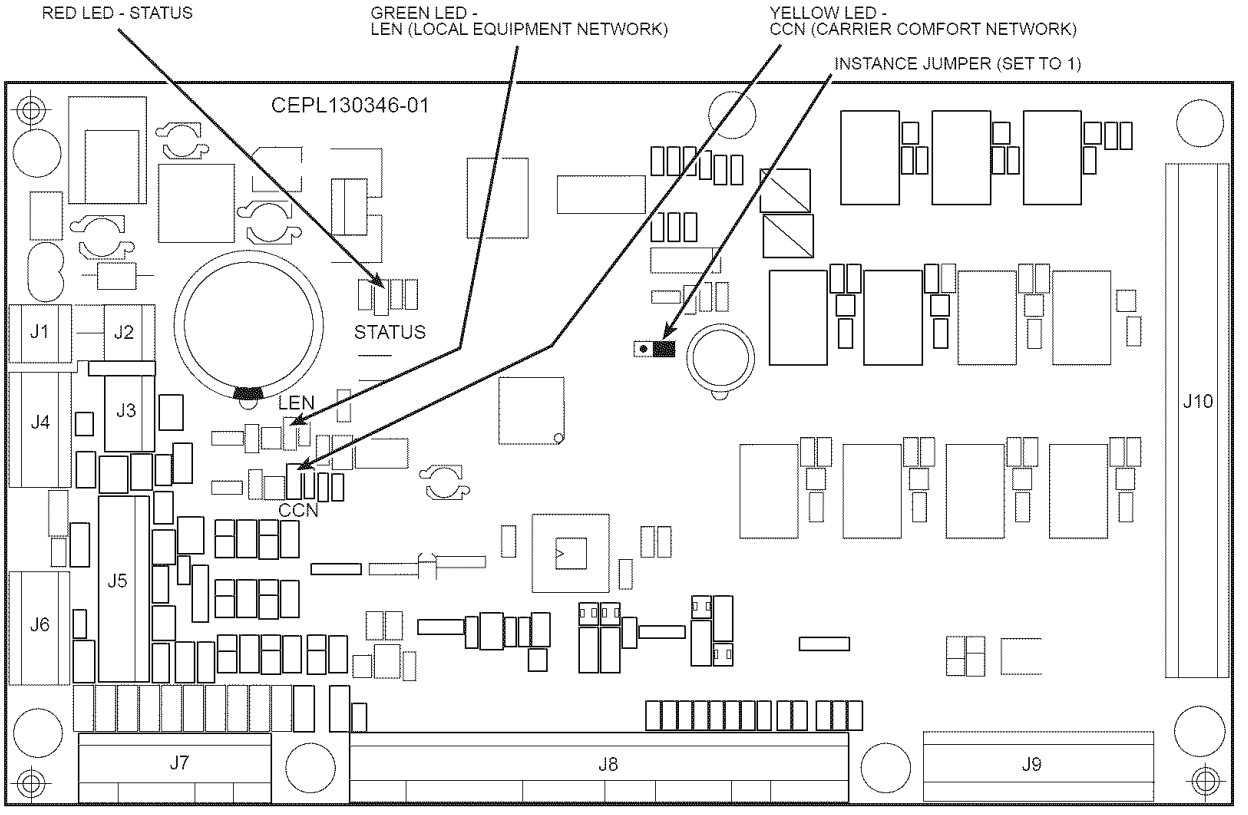


Fig. 22 — Main Base Board (MBB)

Table 53 — MBB Connections

DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
	Input power from TRAN1	control box	24 VAC	J1, 1-3
HUM	Indoor fan output feedback (IGC), or Space humidity switch	gas section space	switch input	J6, 4
FDWN	Fire shutdown switch	supply/return/space	switch input	J6, 5-6
G	Thermostat G (Fan)	space	switch input	J7, 2
W2	Thermostat W2 (2nd Stage Heat)	space	switch input	J7, 4
W1	Thermostat W1 (1st Stage Heat)	space	switch input	J7, 6
Y2	Thermostat Y2 (2nd Stage Cool)	space	switch input	J7, 8
Y1	Thermostat Y1 (1st Stage Cool)	space	switch input	J7, 10
SPT	Space temperature (T55/56)	space	10k thermistor	J8, 1-2
SPTO or RAT	Space temperature offset (T56), or Return air temperature	space return	10k thermistor	J8, 2-3
OAT	Outdoor air temperature	outdoor coil support	10k thermistor	J8, 5-6
SAT	Supply air temperature	indoor fan housing, or supply duct	10k thermistor	J8, 7-8
SCT.A	Saturated condenser temperature, circuit A	outdoor coil, circuit A	5k thermistor	J8, 9-10
SCT.B	Saturated condenser temperature, circuit B	outdoor coil, circuit B	5k thermistor	J8, 11-12
SCT.C	Saturated condenser temperature, circuit C	outdoor coil, circuit C	5k thermistor	J8, 13-14
FAN.S	Fan status switch	indoor fan section	switch input	J8, 15-16
SSP.A	Suction pressure, circuit A	compressor A suction	analog input	J8, 18-20
SSP.B	Suction pressure, circuit B	compressor B suction	analog input	J8, 21-23
SSP.C	Suction pressure, circuit C	compressor C suction	analog input	J8, 24-26
FIL.S	Filter status switch	indoor fan section	switch input	J9, 2-3
CS.A1	Compressor A1 feedback	control box	digital input	J9, 4-6
CS.B1 or CS.A2	Compressor B1 feedback, or Compressor A2 feedback	control box	digital input	J9, 7-9
CS.C1 or CS.B1	Compressor C1 feedback, or Compressor B1 feedback	control box	digital input	J9, 10-12
OUTPUTS				
	Output power to ECB		24 VAC	J2, 1-2
	Output power to Marquee Display		24 VAC	J4, 5-6
CRC	Cool-Reheat1 control		relay	J10, 3
CMP.C or OFC.2	Compressor C1 relay, or Outdoor fan 2 relay		relay	J10, 6
CMP.B	Compressor B1 relay		relay	J10, 9
CMP.A	Compressor A1 relay		relay	J10, 11
CCH or OFC.3 or OFC.1	Crankcase heat relay, or Outdoor fan 3 relay, or Outdoor fan 1 relay		relay	J10, 13
OFC.2 or RH2.B	Outdoor fan 2 relay, or Reheat2 valve, circuit B and C		relay	J10, 16
OFC.1 or RH2.A	Outdoor fan 1 relay, or Reheat2 valve, circuit A		relay	J10, 19
IDF	Indoor fan relay		relay	J10, 21
ALRM	Alarm relay		relay	J10, 23
HT.1	Heat stage 1 relay		relay	J10, 25
HT.2	Heat stage 2 relay		relay	J10, 27
COMMUNICATION				
	Local Equipment Network (LEN)		communication	J5, 1-3
	Carrier Comfort Network (CCN)		communication	J5, 5-7
	Network device power		24 VAC	J5, 9-10

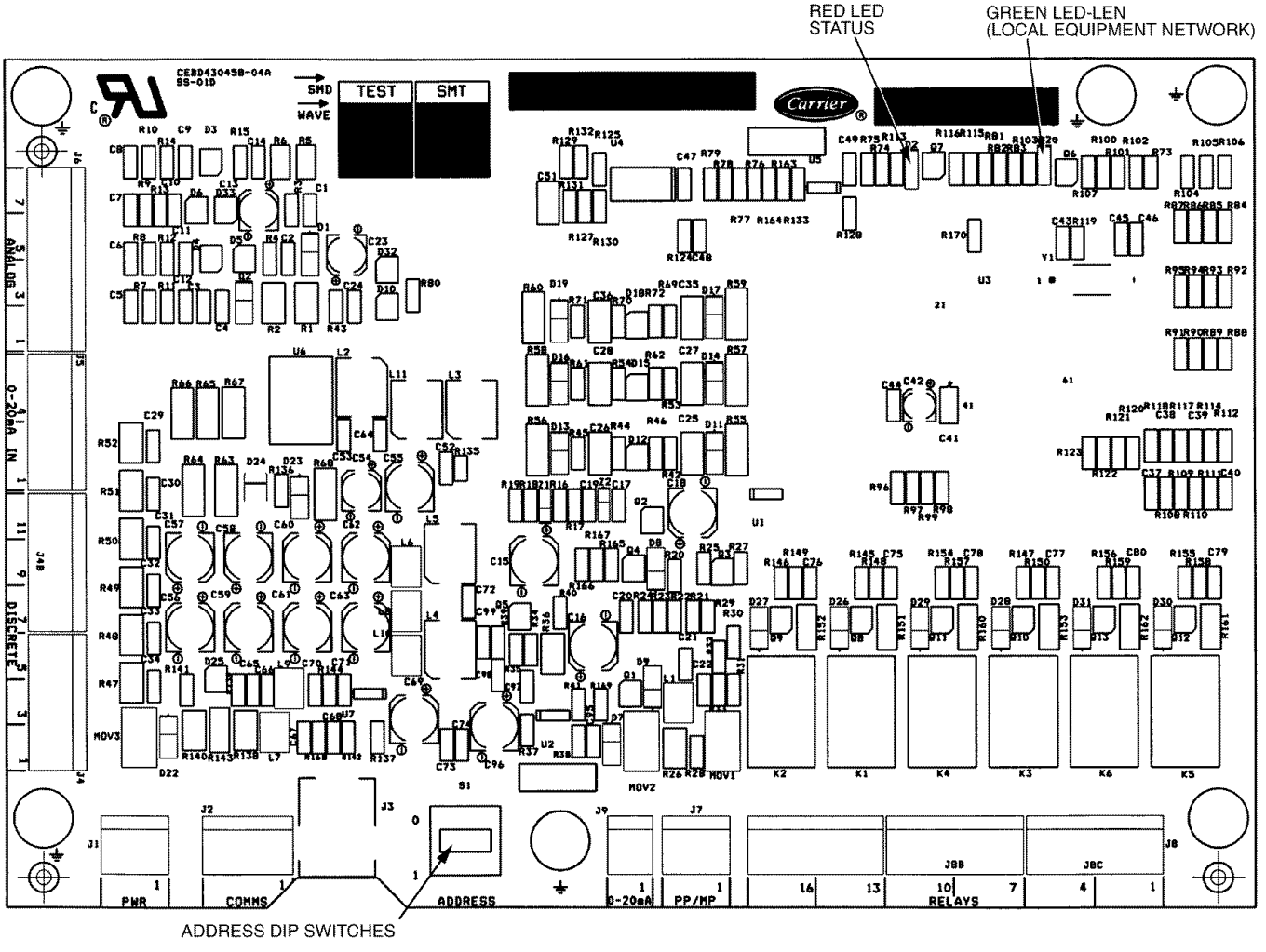


Fig. 23 — Economizer Control Board (ECB)

Table 54 — ECB Connections

DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
	Input power from MBB	control box	24 VAC	J1, 1-2
RM.OC	Remote occupancy switch	field installed	switch input	J4, 2-3
ENTH or IAQ.S	Outdoor enthalpy switch, or Indoor air quality switch	economizer space or return	switch input	J4, 4-3
IAQ	Indoor air quality sensor	space or return	4-20 mA	J5, 2-3
OAQ or SP.RH	Outdoor air quality sensor, or Space humidity sensor	economizer space	4-20 mA	J5, 4-3
OUTPUTS				
PE.1	Power exhaust 2 relay		relay	J8, 3
PE.2	Power exhaust 2 relay		relay	J8, 6
EC.CP or EC.AP	Economizer actuator (analog, digital)		4-20 mA	J9, 1
COMMUNICATION				
	Local Equipment Network (LEN)		communication	J2, 1-3
EC.CP and EC.AP	Economizer actuator (digital control)		communication	J7, 1-3

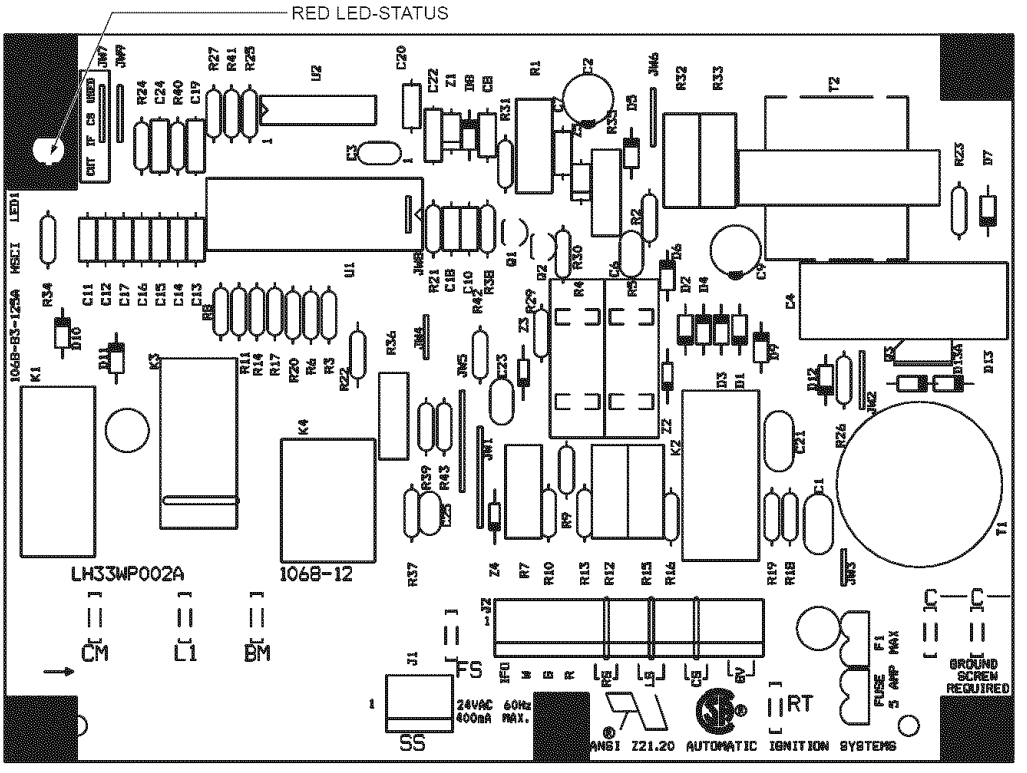


Fig. 24 — Integrated Gas Control (IGC) Board

Table 55 — IGC Connections

TERMINAL LABEL	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
RT, C	Input power from TRAN 1	control box	24 VAC	—
SS	Speed sensor	gas section	analog input	J1, 1-3
FS, T1	Flame sensor	gas section	switch input	—
W	Heat stage 1	MBB	24 VAC	J2, 2
RS	Rollout switch	gas section	switch input	J2, 5-6
LS	Limit switch	gas section	switch input	J2, 7-8
CS	Centrifugal switch (not used)	—	switch input	J2, 9-10
OUTPUTS				
L1, CM	Induced draft combustion motor	gas section	line VAC	
IFO	Indoor fan	MBB	relay	J2, 1
GV	Gas valve (heat stage 1)	gas section	relay	J2, 11-12

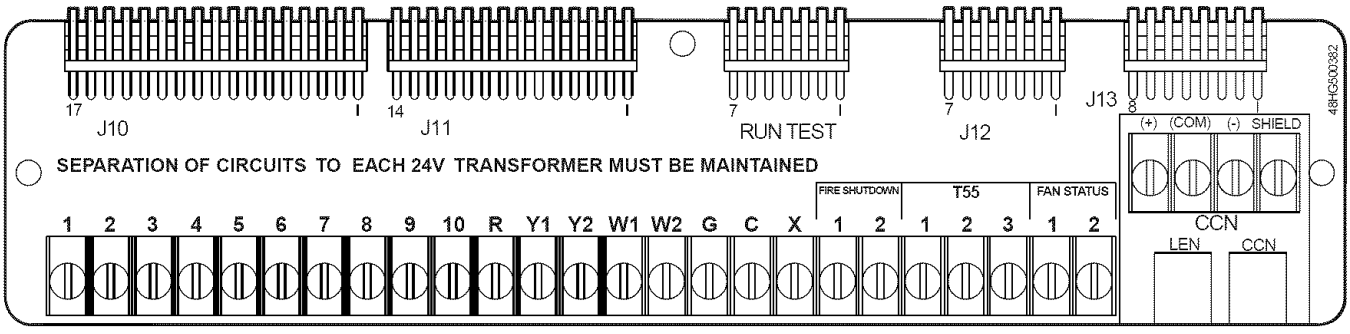


Fig. 25 — Low-Voltage Terminal Strip

Table 56 — Field Connection Terminal Strip

TERMINAL LABEL	DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
1		24 VAC power		24 VAC output	J10, 17
2	IAQ	Indoor air quality sensor	return/space	4-20 mA input	J10, 16
3		Indoor & outdoor air quality common		4-20 mA input	J10, 15
4	OAQ or SP.RH	Outdoor air quality sensor, or Space humidity sensor	economizer space	4-20 mA input	J10, 14
5	RM.OC	Remote occupancy switch	field installed	24 VAC input	J10, 13
6		Outdoor enthalpy switch power	economizer	24 VAC input	J10, 11-12
7	ENTH or IAQ.S	Outdoor enthalpy switch, or Indoor air quality switch	economizer, or return/space	24 VAC input	J10, 9-10
8	EC.CP or EC.AP EC.CP	Economizer actuator (digital control) Economizer actuator (analog control)	economizer	2-10 VDC output 2-10 VDC output	J10, 6-8
9		Economizer signal common	economizer	VDC	J10, 3-5
10	EC.CP EC.AP	Economizer actuator (digital control) Economizer actuator (analog control)	economizer	communication 2-10 VDC output	J10, 1-2
R		24 VAC power		24 VAC output	J11, 11-14
Y1	Y1	Thermostat Y1 (1st stage cool)	space	24 VAC input	J11,10
Y2	Y2	Thermostat Y2 (2nd stage cool)	space	24 VAC input	J11, 9
W1	W1	Thermostat W1 (1st stage heat)	space	24 VAC input	J11, 7-8
W2	W2	Thermostat W2 (2nd stage heat)	space	24 VAC input	J11, 6
G	G	Thermostat G (Fan)	space	24 VAC input	J11, 5
C		24 VAC common		24 VAC output	J11, 2-4
X	ALRM	Alarm output (normally open)		24 VAC output	J11, 1
FIRE SHUTDOWN 1-2, or HUMIDISTAT 1-2*	FDWN HUM	Fire shutdown switch Space humidity switch	supply/return/space space	switch input	J12, 6-7
T55 1-2	SPT	Space temperature (T55/56)	space	10k thermistor	J12, 4-5
T55 2-3	SPTO or RAT	Space temperature offset (T56) or Return air temperature	space or return	10k thermistor	J12, 3-4
LEN		Local Equipment Network (LEN)		communication	J13, 1-3, 4-5
CCN		Carrier Comfort Network (CCN)		communication	J13, 6-8, 4-5

*Refer to Third Party Control section on page 38 for information on wiring fire shutdown with a Humidi-MiZer™ system.

Scrolling Marquee Display — This device is the keypad interface used to access rooftop information, read sensor values, and test the unit. See Fig. 26. The Scrolling Marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. Eleven mode LEDs are located on the display as well as an Alarm Status LED. See Scrolling Marquee section on page 2 for further details.

Accessory Navigator™ Display — The accessory hand-held Navigator display can be used with the 48/50PG series units. See Fig. 27. The Navigator display operates the same way as the Scrolling Marquee device. The Navigator display plugs into the LEN port on either TB2 or the ECB board.

Carrier Comfort Network® (CCN) Interface — The 48/50PG 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. The system elements are connected to the communication bus in a daisy chain arrangement. See Fig. 28. 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 TB2. See Fig. 14-17. Consult the CCN Contractor's Manual for further information.

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

MANUFACTURER	PART NO.
Alpha	2413 or 5463
Belden	8772
Carol	C2528
West Penn	302

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. The shield screw on TB2 can be used to tie the cables together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. The shield screw on TB2 is not acceptable for grounding. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (–) conductors. (Substitute appropriate colors for different colored cables.)
3. Connect the red wire to (+) terminal on TB2, the white wire to COM terminal, and the black wire to the (–) terminal.
4. The RJ14 CCN connector on TB2 can also be used, but is only intended for temporary connection (for example, a laptop computer running Carrier network software).

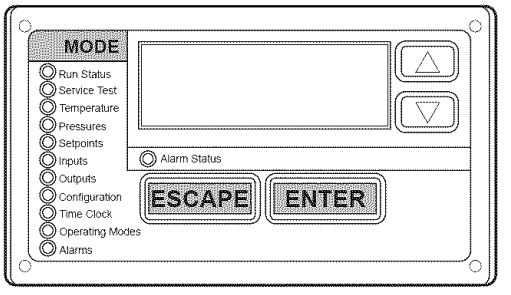


Fig. 26 — Scrolling Marquee

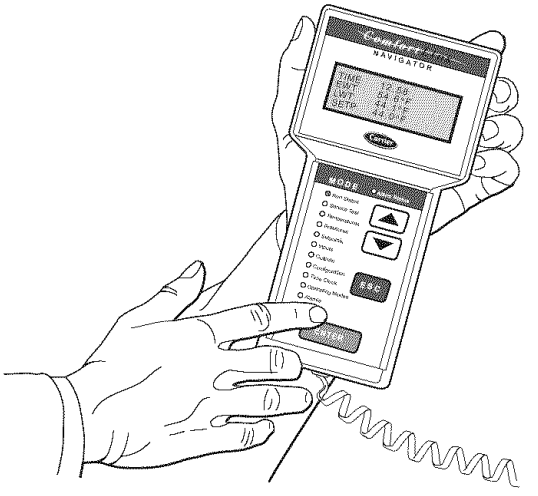


Fig. 27 — Accessory Navigator™ Display

5. Restore power to unit.

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

Subcooler Heat Exchanger (SHX) — The purpose of the subcooler heat exchanger (SHX) and the subcooler TXV is to increase the capacity of the evaporator by sending subcooled liquid refrigerant into the evaporator. Normally, the condenser subcools the liquid refrigerant by approximately 10 F. The SHX adds another 10 F to 15 F degrees of subcooling before the refrigerant reaches the evaporator. This allows the refrigerant to absorb more heat from the mixed air, thereby providing more cooling capacity.

The subcooler functions by taking a small percentage of the high pressure, medium temperature liquid refrigerant which exits the condenser and converting it into a low pressure, low temperature gas. This is accomplished by using the subcooler TXV. The gas is then routed through a reverse-flow heat exchanger (SHX), which transfers heat from the remaining liquid refrigerant in the liquid line to the reverse flow gas refrigerant. The moderate temperature gas is then sent to the compressor to complete the loop and the cooler liquid refrigerant continues its normal path to the main TXV and the evaporator. See Fig. 29.

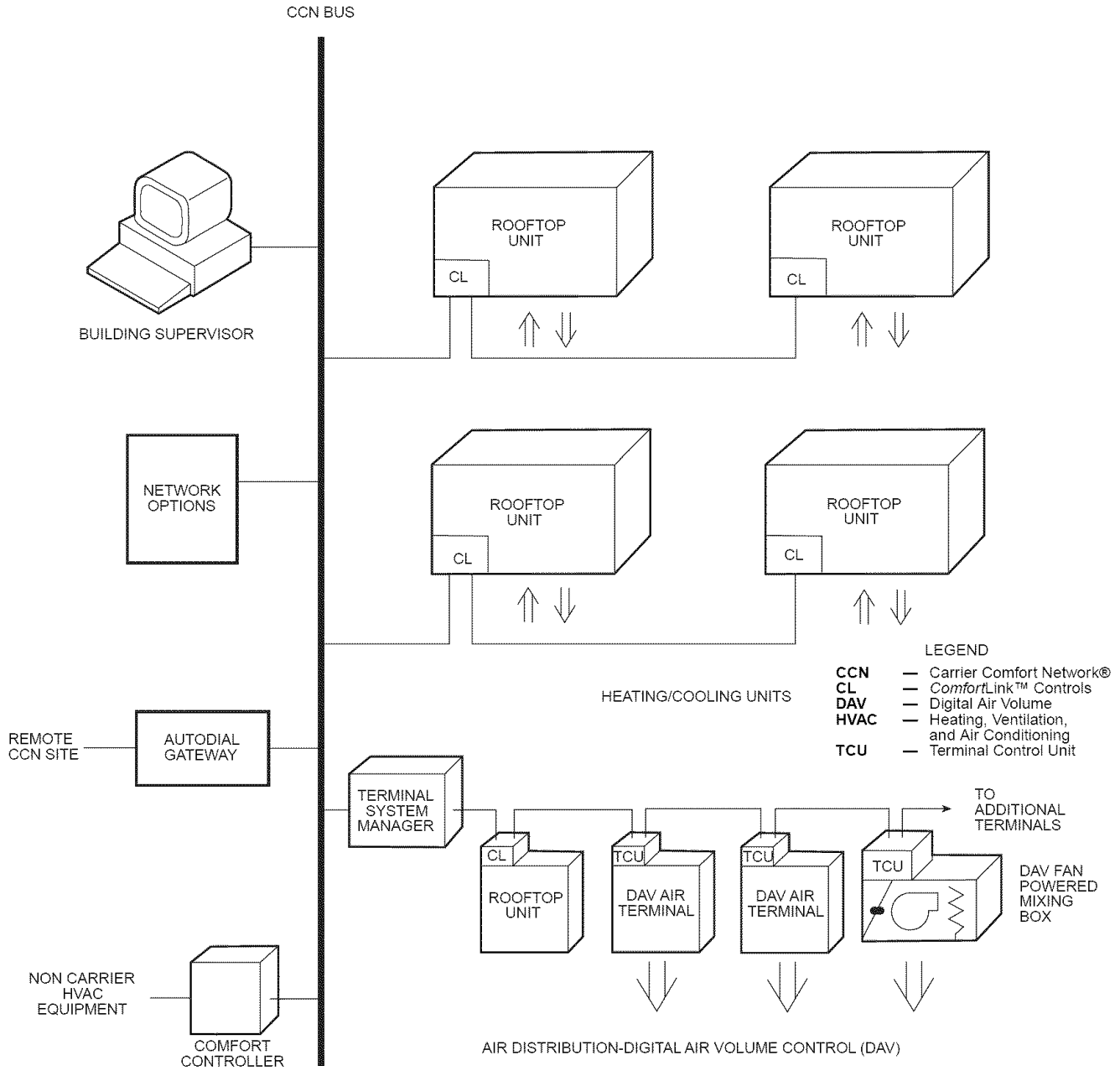


Fig. 28 — CCN System Architecture

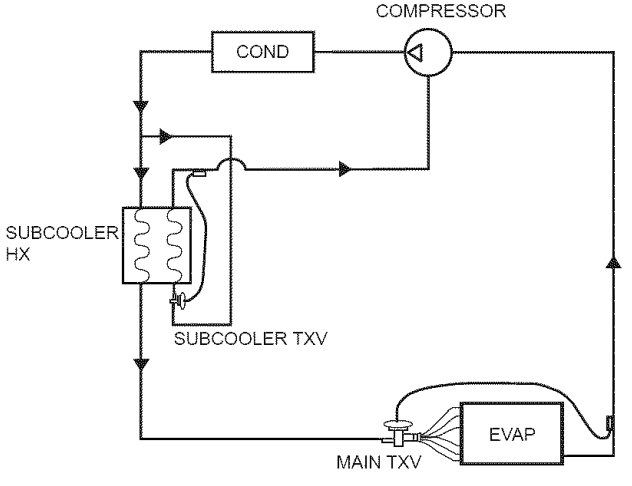


Fig. 29 — Subcooler Operation

Field-Installed Accessories

SPACE TEMPERATURE SENSOR (T-55) — The T-55 space temperature sensor (part no. 33ZCT55SPT) is a field-installed accessory. The sensor is installed on a building interior wall to measure room air temperature. The T-55 sensor also includes an override button on the front cover to permit occupants to override the Unoccupied Schedule (if programmed). The jumper wire in the installer's packet must be connected between R and W1 when using a T-55 device. See Fig. 30 and 31.

SPACE TEMPERATURE SENSOR (T-56) — The T-56 space temperature sensor (part no. 33ZCT56SPT) is a field-installed accessory. This sensor includes a sliding scale on the front cover that permits an occupant to adjust the space temperature set point remotely. The T-56 sensor also includes an override button on the front cover to allow occupants to override the unoccupied schedule (if programmed). The jumper wire in the installer's packet must be connected between R and W1 when using a T-56 device. See Fig. 30 and 32.

SPACE TEMPERATURE SENSOR (T-58) — The T-58 space temperature sensor (part no. 33ZCT58SPT) is a field-installed accessory. The T-58 sensor communicates with the *Comfort*Link™ controller, providing space temperature, heating and cooling set points, and mode operation information. The jumper wire in the installer's packet must be connected between R and W1 when using a T-58 device. See Fig. 33.

Refer to the T-58 installation instructions for information on installing and configuring the T-58 sensor.

Each T-58 sensor must have a unique address on the CCN. Each T-58 sensor must also be configured with the address of the unit control it is communicating to.

SPACE TEMPERATURE SENSOR AVERAGING — See Fig. 34 for space temperature averaging with T-55 sensors only. If the use of one T-56 sensor is required, refer to Fig. 35.

ECONOMIZER — The economizer accessory usage depends on model size. When installing this accessory, the unit must be configured for economizer installation by setting ***Configuration→ECON→EC.EN*** to YES. The default settings for the other economizer configurations should be satisfactory. If they need to be changed, additional information about these configuration settings can be found in the Economizer section.

POWER EXHAUST — The power exhaust accessory usage depends on voltage. When installing this accessory, the unit must be configured for power exhaust installation by setting ***Configuration→ECON→PE.EN*** to ENBL. The default settings for the other power exhaust configurations should be satisfactory. If they need to be changed, additional information about these configurations can be found in the Power Exhaust section.

TWO-POSITION DAMPER — This accessory wires directly into the low voltage circuit for the indoor fan control. No other control configuration is needed.

INDOOR AIR QUALITY — The indoor air quality (IAQ) sensor is a field-installed accessory which measures CO_2 levels in the air. When installing this sensor, the unit must be configured for IAQ use by setting ***Configuration→AIR.Q→IA.CF*** to a value of 1, 2, or 3. See the Indoor Air Quality section for more information.

OUTDOOR AIR QUALITY — The outdoor air quality (OAQ) sensor (part no. 33ZCSENCO2) is a field-installed accessory that measures CO_2 levels in the air. When installing this sensor, the unit must be configured for OAQ use by setting ***Configuration→AIR.Q→OA.CF*** to a value of 1 or 2. See the Indoor Air Quality section for more information.

SMOKE DETECTORS — The smoke detectors are field-installed accessories. These detectors can detect smoke in either the return air (part no. CRSMKDET001D00) or supply and return air (part no. CRSMKSUP001B00). When installing either detector, the unit must be configured for fire shutdown by setting ***Configuration→UNIT→FS.SW*** to normally open (1) or normally closed (2).

NOTE: When a Humidi-Mizer™ system is installed, the inputs to the fire shutdown are moved to the control harness. See the Third Party Control section on page 38 for more information.

FILTER STATUS — The filter status accessory (part no. CRSTATUS003B00) is a field-installed accessory. This accessory detects plugged filters. When installing this accessory, the unit must be configured for filter status by setting ***Configuration→UNIT→FL.SW*** to normally open (1) or normally closed (2). Normally open (1) is the preferred configuration.

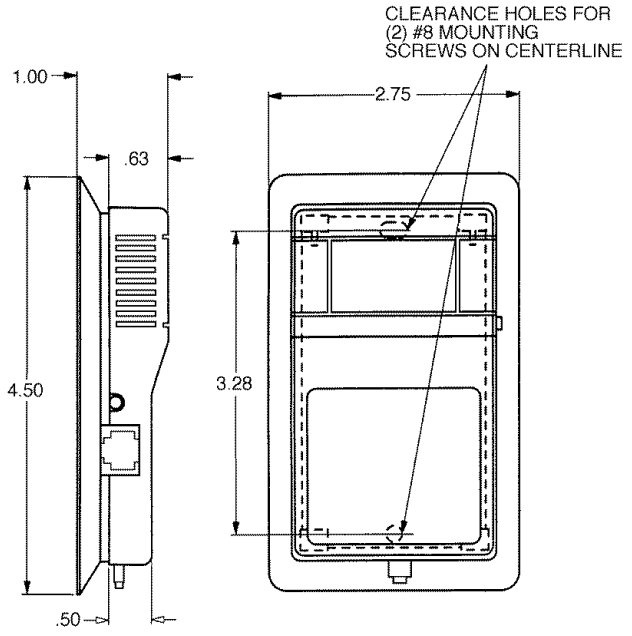
FAN STATUS — The fan status accessory (part no. CRSTATUS003B00) is a field-installed accessory. This accessory detects when the indoor fan is blowing air. When installing this accessory, the unit must be configured for fan status by setting ***Configuration→UNIT→FN.SW*** to normally open (1) or normally closed (2). Normally open (1) is the preferred configuration.

ENTHALPY SENSORS — The enthalpy accessories (part no. CRENTSNG02A00 and CRENTDIF02A00) are field-installed accessories. The first accessory (outdoor air only) determines when the enthalpy is low relative to a fixed reference. Adding the second accessory (return air) compares the enthalpy between the outdoor and return airstreams. In each case, the enthalpy 4 to 20 mA signals are converted to a switch output which is read by the ECB. When installing this accessory, the unit must be configured for enthalpy-based control by setting ***Configuration→ECON→EN.SW*** to normally open (1). See Fig. 14-19 for wiring details.

RETURN/SUPPLY AIR TEMPERATURE SENSOR — The temperature sensor (part no. 33ZCSENSAT) is a field-installed accessory which may be installed on the common return air duct and/or the common supply air duct near the unit. The duct return air temperature (RAT) may be selected for display only if the space temperature offset (SPTO) is not used. When installing the sensor, the unit must be configured by setting ***Configuration→UNIT→RAT.S*** to YES. The duct supply air temperature (SAT) may be used to replace the SAT sensor that is internal to the unit. A supply duct SAT measurement is valid for heating mode display while the factory-standard internal SAT is not valid for heating due to its location upstream of the heating section. When installing the supply duct SAT, the unit must be configured by setting ***Configuration→UNIT→SAT.H*** to ENBL. A SAT sensor in the supply duct is the preferred configuration for systems with Carrier VVT® controls.

SPACE HUMIDITY SENSOR — The space relative humidity sensor (part no. HL39ZZ005 duct mount or HL39ZZ007 wall mount) is a field-installed accessory. The space relative humidity (RHS) may be selected for display only if the outdoor air quality sensor (OAQ) is not used. When installing the relative humidity sensor, the unit must be configured by setting ***Configuration→UNIT→RH.S*** to YES.

ELECTRIC HEAT — The electric heat accessory depends on model size, voltage, and heater kW size. When field installing this accessory, the unit must be configured for electric heat by setting ***Configuration→HEAT→HT.TY*** to a value of 2.



NOTE: Dimensions are in inches.

Fig. 30 — Space Temperature Sensor Mounting

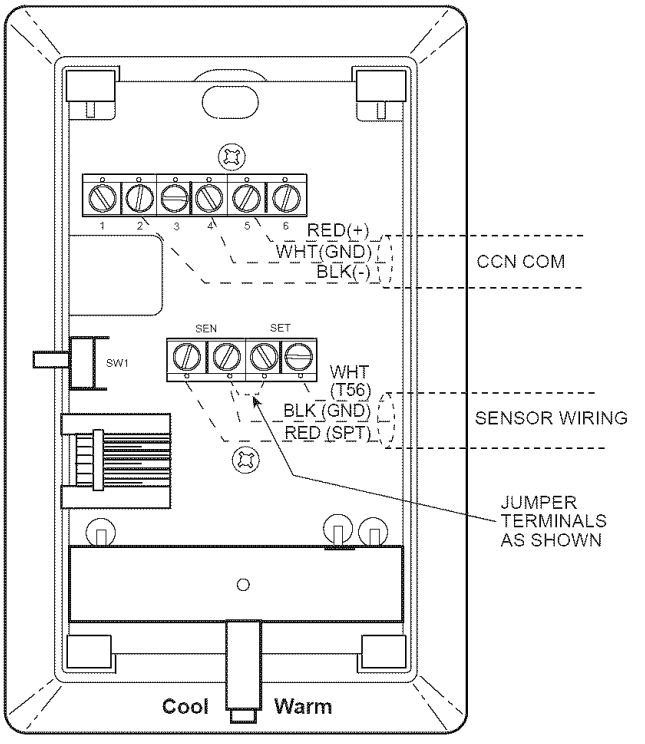


Fig. 32 — T-56 Space Temperature Sensor Wiring (P/N 33ZCT56SPT)

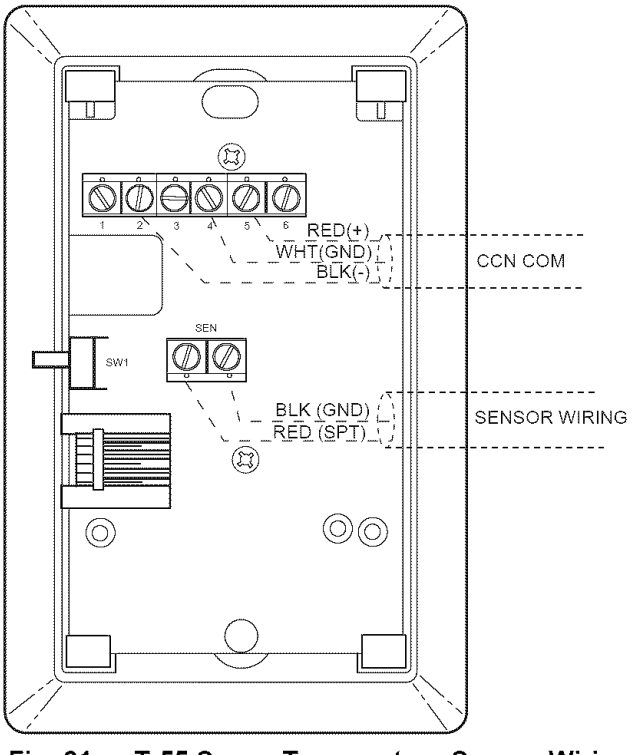
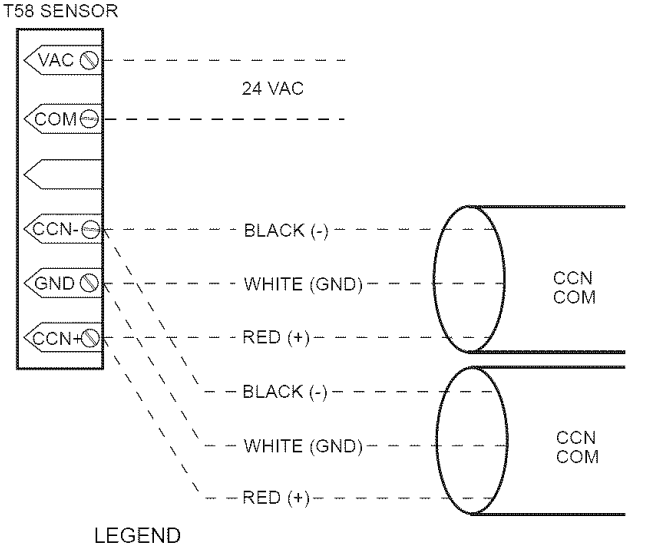


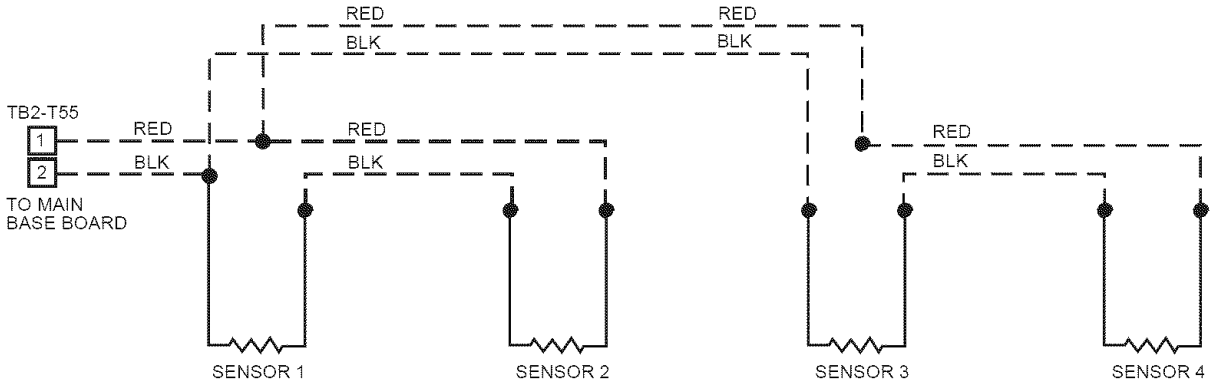
Fig. 31 — T-55 Space Temperature Sensor Wiring (P/N 33ZCT55SPT)



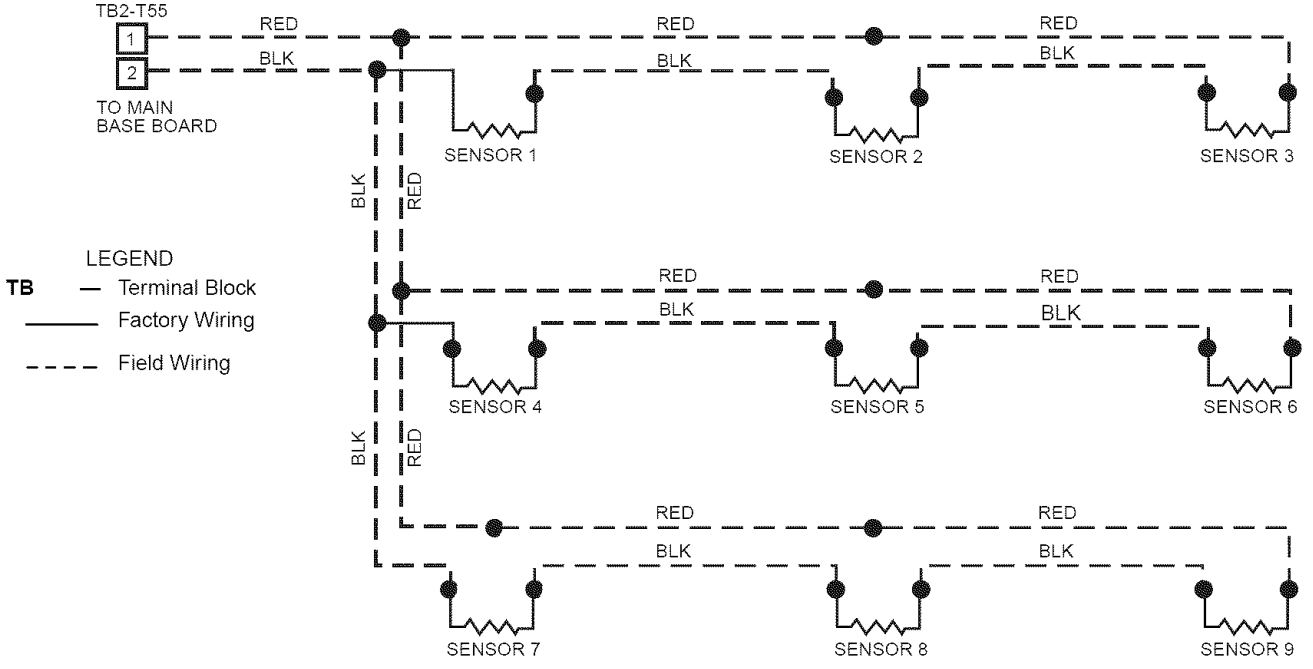
LEGEND

CCN — Carrier Comfort Network

Fig. 33 — T-58 Communicating Space Temperature Sensor Wiring



SPACE TEMPERATURE AVERAGING — 4 T-55 SENSOR APPLICATION



SPACE TEMPERATURE AVERAGING — 9 T-55 SENSOR APPLICATION

Fig. 34 — Space Temperature Sensor Averaging

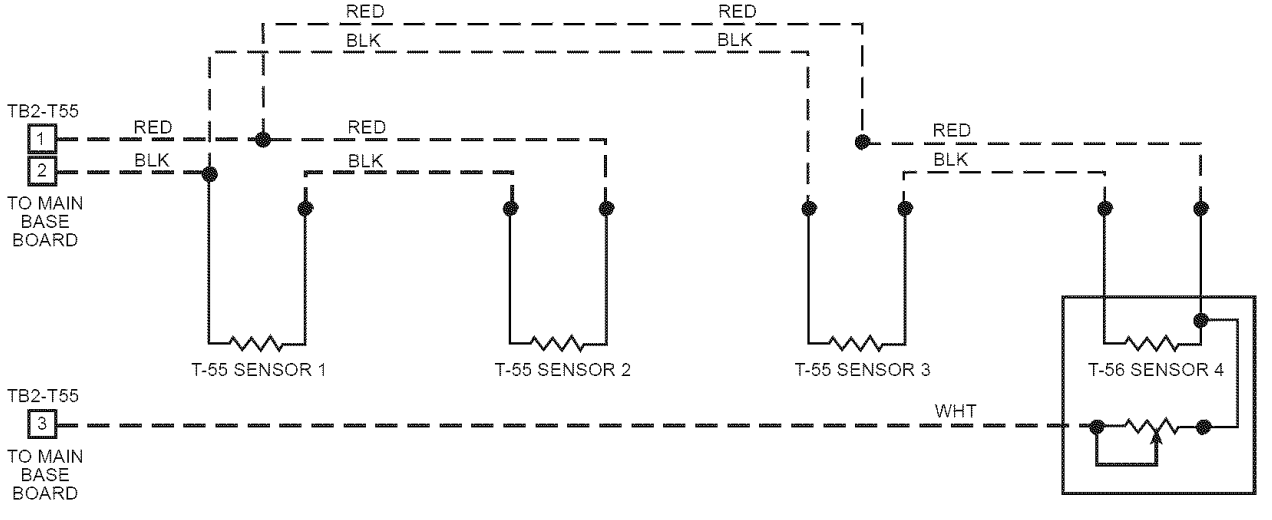


Fig. 35 — Space Temperature Sensor Averaging with 3 T-55 Sensors and One T-56 Sensor

SERVICE

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

⚠ CAUTION

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

⚠ WARNING

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

What to do if you smell gas:

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

⚠ WARNING

Disconnect gas piping from unit when pressure testing at pressure greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, a unit connected to such piping must be isolated by closing the manual gas valve(s).

Cleaning — Inspect unit interior at beginning of each heating and cooling season and as operating conditions require. Remove unit top panel and/or side panels for access to unit interior.

COIL MAINTENANCE AND CLEANING RECOMMENDATION — 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 maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

Remove Surface Loaded Fibers — Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage to the coating of a protected coil) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse — A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

Routine Cleaning of Coil Surfaces — Monthly cleaning with Totaline® environmentally sound coil cleaner is essential to extend the life of coils. This cleaner is available from Carrier Replacement parts division as part number P902-0301 for a one gallon container, and part number P902-0305 for a 5 gallon container. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper or E-coated coils be cleaned with the Totaline environmentally sound coil cleaner as described below. Coil cleaning should be part of the unit's regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Avoid the use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers
- poor quality water for cleaning

Totaline environmentally sound coil cleaner is non-flammable, hypoallergenic, nonbacterial, and a USDA accepted biodegradable agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces, or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

Totaline Environmentally Sound Coil Cleaner Application Equipment

- $2^1/_2$ gallon garden sprayer
- water rinse with low velocity spray nozzle

⚠ CAUTION

Harsh chemicals, household bleach or acid or basic cleaners should not be used to clean outdoor or indoor coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Totaline® environmentally sound coil cleaner as described above.

⚠ CAUTION

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdown may occur.

Totaline Environmentally Sound Coil Cleaner Application Instructions

1. Proper eye protection such as safety glasses is recommended during mixing and application.
2. Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
3. Thoroughly wet finned surfaces with clean water and a low velocity garden hose, being careful not to bend fins.
4. Mix Totaline environmentally sound coil cleaner in a $2^1/_2$ gallon garden sprayer according to the instructions included with the cleaner. The optimum solution temperature is 100 F.

NOTE: Do NOT USE water in excess of 130 F, as the enzymatic activity will be destroyed.

5. Thoroughly apply Totaline environmentally sound coil cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
6. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
7. Ensure cleaner thoroughly penetrates deep into finned areas.
8. Interior and exterior finned areas must be thoroughly cleaned.
9. Finned surfaces should remain wet with cleaning solution for 10 minutes.
10. Ensure surfaces are not allowed to dry before rinsing. Reapplying cleaner as needed to ensure 10-minute saturation is achieved.
11. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

CONDENSATE DRAIN — Check and clean each year at the start of the cooling season. An access panel is located above the condensate connection to allow easy clean out of the condensate pan. The first time the panel is removed, the insulation behind the access panel will need to be cut away. Carefully cut the insulation with a knife or blade on three sides so the insulation can be folded out of the way during cleaning. Be careful not to damage components behind the insulation while cutting. Once cleaning is completed, fold the insulation back into place and secure the access panel in the original position.

FILTERS — Clean or replace at start of each heating and cooling season, or more often if operating conditions require. Refer to unit installation instructions for type and size.

OUTDOOR-AIR INLET SCREENS — Clean screens with steam or hot water and a mild detergent. Do not use throwaway filters in place of screens. See unit installation instructions for quantity and size.

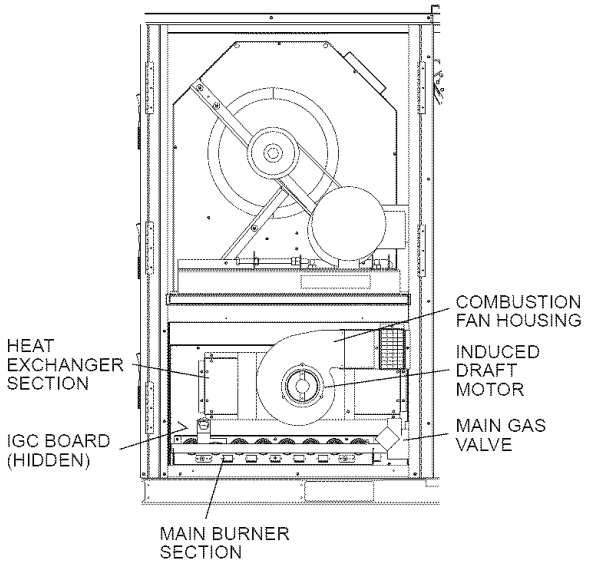
MAIN BURNER (48PG Only) — At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames. Refer to Main Burners section on page 91.

FLUE GAS PASSAGEWAYS (48PG Only) — The flue collector box and heat exchanger cells may be inspected by removing heat section access panel (Fig. 5), flue box cover, and main burner assembly (Fig. 36). Refer to Main Burners section on page 91 for burner removal sequence. If cleaning is required, clean tubes with a wire brush.

Use caution with ceramic heat exchanger baffles. When installing retaining clip, be sure the center leg of the clip extends inward toward baffle. See Fig. 37.

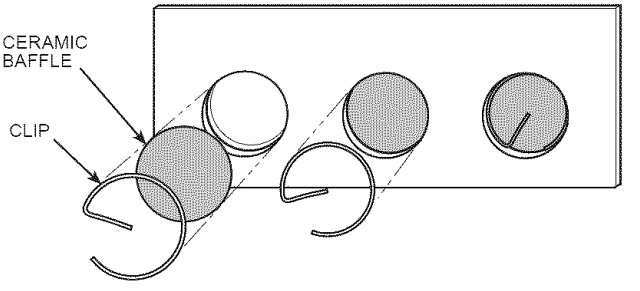
COMBUSTION-AIR BLOWER (48PG Only) — Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bimonthly to determine proper cleaning frequency.

To inspect blower wheel, remove heat section panel. Using an inspection mirror and flashlight, look into the flue exhaust duct to inspect the wheel. If cleaning is required, remove motor and wheel assembly by removing the screws holding the flue box cover to the flue box. See Fig. 36. Remove the screws holding the inducer housing to the inlet plate. The wheel can then be removed from the motor shaft and cleaned with a detergent or solvent. Replace the wheel onto the motor shaft in the correct position and reassemble the flue cover onto the flue box.



IGC — Integrated Gas Controller

Fig. 36 — Typical Gas Heating Section



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

Fig. 37 — Removing Heat Exchanger Ceramic Baffles and Clips

Lubrication

COMPRESSORS — Each compressor is charged with the correct amount of oil at the factory.

⚠ CAUTION

The compressor is in a Puron® refrigerant system and uses a polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Avoid exposure of the oil to the atmosphere. Damage to components could result.

Polyolester (POE) compressor lubricants are known to cause long term damage to some synthetic roofing materials. Exposure, even if immediately cleaned up, may cause roofing materials to become brittle (leading to cracking) within a year. When performing any service which may risk exposure of compressor oil to the roof, take appropriate precautions to protect roofing. Procedures which risk oil leakage include compressor replacement, repairing refrigerant leaks, and replacing refrigerant components. To prepare rooftop:

1. Cover extended roof work area with an impermeable plastic dropcloth or tarp. Make sure a 10 x 10 area around the work area is covered.

2. Cover area in front of the unit service panel with a terry cloth shop towel to absorb lubricant spills and prevent run-offs. Towel will also protect dropcloth from tears caused by tools or components.
3. Place terrycloth shop towel inside the unit directly under components to be serviced to prevent spills through the bottom of the unit.
4. Perform the required service.
5. Remove and dispose of any oil contaminated material per local codes.

FAN SHAFT BEARINGS — Lubricate bearings at least every 6 months with suitable bearing grease. Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No. 1
Sunoco	Prestige 42
Texaco	Multifak 2

*Preferred lubricant because it contains rust and oxidation inhibitors.

FAN MOTOR BEARINGS — Fan motor bearings are of the permanently lubricated type. No field lubrication is required. No lubrication of the condenser or evaporator motors are required.

Manual Outdoor Air Damper — If manual outdoor air damper blade adjustment is required, refer to unit Installation Instructions.

Economizer Adjustment — If economizer adjustment is required, refer to unit Installation Instructions.

Evaporator Fan Service and Replacement — The 48/50PG units feature a slide-out fan deck for easy servicing of the indoor-fan motor, pulleys, belt, and bearings. To service components in this section, perform the following procedure:

1. Turn off unit power.
2. Open the fan section access panel.
3. Remove three no. 10 screws at front of slide-out fan deck. Save screws. See Fig. 38.
4. Disconnect the limit switch wires located on the right side of the fan deck (48PG only). Other wires do not need to be disconnected.
5. Fan deck can now be slid out to access serviceable components.

⚠ CAUTION

DO NOT SLIDE FAN DECK OUT PAST THE STOP BRACKET. If further access is required, the fan deck must be supported. Make sure plugs and wiring are not pinched between fan housing and unit center post. Damage to unit may result.

6. To replace fan deck to operating position, slide fan deck back into the unit. Secure with the three no. 10 screws removed in Step 3.
7. Re-attach electrical plugs and wires.
8. Close fan section access door.
9. Restore power to unit.

Evaporator Fan Performance Adjustment (Fig. 38 and 39) — Fan motor pulleys are factory set for speed shown in Table 57.

To change fan speeds:

1. Shut off unit power supply.
2. Loosen nuts on the 4 carriage bolts in the mounting base. Using adjusting bolts and plate, slide motor and remove belt.
3. Loosen movable-pulley flange setscrew (see Fig. 39).
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in unit Installation Instructions.

   See Tables 27 and 28 for air quantity limits.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Tables 33 and 34 for speed change for each full turn of pulley flange.)
6. Replace and tighten belts (see Evaporator Fan Belt Tension Adjustment section below).
7. Restore power to unit.

To align fan and motor pulleys:

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting plate.

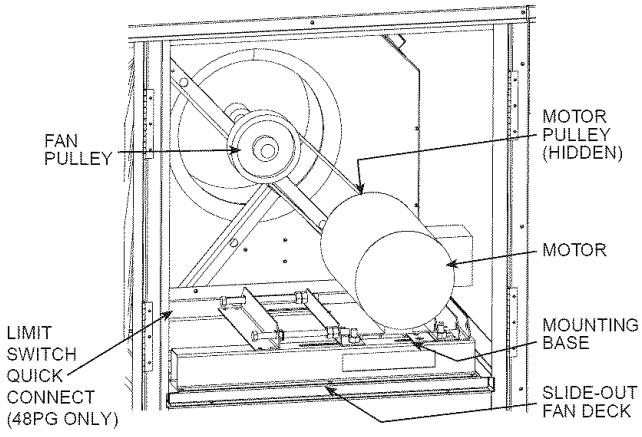


Fig. 38 — Evaporator-Fan Motor Adjustment

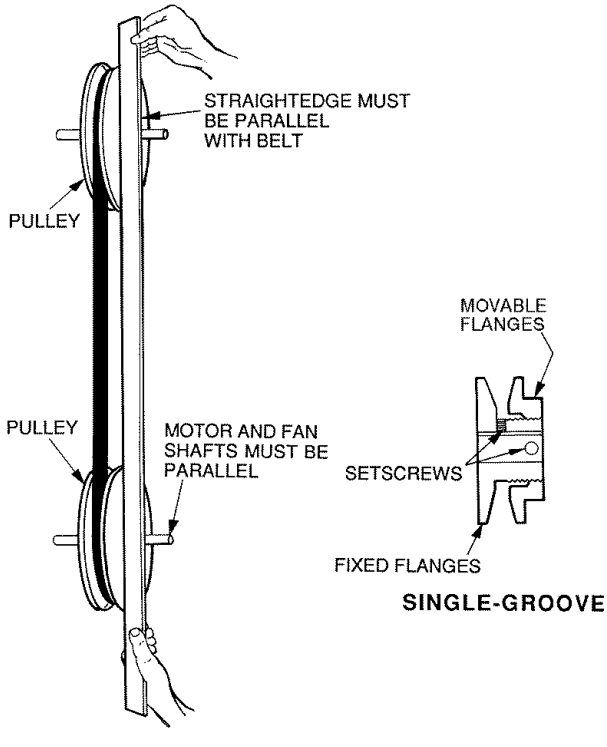


Fig. 39 — Evaporator-Fan Alignment and Adjustment

Evaporator Fan Belt Tension Adjustment — To adjust belt tension:

1. Turn off unit power.
2. Slide out fan deck to service position as shown in Evaporator Fan Service and Replacement section above.
3. Loosen fan motor bolts.
4. Move motor mounting plate to adjust to proper belt tension. See Table 57. Motor adjuster bolts may be used to tighten belts. See Fig. 38.
5. Check for proper belt alignment. Adjust if necessary.
6. Tighten motor mounting plate bolts to lock motor in proper position.
7. Return fan deck back into operating position.
8. Restore power to unit.

Condenser-Fan Adjustment (Fig. 40)

1. Shut off unit power supply.
2. Remove condenser-fan assembly (grille, motor, motor cover, and fan) and loosen fan hub setscrews.
3. Adjust fan height as shown in Fig. 40.
4. Tighten setscrews and replace condenser-fan assembly.
5. Turn on power to unit.

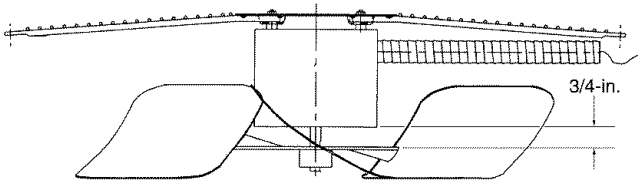


Fig. 40 — Condenser-Fan Adjustment

Verify Sensor Performance — Verify that thermistor, transducer, and switch inputs (see Tables 50-52) are reading correctly. These values can be accessed through the Scrolling Marquee display in the Temperatures, Pressures, and Inputs menus. Some values will depend on configuration choices. Refer to the Control Set Up Checklist completed for the specific unit installation and to the configuration tables in Appendix A.

Economizer Operation During Power Failure — Dampers have a spring return. In event of power failure, dampers will return to fully closed position until power is restored. *Do not manually operate damper motor.*

Evacuation — Proper evacuation of the system will remove noncondensables and ensure a tight, dry system before charging. Evacuate from both high and low side ports. Never use the system compressor as a vacuum pump. Refrigerant tubes and indoor coil should be evacuated to 500 microns. Always break a vacuum with dry nitrogen. The two possible methods are the deep vacuum method and the triple evacuation method.

DEEP VACUUM METHOD — The deep vacuum method requires a vacuum pump capable of pulling a minimum vacuum of 500 microns and a vacuum gage capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water. (See Fig. 41.)

Table 57 — Belt Tension Adjustment

48PG	VOLTAGE	BELT TENSION (lb) Unit Model Number Position 10							
		A,J	B,K	C,L	D,M	E,N	F,P	G,Q	H,R
20	230	4.8	5.1	5.6	4.5	NA	4.7	5.0	5.5
	460	4.8	5.1	5.6	4.5	NA	4.7	5.0	5.5
	575	5.3	5.1	5.6	4.5	NA	5.2	5.0	5.5
24	230	4.8	5.1	5.6	4.5	NA	4.7	5.0	5.5
	460	4.8	5.1	5.6	4.5	NA	4.7	5.0	5.5
	575	5.3	5.1	5.6	4.5	NA	5.2	5.0	5.5
28	230	4.5	5.4	5.9	4.5	4.5	5.4	5.9	4.5
	460	4.5	5.4	5.9	4.5	4.5	5.4	5.9	4.5
	575	4.5	5.4	5.9	4.5	4.5	5.4	5.9	4.5

50PG	VOLTAGE	BELT TENSION (lb) Unit Model Number Position 10							
		A,J	B,K	C,L	D,M	E,N	F,P	G,Q	H,R
20	230	4.8	5.1	5.6	4.5	4.8	5.1	5.6	4.5
	460	4.8	5.1	5.6	4.5	4.8	5.1	5.6	4.5
	575	5.3	5.1	5.6	4.5	5.3	5.1	5.6	4.5
24	230	4.8	5.1	5.6	4.5	4.8	5.1	5.6	4.5
	460	4.8	5.1	5.6	4.5	4.8	5.1	5.6	4.5
	575	5.3	5.1	5.6	4.5	5.3	5.1	5.6	4.5
28	230	4.5	5.4	5.9	4.5	4.5	5.4	5.9	4.5
	460	4.5	5.4	5.9	4.5	4.5	5.4	5.9	4.5
	575	4.5	5.4	5.9	4.5	4.5	5.4	5.9	4.5

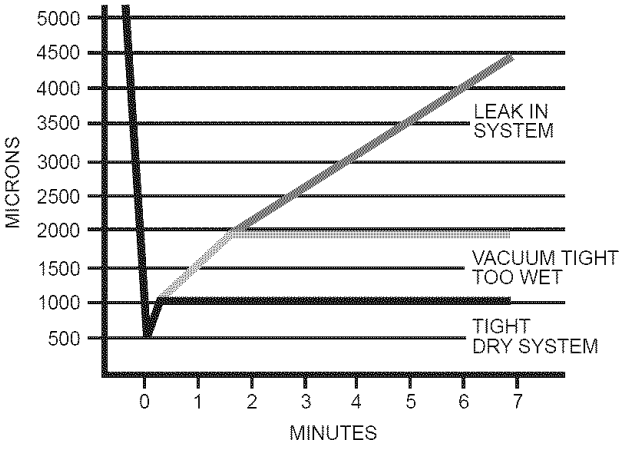


Fig. 41 — Deep Vacuum Graph

TRIPLE EVACUATION METHOD — The triple evacuation method should only be used when vacuum pump is capable of pumping down to 28 in. of mercury and system does not contain any liquid water. Proceed as follows:

1. Pump system down to 28 in. of mercury and allow pump to continue operating for an additional 15 minutes.
2. Close service valves and shut off vacuum pump.
3. Connect a nitrogen cylinder and regulator to system and open until system pressure is 2 psig.
4. Close service valve and allow system to stand for 1 hr. During this time, dry nitrogen will be able to diffuse throughout the system, absorbing moisture.
5. Repeat this procedure. System will then contain minimal amounts of contaminants and water vapor.

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.

Puron® (R-410A) refrigerant cylinders contain a dip tube which allows liquid refrigerant to flow from the cylinder in an upright position. Charge units with cylinder in the upright position and a commercial type metering device in the manifold hose.

⚠ CAUTION

This system uses Puron refrigerant which has higher pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gage set, hoses, and recovery system must be designed to handle Puron refrigerant. If unsure about equipment, consult the equipment manufacturer.

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 (refer to unit nameplate).

NOTE: System charge for units with Humidi-MiZer™ system is greater than the system charge of the standard unit.

LOW CHARGE COOLING — Using cooling charging chart (see Fig. 42-45), add or remove refrigerant until conditions of the chart are met. An accurate pressure gage and temperature-sensing device are required. Charging is accomplished by ensuring the proper amount of liquid subcooling. Measure liquid line pressure at the liquid line service valve using pressure gage. Connect temperature sensing device to the liquid line near the liquid line service valve and insulate it so that outdoor ambient temperature does not affect reading.

TO USE THE COOLING CHARGING CHART, STANDARD UNITS — Use the above temperature and pressure readings, and find the intersection point on the cooling charging chart. If intersection point on chart is above line, add refrigerant. If intersection point on chart is below line, carefully recover some of the charge. Recheck suction pressure as charge is adjusted.

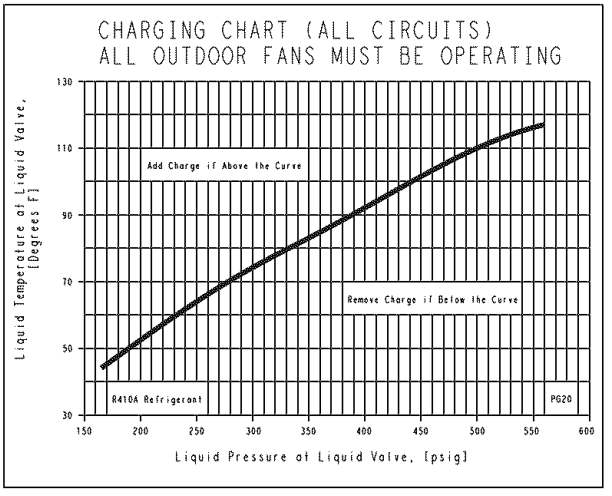


Fig. 42 — Charging Chart — 48/50PG20 — Standard Unit

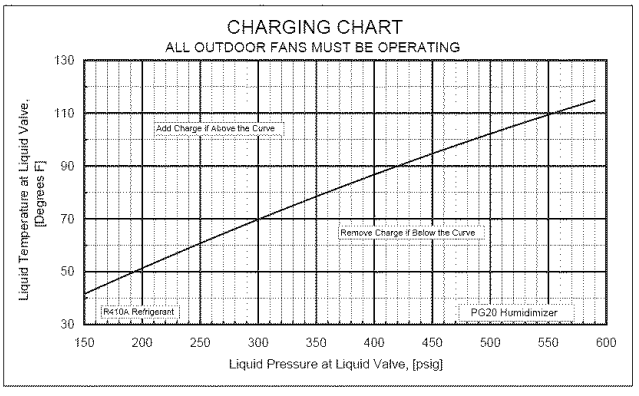


Fig. 43 — Charging Chart — 48/50PG20 — Unit with Humidi-MiZer™ System

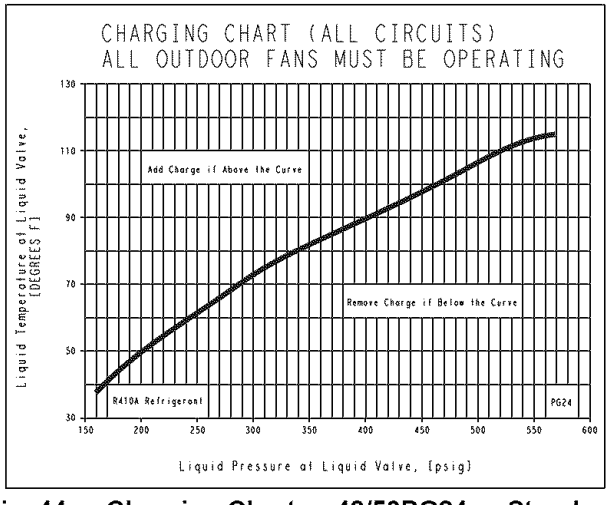


Fig. 44 — Charging Chart — 48/50PG24 — Standard Unit and Unit with Humidi-MiZer™ System

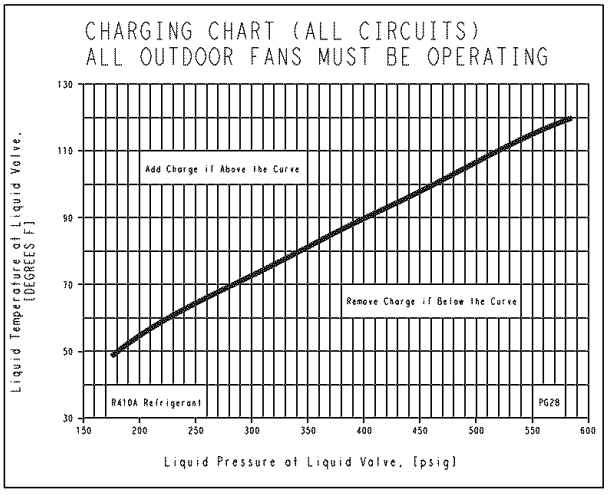


Fig. 45 — Charging Chart — 48/50PG28 — Standard Unit and Unit with Humidi-MiZer™ System

The TXV (thermostatic expansion valve) is set to maintain between 10 and 15 degrees of superheat at the compressors. The valves are factory set and cannot be adjusted. Do not use an R-22 TXV.

NOTE: All circuits must be running in normal cooling mode. Indoor airflow must be within specified air quantity limits for cooling (see Tables 27 and 28). All outdoor fans must be on and running at high speed. If outdoor temperature is low, this may require a temporary change in unit wiring.

TO USE THE COOLING CHARGING CHARTS, 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 (see Tables 27 and 28). All outdoor fans must be on and running at high speed. Use the Cooling Service Test Outdoor Fan function (***Service Test→COOL→OF.OV***) to start all outdoor fans. If the outdoor temperature is low, the Motormaster® outdoor fan control device may need to be temporarily bypassed by rewiring the power leads to obtain full speed.

Be sure unit is in normal cooling mode by checking that the RH2 solenoid coil(s) and the CRC relay are deenergized (control outputs off). Adjust charge per the charging charts as described in the To Use The Cooling Charging Charts, Standard Unit section on page 89. Switch system to run in the dehumidification mode for 5 minutes. Dehumidification mode is when the RH2 solenoid coil(s) and the CRC relay are energized. Switch back to cooling mode to recheck pressures and temperatures on the charging chart and adjust charge if necessary. If charge adjustment is necessary, then repeat the steps in this paragraph until no charge adjustment is necessary. When no more charge adjustment is necessary after switching from Dehumidification mode back to Cooling mode, then charge adjustment procedure is complete. Remove jumper from the outdoor motor speed controller.

PURON® REFRIGERANT — Puron refrigerant operates at 50 to 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with Puron refrigerant. Do not mix with components that have been used with other refrigerants. Puron refrigerant, as with other HFCs, is only compatible with POE oils.

Recovery cylinder service pressure rating must be 400 psig. Puron systems should be charged with liquid refrigerant. Use a commercial-type metering device in the manifold hose. Manifold sets should be 750 psig high-side and 200 psig low-side with 520 psig low-side retard. Use hoses with 750 psig service pressure rating. Leak detectors should be designed to detect HFC refrigerant.

Gas Valve Adjustment (48PG Only)

NATURAL GAS — The gas valve opens and closes in response to the thermostat or limit control.

When power is supplied to valve terminals W2 (High Fire) and C1, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body. The setting is 3.00 in. wg for vertical supply/discharge units. The setting is 2.95 in. wg for horizontal supply/discharge units.

To adjust regulator:

1. Set unit at setting for no call for heat.
2. Turn 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. Set main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment screw (See Fig. 46).
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, set unit 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.

High Altitude (48PG Only) — For high altitude applications greater than 2000 ft the heat input rate should be reduced. The higher the altitude is above sea level, the less oxygen is in the air. See Table 58 for orifice sizing. A high altitude kit is available to convert unit for altitudes up to 7,000 ft.

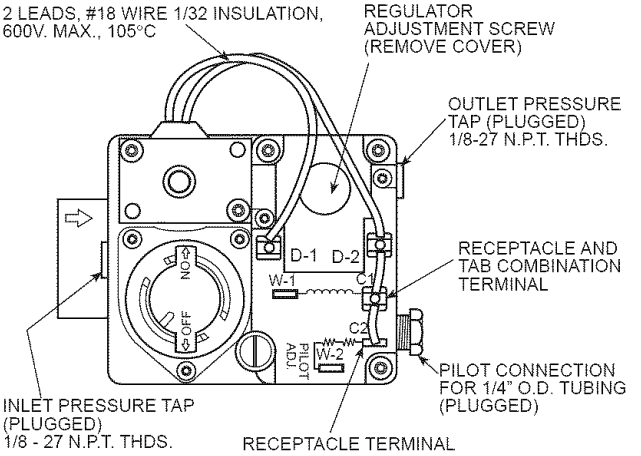


Fig. 46 — Gas Valve (48PG Only)

Main Burners (48PG Only) — For all applications, main burners are factory set and should require no adjustment.

MAIN BURNER REMOVAL

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Remove gas section access panel.
4. Disconnect gas piping from gas valve inlet.
5. Remove wires from gas valve.
6. Remove wires from rollout switch.
7. Remove sensor wire and ignitor cable from IGC board.
8. Remove 2 screws securing manifold bracket to basepan.
9. Remove 2 screws that hold the burner assembly to vestibule plate.
10. Lift burner/manifold assembly out of unit.

CLEANING AND ADJUSTMENT

1. Remove burner rack from unit as described in Main Burner Removal section above.
2. Inspect burners, and if dirty, remove burners from rack.
3. Using a soft brush, clean burners and crossover port as required.
4. Adjust spark gap. See Fig. 47.
5. Reinstall burners on rack.
6. Reinstall burner rack as described above.

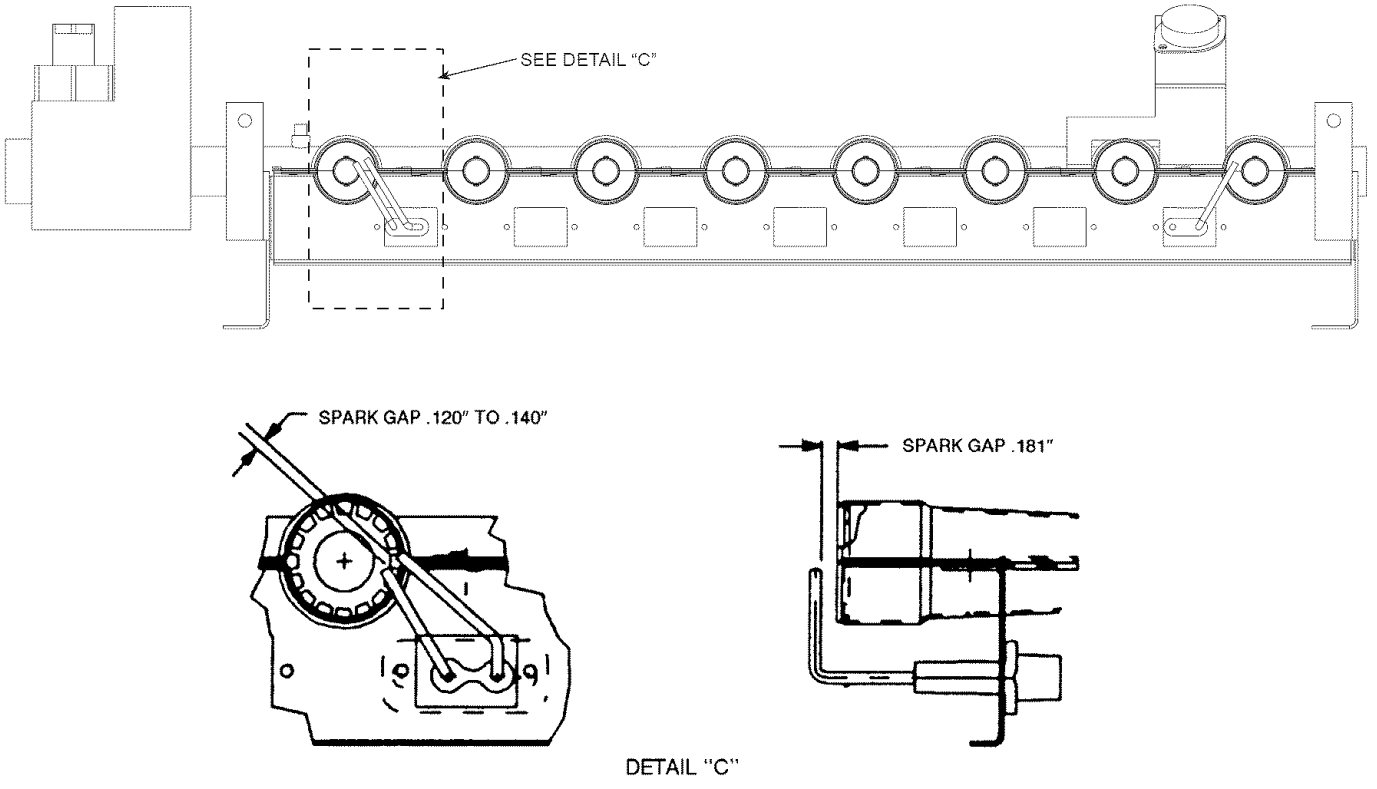


Fig. 47 — Spark Gap Adjustment (48PG Only)

Table 58 — Altitude Compensation* — 48PG20-28

NATURAL GAS

ELEVATION (ft)	NATURAL GAS ORIFICE SIZE†		
	Low Heat (D,L)	Medium Heat (E,M)	High Heat (F,N)
0-1,999	29	30	29
2,000	29	30	29
3,000	30	31	30
4,000	30	31	30
5,000	30	31	30
6,000	30	31	30
7,000	31	32	31
8,000	31	32	31
9,000	31	32	31
10,000	32	33	32

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes. Includes a 4% input reduction per each 1000 ft.
†Orifices available through your Carrier dealer.

PROPANE GAS

ELEVATION (ft)	PROPANE GAS ORIFICE SIZE†		
	Low Heat (D,L)	Medium Heat (E,M)	High Heat (F,N)
0-1,999	35	38	35
2,000	36	39	36
3,000	36	39	36
4,000	37	40	37
5,000	37	40	37
6,000	38	41	38
7,000	39	42	39
8,000	40	43	40
9,000	41	44	41
10,000	42	45	42

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes. Includes a 4% input reduction per each 1000 ft.
†Orifices available through your Carrier dealer.

Filter Drier — Replace whenever refrigerant system is exposed to atmosphere. Only use factory specified liquid-line filter driers with working pressures no less than 650 psig. Do not install a suction-line filter drier in liquid line. A liquid-line filter drier designed for use with Puron® refrigerant is required for each circuit.

Protective Devices

COMPRESSOR PROTECTION

Overcurrent — Each compressor has internal line break motor protection.

Overtemperature — Each compressor has an internal protector to protect it against excessively high discharge gas temperatures.

High-Pressure Switch — If the high-pressure switch trips, the compressor will shut down and the current sensor will not detect current. See the Current Sensor section below for more information.

Current Sensor (CS) — The purpose of the CS is to detect losses in compressor power. After detecting a loss in compressor power, unit control locks out the compressor for 15 minutes. After 15 minutes, the alarm will automatically reset. If this alarm occurs 3 times consecutively, the compressor will remain locked out until an alarm reset is initiated via CCN or manually via the Scrolling Marquee display (see Alarms and Alerts section on page 54 for more details).

EVAPORATOR FAN MOTOR PROTECTION — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

CONDENSER-FAN MOTOR PROTECTION — Each condenser-fan motor is internally protected against overtemperature.

Fuses are also located in the control box and feed power to the condenser fan motors. Always replace blown fuses with the correct size fuse as indicated on the unit fuse label.

SATURATED SUCTION PRESSURE (SSP) — If the SSP for a particular circuit is reading below the alarm set point for an extended period of time, that circuit will be shut down. After 15 minutes, the alarm will automatically reset. If this alarm occurs 3 times consecutively, the circuit will remain locked out until an alarm reset is initiated via CCN or manually via the Scrolling Marquee display (see Alarms and Alerts section on page 54 for more details).

Relief Devices — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side and are located at the suction line service port. Protect joint during brazing operations near joint.

Control Circuit, 24-V — Each control circuit is protected against overcurrent by a 3.2 amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Replacement Parts — A complete list of replacement parts may be obtained from any Carrier distributor upon request.

Diagnostic LEDs — The IGC control board has a LED for diagnostic purposes. See Heating Troubleshooting section on page 60 for more information.

APPENDIX A — LOCAL DISPLAY AND CCN TABLES

MODE — RUN STATUS

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
RUN STATUS				STATUS DISPLAY		
VIEW	Auto View of Run Status			(VIEW = Display only)		
HVAC	HVAC Mode Status	1=Disabled 2=Fan Only 3=Cool 4=Heat				
OCC	Currently Occupied	Yes/No				
SAT	Supply Air Temperature	xxx.x	dF			
ALRM	Current Alarms & Alerts	xx				
TIME	Time of Day	xx.xx	hh.mm			
VERS	Software Version Numbers			VERSIONS		
MBB	CESR131320-xx-xx					
ECB	CESR131249-xx-xx					
MARQ	CESR131171-xx-xx					
HRS	Component Run Hours			STRTHOUR		
A1	Compressor A1 Run Hours	xxxxx.xx	hours		HR_A1	Forcible
A2	Compressor A2 Run Hours	xxxxx.xx	hours		HR_A2	Forcible
B1	Compressor B1 Run Hours	xxxxx.xx	hours		HR_B1	Forcible
C1	Compressor C1 Run Hours	xxxxx.xx	hours		HR_C1	Forcible
CCH	Crankcase Heat Run Hours	xxxxx.xx	hours		HR_CCH	Forcible
IDF	Indoor Fan Run Hours	xxxxx.xx	hours		HR_IDF	Forcible
OFC.1	Outdoor Fan 1 Run Hours	xxxxx.xx	hours		HR_OFC_1	Forcible
OFC.2	Outdoor Fan 2 Run Hours	xxxxx.xx	hours		HR_OFC_2	Forcible
OFC.3	Outdoor Fan 3 Run Hours	xxxxx.xx	hours		HR_OFC_3	Forcible
HT.1	Heat Stage 1 Run Hours	xxxxx.xx	hours		HR_HTR_1	Forcible
HT.2	Heat Stage 2 Run Hours	xxxxx.xx	hours		HR_HTR_2	Forcible
PE.1	Power Exhaust1 Run Hours	xxxxx.xx	hours		HR_PE_1	Forcible
PE.2	Power Exhaust2 Run Hours	xxxxx.xx	hours		HR_PE_2	Forcible
ALRM	Alarm Relay Run Hours	xxxxx.xx	hours		HR_ALM	Forcible
CRC	Reheat1 Valve Run Hours	xxxxx.xx	hours		HR_CRC	Forcible
RH2.A	Reheat2 Valve A Run Hrs	xxxxx.xx	hours		HR_RH2_A	Forcible
RH2.B	Reheat2 Valve BC Run Hrs	xxxxx.xx	hours		HR_RH2_B	Forcible
STRT	Component Starts					
A1	Compressor A1 Starts	xxxxxx			ST_A1	Forcible
A2	Compressor A2 Starts	xxxxxx			ST_A2	Forcible
B1	Compressor B1 Starts	xxxxxx			ST_B1	Forcible
C1	Compressor C1 Starts	xxxxxx			ST_C1	Forcible
CCH	Crankcase Heat Starts	xxxxxx			ST_CCH	Forcible
IDF	Indoor Fan Starts	xxxxxx			ST_IDF	Forcible
OFC.1	Outdoor Fan 1 Starts	xxxxxx			ST_OFC_1	Forcible
OFC.2	Outdoor Fan 2 Starts	xxxxxx			ST_OFC_2	Forcible
OFC.3	Outdoor Fan 3 Starts	xxxxxx			ST_OFC_3	Forcible
HT.1	Heat Stage 1 Starts	xxxxxx			ST_HTR_1	Forcible
HT.2	Heat Stage 2 Starts	xxxxxx			ST_HTR_2	Forcible
PE.1	Power Exhaust1 Starts	xxxxxx			ST_PE_1	Forcible
PE.2	Power Exhaust2 Starts	xxxxxx			ST_PE_2	Forcible
ALRM	Alarm Relay Starts	xxxxxx			ST_ALM	Forcible
CRC	Reheat1 Valve Starts	xxxxxx			ST_CRC	Forcible
RH2.A	Reheat2 Valve A Starts	xxxxxx			ST_RH2_A	Forcible
RH2.B	Reheat2 Valve BC Starts	xxxxxx			ST_RH2_B	Forcible
MODE	Control Modes			MODEDISP		
SYS	System Mode	1=Disabled 2=Enabled 3=Test			SYS_MODE	
HVAC	HVAC Mode	1=Off 2=Fan Only 3=Cool 4=Heat			HVACMODE	
OCC	Currently Occupied	Yes/No			OCCUPIED	Forcible
T.OVR	Timed Override in Effect	Yes/No			MODETOVR	
LINK	Linkage Active	Yes/No			MODELINK	
C.LOC	Circuit OAT Lockout	Yes/No			COMPLOCK	
H.LOC	Heat OAT Lockout	Yes/No			HEATLOCK	
E.LOC	Econo Cool OAT Lockout	Yes/No			ECONLOCK	
COOL	Cooling Status			COOLDISP		
DMD.C	Cooling Demand	xxx.x	^F		COOL_DMD	
AVL.C	Available Cooling Stages	x			AVLCSTGS	
REQ.C	Requested Cooling Stages	x			REQCSTGS	
IDF	Indoor Fan Relay	On/Off			IDF	
CCH	Crankcase Heat Relay	On/Off			CCH	
OFC.1	Outdoor Fan 1 Relay	On/Off			OFC_1	
OFC.2	Outdoor Fan 2 Relay	On/Off			OFC_2	
OFC.3	Outdoor Fan 3 Relay	On/Off			OFC_3	
CRC	Cool->Reheat1 Control	On/Off			CRC	
CIR.A	Refrigerant Circuit A					
CMP.A	Compressors A	On/Off			COMP_A	
TG.A	Timeguard A	xxx	sec		TIMGD_A	
CS.A1	Compressor A1 Feedback	On/Off			CS_A1	
CS.A2	Compressor A2 Feedback	On/Off			CS_A2	
RH2.A	Reheat2 Valve A	On/Off			RH2_A	
SST.A	Sat. Suction Temp A	xxx.x	dF		SST_A	
SSP.A	Suction Pressure A	xxx.x	psig		SSP_A	
SCT.A	Sat. Condenser Temp A	xxx.x	dF		SCT_A	
SCP.A	Condenser Pressure A	xxx.x	psig		SCP_A	

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — RUN STATUS (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
RUN STATUS (cont)						
***COOL* (cont)**						
CIR.B	Refrigerant Circuit B					
CMP.B	Compressors B	On/Off			COMP_B	
TG.B	Timeguard B	xxx	sec		TIMGD_B	
CS.B1	Compressor B1 Feedback	On/Off			CS_B1	
RH2.B	Reheat2 Valve B,C	On/Off			RH2_B	
SST.B	Sat. Suction Temp B	xxx.x	dF		SST_B	
SSP.B	Suction Pressure B	xxx.x	psig		SSP_B	
SCT.B	Sat. Condenser Temp B	xxx.x	dF		SCT_B	
SCP.B	Condenser Pressure B	xxx.x	psig		SCP_B	
CIR.C	Refrigerant Circuit C					
CMP.C	Compressors C	On/Off			COMP_C	
TG.C1	Timeguard C	xxx	sec		TIMGD_C	
CS.C1	Compressor C1 Feedback	On/Off			CS_C1	
RH2.C	Reheat2 Valve B,C	On/Off			RH2_C	
SST.C	Sat. Suction Temp C	xxx.x	dF		SST_C	
SSP.C	Suction Pressure C	xxx.x	psig		SSP_C	
SCT.C	Sat. Condenser Temp C	xxx.x	dF		SCT_C	
SCP.C	Condenser Pressure C	xxx.x	psig		SCP_C	
HEAT	Heating Status			HEATDISP		
DMD.H	Heating Demand	xxx.x	^F		HEAT_DMD	
AVL.H	Available Heating Stages	x			AVLHSTGS	
REQ.H	Requested Heating Stages	x			REQHSTGS	
IDF	Indoor Fan Relay	On/Off			IDF	
HT.1	Heat Stage 1 Relay	On/Off			HEAT_1	
TG.H1	Heat Stage 1 Timeguard	xxx	sec		TIMGD_H1	
HT.2	Heat Stage 2 Relay	On/Off			HEAT_2	
TG.H2	Heat Stage 2 Timeguard	xxx	sec		TIMGD_H2	
ECON	Economizer Status			ECONDISP		
EC.CP	Econo Commanded Position	xxx	%		ECONOCMD	
EC.AP	Econo Actual Position	xxx	%		ECONOPOS	
EC.MP	Minimum Position in Effect	xxx	%		MIN_POS	
IAQ.S	IAQ Level (Switch)	High/Low			IAQIN	
IAQ	IAQ Level (Sensor)	xxxx	ppm		IAQ	
OAT	Outdoor Air Temperature	xxx.x	dF		OA_TEMP	
ENTH	Outdoor Enthalpy Switch	High/Low			ENTHALPY	
OAQ	OAQ Level (Sensor)	xxxx	ppm		OAQ	
PE.1	Power Exhaust 1 Relay	On/Off			PE_1	
PE.2	Power Exhaust 2 Relay	On/Off			PE_2	
(LON_DATA = CCN only)	LON Communication Status			LON_DATA		
	nviSpaceTemp	xxx.x	dF		NVI_SPT	Forcible
	nviSetPoint	xxx.x	dF		NVI_SP	Forcible
	nvoSpaceTemp	xxx.x	dF		NVO_SPT	
	nvoUnitStatus.mode	xxxx			NVO_MODE	
	nvoUnitStatus.heat_out_p	xxx.x	%		NVO_HPRI	
	nvoUnitStatus.heat_out_s	xxx.x	%		NVO_HSEC	
	nvoUnitStatus.cool_out	xxx.x	%		NVO_COOL	
	nvoUnitStatus.econ_out	xxx.x	%		NVO_ECON	
	nvoUnitStatus.fan_out	xxx	%		NVO_FAN	
	nvoUnitStatus.in_alarm	xxx			NVO_ALRM	
	nviSetPtOffset	xxx.x	^F		NVI_SPTO	Forcible
	nviOutsideTemp	xxx.x	dF		NVI_OAT	Forcible
	nviOutsideRH	xxxx.x	%		NVI_OARH	Forcible
	nvoEffectSetPt	xxx.x	dF		NVO_EFSP	
	nvoOutsideTemp	xxxx.x	dF		NVO_OAT	
	nvoOutsideRH	xxx.x	%		NVO_OARH	
	nviSpaceRH	xxx.x	%		NVI_SPRH	Forcible
	nviCO2	xxxxx			NVI_CO2	Forcible
	nvoCO2	xxxxx			NVO_CO2	
	nvoTEMP1	xxx.x	dF		NVO_SAT	
	nvoTEMP2	xxx.x	dF		NVO_RAT	Forcible
	nviPCT1	xxx.x	%		NVI_RHSP	
	nvoPCT1	xxx.x	%		NVO_SPRH	
	nviDISCRETE1	Off/On			NVI_FSD	
	nviDISCRETE2	No/Yes			NVI_OCC	
	nviDISCRETE3	Off/On			NVI_IAQD	
	nvoDISCRETE1	Off/On			NVO_FSD	Forcible
	nvoDISCRETE2	No/Yes			NVO_OCC	Forcible
	nvoDISCRETE3	Off/On			NVO_IAQD	
	nciCO2Limit	xxxxx			NCI_CO2	
	nciSetPnts.occupied_cool	xxx.x	dF		NCI_OCSP	Forcible
	nciSetPnts.standby_cool	xxx.x	dF		NCI_SCSP	Forcible
	nciSetPnts.unoccupd_cool	xxx.x	dF		NCI_UCSP	Forcible
	nciSetPnts.occupied_heat	xxx.x	dF		NCI_OHSP	Forcible
	nciSetPnts.standby_heat	xxx.x	dF		NCI_SHSP	Forcible
	nciSetPnts.unoccupd_heat	xxx.x	dF		NCI_UHSP	Forcible

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — SERVICE TEST

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
SERVICE TEST					MAINTENANCE DISPLAY		
TEST	Field Service Test Mode	On/Off		Off		(TEST = display only)	Forcible
INDP	Test Independent Outputs				TESTINDP		
ECON	Economizer Position Test	0 to 100	%	0		S_ECONO	Forcible
E.CAL	Calibrate Economizer	On/Off		Off		S_ECOCAL	Forcible
PE.1	Power Exhaust 1 Test	On/Off		Off		S_PE_1	Forcible
PE.2	Power Exhaust 2 Test	On/Off		Off		S_PE_2	Forcible
ALRM	Alarm Relay Test	On/Off		Off		S_ALMOUT	Forcible
CCH	Crankcase Heat Test	On/Off		Off		S_CCH	Forcible
FANS	Test Fans				TESTFANS		
IDF	Indoor Fan Test	On/Off		Off		S_IDF	Forcible
OFC.1	Outdoor Fan 1 Test	On/Off		Off		S_OFC_1	Forcible
OFC.2	Outdoor Fan 2 Test	On/Off		Off		S_OFC_2	Forcible
OFC.3	Outdoor Fan 3 Test	On/Off		Off		S_OFC_3	Forcible
COOL	Test Cooling				TESTCOOL		
CMP.A	Cool A Test	On/Off		Off		S_COMP_A	Forcible
CMP.B	Cool B Test	On/Off		Off		S_COMP_B	Forcible
CMP.C	Cool C Test	On/Off		Off		S_COMP_C	Forcible
OF.OV	Outdoor Fan Override	On/Off		Off		S_OFC_3	Forcible
HMZR	Test Humidimizer				TESTHMZR		
RH1.A	Reheat1 A Test	On/Off		Off		S_RH1_A	Forcible
RH1.B	Reheat1 B Test	On/Off		Off		S_RH1_B	Forcible
RH1.C	Reheat1 C Test	On/Off		Off		S_RH1_C	Forcible
RH2.A	Reheat2 A Test	On/Off		Off		S2_RH2_A	Forcible
RH2.B	Reheat2 B Test	On/Off		Off		S2_RH2_B	Forcible
RH2.C	Reheat2 C Test	On/Off		Off		S2_RH2_C	Forcible
CRC	Cool->Reheat1 Valve Test	On/Off		Off		S_CRC	Forcible
RHV.A	Reheat2 Valve A Test	On/Off		Off		S_RH2_A	Forcible
RHV.B	Reheat2 Valve B, C Test	On/Off		Off		S_RH2_B	Forcible
HEAT	Test Heating				TESTHEAT		
HT.1	Heat Stage 1 Test	On/Off		Off		S_HEAT_1	Forcible
HT.2	Heat Stage 2 Test	On/Off		Off		S_HEAT_2	Forcible

MODE — TEMPERATURES

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
				STATUS DISPLAY		
TEMPERATURES				UINPUT		
AIR.T	Air Temperatures					
SAT	Supply Air Temperature	xxx.x	dF		SAT_DISP	
OAT	Outdoor Air Temperature	xxx.x	dF		OA_TEMP	Forcible
SPT	Space Temperature	xxx.x	dF		SPACE_T	Forcible
SPTO	Space Temperature Offset	xxx.x	dF		SPTO	Forcible
RAT	Return Air Temperature	xxx.x	dF		RETURN_T	Forcible
REF.T	Refrigerant Temperatures	xxx.x	dF			
SST.A	Sat. Suction Temp A	xxx.x	dF		SST_A	
SCT.A	Sat. Condenser Temp A	xxx.x	dF		SCT_A	
SST.B	Sat. Suction Temp B	xxx.x	dF		SST_B	
SCT.B	Sat. Condenser Temp B	xxx.x	dF		SCT_B	
SST.C	Sat. Suction Temp C	xxx.x	dF		SST_C	
SCT.C	Sat. Condenser Temp C	xxx.x	dF		SCT_C	

MODE — PRESSURES

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
				STATUS DISPLAY		
PRESSURES				UINPUT		
	Refrigerant Pressures					
SSP.A	Suction Pressure A	xxx.x	psig		SSP_A	
SCP.A	Condenser Pressure A	xxx.x	psig		SCP_A	
SSP.B	Suction Pressure B	xxx.x	psig		SSP_B	
SCP.B	Condenser Pressure B	xxx.x	psig		SCP_B	
SSP.C	Suction Pressure C	xxx.x	psig		SSP_C	
SCP.C	Condenser Pressure C	xxx.x	psig		SCP_C	

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — SET POINTS

DISPLAY MENU/ SUB-MENU/NAME	EXPANDED NAME	VALUES	UNITS	DEFAULT	CCN TABLE/ SUB-TABLE	CCN NAME
					SETPOINT CONFIGURATION	
SETPOINTS					SET_PNT	
OCSP	Occupied Cool Setpoint	55 to 80	dF	78		OCSP
UCSP	Unoccupied Cool Setpoint	75 to 95	dF	85		UCSP
OHSP	Occupied Heat Setpoint	55 to 80	dF	68		OHSP
UHSP	Unoccupied Heat Setpoint	40 to 80	dF	60		UHSP
GAP	Heat-Cool Setpoint Gap	2 to 10	dF	5		HCSP_GAP
STO.R	SPT Offset Range (+/–)	1 to 5	^F	5		SPTO_RNG
RH.SP	Space RH Setpoint	30 to 95	%	50		SPRH_SP
RH.DB	Space RH Deadband	2 to 20	%	5		SPRH_DB
RH.HB	Reheat Heat SP Deadband	–5 to 5	^F	2		RH_HSPDB
CA.LO	Circuit A Lockout Temp	0 to 100	dF	0		OATLCMPA
CB.LO	Circuit B Lockout Temp	0 to 100	dF	0: no Humidi-Mizer 0: Humidi-Mizer		OATLCMPB
CC.LO	Circuit C Lockout Temp	0 to 100	dF	0		OATLCMPC
HT.LO	Heating Lockout Temp	40 to 125	dF	75		OATLHEAT
EH.LO	Econo Cool Hi Temp Limit	40 to 100	dF	65		OATLECLH
EL.LO	Econo Cool Lo Temp Limit	–30 to 50	dF	0		OATLECLL
FC.LO	Free Cool Low Temp Limit	–35 to 70	dF	50		OATLUEFC
LCSP	Low Cool SAT Setpoint	55 to 75	dF	65		LCSASP
HCSP	High Cool SAT Setpoint	50 to 70	dF	55		HCSASP
SAT.U	Minimum SAT Upper Level	35 to 65	dF	58 (20, 24) 53 (28)		SATMIN_H
SAT.L	Minimum SAT Lower Level	35 to 65	dF	48		SATMIN_L

MODE — INPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
INPUTS				STATUS DISPLAY		
STAT	Thermostat Inputs			UINPUT		
Y1	Thermostat Y1 Input	On/Off			Y1	Forcible
Y2	Thermostat Y2 Input	On/Off			Y2	Forcible
W1	Thermostat W1 Input	On/Off			W1	Forcible
W2	Thermostat W2 Input	On/Off			W2	Forcible
G	Thermostat G Input	On/Off			G	Forcible
GEN.I	General Inputs					
FIL.S	Filter Status Switch	Dirty/Clean			FILTSTAT	
FAN.S	Fan Status Switch	On/Off			FAN_STAT	
FDWN	Fire Shutdown Switch	On/Off			FIREDOWN	Forcible
ENTH	Outdoor Enthalpy Switch	High/Low			ENTHALPY	Forcible
RM.OC	Remote Occupancy Switch	On/Off			REM_OCC	Forcible
HUM	Space Humidity Switch	High/Low			HUM_STAT	Forcible
CS.IN	Current Sensor Inputs					
CS.A1	Compressor A1 Feedback	On/Off			CS_A1	
CS.A2	Compressor A2 Feedback	On/Off			CS_A2	
CS.B1	Compressor B1 Feedback	On/Off			CS_B1	
CS.C1	Compressor C1 Feedback	On/Off			CS_C1	
AIR.Q	Air Quality Inputs					
IAQ.S	IAQ Level (Switch)	High/Low			IAQIN	Forcible
IAQ	IAQ Level (Sensor)	xxxx	ppm		IAQ	Forcible
OAQ	OAQ Level (Sensor)	xxxx	ppm		OAQ	Forcible
SP.RH	Space Humidity Sensor	xxx.x	%		SPRH	Forcible

MODE — OUTPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
OUTPUTS				STATUS DISPLAY		
FANS	Fan Outputs			UOUTPUT		
IDF	Indoor Fan Relay	On/Off			IDF	
OFC.1	Outdoor Fan 1 Relay	On/Off			OFC_1	
OFC.2	Outdoor Fan 2 Relay	On/Off			OFC_2	
OFC.3	Outdoor Fan 3 Relay	On/Off			OFC_3	
COOL	Cool Outputs					
CMP.A	Circuit A Compressors	On/Off			COMP_A	
CMP.B	Circuit B Compressors	On/Off			COMP_B	
CMP.C	Circuit C Compressors	On/Off			COMP_C	
CCH	Crankcase Heat Relay	On/Off			CCH	
CRC	Cool–>Reheat1 Control	On/Off			CRC	
RH2.A	Reheat2 Valve A	On/Off			RH2_A	
RH2.B	Reheat2 Valve BC	On/Off			RH2_B	
HEAT	Heat Outputs					
HT.1	Heat Stage 1 Relay	On/Off			HEAT_1	
HT.2	Heat Stage 2 Relay	On/Off			HEAT_2	
ECON	Economizer Outputs					
EC.CP	Econo Commanded Position	0 to 100	%		ECONOCMD	Forcible
EC.AP	Econo Actual Position	0 to 100	%		ECONOPOS	
PE.1	Power Exhaust 1 Relay	On/Off			PE_1	Forcible
PE.2	Power Exhaust 2 Relay	On/Off			PE_2	Forcible
ALRM	Alarm Relay	On/Off			ALMOUT	Forcible

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — CONFIGURATION

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB-TABLE	CCN POINT	PAGE NO.
CONFIGURATION					SERVICE CONFIGURATION		
DISP	Display Configuration				DISPLAY		
METR	Metric Display	On/Off		Off		DISPUNIT	39
LANG	Language Selection	0=English 1=Spanish 2=French 3=Portuguese		0		LANGUAGE	39
PROT	Password Enable	Enable/Disable		Enable		PASS_EBL	39
PSWD	Service Password	0000 to 9999		1111		PASSWORD	39
TEST	Test Display LEDs	On/Off		Off		DISPTEST	39
UNIT	Unit Configuration				UNIT		
S.DLY	Start Up Delay	0 to 600	sec	30		STARTDLY	39
U.CTL	Unit Control Type	1=Auto Select 2=Thermostat 3=Space Sensor		2		CTL_TYPE	35, 39, 41, 43, 47
T.CTL	Thermostat Control Type	0=Adaptive 1=1 Stage Y1 2=2 Stage Y1		0		STATTYPE	38, 39, 41
OC.FN	Fan On When Occupied	Yes/No		Yes		OCC_FAN	39, 41, 43
IDF.F	Shut Down on IDF Failure	Yes/No		Yes		FATALFAN	40, 56
EC.EN	Economizer Installed	Yes/No		No: no FIOP Yes: FIOP		ECONO	40, 41
FN.SW	Fan Status Switch	0=No Switch 1=Normally Open 2=Normally Closed		0: no FIOP 1: FIOP		FANSTCFG	40, 56, 82
FL.SW	Filter Status Switch	0=No Switch 1=Normally Open 2=Normally Closed		0: no FIOP 1: FIOP		FILSTCFG	40, 82
FS.SW	Fire Shutdown Switch	0=No Switch 1=Normally Open 2=Normally Closed		0: no FIOP 1: FIOP		SHTDNCFG	38, 40
RM.SW	Remote Occupancy Switch	0=No Switch 1=Normally Open 2=Normally Closed		0		REMOCCFG	38, 40
SAT.T	SAT Settling Time	10 to 900	sec	240		SAT_SET	40, 42
SAT.H	SAT Heat Mode Sensing	Enable/Disable		Disable		SAT_HEAT	40, 44
RAT.S	RAT Sensor On SPTO Input	Yes/No		No		RAT_SPTO	40, 82
RH.S	RH Sensor ON OAQ Input	Yes/No		No		RH_OAQ	35, 38, 40, 47, 82
RH.SW	Space Humidity Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no Humidi-MiZer FIOP 1: Humidi-MiZer FIOP		HUMSTCFG	35, 38, 40, 47, 82
TCS.C	Temp Cmp Strt Cool Factr	0 to 60	mins	0		TCSTCOOL	40, 51
TCS.H	Temp Cmp Strt Heat Factr	0 to 60	mins	0		TCSTHEAT	40, 41
COOL	Cooling Configuration				COOL_CFG		
N.CIR	Number of Circuits	1 to 3		2		NUM_CIRC	56
N.A	Compressors on Circuit A	1 to 2		1		A_COMPS	56
MRT.C	Compressor Min On Time	120 to 999	sec	180		MIN_ON	41, 42
MOT.C	Compressor Min Off Time	300 to 999	sec	300		MIN_OFF	41, 42
RST.C	Runtime to Reset Strikes	120 to 999	sec	300		MIN_ON_S	
C.DEC	Cool Stage Decrease Rate	120 to 999	sec	300		STAGEDEC	41, 42
C.INC	Cool Stage Increase Rate	120 to 999	sec	450		STAGEINC	41, 42
FOD.C	Fan-off Delay, Mech Cool	0 to 600	sec	60		COOL_FOD	
CA.LO	Circuit A Lockout Temp	0 to 100	dF	0		OATLCMPA	41
CB.LO	Circuit B Lockout Temp	0 to 100	dF	0: no Humidi-MiZer FIOP Humidi-MiZer FIOP: 0		OATLCMPB	41
CC.LO	Circuit C Lockout Temp	0 to 100	dF	0		OATLCMPC	41
ALM.N	Alert Each Strike	Yes/No		Yes		ALM_NOW	52
SAT	Supply Air Temperature						
SA.PD	SAT Cool Demand (+) Level	0.5 to 10	^F	1		SAT_POS	
SA.ND	SAT Cool Demand (–) Level	–10 to –0.5	^F	–1		SAT_NEG	
SAT.U	Minimum SAT Upper Level	35.0 to 65.0	dF	58		SATMIN_H	
SAT.L	Minimum SAT Lower Level	35.0 to 65.0	dF	48		SATMIN_L	
SPT	Space Temperature						
CL.PD	SPT Cool Demand (+) Level	0.5 to 5	^F	1		DEM_POS	
CL.ND	SPT Cool Demand (–) Level	–5 to –0.5	^F	–1		DEM_NEG	
C.LAG	Cool Thermal Lag Factor	0 to 5	min	1		COOL_LAG	
CIR.A	Circuit A						42
CS.A1	A1 Current Sensing	Enable/Disable		Disable (1-phase) Enable (3-phase)		A1_SENSE	55
CS.A2	A2 Current Sensing	Enable/Disable		Disable		A2_SENSE	
A1.FN	A Circuit Level 1 Fans	0 to 7		1: No Humidi-MiZer FIOP (20, 24) 5: No Humidi-MiZer FIOP (28) 1: Humidi-MiZer FIOP		CIR_A_1	
A2.FN	A Circuit Level 2 Fans	0 to 7		No Humidi-MiZer FIOP 3 (20) 2 (24, 28) Humidi-MiZer FIOP 3 (20) 2 (24, 28)		CIR_A_2	
A3.FN	A Circuit Level 3 Fans	0 to 7		No Humidi-MiZer FIOP 3 (20, 24) 7 (28) Humidi-MiZer FIOP 3		CIR_A_3	

LEGEND

FIOP — Factory-Installed Option

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/ SUB-TABLE	CCN POINT	PAGE NO.
CONFIGURATION (cont)							
COOL (cont)							
CIR.B	Circuit B						42
CS.B1	B1 Current Sensing	Enable/Disable		Enable		B1_SENSE	55
B1.FN	B Circuit Level 1 Fans	0 to 7		No Humidi-MiZer FIOP 4 Humidi-MiZer FIOP 1		CIR_B_1	
B2.FN	B Circuit Level 2 Fans	0 to 7		No Humidi-MiZer FIOP 6 (20) 2 (24, 28) Humidi-MiZer FIOP 3 (20) 2 (24, 28)		CIR_B_2	
B3.FN	B Circuit Level 3 Fans	0 to 7		No Humidi-MiZer FIOP 6 Humidi-MiZer FIOP 3		CIR_B_3	
CIR.C	Circuit C						42
CS.C1	C1 Current Sensing	Enable/Disable		Disable		C1_SENSE	55
C1.FN	C Circuit Level 1 Fans	0 to 7		0		CIR_C_1	
C2.FN	C Circuit Level 2 Fans	0 to 7		0		CIR_C_2	
C3.FN	C Circuit Level 3 Fans	0 to 7		0		CIR_C_3	
SST	Low Suction Control				LOW SUCTION CONTROL		
SST.O	Suction OK Temperature	10 to 50	dF	18		SSTOK	
SST.1	Low Suction — Level 1	10 to 50	dF	20		SSTLEV1	55
SST.2	Low Suction — Level 2	5 to 50	dF	15		SSTLEV2	55
SST.3	Low Suction — Level 3	0 to 50	dF	10		SSTLEV3	55
OFC	Outdoor Fan Control				OUTDOOR FAN CONTROL		42
OFC.3	OFC3 Enable. CCH Disable	Yes/No		Yes		OFC3_CTL	56
0.MXP	Fan Lev0 Max Pressure	100 to 500	psig	200		LEV0MAXP	
1.MXP	Fan Lev1 Max Pressure	100 to 500	psig	450		LEV1MAXP	
2.MNP	Fan Lev2 Min Pressure	100 to 500	psig	200		LEV2MNP	
2.ON	Fan Lev2 On Temperature	0 to 100	F	no Humidi-MiZer FIOP: 55 (20) 45 (24-28) Humidi-MiZer FIOP: 68 (20) 61 (24) 61 (28)		LEV2ON	
2.OFF	Fan Lev2 Off Temperature	0 to 100	F	no Humidi-MiZer FIOP: 50 (20) 40 (24-28) Humidi-MiZer FIOP: 57 (20) 57 (24) 57 (28)		LEV2OFF	
2.MXP	Fan Lev2 Max Pressure	100 to 500	psig	400		LEV2MAXP	
3.MNP	Fan Lev3 Min Pressure	100 to 500	psig	250		LEV3MINP	
3.ON	Fan Lev3 on Temperature	0 to 100	F	no Humidi-MiZer FIOP: 65 Humidi-MiZer FIOP: 88 (20) 68 (24) 68 (28)		LEV3ON	
3.OFF	Fan Lev3 Off Temperature	0 to 100	F	no Humidi-MiZer FIOP: 55 Humidi-MiZer FIOP: 78 (20) 62 (24) 62 (28)		LEV3OFF	

LEGEND

FIOP — Factory-Installed Option

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB-TABLE	CCN POINT	PAGE NO.
CONFIGURATION (cont)							
HMZR	Humidimizer Config				HMZR CFG		42, 47
REHT	Humidimizer Equipped	Yes/No		No: no Humidi-MiZer FIOP Yes: Humidi-MiZer FIOP		REHEAT	47, 56
R.DEC	Reheat2 Stage Decr. Time	0 to 999	secs	60		RSTAGDEC	47
R.INC	Reheat2 Stage Incr. Time	0 to 999	secs	300		RSTAGINC	47
RH.FN	Reheat Fan Control	Yes/No		Yes		RHFANCTL	47, 56
RF.LV	Reheat2 ODF Fan On Level	0 to 3		2		RHFANLEV	47
RF.ON	Reheat2 ODF Fan On Temp	0 to 100	F	93 (20) 93 (24) 85 (28)		RHFANON	47
RF.OF	Reheat2 ODF Fan Off Temp	0 to 100	F	83 (20) 88 (24) 80 (28)		RHFANOFF	47
RA.LO	Reheat2 OAT Limit A	20 to 70	F	40		OATLRH_A	47
RA.LP	Reheat2 SSP Lo Limit A	50 to 100	psig	80		RHSSPL_A	47
RA.HP	Reheat2 SSP Hi Limit A	50 to 100	psig	90		RHSSPH_A	47
RB.LO	Reheat2 OAT Limit B, C	20 to 70	F	50		OATLRH_B	47
RB.LP	Reheat2 SSP Lo Limit B, C	50 to 100	psig	80		RHSSPL_B	47
RB.HP	Reheat2 SSP Hi Limit B, C	50 to 100	psig	90		RHSSPH_B	47
HEAT	Heating Configuration				HEAT_CFG		
HT.TY	Type of Heat Installed	0 = No Heat 1 = Gas 2 = Electric		0 (50 series with no electric heat) 1 (48 series) 2 (50 series with electric heat)		HEATTYPE	42, 44, 82
N.HTR	Number of Heat Stages	1 to 2		1 (48 series 1-phase, 50 series <15kW) 2 (48 series 3-phase, 50 series >=15kW)		NUM_HEAT	44
MRT.H	Heat Minimum On Time	60 to 999	sec	120		HMIN_ON	42, 44
MOT.H	Heat Minimum Off Time	60 to 999	sec	120		HMIN_OFF	42, 44
H.DEC	Heat Stage Decrease Rate	120 to 999	sec	300		HSTAGDEC	43, 44
H.INC	Heat Stage Increase Rate	120 to 999	sec	450		HSTAGINC	43, 44
FOD.E	Fan-off Delay, Elect Heat	10 to 600	sec	30		ELEC_FOD	44
FOD.G	Fan-off Delay, Gas Heat	45 to 600	sec	45		GAS_FOD	43
HT.LO	Heating Lockout Temp	40 to 125	dF	75		OATLHEAT	42
SAT.H	SAT Heat Mode Sensing	Enable/Disable		Disable		SAT_HEAT	44
SPT	Space Temperature Sensor						
HT.PD	SPT Heat Demand (+) Level	0.5 to 5	^F	1		HDEM_POS	
HT.ND	SPT Heat Demand (–) Level	–5 to –0.5	^F	–1		HDEM_NEG	
H.LAG	Heat Thermal Lag Factor	0 to 5	min	1		HEAT_LAG	
ECON	Economizer Configuration				ECON_CFG		
EC.EN	Economizer Installed	Yes/No		No: no FIOP Yes: FIOP		ECONO	44, 82
E.CTL	Economizer Control Type	1=Digital, Position Feedback 2=Digital, Command Feedback 3=Analog Control		1		ECON_CTL	36, 45, 57
EC.MN	Econo Minimum Position	0 to 100	%	30		ECONOMIN	44
EC.MX	Econo Cool Max Position	0 to 100	%	100		ECONOMAX	44, 45
EH.LO	Econo Cool Hi Temp Limit	40 to 100	dF	65		OATLECLH	
EL.LO	Econo Cool Lo Temp Limit	–30 to 50	dF	0		OATLECLL	
UEFC	Unoccupied Free Cooling	0=Disabled 1=Entire Unoccupied Period 2=PreOccupancy Time		2		UEFC_CFG	45
FC.TM	Free Cool PreOcc Time	1 to 9999	min	120		UEFCTIME	45
FC.LO	Free Cool Low Temp Limit	0 to 70	dF	50		OATLUEFC	45
PE.EN	Power Exhaust Installed	Yes/No		No: no FIOP Yes: FIOP		PE_ENABL	45, 82
PE.1	PE Stage1 Econo Position	10 to 100	%	40		PE1_POS	45
PE.2	PE Stage2 Econo Position	10 to 100	%	75		PE2_POS	45
EN.SW	Enthalpy Switch	0=No Switch 1=Normally Open 2=Normally Closed		0: no FIOP 1: FIOP		ENTHLCFG	38
E.TRV	Economizer Travel Time	5 to 300	sec	150		ECONOTRV	
E.MXB	Bottom Stage Max Econo	0 to 100	%	50		ECONMAXB	
E.MXM	Middle Stage Max Econo	1 to 100	%	35		ECONMAXM	
E.MXT	Top Stage Max Econo	0 to 100	%	25		ECONMAXT	
E.DBD	Economizer PID Deadband	0 to 25	%	3		ECONBAND	
EC.P	Economizer PID — kP	0.0 to 99.9	sec	2.5		ECONO_P	
EC.I	Economizer PID — kI	0.0 to 99.9	sec	0.1		ECONO_I	
EC.D	Economizer PID — kD	0.0 to 99.9	sec	1		ECONO_D	
EC.DT	Economizer PID — rate	10.0 to 180.0	sec	15		ECONO_DT	

LEGEND

FIOP — Factory-Installed Option

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB-TABLE	CCN POINT	PAGE NO.
CONFIGURATION (cont)							
AIR.Q	Air Quality Configuration				IAQ_CFG		
IA.CF	IAQ Analog Input Config	0=No IAQ 1=Demand Ventilation 2=Econ Position Override 3=Econ Min Position Control		0: no FIOP 1: FIOP		IAQANCFG	39, 49, 82
IA.FN	IAQ Analog Fan Config	0=Never 1=Only While Occupied 2=Always		0		IAQANFAN	41, 51
II.CF	IAQ Switch Input Config	0=No IAQ 1=DCV Normally Open 2=DCV Normally Closed 3=Override Normally Open 4=Override Normally Closed		0		IAQINCFG	39, 49, 50
II.FN	IAQ Switch Fan Config	0=Never 1=Only While Occupied 2=Always		0		IAQINFAN	41
AQ.MN	Econo Min IAQ Position	0 to 100		10		IAQMINP	49
EC.MN	Econo Minimum Position	0 to 100		30		ECONOMIN	49, 50
OVR.P	IAQ Override Position	0 to 100		100		IAQOVPOS	49, 50
OA.CF	OAQ Analog Input Cfg	0=No OAQ 1=Demand Ventilation 2=Outdoor Air Lockout		0		OAQANCFG	39, 49, 50, 82
OAQ.L	OAQ Lockout Limit	0 to 5000		600		OAQLOCK	50
AQD.L	AQ Differential Low	0 to 5000		100		DAQ_LOW	49
AQD.H	AQ Differential High	0 to 5000		700		DAQ_HIGH	49
DF.ON	Fan On AQ Differential	0 to 5000		600		DAQFNON	50
DF.OF	Fan Off AQ Differential	0 to 5000		200		DAQFNOFF	50
I.4M	IAQ Sensor Value at 4mA	0 to 5000		0		IAQ_4MA	49
I.20M	IAQ Sensor Value at 20mA	0 to 5000		2000		IAQ_20MA	49
O.4M	OAQ Sensor Value at 4mA	0 to 5000		0		OAQ_4MA	50
O.20M	OAQ Sensor Value at 20mA	0 to 5000		2000		OAQ_20MA	50
H.4M	RH Sensor Value at 4mA	0 to 50	%	0		RH_4MA	47
H.20M	RH Sensor Value at 20mA	60 to 100	%	100		RH_20MA	47
ALM.O	Alarm Relay Configuration				ALM_CFG		52
A.SPC	SPT/SPRH Sensor Failure	Yes/No		Yes		SPACE_AL	
A.SRT	SAT/RAT Sensor Failure	Yes/No		Yes		SATRATAL	
A.OAT	OAT Thermistor Failure	Yes/No		Yes		OAT_AL	
A.CS	Current Sensor Failure	Yes/No		Yes		CS_AL	
A.CMP	Compressor Failure	Yes/No		Yes		COMP_AL	
A.CKT	Refrigerant Circuit Failure	Yes/No		Yes		CKT_AL	
A.SSP	SSP Transducer Failure	Yes/No		Yes		SSP_AL	
A.SCT	SCT Thermistor Failure	Yes/No		Yes		SCT_AL	
A.FAN	Indoor Fan Failure	Yes/No		Yes		FAN_AL	
A.FIL	Dirty Filter	Yes/No		Yes		FILT_AL	
A.TST	Thermostat Failure	Yes/No		Yes		TSTAT_AL	
A.ECO	Economizer Failure	Yes/No		Yes		ECON_AL	
TRIM	Sensor Calibration				(CCN TRIM — see Maintenance Display)		64
SPT.C	Space Temp Calibration	–30 to 120	dF				64
SPT.T	Space Temp Trim	–30 to 30	^F	0			64
SAT.C	Supply Air Temp Calib.	–30 to 130	dF				64
SAT.T	Supply Air Temp Trim	–30 to 30	^F	0			64
RAT.C	Return Air Temp Calib.	–30 to 130	dF				
RAT.T	Return Air Temp Trim	–30 to 30	^F	0			
CCN	CCN Configuration				CONFIGURATION		
CCN.A	CCN Element Number	1 to 239		1	(not in CCN table)		35, 51
CCN.B	CCN Bus Number	0 to 239		0	(not in CCN table)		35, 51
BAUD	CCN Baud Rate	1=2400 2=4800 3=9600 4=19200 5=38400		3	(not in CCN table)		35, 51
BROD	CCN Broadcast Configuration				BRODEFS		
B.TIM	CCN Time/Date Broadcast	Yes/No		No		CCNBC	51
B.OAT	CCN OAT Broadcast	Yes/No		No		OATBC	51
B.GS	Global Schedule Broadcast	Yes/No		No		GSBC	40, 51
B.ACK	CCN Broadcast Ack'er	Yes/No		No		CCNBCACK	51
SCH.O	CCN Schedule Overrides				SCHEDOVR		
SCH.N	Schedule Number	0=Always Occupied 1 to 64=Local Schedule 65 to 99=Global Schedule		0		SCHEDNUM	36, 40, 51
HOL.G	Accept Global Holidays	Yes/No		No		HOLIDAYT	51
OV.TL	Override Time Limit	0 to 4	hours	1		OTL	51
OV.EX	Timed Override Hours	0 to 4	hours	0		OVR_EXT	40, 52
OV.SP	SPT Override Enabled	Yes/No		Yes		TIMEOVER	40, 52

LEGEND

FIOP — Factory-Installed Option

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — TIME CLOCK

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/ SUB-TABLE	CCN POINT
TIME CLOCK					CONFIGURATION	
TIME	Time of Day					
TIME	Hour and Minute	xx.xx	hh.mm		(not in CCN table)	
DATE	Current Date					
MNTH	Month of Year	1 to 12 = January to December			(not in CCN table)	
DOM	Day of Month	1 to 31			(not in CCN table)	
YEAR	Year	xxxx			(not in CCN table)	
DAY	Day of Week	1 to 7 = Monday to Sunday			(not in CCN table)	
DST	Daylight Savings Config				BRODEFS	
	Daylight Savings Start:					
STR.M	Start Month	1 to 12 = January to December		4		STARTM
STR.W	Start Week	1 to 5		1		STARTW
STR.D	Start Day	1 to 7		7		STARTD
M.ADD	Minutes to Add	0 to 90		60		MINADD
	Daylight Savings Stop:					
STP.M	Stop Month	1 to 12 = January to December		10		STOPM
STP.W	Stop Week	1 to 5		5		STOPW
STP.D	Stop Day	1 to 7		7		STOPD
M.SUB	Minutes to Subtract	0 to 90		60		MINSUB
SCH.L	Occupancy Schedule				(SCH.L = Display only)	
PER.x	Occupancy Period x					
OCC.x	Occupied From	00.00 to 23.59	hh.mm	00.00		
UNC.x	Occupied To	00.00 to 23.59	hh.mm	00.00		
MON.x	Monday in Period	Yes/No		No		
TUE.x	Tuesday in Period	Yes/No		No		
WED.x	Wednesday in Period	Yes/No		No		
THU.x	Thursday in Period	Yes/No		No		
FRI.x	Friday in Period	Yes/No		No		
SAT.x	Saturday in Period	Yes/No		No		
SUN.x	Sunday in Period	Yes/No		No		
HOL.x	Holiday in Period	Yes/No		No		
(repeat up to x= 8 Periods)						
(OCCFECS = CCN only)	Occupancy Supervisory				OCCDEFCS	
	Period x DOW (MTWTFSSH)	xxxxxxxx		00000000		DOWx
	Occupied From	00.00 to 23.59	hh.mm	00.00		OCCTODx
	Occupied To	00.00 to 23.59	hh.mm	00.00		UNOCTODx
						(repeat up to x= 8 Periods)
HOL.L	Holiday Schedule				HOLIDAY	
HOL.x	Holiday x				HOLDYxxS	
MON.x	Holiday Start Month	1 to 12 = January to December		0		HOL_MON
DAY.x	Holiday Start Day	1 to 31		0		HOL_DAY
LEN.x	Holiday Duration (days)	1 to 99		0		HOL_LEN
(repeat up to x= 9 Holidays)						(repeat up to xx= 30 Holidays)

CCN ONLY TABLES

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/ SUB-TABLE	CCN POINT
(ALARMDEF = CCN only)					ALARMDEF	
	Alarm Routing Control	00000000 to 11111111		11000000		ALRM_CNT
	Equipment Priority	0 to 7		5		EQP_TYPE
	Comm Failure Retry Time	1 to 240	min	10		RETRY_TM
	Re-Alarm Time	1 to 255	min	180		RE-ALARM
	Alarm System Name	up to 8 alphanum		48_50_PG		ALRM_NAM
(CTLRID = CCN only)					CTLR-ID	
	Device Name:	48_50_PG				
	Description:	text string				
	Location:	text string				
	Software Part Number:	CESR131320-XX-XX				
	Model Number:					
	Serial Number:					
	Reference Number:					

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — OPERATING MODES

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
OPERATING MODES				MAINTENANCE DISPLAY		
MODE	Control Modes			MODES		
SYS	System Mode	text string			SYS_MODE	
HVAC	HVAC Mode	text string			HVACMODE	
OCC	Currently Occupied	Yes/No			OCCUPIED	Forcible
T.OVR	Timed Override in Effect	Yes/No			MODETOVR	
LINK	Linkage Active	Yes/No			MODELINK	
C.LOC	Comp Cool OAT Lockout	Yes/No			COMPLOCK	
H.LOC	Heat OAT Lockout	Yes/No			HEATLOCK	
E.LOC	Econ Cool OAT Lockout	Yes/No			ECONLOCK	
COOL	Cool Mode Diagnostic			COOLDIAG		
COOL	In Cooling Mode?	Yes/No			IN_COOL	
OK.CL	OK to Select Cool Mode?	Yes/No			OK TO COOL	
MS.TG	Mode Select Timeguard	0 to 999	secs		COOLMSTG	
OK.EC	OK to Use Economizer?	Yes/No			ECONCOOL	
OK.MC	OK to Use Compressors?	Yes/No			MECHCOOL	
C.LOC	Circuit OAT Lockout	Yes/No			COMPLOCK	
CA.LO	Circuit A Lockout Temp	0 to 100	dF		OATLCMPA	
CB.LO	Circuit B Lockout Temp	0 to 100	dF		OATLCMPB	
CC.LO	Circuit C Lockout Temp	0 to 100	dF		OATLCMPC	
AVL.C	Available Cooling	x			AVLCSTGS	
REQ.C	Requested Cooling	x			REQCSTGS	
ACT.C	Actual Compressors	x			ACTCSTGS	
CMP.A	Circuit A Compressors	On/Off			COMP_A	
CMP.B	Circuit B Compressors	On/Off			COMP_B	
CMP.C	Circuit C Compressors	On/Off			COMP_C	
ST.A	Circuit A Strikes	x			ASTRIKES	
ST.B	Circuit B Strikes	x			BSTRIKES	
ST.C	Circuit C Strikes	x			CSTRIKES	
F.LEV	Outdoor Fan Level	x			FANLEV	
SAT	Supply Air Temperature					
SAT	Supply Air Temperature	xxx.x	dF		SAT	
SA.DM	Supply Air Temp Demand	xxx.x	^F		SAT_DMD	
SA.PD	SAT Cool Demand (+) Level	xx.x	^F		SAT_POS	
SA.ND	SAT Cool Demand (–) Level	xx.x	^F		SAT_NEG	
SAT.U	Minimum SAT Upper Level	xx.x	dF		SATMIN_H	
SAT.L	Minimum SAT Lower Level	xx.x	dF		SATMIN_L	
SA.TR	Supply Air d/dt (F/min)	xxxx.x			SAT_TREND	
SA.DR	SAT Delta Reference Temp	xxx.x	dF		SAT_REF	
SPT	Space Temperature					
SPT	Space Temperature	xxx.x	dF		SPACE_T	Forcible
DMD.C	Cooling Demand	xxx.x	^F		COOL_DMD	
TRD.C	Cool Demand d/dt (F/min)	xxx.x			CLDTREND	
CL.PD	SPT Cool Demand (+) Level	xx.x	^F		DEM_POS	
CL.ND	SPT Cool Demand (–) Level	xx.x	^F		DEM_NEG	
C.LAG	Cool Thermal Lag Factor	x.x	min		COOL_LAG	
HMZR	Humidimizer			HUMIDIMIZER		
REHT	Humidimizer Equipped	Yes/No			REHEAT	
HUM	Space Humidity Switch	High/Low			HUM_STAT	Forcible
SP.RH	Space Humidity Sensor	xxx.x	%		SPRH	Forcible
R.LO.A	Reheat2 OAT Lockout A	Yes/No			RHALOCK	
RA.LO	Reheat2 OAT Limit A	xx	F		OATLRH_A	
R.LP.A	Reheat2 SSP Override A	Yes/No			RHALPOV	
R.LO.B	Reheat2 OAT Lockout B, C	Yes/No			RHBLOCK	
RB.LO	Reheat2 OAT Limit B, C	xx	F		OATLRH_B	
R.LP.B	Reheat2 SSP Override B, C	Yes/No			RHBLPOV	
AVL.R	Available Reheat2 Stages	x			AVLRSTGS	
REQ.R	Requested Reheat2 Stages	x			REQRSTGS	
ACT.R	Actual Reheat2 Stages	x			ACTRSTGS	
CRC	Cool–>Reheat1 Control	On/Off			CRC	
RH2.A	Reheat2 Valve A	On/Off			RH2_A	
RH2.B	Reheat2 Valve B, C	On/Off			RH2_B	
HEAT	Heat Mode Diagnostic			HEATDIAG		
HEAT	In Heating Mode?	Yes/No			IN_HEAT	
OK.HT	OK to Select Heat Mode?	Yes/No			OK TO HEAT	
MS.TG	Mode Select Timeguard	0 to 999	secs		HEATMSTG	
H.LOC	Heat OAT Lockout	Yes/No			HEATLOCK	
HT.LO	Heating Lockout Temp	40 to 125 F	dF		OATLHEAT	
AVL.H	Available Heating Stages	x			AVLHSTGS	
REQ.H	Requested Heating Stages	x			REQHSTGS	
ACT.H	Actual Heating Stages	x			ACTHSTGS	
HT.1	Heat Stage 1 Relay	On/Off			HEAT_1	
HT.2	Heat Stage 2 Relay	On/Off			HEAT_2	
SPT	Space Temperature					
SPT	Space Temperature	xxx.x	dF		SPACE_T	Forcible
DMD.H	Heating Demand	xxx.x	^F		HEAT_DMD	
TRD.H	Heat Demand d/dt (F/min)	xxx.x			HTDTREND	
HT.PD	SPT Heat Demand (+) Level	xx.x	^F		HDEM_POS	
HT.ND	SPT Heat Demand (–) Level	xx.x	^F		HDEM_NEG	
H.LAG	Heat Thermal Lag Factor	x.x	min		HEAT_LAG	

APPENDIX A — LOCAL DISPLAY AND CCN TABLES (cont)

MODE — OPERATING MODES (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
OPERATING MODES (cont)				MAINTENANCE DISPLAY		
ECON	Economizer Diagnostic			ECONDIAG		
EC.EN	Economizer Installed	Yes/No			ECONO	
OCC	Currently Occupied	Yes/No			OCCUPIED	Forcible
IDF	Indoor Fan Relay	On/Off			IDF	
COOL	In Cooling Mode?	Yes/No			IN_COOL	
E.LOC	Econo Cool OAT Lockout	Yes/No			ECONLOCK	
EH.LO	Econo Cool Hi Temp Limit	40 to 100 F	dF		OATLECLH	
EL.LO	Econo Cool Lo Temp Limit	0 to 50 F	dF		OATLECLL	
FC.LO	Free Cool Low Temp Limit	0 to 70 F	dF		OATLUEFC	
EN.LO	Econo Cool Enth Lockout	Yes/No			ENTHLOCK	
EC.MX	Econo Cool Max Position	0 to 100	%		ECONOMAX	
EC.MN	Econo Minimum Position	0 to 100	%		ECONOMIN	
AQ.DV	IAQ DCV Mode	Yes/No			IN_IAQDV	
AQ.MN	Econo Min IAQ Position	0 to 100	%		IAQMINP	
AQ.OV	IAQ Override Mode	Yes/No			IN_IAQOV	
OVR.P	IAQ Overide Position	0 to 100	%		IAQOVPOS	
AQ.LO	OAQ Lockout Mode	Yes/No			IN_OAQLO	
OAQ.L	OAQ Lockout Limit	0 to 5000			OAQLOCK	
LP.OV	Lo Refrig Press Override	Yes/No			IN_LPOV	
EC.CP	Econo Commanded Position	xxx	%		ECONOCMD	Forcible
EC.AP	Econo Actual Position	xxx	%		ECONOPOS	
EC.MP	Min Position in Effect	xxx	%		MIN_POS	
E.CAL	Economizer Calibrating	Yes/No			ECOINCAL	
(Display TRIM — see Calibration)	Sensor Calibration			TRIM		
(TRIM=CCN Only)	Space Temp Calibration	–30 to 130	dF		SPT_CAL	Forcible
	Space Temp Trim	–30 to 30	^F		SPT_OFF	Forcible
	Supply Air Temp Calib.	–30 to 130	dF		SAT_CAL	Forcible
	Supply Air Temp Trim	–30 to 30	^F		SAT_OFF	Forcible
	Return Air Temp Calib.	–30 to 130	dF		RAT_CAL	Forcible
	Return Air Temp Trim	–30 to 30	^F		RAT_OFF	Forcible
(OCCDEFM = CCN only)	Occupancy Supervisory			OCCDEFM		
	Current Mode (1=Occup)	0,1			MODE	
	Current Occup Period #	0 to 8			PER_NO	
	Time-Override in Effect	Yes/No			OVERLAST	
	Time-Override Duration	0 to 4	hours		OVR_HRS	
	Current Occupied Tiime	xx.xx	hh.mm		STRTTIME	
	Current Unoccupied Time	xx.xx	hh.mm		ENDTIME	
	Next Occupied Day				NXTOCDAY	
	Next Occupied Time	xx.xx	hh.mm		NXTOCTIM	
	Next Unoccupied Day				NXTUNDAY	
	Next Unoccupied Time	xx.xx	hh.mm		NXTUNTIM	
	Previous Unoccupied Day				PRVUNDAY	
	Previous Unoccupied Time	xx.xx	hh.mm		PRVUNTIM	
OPERATING MODES				MAINTENANCE DISPLAY		
(LINKDATA = CCN only)	CCN — Linkage			LINKDATA		
	Supervisory Element #	xxx			SUPE-ADR	
	Supervisory Bus	xxx			SUPE-BUS	
	Supervisory Block Number	xxx			BLOCKNUM	
	Average Occup. Heat Stp.	xxx.x	dF		AOHS	
	Average Occup. Cool Stp.	xxx.x	dF		AOCS	
	Average Unocc. Heat Stp.	xxx.x	dF		AUHS	
	Average Unocc. Cool Stp.	xxx.x	dF		AUCS	
	Average Zone Temperature	xxx.x	dF		AZT	
	Average Occup. Zone Temp	xxx.x	dF		AOZT	
	Linkage System Occupied?	Yes/No			LOCC	
	Next Occupied Day	Mon-Sun			LNEXTOCD	
	Next Occupied Time	xx:xx	hh.mm		LNEXTOCC	Forcible
	Next Unoccupied Day	Mon-Sun			LNEXTUOD	
	Next Unoccupied Time	xx.xx	hh.mm		LNEXTUNC	Forcible
	Last Unoccupied Day	Mon-Sun			LLASTUOD	
	Last Unoccupied Time	xx.xx	hh.mm		LLASTUNC	Forcible

MODE — ALARMS

ITEM	EXPANSION	RANGE	DEFAULT	CCN TABLE/ SUB-TABLE	CCN POINT	WRITE STATUS
ALARMS				ALARMS		
R.CURR	Reset All Current Alarms	Yes/No	No		ALRESET	Forcible
R.HIST	Reset Alarm History	Yes/No	No		ALHISCLR	Forcible
CURR	Currently Active Alarms					
alarm#	text string					
(repeat up to 25 alarms)						
HIST	Alarm History			ALARM HISTORY		
alarm#	alarm#-mm/dd/yy-hh.mm-text string					
(repeat up to 20 Alarms)						

APPENDIX B — CONTROL MODES WITH HUMIDI-MIZER™ SYSTEM AND ECONOMIZER

Thermostat input shown for cooling demand (versus temperature sensor and set point). Humidistat input shown for dehumidification demand (versus relative humidity sensor and set point). Economizer cooling availability is dependent on outdoor temperature or enthalpy.

Circuit Subcooling mode = REHEAT 1
Circuit HGRH mode = hot gas reheat = REHEAT 2
Circuit ON mode = normal cooling
Thermostat Control type configuration = 0 = Adaptive, or Unit Control Type configuration = 3 = Space Temperature, for Dual-circuit and Tri-Circuit units results in added staging timers and flex between 1-stage Y1 and 2-stage Y1.

DUAL CIRCUIT UNITS
1-Stage Y1 (Thermostat Control Type configuration = 1) and 2-Stage Y1 (Thermostat Control Type configuration = 2)

ECONO AVAILABLE?	Y1	Y2	HUMIDISTAT	CIRCUIT A	CIRCUIT B	ECONOMIZER	
NO	OFF	OFF	LOW	OFF	OFF	Min. Position	(Econo closed if fan off)
NO	OFF	OFF	HIGH	HGRH	HGRH	Min. Position	
NO	ON	OFF	HIGH	Subcooling	HGRH	Min. Position	
NO	OFF	ON	HIGH	Subcooling	Subcooling	Min. Position	alarm T411: Y2 without Y1
NO	ON	ON	HIGH	Subcooling	Subcooling	Min. Position	
NO	ON	OFF	LOW	ON	OFF	Min. Position	
NO	OFF	ON	LOW	ON	ON	Min. Position	alarm T411: Y2 without Y1
NO	ON	ON	LOW	ON	ON	Min. Position	
YES	OFF	OFF	LOW	OFF	OFF	Min. Position	(Econo closed if fan off)
YES	OFF	OFF	HIGH	HGRH	HGRH	Min. Position	
YES	ON	OFF	HIGH	Subcooling	HGRH	Min. Position	
YES	OFF	ON	HIGH	Subcooling	Subcooling	Min. Position	alarm T411: Y2 without Y1
YES	ON	ON	HIGH	Subcooling	Subcooling	Min. Position	
YES	ON	OFF	LOW	OFF or ON	OFF	Cooling	
YES	OFF	ON	LOW	OFF or ON	OFF or ON	Cooling	alarm T411: Y2 without Y1
YES	ON	ON	LOW	OFF or ON	OFF or ON	Cooling	

DUAL-CIRCUIT UNITS
Digital (Thermostat Control Type configuration = 3)

ECONO AVAILABLE?	Y1	Y2	HUMIDISTAT	CIRCUIT A	CIRCUIT B	ECONOMIZER	
NO	OFF	OFF	LOW	OFF	OFF	Min. Position	(Econo closed if fan off)
NO	OFF	OFF	HIGH	HGRH	OFF	Min. Position	
NO	ON	OFF	HIGH	HGRH	HGRH	Min. Position	
NO	OFF	ON	HIGH	Subcooling	HGRH	Min. Position	
NO	ON	ON	HIGH	Subcooling	Subcooling	Min. Position	
NO	ON	OFF	LOW	ON	OFF	Min. Position	
NO	OFF	ON	LOW	ON	ON	Min. Position	
NO	ON	ON	LOW	ON	ON	Min. Position	
YES	OFF	OFF	LOW	OFF	OFF	Min. Position	(Econo closed if fan off)
YES	OFF	OFF	HIGH	HGRH	OFF	Min. Position	
YES	ON	OFF	HIGH	HGRH	HGRH	Min. Position	
YES	OFF	ON	HIGH	Subcooling	HGRH	Min. Position	
YES	ON	ON	HIGH	Subcooling	Subcooling	Min. Position	
YES	ON	OFF	LOW	OFF or ON	OFF	Cooling	
YES	OFF	ON	LOW	OFF or ON	OFF or ON	Cooling	
YES	ON	ON	LOW	OFF or ON	OFF or ON	Cooling	

CONTROL SET POINT AND CONFIGURATION LOG

Model Number: _____ Software Versions: _____

Serial Number: _____ MBB: CESR131320-- __ __

Date: _____ ECB: CESR131249-- __ __

Technician: _____ MARQ: CESR131171-- __ __

INDICATE UNIT SETTINGS BELOW

Control Type: Thermostat / T-55 Space Temp. / T-56 Space Temp. / T-58 Space Temp.

Set Points: Cooling Occupied: _____ Unoccupied: _____

Heating Occupied: _____ Unoccupied: _____

MODE — CONFIGURATION

ITEM	EXPANSION	RANGE	DEFAULT	ENTRY
CONFIGURATION				
DISP	Display Configuration			
METR	Metric Display	On/Off	Off	
LANG	Language Selection	0=English 1=Spanish 2=French 3=Portuguese	0	
PROT	Password Enable	Enable/Disable	Enable	
PSWD	Service Password	0000 to 9999	1111	
TEST	Test Display LEDs	On/Off	Off	
UNIT	Unit Configuration			
S.DLY	Start Up Delay	0 to 600 sec	30	
U.CTL	Unit Control Type	1=Auto Select 2=Thermostat 3=Space Sensor	1	
T.CTL	Thermostat Control Type	0=Adaptive 1=1 Stage Y1 2=2 Stage Y1	0	
OC.FN	Fan On When Occupied	Yes/No	Yes	
IDF.F	Shut Down on IDF Failure	Yes/No	Yes	
EC.EN	Economizer Installed	Yes/No	No: no FIOP Yes: FIOP	
FN.SW	Fan Status Switch	0=No Switch 1=Normally Open 2=Normally Closed	0: no FIOP 1: FIOP	
FL.SW	Filter Status Switch	0=No Switch 1=Normally Open 2=Normally Closed	0: no FIOP 1: FIOP	
FS.SW	Fire Shutdown Switch	0=No Switch 1=Normally Open 2=Normally Closed	0: no FIOP 1: FIOP	
RM.SW	Remote Occupancy Switch	0=No Switch 1=Normally Open 2=Normally Closed	0	
SAT.T	SAT Settling Time	10 to 900 sec	240	
SAT.H	SAT Heat Mode Sensing	Enable/Disable	Disable	
RAT.S	RAT Sensor On SPTO Input	Yes/No	No	
RH.S	RH Sensor ON OAQ Input	Yes/No	No	
RH.SW	Space Humidity Switch	0=No Switch 1=Normal Open 2=Normal Closed	0: no Humidi-MiZer FIOP 1: Humidi-MiZer FIOP	
TCS.C	Temp Cmp Strt Cool Factr	0 to 60 mins	0	
TCS.H	Temp Cmp Strt Heat Factr	0 to 60 mins	0	
COOL	Cooling Configuration			
N.CIR	Number of Circuits	1 to 3	2	
N.A	Compressors on Circuit A	1 to 2	1	
MRT.C	Compressor Min On Time	120 to 999 sec	180	
MOT.C	Compressor Min Off Time	300 to 999 sec	300	
RST.C	Runtime to Reset Strikes	120 to 999 sec	300	
C.DEC	Cool Stage Decrease Rate	120 to 999 sec	300	
C.INC	Cool Stage Increase Rate	120 to 999 sec	450	
FOD.C	Fan-off Delay, Mech Cool	0 to 600 sec	60	
CA.LO	Circuit A Lockout Temp	0 to 100 dF	0	
CB.LO	Circuit B Lockout Temp	0 to 100 dF	0: no Humidi-MiZer FIOP Humidi-MiZer FIOP: 0	
CC.LO	Circuit C Lockout Temp	0 to 100 dF	0	
ALM.N	Alert Each Strike	Yes/No	Yes	

LEGEND

FIOP — Factory-Installed Option

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	DEFAULT	ENTRY
CONFIGURATION (cont)				
***COOL* (cont)**				
SAT	Supply Air Temperature			
SA.PD	SAT Cool Demand (+) Level	0.5 to 10 ^F	1	
SA.ND	SAT Cool Demand (–) Level	–10 to –0.5 ^F	–1	
SAT.U	Minimum SAT Upper Level	35.0 to 65.0 dF	58	
SAT.L	Minimum SAT Lower Level	35.0 to 65.0 dF	48	
SPT	Space Temperature			
CL.PD	SPT Cool Demand (+) Level	0.5 to 5 ^F	1	
CL.ND	SPT Cool Demand (–) Level	–5 to –0.5 ^F	–1	
C.LAG	Cool Thermal Lag Factor	0 to 5 min	1	
CIR.A	Circuit A			
CS.A1	A1 Current Sensing	Enable/Disable	Disable (1-phase) Enable (3-phase)	
CS.A2	A2 Current Sensing	Enable/Disable	Disable	
A1.FN	A Circuit Level 1 Fans	0 to 7	No Humidi-MiZer FIOP 1 (20, 24) 5 (28) Humidi-MiZer FIOP 1	
A2.FN	A Circuit Level 2 Fans	0 to 7	No Humidi-MiZer FIOP 3 (20) 2 (24, 28) Humidi-MiZer FIOP 3 (20) 2 (24, 28)	
A3.FN	A Circuit Level 3 Fans	0 to 7	No Humidi-MiZer FIOP 3 (20, 24) 7 (28) Humidi-MiZer FIOP 3	
CIR.B	Circuit B			
CS.B1	B1 Current Sensing	Enable/Disable	Enable	
B1.FN	B Circuit Level 1 Fans	0 to 7	No Humidi-MiZer FIOP 4 Humidi-MiZer FIOP 1	
B2.FN	B Circuit Level 2 Fans	0 to 7	No Humidi-MiZer FIOP 6 (20) 2 (24, 28) Humidi-MiZer FIOP 3 (20) 2 (24, 28)	
B3.FN	B Circuit Level 3 Fans	0 to 7	No Humidi-MiZer FIOP 6 Humidi-MiZer FIOP 3	
CIR.C	Circuit C			
CS.C1	C1 Current Sensing	Enable/Disable	Disable	
C1.FN	C Circuit Level 1 Fans	0 to 7	0	
C2.FN	C Circuit Level 2 Fans	0 to 7	0	
C3.FN	C Circuit Level 3 Fans	0 to 7	0	
SST	Low Suction Control			
SST.O	Suction OK Temperature	10 to 50 dF	18	
SST.1	Low Suction — Level 1	10 to 50 dF	20	
SST.2	Low Suction — Level 2	5 to 50 dF	15	
SST.3	Low Suction — Level 3	0 to 50 dF	10	
OFC	Outdoor Fan Control			
OFC.3	OFC3 Enable. CCH Disable	Yes/No	Yes	
0.MXP	Fan Lev0 Max Pressure	100 to 500 psig	200	
1.MXP	Fan Lev1 Max Pressure	100 to 500 psig	450	
2.MNP	Fan Lev2 Min Pressure	100 to 500 psig	200	
2.ON	Fan Lev2 On Temperature	0 to 100 F	no Humidi-MiZer FIOP: 55 (20) 45 (24-28) Humidi-MiZer FIOP: 68 (20) 61 (24) 61 (28)	
2.OFF	Fan Lev2 Off Temperature	0 to 100 F	no Humidi-MiZer FIOP: 50 (20) 40 (24-28) Humidi-MiZer FIOP: 57 (20) 57 (24) 57 (28)	
2.MXP	Fan Lev2 Max Pressure	100 to 500 psig	400	
3.MNP	Fan Lev3 Min Pressure	100 to 500 psig	250	
3.ON	Fan Lev3 on Temperature	0 to 100 F	no Humidi-MiZer FIOP: 65 Humidi-MiZer FIOP: 88 (20) 68 (24) 68 (28)	

LEGEND
FIOP — Factory-Installed Option

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MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	DEFAULT	ENTRY
CONFIGURATION (cont)				
***OFC* (cont)**				
3.OFF	Fan Lev3 Off Temperature	0 to 100 F	no Humidi-MiZer FIOP: 55 Humidi-MiZer FIOP: 78 (20) 62 (24) 62 (28)	
HMZR	Humidimizer Config			
REHT	Humidimizer Equipped	Yes/No	No: no Humidi-MiZer FIOP Yes: Humidi-MiZer FIOP	
R.DEC	Reheat2 Stage Decr. Time	0 to 999 secs	60	
R.INC	Reheat2 Stage Incr. Time	0 to 999 secs	300	
RH.FN	Reheat Fan Control	Yes/No	Yes	
RF.LV	Reheat2 ODF Fan On Level	0 to 3	2	
RF.ON	Reheat2 ODF Fan On Temp	0 to 100 F	93 (20) 93 (24) 85 (28)	
RF.OF	Reheat2 ODF Fan Off Temp	0 to 100 F	83 (20) 88 (24) 80 (28)	
RA.LO	Reheat2 OAT Limit A	20 to 70 F	40	
RA.LP	Reheat2 SSP Lo Limit A	50 to 100 psig	80	
RA.HP	Reheat2 SSP Hi Limit A	50 to 100 psig	90	
RB.LO	Reheat2 OAT Limit B, C	20 to 70 F	50	
RB.LP	Reheat2 SSP Lo Limit B, C	50 to 100 psig	80	
RB.HP	Reheat2 SSP Hi Limit B, C	50 to 100 psig	90	
HEAT	Heating Configuration			
HT.TY	Type of Heat Installed	0 = No Heat 1 = Gas 2 = Electric	0 (50 series with no electric heat) 1 (48 series) 2 (50 series with electric heat)	
N.HTR	Number of Heat Stages	1 to 2	1 (48 series 1-phase, 50 series <15kW) 2 (48 series 3-phase, 50 series >=15kW)	
MRT.H	Heat Minimum On Time	60 to 999 sec	120	
MOT.H	Heat Minimum Off Time	60 to 999 sec	120	
H.DEC	Heat Stage Decrease Rate	120 to 999 sec	300	
H.INC	Heat Stage Increase Rate	120 to 999 sec	450	
FOD.E	Fan-off Delay, Elect Heat	10 to 600 sec	30	
FOD.G	Fan-off Delay, Gas Heat	45 to 600 sec	45	
HT.LO	Heating Lockout Temp	40 to 125 dF	75	
SAT.H	SAT Heat Mode Sensing	Enable/Disable	Disable	
SPT	Space Temperature Sensor			
HT.PD	SPT Heat Demand (+) Level	0.5 to 5 ^F	1	
HT.ND	SPT Heat Demand (–) Level	–5 to –0.5 ^F	–1	
H.LAG	Heat Thermal Lag Factor	0 to 5 min	1	
ECON	Economizer Configuration			
EC.EN	Economizer Installed	Yes/No	No: no FIOP Yes: FIOP	
E.CTL	Economizer Control Type	1=Digital, Position Feedback 2=Digital, Command Feedback 3=Analog Control	1	
EC.MN	Econo Minimum Position	0 to 100 %	30	
EC.MX	Econo Cool Max Position	0 to 100 %	100	
EH.LO	Econo Cool Hi Temp Limit	40 to 100 dF	65	
EL.LO	Econo Cool Lo Temp Limit	–30 to 50 dF	0	
UEFC	Unoccupied Free Cooling	0=Disabled 1=Entire Unoccupied Period 2=PreOccupancy Time	2	

LEGEND

FIOP — Factory-Installed Option

MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	DEFAULT	ENTRY
CONFIGURATION (cont)				
***ECON* (cont)**				
FC.TM	Free Cool PreOcc Time	1 to 9999 min	120	
FC.LO	Free Cool Low Temp Limit	0 to 70 dF	50	
PE.EN	Power Exhaust Installed	Yes/No	No: no FIOP Yes: FIOP	
PE.1	PE Stage1 Econo Position	10 to 100 %	40	
PE.2	PE Stage2 Econo Position	10 to 100 %	75	
EN.SW	Enthalpy Switch	0=No Switch 1=Normally Open 2=Normally Closed	0: no FIOP 1: FIOP	
E.TRV	Economizer Travel Time	5 to 300 sec	150	
E.MXB	Bottom Stage Max Econo	0 to 100 %	50	
E.MXM	Middle Stage Max Econo	1 to 100 %	35	
E.MXT	Top Stage Max Econo	0 to 100 %	25	
E.DBD	Economizer PID Deadband	0 to 25 %	3	
EC.P	Economizer PID — kP	0.0 to 99.9 sec	2.5	
EC.I	Economizer PID — kI	0.0 to 99.9 sec	0.1	
EC.D	Economizer PID — kD	0.0 to 99.9 sec	1	
EC.DT	Economizer PID — rate	10.0 to 180.0 sec	15	
AIR.Q	Air Quality Configuration			
IA.CF	IAQ Analog Input Config	0=No IAQ 1=Demand Ventilation 2=Econ Position Override 3=Econ Min Position Control	0: no FIOP 1: FIOP	
IA.FN	IAQ Analog Fan Config	0=Never 1=Only While Occupied 2=Always	0	
II.CF	IAQ Switch Input Config	0=No IAQ 1=DCV Normally Open 2=DCV Normally Closed 3=Override Normally Open 4=Override Normally Closed	0	
II.FN	IAQ Switch Fan Config	0=Never 1=Only While Occupied 2=Always	0	
AQ.MN	Econo Min IAQ Position	0 to 100	10	
EC.MN	Econo Minimum Position	0 to 100	30	
OVR.P	IAQ Override Position	0 to 100	100	
OA.CF	OAQ Analog Input Cfg	0=No OAQ 1=Demand Ventilation 2=Outdoor Air Lockout	0	
OAQ.L	OAQ Lockout Limit	0 to 5000	600	
AQD.L	AQ Differential Low	0 to 5000	100	
AQD.H	AQ Differential High	0 to 5000	700	
DF.ON	Fan On AQ Differential	0 to 5000	600	
DF.OF	Fan Off AQ Differential	0 to 5000	200	
I.4M	IAQ Sensor Value at 4mA	0 to 5000	0	
I.20M	IAQ Sensor Value at 20mA	0 to 5000	2000	
O.4M	OAQ Sensor Value at 4mA	0 to 5000	0	
O.20M	OAQ Sensor Value at 20mA	0 to 5000	2000	
H.4M	RH Sensor Value at 4mA	0 to 50 %	0	
H.20M	RH Sensor Value at 20mA	60 to 100 %	100	
ALM.O	Alarm Relay Configuration			
A.SPC	SPT/SPRH Sensor Failure	Yes/No	Yes	
A.SRT	SAT/RAT Sensor Failure	Yes/No	Yes	
A.OAT	OAT Thermistor Failure	Yes/No	Yes	
A.CS	Current Sensor Failure	Yes/No	Yes	
A.CMP	Compressor Failure	Yes/No	Yes	
A.CKT	Refrigerant Circuit Failure	Yes/No	Yes	
A.SSP	SSP Transducer Failure	Yes/No	Yes	
A.SCT	SCT Thermistor Failure	Yes/No	Yes	
A.FAN	Indoor Fan Failure	Yes/No	Yes	
A.FIL	Dirty Filter	Yes/No	Yes	
A.TST	Thermostat Failure	Yes/No	Yes	
A.ECO	Economizer Failure	Yes/No	Yes	

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MODE — CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	DEFAULT	ENTRY
CONFIGURATION (cont)				
TRIM	Sensor Calibration			
SPT.C	Space Temp Calibration	–30 to 120 dF		
SPT.T	Space Temp Trim	–30 to 30 ^F	0	
SAT.C	Supply Air Temp Calib.	–30 to 130 dF		
SAT.T	Supply Air Temp Trim	–30 to 30 ^F	0	
RAT.C	Return Air Temp Calib.	–30 to 130 dF		
RAT.T	Return Air Temp Trim	–30 to 30 ^F	0	
CCN	CCN Configuration			
CCN.A	CCN Element Number	1 to 239	1	
CCN.B	CCN Bus Number	0 to 239	0	
BAUD	CCN Baud Rate	1=2400 2=4800 3=9600 4=19200 5=38400	3	
BROD	CCN Broadcast Configuration			
B.TIM	CCN Time/Date Broadcast	Yes/No	No	
B.OAT	CCN OAT Broadcast	Yes/No	No	
B.GS	Global Schedule Broadcast	Yes/No	No	
B.ACK	CCN Broadcast Ack'er	Yes/No	No	
SCH.O	CCN Schedule Overrides			
SCH.N	Schedule Number	0=Always Occupied 1 to 64=Local Schedule 65 to 99=Global Schedule	0	
HOL.G	Accept Global Holidays	Yes/No	No	
OV.TL	Override Time Limit	0 to 4 hours	1	
OV.EX	Timed Override Hours	0 to 4 hours	0	
OV.SP	SPT Override Enabled	Yes/No	Yes	

UNIT START-UP CHECKLIST

MODEL NO.:_____ SERIAL NO.:_____

DATE:_____ TECHNICIAN: _____

I. PRE-START-UP:

- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ VERIFY INSTALLATION OF OUTDOOR AIR HOOD
- ☐ VERIFY INSTALLATION OF FLUE EXHAUST AND INLET HOOD (48PG ONLY)
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ VERIFY GAS PRESSURE TO UNIT GAS VALVE IS WITHIN SPECIFIED RANGE (48PG ONLY)
- ☐ CHECK GAS PIPING FOR LEAKS (48PG ONLY)
- ☐ CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SETSCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ VERIFY THAT SCROLL COMPRESSORS ARE ROTATING IN THE CORRECT DIRECTION
- ☐ VERIFY INSTALLATION OF THERMOSTAT/SPACE SENSOR
- ☐ VERIFY INSTALLATION OF HUMIDITY SWITCH/SENSOR (HUMIDI-MIZER™ UNITS ONLY)
- ☐ VERIFY CONFIGURATION VALUES FOR ELECTRONIC CONTROLS (REFER TO CONTROL SET UP CHECKLIST)
- ☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR AT LEAST 24 HOURS

II. START-UP

ELECTRICAL

SUPPLY VOLTAGE L1-L2 _____ L2-L3 _____ L3-L1 _____

COMPRESSOR AMPS — COMPRESSOR A1	L1	_____	L2	_____	L3	_____
— COMPRESSOR B1	L1	_____	L2	_____	L3	_____
ELECTRIC HEAT AMPS (IF EQUIPPED)	L1	_____	L2	_____	L3	_____
SUPPLY FAN AMPS _____	L1	_____	L2	_____	L3	_____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ F DB (Dry Bulb)
RETURN-AIR TEMPERATURE _____ F DB _____ F WB (Wet Bulb)
COOLING SUPPLY AIR _____ F
GAS HEAT SUPPLY AIR (48PG) _____ F
ELECTRIC HEAT SUPPLY AIR (50PG) _____ F

PRESSURES

GAS INLET PRESSURE _____ IN. WG
GAS MANIFOLD PRESSURE STAGE NO. 1 _____ IN. WG STAGE NO. 2 _____ IN. WG
REFRIGERANT SUCTION CIRCUIT A _____ PSIG
CIRCUIT B _____ PSIG
REFRIGERANT DISCHARGE CIRCUIT A _____ PSIG
CIRCUIT B _____ PSIG

☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS ON PAGES 89 AND 90

GENERAL

☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS

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