to start unit without handheld, you will need a separate 24 volt source, on DSIO2 chanel 49 jump J3 #1 and #2 with the hot and neutral source to shock unit into starting.

48ZJ030-105, 48ZL,ZW075-105
50ZJ,ZK030-105; 50ZL,ZM,ZW,ZZ075-105
Single-Package Heating/Cooling Units
With Product Integrated Controls
50/60 Hz

Cont eration and Troubleshooting

CONTENTS

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CONTENTS (cont)

SAFETY CONSIDERATIONS

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components; and equipment location (roof, elevated structures, etc.). Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature; on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

⚠ WARNING

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.

GENERAL

This Controls and Troubleshooting book includes the following units and sizes:

- 48ZJ030-105
- 48ZL075-105
- 48ZW075-105
- 50ZJ030-105
- 50ZK030-105
- 50ZL,ZM075-105
- 50ZW075-105
- 50ZZ075-105

All units have Product Integrated Controls (PIC).

Carrier Comfort Network System Architecture (Fig. 1)

> IMPORTANT: This literature contains controls, operation, and troubleshooting data for 48ZJ,ZL,ZW and 50ZJ,ZK,ZL,ZM,ZW,ZZ rooftop units. Use this guide in conjunction with the separate Installation Instructions literature packaged with the unit.

These units provide ventilation, cooling, and heating (when equipped) in Variable Air Volume (VAV) and Constant Volume (CV) applications. The 48ZJ,ZL,ZW and 50ZJ,ZK,ZL,ZM, ZW,ZZ units contain factory-installed Product Integrated Controls (PIC) which provide full system management. Processor modules (PSIO) store hundreds of configuration settings and several building schedules. The PSIOs also perform self diagnostic tests at unit start-up, monitor operation of the unit, and provide alarms. Information on system operation and status are sent to the central processors by various sensors that are located at the unit and in the conditioned space. Access to the unit controls for configuration, set point selection, schedule creation, and service can be done through a unit-mounted keypad and display module (HSIO) which is available as an accessory. One HSIO is **required** for each installation site. A separate HSIO may be purchased for each unit, or a single HSIO may be moved and installed on each unit as required. An HSIO may be unit mounted or remotely located.

The PIC units can operate either in a stand-alone mode or they can be interfaced with the Carrier Comfort Network (CCN), Building Supervisor, or Service Tool. When being installed in network applications, the unit is connected to the CCN communications bus with field-installed cable.

Other equipment can also be installed on the CCN by fitting the equipment with a Comfort Controller Device. The Comfort Controller Device has a standard processor module (PSIO) but is field-programmed for use with other HVAC components.

Heating, ventilation and air conditioning (HVAC) and other building equipment being controlled by PICs or Comfort Controller Device have the inherent ability to ‘talk’ on a common communications bus or network. The configuration of the communications bus with 2 or more PIC- or Comfort Controller-controlled pieces of equipment is referred to as a Carrier Comfort Network (CCN) system. The CCN communications bus conveys commands, data, and alarms between all elements of the system. Any system element connected to the bus may communicate with any other system element, regardless of their physical locations. The communications bus consists of a field-supplied, shielded, 3-conductor cable connected in daisy-chain fashion. The PICs, Comfort Controllers, and other network devices (such as TELink) can be added at any time to the network.

The main human interface with the CCN system is the ComfortWORKS® software. The ComfortWORKS software is installed on an IBM PC compatible computer that allows it to connect to the communications bus and ‘talk’ directly with any equipment connected to the network. An operator working with ComfortWORKS software can command, monitor, configure, or modify any portion of the system. More than one computer with ComfortWORKS software can be used. The computer with ComfortWORKS software, in conjunction with optional network products, can generate a wide variety of managerial reports which reflect the operational characteristics of one or more buildings.

To take further advantage of the network, accessory or optional control options modules that perform specialized functions can be added to the communications bus at any time to enhance the CCN system’s capabilities. Each control options module consists of a standard hardware module with special purpose algorithms and communications software that provide an advanced control function for the entire CCN system or a designated portion of the system. Data collection, remote communications, demand limiting, and tenant billing are a few examples of the network capabilities available to give the building owner increased system performance and superior building management capabilities.

Zoned systems meet the zone temperature control needs for many commercial applications. These systems utilize a microelectronic thermostat as a basis for individual zone control and typically build multiple-zone systems with constant volume (CV) or variable-air volume (VAV) units. Zoned systems can provide complete control of heating and cooling equipment and zone dampers in many types of HVAC (heating, ventilation and air conditioning) systems.

PIC Rooftop Information — The PIC rooftop controls cycle supply-fan motor, compressors, and unloaders to maintain the proper temperature conditions. The controls also cycle condenser fans to maintain suitable head pressure. Safeties are continuously monitored to prevent the unit from operating under abnormal conditions. The controls provide control of economizer, power exhaust, and inlet guide vane actuators or variable frequency drives, and cycle or control heating as required.

A scheduling function, programmed by the user, controls the unit occupied/unoccupied schedule. The controls also allow the service person to operate a ‘quick test’ so that all the controlled components can be checked for proper operation.

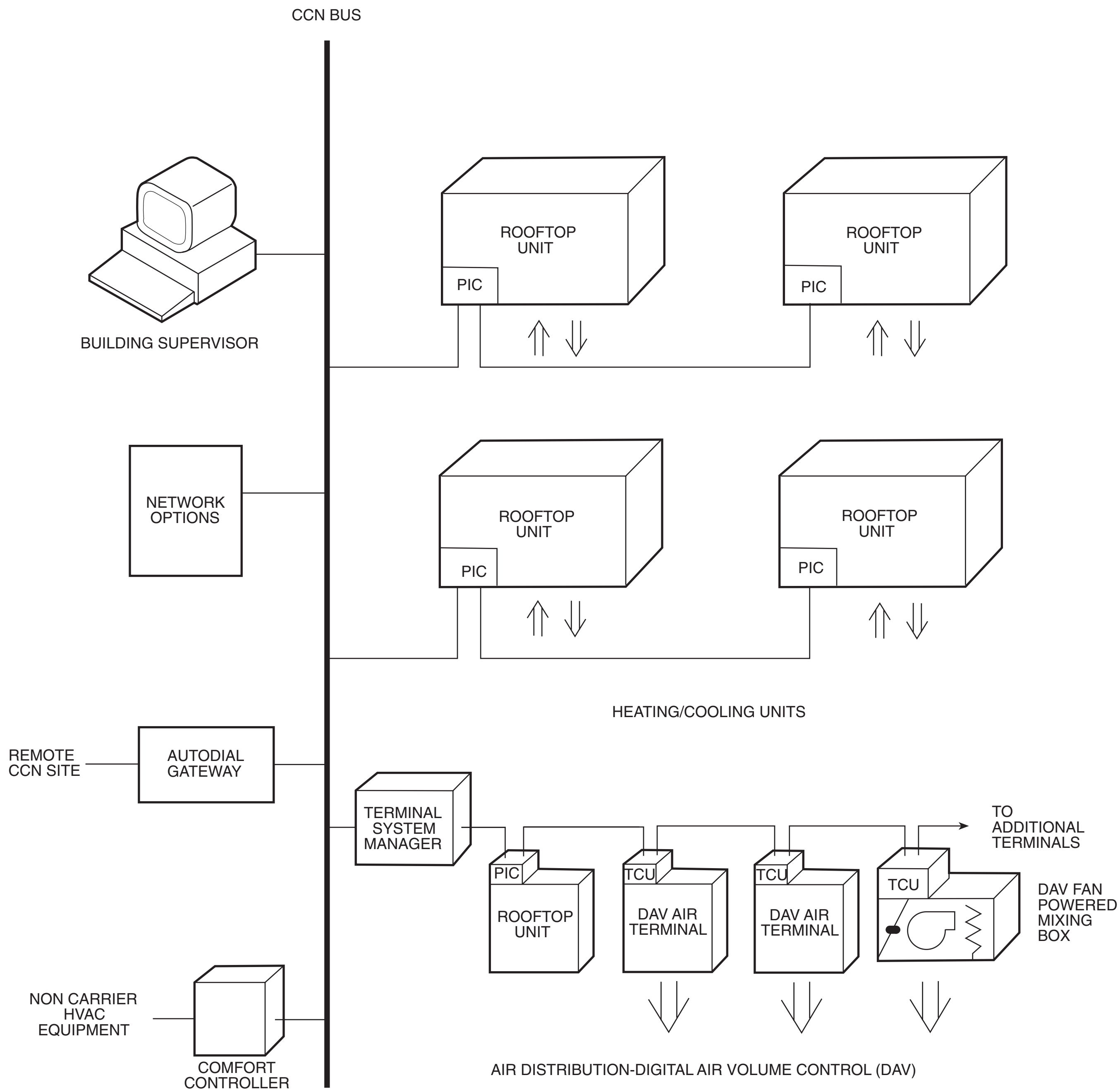
The PIC controls are modular and use a processor module (PSIO-1), 2 relay modules (DSIO-1 and DSIO-2), a control options module (PSIO-2), and an accessory field-installed keypad and display module (HSIO).

Digital Air Volume (DAV) Linkage — Carrier rooftop units with PIC may also have a communication linkage with the VAV terminal units in a particular application. This linkage is called the DAV linkage. In order for this linkage to be possible, the individual VAV air terminals must be equipped with Carrier PIC controls and the air terminals must be linked by a Terminal System Manager (TSM). The TSM acts as the communication link between the VAV air terminal PICs and the rooftop unit. When the TSM is fully programmed and begins communication, the rooftop control begins using information from the TSM for rooftop unit control operation. This is automatic, and does not require a configuration change to the standard rooftop unit PIC.

MAJOR CONTROL COMPONENTS

General — The control system consists of the following components (see Fig. 2):

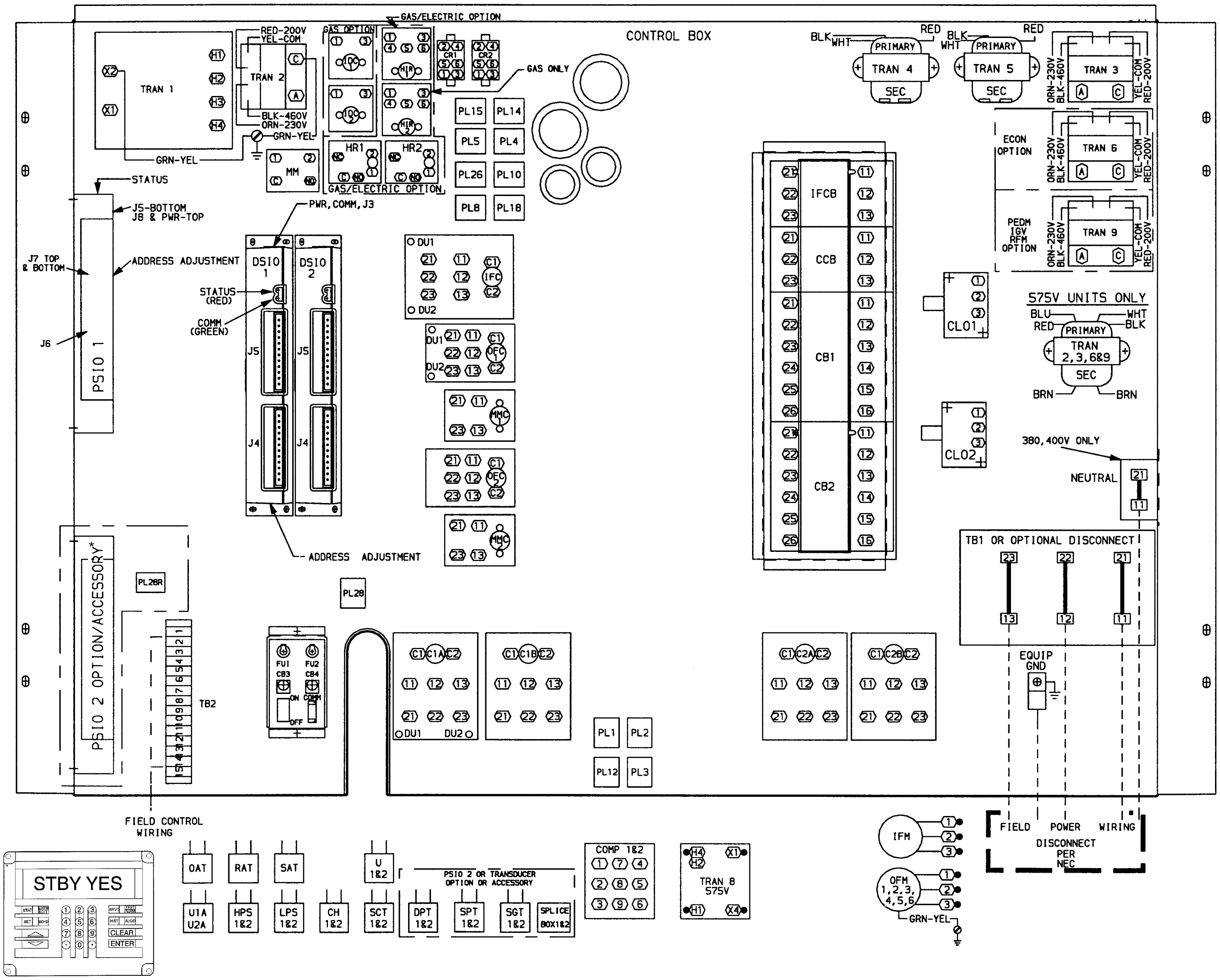
- standard processor module (PSIO 8088 or PSIO-1)
- control options module (PSIO 8052 or PSIO-2) (option and accessory on sizes 030-070, standard on sizes 075-105)
- two standard high-voltage relay modules (DSIO-1 and DSIO-2)
- keypad and display module (HSIO) (accessory)
- enthalpy sensor
- thermistors (standard and accessory)
- pressure transducers (standard and accessory)
- accessory humidity sensors
- space temperature sensors (standard T-55 and accessory T-56)
- supply-air fan status switch
- check filter switch



LEGEND

CCN — Carrier Comfort Network
DAV — Digital Air Volume
HVAC — Heating, Ventilation, and Air Conditioning
PIC — Product Integrated Controls
TCU — Terminal Control Unit

Fig. 1 — CCN System Architecture



LEGEND

CB	— Circuit Breaker	**HPS**	— High-Pressure Switch	**PRI**	— Primary
CCB	— Control Circuit Breaker	**HR**	— Heater Relay	**PSIO**	— Processor Sensor Input/Output Module
CH	— Crankcase Heater	**IDC**	— Induced-Draft Contactor	**RAT**	— Return-Air Thermistor
CLO	— Compressor Lockout	**IFC**	— Indoor-Fan Contactor	**RFM**	— Return Fan Motor
COMP	— Compressor	**IFCB**	— Indoor Fan Circuit Breaker	**SAT**	— Supply-Air Thermistor
CR	— Control Relay	**IFM**	— Indoor-Fan Motor	**SCT**	— Saturated Condensing Thermistor
DPT	— Duct Pressure Transducer	**IGV**	— Inlet Guide Vanes	**SEC**	— Secondary
DSIO	— Discrete Sensor Input/Output Module	**LPS**	— Low-Pressure Switch	**SGT**	— Suction Gas Thermistor
DU	— Dummy Terminal	**MMC**	— Motormaster® Contactor	**SPT**	— Suction Pressure Transducer
ECON	— Economizer	**NEC**	— National Electrical Code	**TB**	— Terminal Block
EQUIP	— Equipment	**OAT**	— Outdoor-Air Thermistor	**TRAN**	— Transformer
FU	— Fuse	**OFC**	— Outdoor-Fan Contactor	**U**	— Unloader
GND	— Ground Connection	**OFM**	— Outdoor-Fan Motor		
HIR	— Heat Interlock Relay	**PEDM**	— Power Exhaust Damper Motor		
		PL	— Plug Assembly		

*Standard on sizes 075-105.

Fig. 2 — Major Control Components in Control Box

PROCESSOR MODULE NO. 1 (Standard) — The PSIO-1 module contains the factory-loaded software that monitors and processes the following inputs, outputs, and system information:

Inputs:

- transducers
- thermistors
- switches

Outputs:

- optional integrated economizer motor (4 to 20 mA)
- optional variable frequency drive or inlet guide vane actuator (4 to 20 mA)
- optional modulating power exhaust control (4 to 20 mA)
- heat stages 1 and 2 operation
- head pressure control, stage 1 (030-075 only)

⚠ CAUTION

The PSIO-1 module contains a specially designed battery that provides power to maintain the module software in the event of unit power failure. DO NOT remove this battery, or system software will be lost if there is a unit power failure.

System Information:

- generates alert and alarm information (via transducer, thermistor, and sensor inputs)
- supports CCN (Carrier Comfort Network) communications
- supports digital air volume (DAV) interface

CONTROL OPTIONS MODULE — The PSIO-2 module does not contain software. Through input and output channels on the hardware, it supports the sensors used for:

- suction thermistors
- relative humidity
- outdoor-air cfm
- indoor-air quality (IAQ)
- smoke control
- supply air set point reset via external device

In addition, the PSIO-2 supplies the outputs (4 to 20 mA signal) for humidifier and hydronic heating coil control, a discrete output for timed clock control (for outdoor building or parking lot lights), condenser fan staging (090,105 only), and a remote alert light (090,105 only).

The PSIO-2 options module is available as a factory-installed option or as a field-installed accessory for sizes 030-070 and is standard on sizes 075-105.

HIGH-VOLTAGE RELAY MODULES (DSIO-1 and DSIO-2) — The DSIO modules close contacts to energize supply and condenser fan contactors. The modules also control compressor contactors, compressor unloaders, compressor crankcase heaters, heat interlock relay, and power exhaust contactor. In addition, DSIO outputs provide a discrete remote alarm light signal (all sizes) and a remote alert light signal (sizes 030-075). Inputs to the DSIO module are the remote occupied/unoccupied signal, compressor status (through the compressor lockout [CLO] relays), and high-pressure switches (safety circuits).

KEYPAD AND DISPLAY MODULE (HSIO) — This device consists of a keypad with 6 function keys, 5 operative keys, 12 numeric keys, and an alpha-numeric 2-line, 24-character per line display. Key usage is explained in Keypad and Display Module section on page 13. The HSIO is a field-installed accessory.

ECONOMIZER ACTUATOR — The PIC controls output a 4 to 20 mA signal to the optional economizer actuator in the unit to modulate it as required by the control algorithm. Economizer dampers use a spring-return type actuator to allow automatic closing of the outdoor air damper on power loss. Actuator is factory-set to match factory damper rotation.

VARIABLE FREQUENCY DRIVE — If variable frequency drive (VFD) is used for supply-fan control, the PSIO-1 output may be used to control the VFD. Either factory-installed optional VFD or field-supplied VFD may be used.

INLET GUIDE VANES — If the inlet guide vanes (IGV) option is used for supply fan control, the PSIO-1 output is used to control the IGV actuator.

MODULATING POWER EXHAUST — The PIC controls output a 4 to 20 mA signal to the power exhaust damper actuator in the unit to modulate the exhaust fan as required by the control algorithm.

HIGH-CAPACITY MODULATING POWER EXHAUST — The PIC controls output a 4 to 20 mA signal to the power exhaust VFD in the unit to modulate the power exhaust fan as required by the control algorithm.

THERMISTORS AND REFRIGERANT PRESSURE TRANSDUCERS — The unit control system gathers information from the sensors to control the operation of the unit. The units use 5 standard and 2 additional accessory thermistors and up to 4 accessory pressure transducers to monitor various temperatures and pressures at selected points throughout the system. See Table 1.

FAN STATUS PRESSURE SWITCH — The Fan Status Switch (FSS) is a snap-acting SPDT (single-pole, double-throw) switch. The switch senses the airflow supplied by the unit supply fan and provides the PSIO-1 module with a 10-vdc discrete signal for fan status.

CHECK FILTER PRESSURE SWITCH — The Check Filter Switch (CFS) is a snap-acting SPDT switch. When dirty filter elements cause the pressure drop across the filter section to exceed the switch setting, the switch contacts close and send a discrete signal (5 vdc) to the PSIO-1 module.

Optional and Accessory Control Components

SPACE TEMPERATURE SENSOR (T-55) — The T-55 Space Temperature Sensor (Part No. CEC0121448-01) is shipped inside the unit in the main control box. The sensor is installed on a building interior wall to measure room air temperature. The T-55 also includes an override button on the front cover, to permit occupants to override the Unoccupied Schedule (if programmed). See Fig. 3.

SPACE TEMPERATURE SENSOR (T-56) (Use with CV Only) — The T-56 Space Temperature Sensor (Part No. CEC0121503-01) (a field-installed accessory) may be used on CV installations. This sensor includes a sliding scale on the front cover that permits an occupant to adjust the space temperature set point remotely. See Fig. 4.

RELATIVE HUMIDITY (RH) SENSORS — The accessory field-installed RH sensors measure relative humidity of the air within the occupied space, in the return-air ductwork and/or in the outdoor air hood. The RH sensors provide input signals to the PSIO-2 (control options) module. There are two types of RH sensors available, wall-mounted or duct-mounted. Humidity sensors require separate and isolated 24-vac power source(s). See Fig. 5.

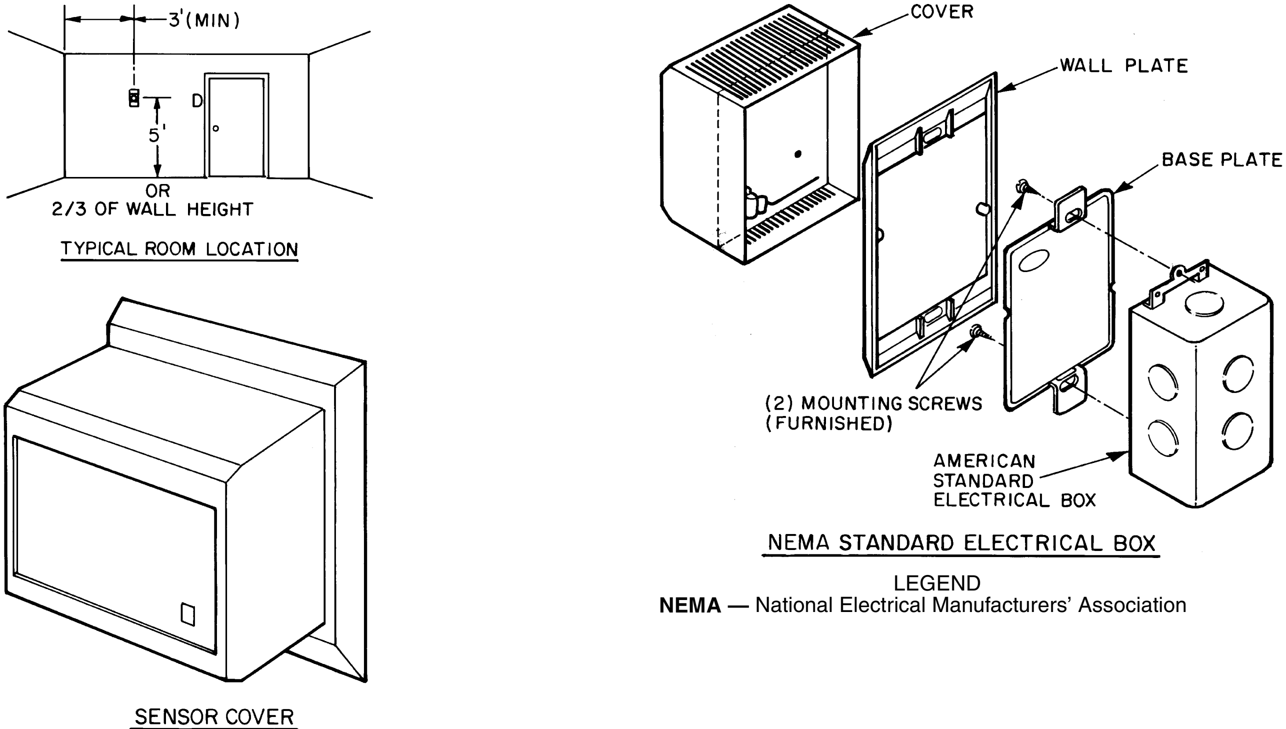
NOTE: Sizes 030-070 also require the installation of the control options module (PSIO-2), available as a factory-installed option or field-installed accessory.

INDOOR AIR QUALITY (CO_2) SENSORS — The Indoor Air Quality sensor accessories monitor carbon dioxide levels. This information is used to modify the position of outdoor air dampers to admit more or less outdoor air to dilute indoor CO_2 levels. Two types of sensors are available. The wall sensor can be used to monitor conditions in the conditioned air space. The duct sensor monitors conditions in the return air duct. Both wall and duct sensors use infrared technology. The wall sensor is available with or without an LCD readout to show CO_2 levels in ppm. See Fig. 6.

NOTE: Sizes 030-070 also require the installation of the control options module (PSIO-2), available as a factory-installed option or field-installed accessory.

OUTDOOR AIR VOLUME CONTROL — This feature ensures a continuous supply of outdoor air to the unit and the occupied space. The OAC (outdoor air control) monitors the outdoor air velocity pressure with a velocity probe and pressure transducer (included in the accessory package). See Fig. 7.

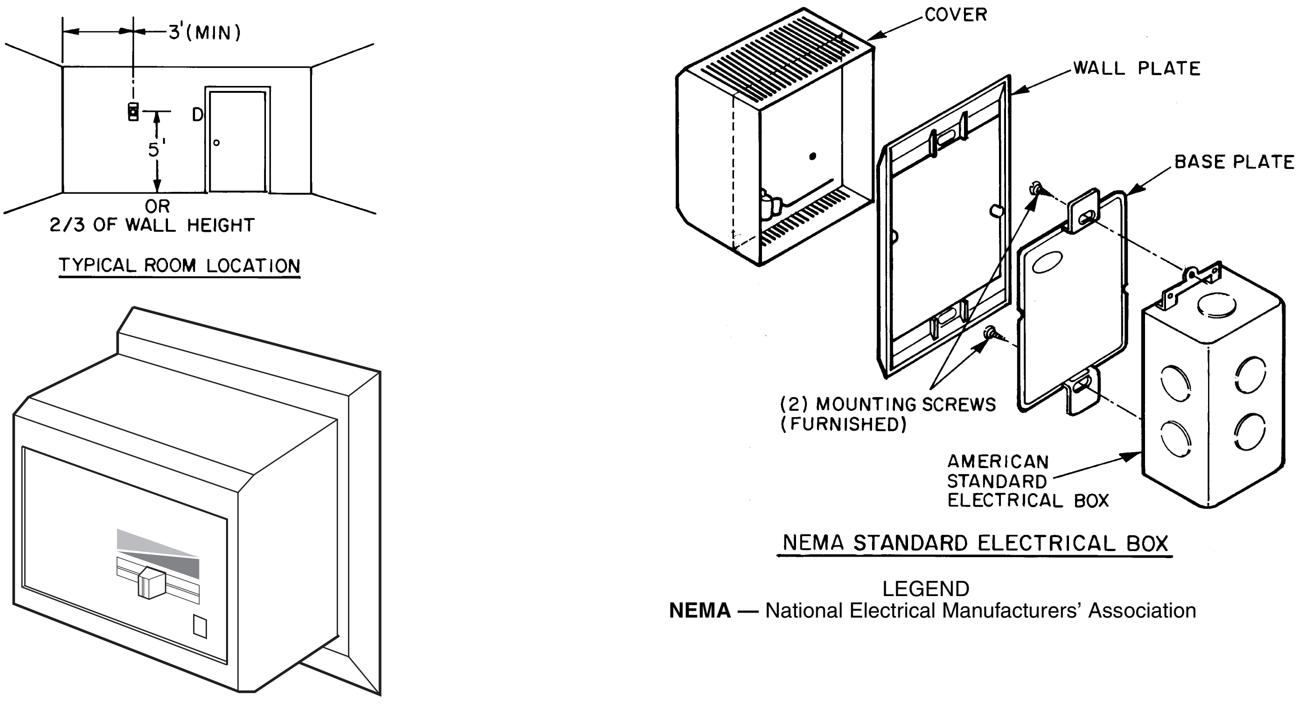
NOTE: Sizes 030-070 also require the installation of the control options module (PSIO-2), available as a factory-installed option or field-installed accessory.



LEGEND

NEMA — National Electrical Manufacturers' Association

Fig. 3 — Space Temperature Sensor (T-55)



LEGEND

NEMA — National Electrical Manufacturers' Association

Fig. 4 — Space Temperature Sensor (T-56)

HUMIDIFIER DEVICES — The unit control is capable of controlling two different types of humidifier devices, a 1-step discrete step humidifier control (via a contact closure) or a proportional control humidifier control valve (with a 4 to 20 mA signal and an impedance not to exceed 600 ohms). Humidifier devices must be field-supplied and -installed, for location in ductwork outside the unit cabinet.

NOTE: Sizes 030-070 also require the installation of the control options module (PSIO-2), available as a factory-installed option or field-installed accessory.

HYDRONIC COIL AND CONTROL VALVE — The unit control can provide a 4 to 20 mA proportional signal to a hydronic coil control valve. All hydronic coils and control valves must be field-supplied and -installed.

NOTE: Sizes 030-070 also require the installation of the control options module (PSIO-2), available as a factory-installed option or field-installed accessory.

Table 1 — Thermistors and Unit Operation Control Pressure Transducers

SENSOR	LOCATION AND FUNCTION	PART NO.
DPT1*	Compressor A located at the discharge service valve — Senses discharge pressure (replaces T3)	HK05YZ002
SPT1*	Compressor A located at the LPS connection on the compressor instead of LPS1 (low-pressure switch) — Senses suction pressure	
DPT2*	Compressor B located at the discharge service valve — Senses discharge pressure (replaces T4)	
SPT2*	Compressor B located at the LPS connection on compressor instead of LPS2 — Senses suction pressure	
	Thermistors	
T1	Located in supply-air section — Senses supply-air temperature (SAT)	HH79NZ026
T2	Located in return air section, right hand side — Senses return-air temperature (RAT)	
T3	Located in condenser coil circuit no. 1 at the return bend end (030-070 units); or at the header end (055-105 units) — Senses saturated condensing temperature (SCT1)	HH79NZ013
T4	Located in condenser coil circuit no. 2 at the return bend end (030-070 units); or at the header end (055-105 units) — Senses saturated condensing temperature (SCT2)	
T5	Coiled at the corner post (030-050) or below main control box (055-105) — Senses outdoor-air temperature (OAT)	HH79NZ026
T6	Located in compressor A suction service valve — Senses suction gas temperature (SGT1)	HH79NZ026
T7	Located in compressor B suction service valve — Senses suction gas temperature (SGT2)	

*Accessory sensors (all sizes), which are also available as factory-installed option with optional Control Options Module package (sizes 030-070 only).

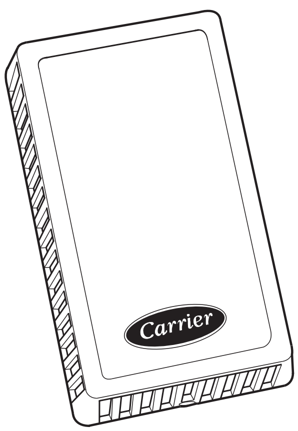


Fig. 5 — Space Humidity Sensor (P/N HL39ZZ001)

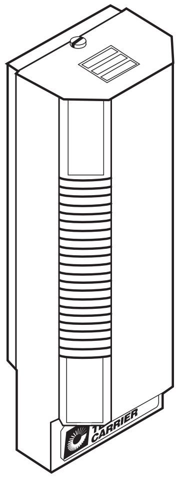


Fig. 6 — Air Quality (CO_2) Sensor (Wall-Mount Version Shown)

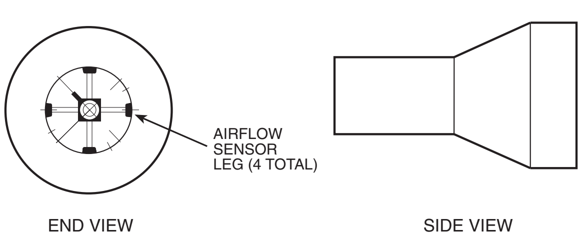


Fig. 7 — Outdoor Air Control Velocity Probe

Optional Staged Gas Control

GENERAL — The 48Z series large rooftop units may be ordered with an optional factory-installed staged gas control system that monitors heating operation of the rooftop. The control system is composed of several components as listed in sections below. See Fig. 8 and 9 for the control schematic. Table 2 shows 48Z series Staged Gas implementation.

> IMPORTANT: An accessory field-supplied Navigator™ display module is required for all staged gas control units.

STAGED GAS CONTROL BOARD (SGC) — See Fig. 10. The SGC is the center of the Staged Gas control system. It contains the major portion of the operating software and controls the operation of the unit. The SGC continuously monitors input/output channel information received from its inputs. The SGC receives inputs from thermistors (SAT1, SAT2, SAT3, LIMTTEMP). See Table 3. The staged gas control board discrete and digital inputs are shown in Table 4. The analog inputs are shown in Table 5. The outputs are shown in Table 6.

NAVIGATOR DISPLAY (Field-Installed Accessory) — Navigator display is a field-installed accessory. This device is the keypad interface that is used to access rooftop information, read sensor values, and test the unit. Navigator 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.

BOARD ADDRESSES — Staged Gas Control Board (SGC) has a 3-position instance jumper that is set at the factory to “1.” Do not change this setting.

The staging pattern is selected based on Heat Stage Type (HTSTGTYP). Limit switch monitoring (LIMTMON1) default valve is YES. Limit switch thermistor default values are selected based on Limit Switch Thermistor High Temp (LIMTHIHT) and Limit Switch Thermistor Low Temp (LIMTLOHT). Maximum Capacity per changes default value is selected based on CAPMXSTG. Refer to Start-Up, Staged Gas Control Heating section on page 65 for detail information.

CONTROL MODULE COMMUNICATION

Red LED — Proper operation of the 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 LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Also, be sure that the Staged Gas Control Board is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the SGC. 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 SGC has 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 (J5 connector). Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module.

Yellow LED — The SGC has one yellow LED. The Carrier Comfort Network (CCN) LED will blink during times of network communication.

SUPPLY-AIR THERMISTORS (Staged Gas Units Only) — Supply-air thermistors are a field-installed, factory-provided component. Three supply-air thermistors are shipped with staged gas units inside the heating section. Thermistor wires must be connected to SGC in the heating section. See Table 3 and Fig. 8 and 9. The supply-air thermistors should be located in the supply duct with the following criteria:

- downstream of the heat exchanger cells
- equally spaced as far as possible from the heat exchanger cells
- a duct location where none of the supply air thermistors are within sight of the heat exchanger cells
- a duct location with good mixed supply air portion of the unit.

Table 2 — 48Z Series Staged Gas Implementation

NO. OF STAGES	MODEL NUMBER POSITION				POINT				HEAT SIZE
	3	5	6,7,8	10	HTSTGTYP	CAPMXSTG	LIMTHIHT	LIMTLOHT	
2 stages	Z	H, K, W, Y	030 035 040 050		Default=0	Default=45	Default=170 F	Default=160 F	Low
5 stages	Z	J, L, X, Z	030 035 040 050		Default=1	Default=20	Default=170 F	Default=160 F	High
		H, K, W, Y	055 060 070		Default=1	Default=20	Default=135 F	Default=125 F	Low
		H, K	075 090 105	-,A,B C,D,E	Default=1	Default=20	Default=135 F	Default=125 F	
		H, K	075 090 105	G,H,J,K,L,M	Default=1	Default=20	Default=130 F	Default=120 F	
9 stages	Z	J, L, X, Z	055 060 070		Default=3	Default=15	Default=135 F	Default=125 F	High
		J, L	075 090 105	-,A,B C,D,E	Default=3	Default=15	Default=135 F	Default=125 F	
		J, L	075 090 105	G,H,J,K,L,M	Default=3	Default=15	Default=130 F	Default=120 F	

LEGEND

CAPMXSTG — Maximum Capacity per Changes
HTSTGTYP — Heat Stage Type
LIMTHIHT — Limit Switch Thermistor High Temperature
LIMTLOHT — Limit Switch Thermistor Low Temperature

Table 3 — SGC Thermistor Designations

THERMISTOR	PIN CONNECTION POINT	FUNCTION AND LOCATION Thermistors	PART NO.
SAT1	J8 – 1,2 (SGC)	Supply-Air Thermistor (SAT) — Inserted into supply section underneath the gas heat section (factory-provided, field-installed)	HH79NZ033
SAT2	J8 – 3,4 (SGC)	Supply-Air Thermistor (SAT) — Inserted into supply section underneath the gas heat section (factory-provided, field-installed)	
SAT3	J8 – 5,6 (SGC)	Supply-Air Thermistor (SAT) — Inserted into supply section underneath the gas heat section (factory-provided, field-installed)	
LIMTTEMP	J8 – 15,16 (SGC)	Limit Switch Thermistor (LIMTTEMP) — Inserted next the lower limit switch (factory-installed)	

Table 4 — SGC Discrete and Digital Inputs

INPUT	PIN CONNECTION POINT
COOL_IN1	J6, 3-4 (SGC)
COOL_IN2	J6, 5-6 (SGC)
SFANSTAT	J7, 1-2 (SGC)
HEAT_IN1	J7, 3-4 (SGC)
HEAT_IN2	J7, 5-6 (SGC)
DEHUMID	J7, 7-8 (SGC)

Table 5 — SGC Analog Inputs

INPUT	PIN CONNECTION POINT	TERMINAL CONNECTION POINT	COMMENT
Cool Set Point Top	J8, 7-8 (SGC)	—	Part No.= HT24AV121
Cool Set Point Bottom	J8, 9-10 (SGC)	—	
Heat Set Point Top	J8, 11-12 SGC)	—	Part No.= HT24AV121
Heat Set Point Bottom	J8, 13-14 (SGC)	—	

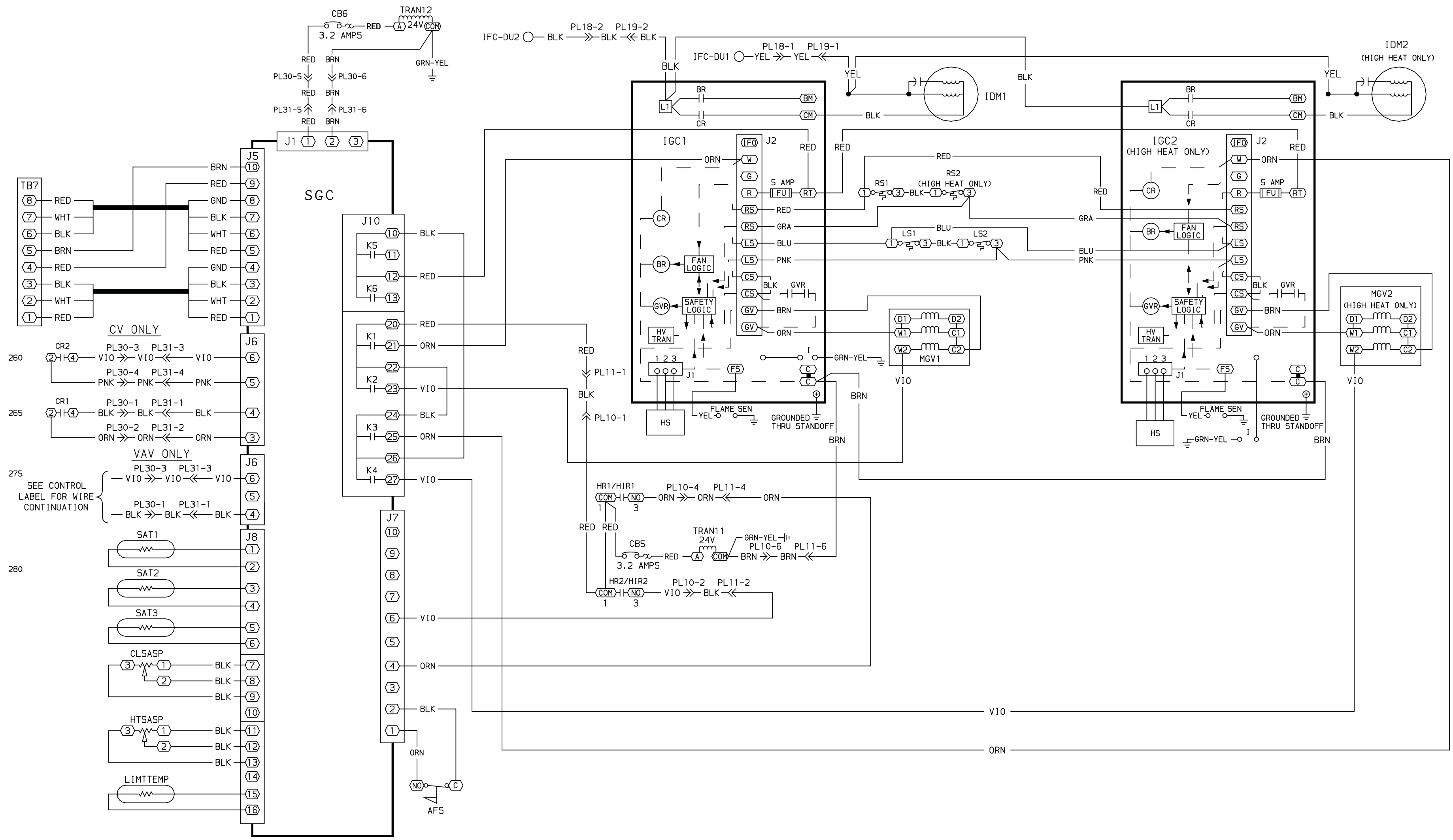


Fig. 8 — Label Diagram — Staged Gas Heat Units — Sizes 030-050

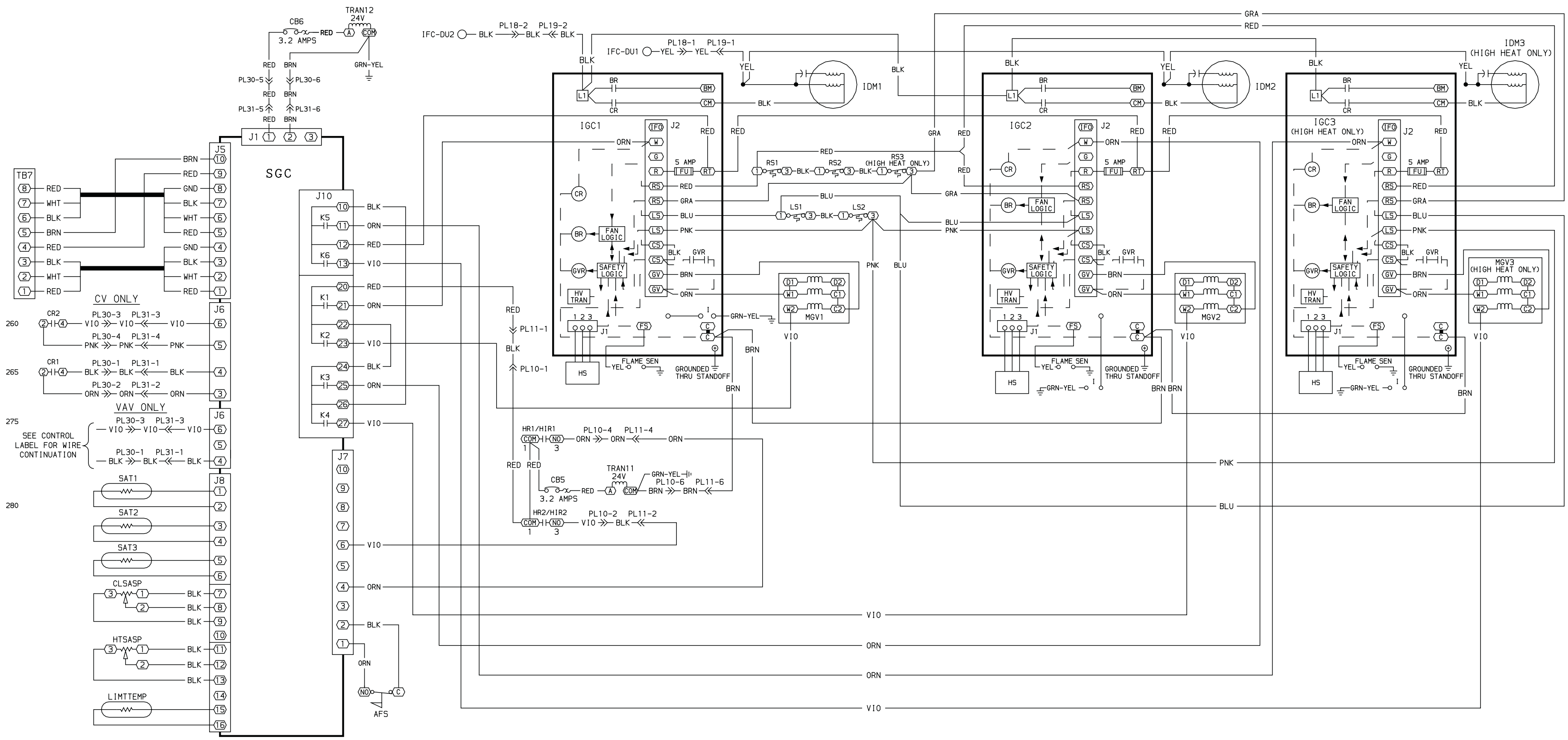


Fig. 9 — Label Diagram — Staged Gas Heat Units — Sizes 055-105

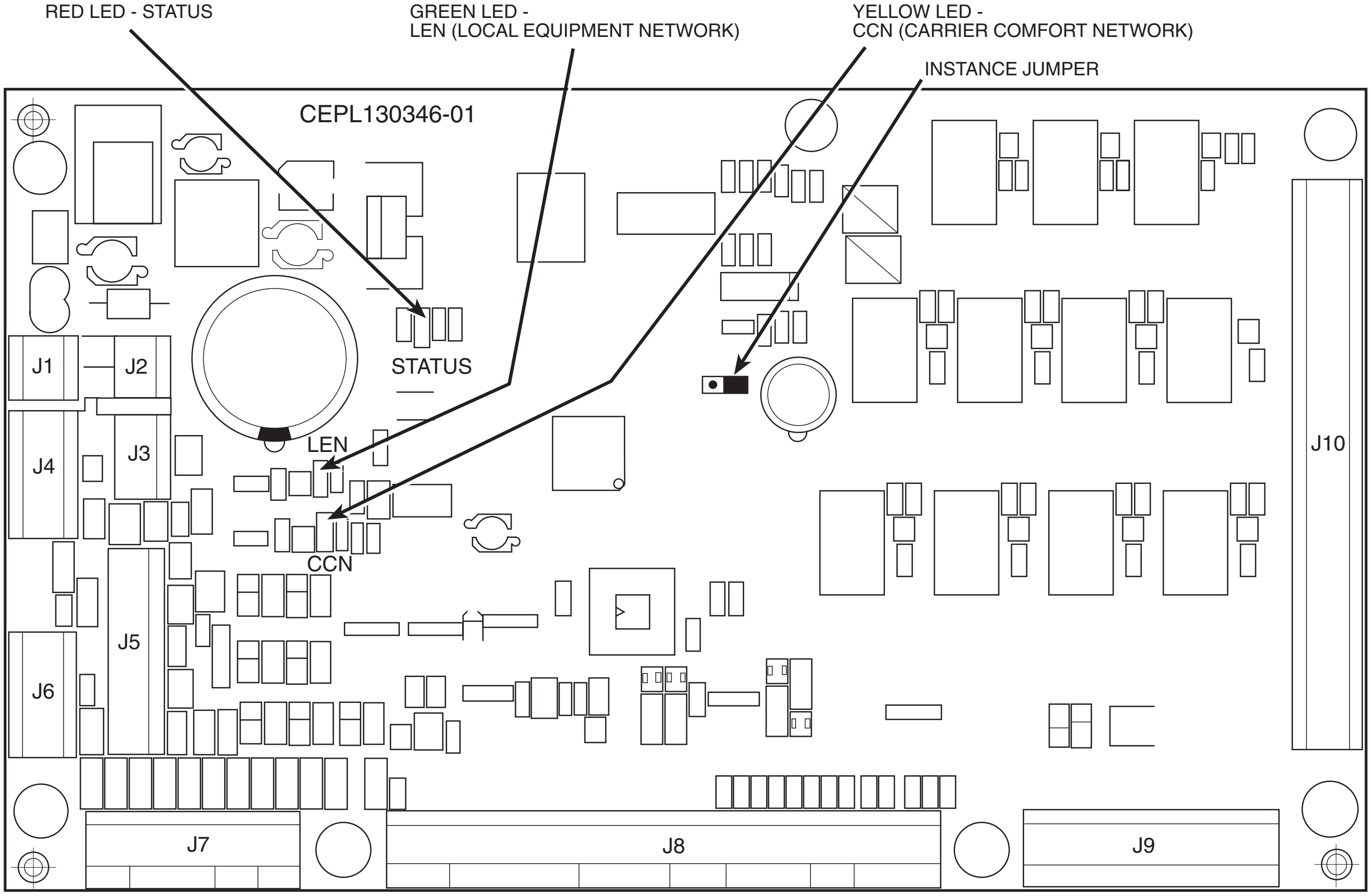


Fig. 10 — Staged Gas Control Board

Table 6 — SGC Outputs

OUTPUT	PIN CONNECTION POINT	DESCRIPTION
HEATOUT1	J10, 20-21 (SGC)	Heat Relay Output#1
HEATOUT2	J10, 22-23 (SGC)	Heat Relay Output#2
HEATOUT3	J10, 24-25 (SGC)	Heat Relay Output#3
HEATOUT4	J10, 26-27 (SGC)	Heat Relay Output#4
HEATOUT5	J10, 10-11 (SGC)	Heat Relay Output#5
HEATOUT6	J10, 12-13 (SGC)	Heat Relay Output#6

CONTROLS AND FUNCTIONS

The internal logic circuits of the PIC controls consist essentially of seven sets of control loops that provide direction and control for the major unit systems. These seven major unit systems are:

- Cooling Stages
- Staged Heating
- Economizer Position
- Building Pressure
- Supply Fan Volume
- Heating Coil (position)
- Humidifier (staged or position)

Each of these unit systems is controlled by a set of logic loops. Each set consists of a “Master Loop” and a corresponding “Submaster Loop.” Each Master Loop surveys configuration inputs, time schedules, set points, and current operating conditions (via all available sensor inputs). From this information, each Master Loop will decide which functions are available within its own system group and which functions should be in operation. Each loop then calculates the required leaving condition from the unit that will be necessary to satisfy the set points consistent with current occupancy requirements. These required leaving condition values are called “Submaster Reference Values” (or SR). Typically the SR values are updated every two minutes by each Master Loop.

The Submaster Loops in the control system provide specific operating instructions to their specific unit functions. Each of these Submaster Loops receives a unique SR from its Master Loop. Each Submaster Loop then surveys its own control outputs for current status or position, and then generates appropriate changes in its own outputs that will produce the desired operation as determined by its Master Loop. Submaster Loops recompute their required outputs much more rapidly than do their Master Loops (typically every two seconds).

The following sections provide descriptions of the available functions of the unit control system that the users can select and configure for their own requirements. For each function, there is a brief description of what the feature is intended to do for the user, what additional hardware is required to use the feature, an expanded sequence of operation, instructions on configuring the function, and any formulae used by the Master Loop for determining the appropriate Submaster Reference Values for this algorithm.

Definitions

ALGORITHM — A series of instructions that translate an input value into a specific set of output commands that will modify the operation of the system, until the modified system operation satisfies the required input command value.

DEMAND TERM — Difference between desired position or value and current position or value. (Control designers also refer to this as an “error term.”)

PID (Proportional Integrated Derivative) — A calculation process that considers the difference between desired condition (set point) and current condition (actual value), plus the direction of change (increasing or decreasing) and the rate of change (is the difference between set point and actual condition changing at increasing rate or slowing rate). A PID process will attempt to reverse a change quickly when needed or “soft-land” a change that is already approaching its set point without overshooting the set point.

FORCED VALUE — A submaster reference value that overwrites a calculated value from a function master loop or a real value direct from a sensor. Forced values may be generated by another control function (example: Fire Shutdown) or by service personnel in order to achieve an override or test function.

GAIN — A parameter or correction factor used in a control loop calculation that adjusts the responsiveness and sensitivity of the control loop.

Accessing the Control System (HSIO)

KEYPAD AND DISPLAY MODULE (HSIO) — The keypad and display module HSIO (human sensory input/output) is a field-installed accessory. The HSIO provides unit function information at the unit. See Fig. 11. The module consists of a keypad with 6 function keys, 5 operative keys, 10 numeric keys (0 through 9). The display is a 2-line, backlit, alphanumeric liquid crystal display (LCD). Each line of the LCD displays up to 24 characters (with expanded scrolling display capability). The HSIO module contains an RJ-14 data cable connection for simple installation on unit or a remote site (maximum 1000 ft cable length). Module is powered by the 24-v control circuit of the unit. Key usage is explained in Table 7. Each function has one or more subfunctions as shown in Table 8.

Table 7 — HSIO Keypad Key Usage

FUNCTION KEYS	USE
[STAT]	Status — To display diagnostic codes and current operating information about the unit.
[TEST ALRM]	Quick Test — To check inputs and outputs for proper operation
[HIST]	History — To check most recent alarms.
[SRVC]	Service — To enter specific unit configuration information.
[SET]	Set Point — To enter operating set points and day/time information.
[SCHD]	Schedule — To enter occupied/unoccupied schedules for unit operation.
OPERATIVE KEYS	**USE**
[EXPN EDIT]	Expand Display — To display a non-abbreviated expansion of the display.
[CLEAR]	Clear — To clear the screen and return to previous display. Also used to enter data value of zero.
[▲]	Up Arrow — To return to previous display position.
[▼]	Down Arrow — To advance to next display position.
[ENTER]	To enter data.

NOTE: The [ALGO] key is not used with these units.

STANDBY/RUN MODE — Unit operation is controlled by the status of the run/standby mode on the HSIO. To access the mode, press [1] [1] [STAT] on the HSIO keypad, and then press [▼]. The HSIO will display either STBY YES (unit in standby mode) or STBY NO (unit in run status).

SUMMARY DISPLAY — Whenever the keypad has not been used for 10 minutes, the display will automatically switch to an alternating summary display. This display has 5 parts, shown below, which alternate in continuous rotating sequence.

Display	Expansion [EXPN EDIT] (Press)
TUE 12:45	TODAY IS TUE, TIME IS 12:45 PM
MODE 23	MODE IS UNOCCUPIED HEAT
COOL 1	COOLING STAGES 1
HEAT 1	HEATING STAGES 1
2 ALARMS	THERE ARE 2 ALARMS

SETTING DATE AND TIME OF DAY — The date and time subfunction is located in the set point function under [3] [SET]. Refer to detailed instructions in the Adjusting Set Points section on page 56.

ACCESSING FUNCTIONS AND SUBFUNCTIONS — The functions and subfunctions are shown in Table 8. See Table 9 for a procedure on how to access these functions.

OPERATING MODE DISPLAY — The operating mode codes are displayed to indicate the operating status of the unit at a given time. To enter the Modes subfunction, press [3] and [STAT]. Use [▼] to determine if more than one mode is in effect. See Table 10 for a list of the modes and mode names.

LOGON AND LOGOFF/PASSWORD — Password access is required when entering any subfunction under the SERVICE group. The user configuration inputs are located in the Service subfunctions. To Log On, enter the password. When configuration checks and changes are completed, enable the Data Reset function and then Log Off. To log on to the Service function, perform the actions in Table 11.

DATA RESET — Whenever a configuration in the Factory Configuration group (Service function, Subfunction 3) has been changed by the user or service person, it is necessary to enable the Data Reset function before the control will recognize these changes in configuration instructions. To enable Data Reset, enter Data Reset by pressing [3] [SRVC]. Scroll down until the HSIO displays the letters DTRS. Press [1] and [ENTER].

DESCRIPTION	HOW TO CONFIGURE	SET POINT	ACTION
Enable Data Reset	[3] [SRVC]	DTRS	Select [1], [ENTER]

CHANGING DISPLAY FOR METRIC UNITS — To change the display of the HSIO from English to Metric units, enter Service subfunction 5 by pressing [5] and [SRVC]. Scroll down until the HSIO displays UNITS. Select desired units of measure. To select Imperial (English), press [0] and [ENTER]. To select Metric, press [1] and [ENTER]. See Table 12.

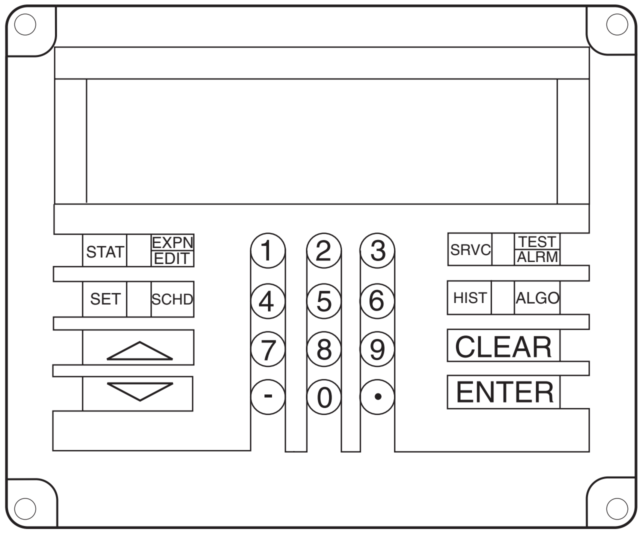


Fig. 11 — Keypad and Display Module

Basic System Functions — The unit control system provides over 35 separate unit system and unit control functions. Descriptions of these functions (including purpose of the function, necessary additional hardware, configuration, and operating sequence) have been arranged into 11 separate groups, with each group representing similar topics. These groups are: Basic Systems, Service, Schedules, Economizer and Power Exhaust, Smoke Control, Special Ventilation, Dehumidification and Humidifier, Supply Fan Duct Pressure and VAV Control, Remote Controls, Special Systems, and CCN Applications.

BASIC SYSTEMS — The basic control systems group of the unit controls include Standby, Supply Fan Interlock and Operation, Cooling Stage Control, and Staged Heat Control.

System Type — The unit control system is field-configurable for Variable Air Volume (VAV) or Constant Volume (CV) air systems. For VAV systems, the control will maintain the unit supply-air temperature (SAT) at the user configured set point, with continuous fan operation during Occupied periods. For CV systems, the control will maintain space temperature at the user configured space temperature set point during Occupied periods.

To check and modify the configuration, the Service function is used. Press 1 SRVC ENTER to log on to the Service function. Enter the password. Press 3 SRVC to enter into the Factory Configuration subfunction. Use ▼ to scroll down to TYPE. The configuration type will be shown (CV or VAV). Enter new value if appropriate. Press 0 and ENTER for CV operation. Press 1 and ENTER for VAV operation. If reconfigured, enable Data Reset. Log off when completed (unless other Service functions are to be performed).

If configuring unit for Constant Volume operation, the Fan Operation Type (Continuous Fan or Auto Fan) must be configured for use in Occupied time schedules. To configure the Fan Operation Type, enter the Service function. Log on, if required. Press 6 SRVC to enter the User Configuration subfunction. Scroll down to Fan Mode (FANM). Select the desired mode (Continuous = 1, Auto = 0), by pressing 0 or 1 and ENTER. Log off when completed.

Heat Type — Heat type is configured at the factory when factory-installed gas heating or electric heaters are installed. If there is no heating element, the control will be configured for No Heat. If field-installed accessory electric heaters are being installed or a remote staged heating device will be used, change Heat Type to 2 (Electric Heat).

If a field-installed hydronic heating device (with modulating control valve) will be controlled by the unit controls, refer to the Hydronic Heating section on page 40 for information on modifying this configuration value.

To check Heat Type, log on to the Service function by pressing 1 SRVC. Enter the password. Press 3 SRVC to enter the Factory Configuration subfunction. Scroll down to the Heat Type configuration (HEAT). Check value. A value of 0 = None, 1 = Water/Steam (hydronic), 2 = Electric Heat, and 3 = Gas Heat. Press the number 0, 1, 2, or 3 and ENTER to reconfigure. If reconfigured, enable Data Reset. Logout when complete.

STANDBY MODE — Standby mode is used to disable the unit during installation or service. A unit in Standby mode indicates the unit control has been disabled, for purposes of shipping and start-up or for service activity. A unit which is not in Standby (equivalent to RUN status) indicates unit control has been enabled. The unit will operate according to occupancy schedules and function set points. Standby is Mode 25.

NOTE: Units are shipped from the factory in Standby (''STBY YES'') mode. Installers **must** exit Standby to start unit (by using the HSIO or by using the Remote Start option).

During "STBY YES" status, the unit control will stop all functions. All attempted communication from a CCN network to the unit will be blocked.

During ''STBY NO'' status, the unit control will operate according to occupancy schedules and appropriate set points for any and all available functions.

> IMPORTANT: There are two exceptions to the Standby status. All Smoke Control functions are active at all times. If any of the fire/smoke modes become active, the unit will be controlled with a Force Priority "FIRE" regardless of RUN/STANDBY/TEST state. Remote Start input will also override STANDBY OFF status.

Configuration — To enter into Standby mode, press 1 1 STAT to enter the Status function and the Standby subfunction. Press 1 ENTER to enter standby mode. The display will read STBY YES.

To exit Standby mode, press 1 1 STAT to enter the Status function and the Standby subfunction. Press CLEAR ENTER to exit Standby mode. The display will read STBY NO. See Table 13.

SUPPLY FAN — The Supply Fan Operation Type feature allows user configuration for type of fan operation during Occupied time periods on CV units. The supply fan control function provides confirmation of operation of the fan to other unit functions. The fan status pressure switch is checked and then status is communicated to other modes (where confirmation of fan operation is required before a function algorithm may initiate other functions). No additional hardware is required.

Sequence of Operation (VAV) — During Occupied periods, the control will energize the supply fan contactor. The contactor will close, energizing supply fan motor. The fan wheel will turn. The airflow switch (differential pressure switch) contacts close, providing discrete input (DI) to Channel 12 (Closed = Fan ON). Fan operation will continue through the Occupied period.

During Unoccupied period with demand, the control will energize the fan contactor when demand is sensed. After fan status is confirmed, operating routines will commence. When demand is removed, routines will end and fan will shut off.

Sequence of Operation (CV, Continuous Fan) — During Occupied periods, the control will energize the supply fan contactor. The contactor will close, energizing supply fan motor. The fan wheel will turn. The airflow switch (differential pressure switch) contacts close, providing discrete input (DI) to Channel 12 (Closed = Fan ON). Fan operation will continue through the Occupied period.

During Unoccupied period with demand, the control will energize the fan contactor when demand is sensed. After fan status is confirmed, operating routines will commence. When demand is removed, routines will end and fan will shut off.

Table 8 — HSIO Keypad and Display Module Functions and Subfunctions

SUB FUNCTION NO.	FUNCTIONS					
	Status (Table 73) STAT	**History (Table 96)** HIST	**Schedule (Table 68)** SCHD	**Service (Table 97)** SRVC	**Set Point (Table 64)** SET	**Test (Table 99)** TEST ALRM
1	Current Alarms	Alarms	Occupied Mode Override (Unit)	Log on and Log off	System Set Point	Test of Inputs
2	Current Alerts	Maintenance	Period 1 (Unit)	Software Version	Demand Limit	Analog Outputs
3	Current Operating Modes	—	Period 2 (Unit)	Factory Configuration	Current Time	Discrete Outputs
4	Capacity Stages	—	Period 3 (Unit)	Bus Address	Daylight Savings Time	Test Compressors
5	Current Operating Set Points	—	Period 4 (Unit)	Units of Measure	Configure Holiday	Test Heat
6	System Temperatures	—	Period 5 (Unit)	User Configuration	—	Exit Test
7	System Pressures	—	Period 6 (Unit)	Heating Coil	—	—
8	Inputs	—	Period 7 (Unit)	Cooling	—	—
9	Analog Outputs	—	Period 8 (Unit)	Duct Pressure	—	—
10	Discrete Outputs	—	Occupied Mode 2 Override (DTCC)	Economizer	—	—
11	Run/ Standby	—	Period 1 (DTCC)	Staged Heat	—	—
12	—	—	Period 2 (DTCC)	Nighttime Free Cool	—	—
13	—	—	Period 3 (DTCC)	Adaptive Optimal Start/Stop	—	—
14	—	—	Period 4 (DTCC)	Temperature Reset	—	—
15	—	—	Period 5 (DTCC)	Configure Loadshed	—	—
16	—	—	Period 6 (DTCC)	Configure IAQ	—	—
17	—	—	Period 7 (DTCC)	Configure Humidity	—	—
18	—	—	Period 8 (DTCC)	Building Pressure	—	—
19	—	—	—	Alert Limits	—	—
20	—	—	—	Service History	—	—
21	—	—	—	Service Maintenance Alarm	—	—
22	—	—	—	Override History	—	—

LEGEND

DTCC — Discrete Timeclock Control
IAQ — Indoor-Air Quality

NOTE: Expanded details on each function can be found in the table listed under each function in the table headings.

Table 9 — Accessing Functions and Subfunctions

OPERATION	KEYPAD ENTRY	DISPLAY	DESCRIPTION
To access a function, press the subfunction number and the function name key. The display will show the subfunction group.	4 STAT	STAGES	Current stages
To move to the other elements, scroll up or down using the arrow keys.	▼	COOL X	Cooling stages
	▼	CPC X	Cooling percent capacity
	▼	HEAT X	Heating stages
	▼	HPC X	Heating percent capacity
	▼	SMZ X	SUM/Z ratio
When the last element in a subfunction has been displayed, the subfunction group name will be repeated.	▼	STAGES	Current stages
To move to the next subfunction, it is not necessary to use the subfunction number; pressing the function name key will advance the display through all subfunctions within a function and then back to the first.	STAT	SETPOINT	Current operating set point
	STAT	TEMPS	System temperatures
	STAT	PRESSURE	System pressures
	STAT	INPUTS	System inputs
	STAT	ANLGOUT	Analog outputs
	STAT	OUTPUTS	Discrete outputs
	STAT	STANDBY	Standby/run mode
To move to another function, either press the function name key for the desired function (display will show the first subfunction) or Access a particular subfunction by using the subfunction number and the function name key.	HIST	ALRMHST	Alarm history
	2 HIST	MTN/HIS	Maintenance history

Table 10 — Mode Numbers and Names (3 STAT)

MODE NUMBER	MODE NAME
21	Supply-Air Temperature Reset (VAV Only)
22	Demand Limit
23	Unoccupied Heating
24	Unoccupied Cooling
25	Standby
26	Optimal Start
27	Unoccupied
28	Indoor-Air Quality Purge
29	Optimal Stop
30	Occupied Heating
31	Occupied Cooling
32	Occupied Fan Only
33	Nighttime Free Cooling
34	Pressurization
35	Evacuation
36	Smoke Purge
37	Fire Shutdown
38	Timed Override
39	Digital Air Volume Control
40	Quick Test
41	High Humidity Override
42*	Indoor Air Quality/Outdoor Air Control*

*Sizes 090 and 105 only.
NOTE: Optimal start will initiate both mode 26 (optimal start) and mode 30 (occupied heating).

Table 11 — Logging On and Off to Service Function

ACTION	KEYPAD ENTRY	DISPLAY	DESCRIPTION
LOG ON	1 SRVC	LOG ON	Enter password followed by ENTER
Enter Password	1 1 1 1 ENTER	LOGGEDON	Logged on okay
LOG OFF	▼	LOG OFF	Press ENTER to log off
Confirm	ENTER	LOGD OFF	Logged off okay

Table 12 — Configuring Units of Measure in Display

DESCRIPTION	HOW TO CONFIGURE	SET POINT	RANGE
Select Units of Measure	5 SRVC	UNITS	Metric = 1; English (Imperial) = 0

Sequence of Operation (CV, Automatic Fan) — The fan will be turned OFF during an Occupied period when there is no demand for heating or cooling operation. When demand is sensed, the control will energize fan contactor and fan status will be confirmed. When demand is removed, routines will terminate and fan will be shut off.

Configuration — To configure the Fan Operation Type, enter the Service function. Log on, if required. Press 6 SRVC to enter the User Configuration subfunction. Scroll down to Fan Mode (FANM). Select the desired mode (Continuous = 1, Auto = 0), by pressing 0 or 1 and ENTER . Log off when completed. See Table 14.

COOLING — The cooling control loop is used to calculate the desired supply-air temperature (SAT) needed to satisfy the space temperature (CV) or the supply air set point (VAV). The calculated cooling control submaster reference (CCSR) is then used by the capacity algorithm (cooling submaster loop) to control the required number of cooling stages. See Table 15 for cooling control operation definitions.

Occupied/Unoccupied Cooling Modes

NOTE: Occupied Cooling Mode is 31. Unoccupied Cooling Mode is 24.

The Cooling Control routine determines the staging of the available compressors and unloaders to maintain space comfort conditions. Cooling cycle is available during the Occupied period, during Optimal Start routine, and during the Unoccupied period. Cooling Control may be overridden by Dehumidification mode (if enabled) when conditions warrant.

For full VAV operation, a T-55 space temperature sensor is required (factory-supplied, field-installed). For CV operation, a Space Sensor (T-55 [factory-supplied, field-installed] or T-56 [field-supplied, field-installed]) is required.

Sequence of Operation, Occupied Cooling (VAV) — The economizer cycle must not be permitted or, if permitted, the outdoor air damper position must be open to 90% or higher. For VAV operation the supply fan must be ON for cooling control to operate and the unit must not be in Heating mode. The Master Loop will survey occupancy status, SASP and any SAT Reset command, then issue CCSR to Cooling Submaster Loop (CSL). The CSL surveys actual SAT, then calculates number of capacity stages required to produce the CCSR leaving the unit. Stages of cooling capacity are initiated. The time delay between stages in increasing demand is 90 seconds. As actual SAT approaches CCSR value, stages are released. Minimum time delay between stages on decreasing demand is 90 seconds.

NOTE: Demand for heating has priority when the control senses a demand for heating, and Master Loop will either terminate existing or prevent initiation of Cooling Cycle by issuing a CCSR at the maximum limit. This will cause CSL to select zero stages of cooling capacity.

Sequence of Operation, Occupied Cooling (CV) — The economizer cycle must not be permitted or, if permitted, the outdoor air damper position must be open to 90% or higher. The supply fan must be ON for cooling control to operate. The Master Loop will survey Space Temp and Space Temp Offset inputs, then calculate CCSR value. The CSL surveys actual SAT, then calculates number of capacity stages required to satisfy space load. Stages of cooling capacity are initiated. (From zero stages, there will be a 1.5 to 3 minute delay before first stage is initiated.)

Unoccupied Cooling —The Unoccupied Cooling function is similar to Occupied Cooling except for the following: the supply fan will be OFF as demand is initiated, the Master Loop will start Supply Fan and fan status must be proved as ON, the control set point will be the Unoccupied Cooling Set Point (UCSP), and at the end of the cooling cycle, the supply fan will be turned OFF.

Configure Cooling Set Points — To configure cooling set points, enter the Set Point function and the Set Point subfunction by pressing 1 and SET. To select the Occupied Cooling Set Point, scroll down to OCSP. The current set point value will be displayed. The default is 78 F. The range of acceptable values is 55 to 80 F. To change the set point, press the numbers of the new set point (example: 7 4) and then press ENTER .

To select the Unoccupied Cooling Set Point, scroll down to UCSP. The current set point value will be displayed. The default is 90 F. The range of acceptable values is 75 to 95 F. To change the set point, press the numbers of the new set point (example: 8 4) and then press ENTER .

To select the Supply Air Temperature Set Point, scroll down to SASP. The current set point value will be displayed. The default is 55 F. The range of acceptable values is 45 to 70 F. To change the set point, press the numbers of the new set point (example: 6 0) and then press ENTER . See Table 16.

Cooling Algorithms

VAV: CCSR = MSAS = SASP + RESET

CV: CCSR = PID function on (Demand term)

where (Demand term) = OCSP + STO - SPT

Overrides

First Stage and Slow Change Override — The first stage override reduces cycling on the first stage of capacity. The slow change override prevents the addition or subtraction of another stage of capacity if the SAT is close to the set point and gradually moving towards the set point.

Low Temperature Override — The low temperature override function protects against rapid load decreases by removing a stage every 30 seconds when required, based on temperature and the temperature rate of change.

High Temperature Override — The high temperature override function protects against rapid load increases by adding a stage once every 60 seconds as required, based on temperature and temperature rate of change.

Table 13 — Configuring STANDBY OFF (“Run”)/STANDBY ON

DESCRIPTION	HOW TO CONFIGURE	SET POINT	ACTION
Exit STANDBY (Place in “Run”)	1 1 STAT	STBY	Select CLEAR or · , ENTER Display: STBY NO
Enter STANDBY	1 1 STAT	STBY	Select 1 ENTER Display: STBY YES

Table 14 — Configuring Fan Operation (CV)

DESCRIPTION	HOW TO CONFIGURE	SET POINT	RANGE
Select Auto or Continuous Operation (CV only)	6 SRVC	FANM	Auto = 0; Cont = 1*

*If value changed, enable Data Reset before leaving 3 SRVC .

Table 15 — Cooling Control Operation Definitions

ITEM	DEFINITION
CCSR	Cooling Control Submaster Reference
CSL	Cooling Submaster Loop
CV	Constant Volume
LIMT	Reset Limit
MSAS	Modified Supply-Air Set Point
OCSP	Occupied Cooling Set Point (Space Set Point)
PID	Proportional, Integral, Derivative Controls
RESET	Supply Air Temperature Reset Value (Based on Space Temperature)
RTIO	Reset Ratio
SASP	Supply Air Set Point
SAT	Supply Air Temperature
SATRESET	Supply Air Temperature Reset Value (Based on 2 to 10 v Input)
SATRV	Input Voltage to Control Reset (VAV) or Offset (CV)
SPT	Space Temperature
STO	Space Temperature Offset
SUM	Proportional PID Parameter Based on Temperature
UCSP	Unoccupied Cooling Set Point
VAV	Variable Air Volume
Z	Calculated Integral Limit Based on Temperature Rise Per Stage.

Table 16 — Configuring Cooling (CV/VAV) and Space Temperature Reset (VAV Only)

DESCRIPTION	HOW TO CONFIGURE AT HISO	SET POINT	RANGE
Unit Type	3 SRVC	TYPE	CV = 0; VAV = 1*
Supply Air Set Point (VAV only)	1 SET	SASP	45 to 70 F (7 to 21 C)
Occupied Cooling Set Point	1 SET	OCSP	55 to 80 F (13 to 27 C)
Unoccupied Cooling Set Point	1 SET	UCSP	75 to 95 F (24 to 35 C)
Enable Supply Air Reset (VAV only)	6 SRVC	RSEN	Enable = 1; Disable = 0
Reset Ratio	1 4 SRVC	RTIO	0° to 10 F (0° to 5.6 C)
Reset Limit	1 4 SRVC	LIMT	0° to 20 F (0° to 11 C)

*If value changed, enable Data Reset before leaving 3 SRVC .

HEATING — The Staged Heating Control routine determines the staging of the available heating system to maintain space comfort conditions. The heating cycle is available during the Occupied period (for all CV units, and for VAV units when enabled), during Optimal Start/Morning Warm-up routine, and during the Unoccupied period. A modified Heating function is also available during Dehumidification and Reheat functions. This function provides control of two stages of factory-installed gas or electric heat or two stages of field-installed accessory electric heaters, via Channels 17 and 18.

Occupied Heating is Mode 30. Unoccupied Heating is Mode 23.

On VAV units, Heating control will maintain set point temperature at the Return Air Temperature sensor. On CV units, Heating Control will prevent the space temperature from falling below the Heating set point. Heating control definitions are shown in Table 17.

NOTE: On VAV units, VAV terminals must be fully open during heating operation. The HIR (heat interlock relay) function provides a control signal to the VAV terminals to move to Heating-Open positions. The HIR is energized whenever Heating mode is active.

For CV heating operation, a Space Temperature sensor (T-55 factory-supplied, field-installed or T-56 field-supplied, field-installed) is required.

NOTE: If heat type is electric, all compressor stages must be off before Heating control is permitted.

Table 17 — Heating Control Operation Definitions

ITEM	DEFINITION
CV	Constant Volume
HD	Heat Demand (Degrees F for Staged Heat and Percent for Modulating)
HS	Heating Stages
HSL	Heating Submaster Loop
HSR	Heating Submaster Reference
OAT	Outdoor Air Temperature
OHEN	Occupied Heat Enable/Disable
OHSP	Occupied Heating Set Point (Space Set Point)
PID	Proportional, Integral, Derivative Controls
RAT	Return-Air Temperature
SAT	Supply-Air Temperature
SATRV	STO Reset Value (Based on 2 to 10 v Input)
SHSMG	Staged Heating Submaster Gain
SHSR	Staged Heating Submaster Reference
SPT	Space Temperature
STO	Space Temperature Offset (CV Only)
UHSP	Unoccupied Heating Set Point
VAV	Variable Air Volume

VAV Units Occupied Heating — Occupied Heat must be enabled for Heating control to operate during Occupied periods. The supply fan must be ON before Heating control can start. Fan Status is determined by closure of contacts at Fan Status switch. The RAT must be less than Occupied Heat Set Point. The Master Loop (ML) checks the RAT and OHSP, and then issues a Staged Heating Submaster Reference value (SHSR) to the Heating Submaster Loop (HSL). The HSL compares SHSR to actual SAT, then calculates number of heating stages required to deliver the SHSR. Heating stages are initiated. Heat Interlock Relays are energized, initiating signal to room terminals to move to heating position. As RAT approaches OHSP, the HSL will deactivate stages of heating.

Gas Heat Units — If the RAT decreases below OHSP, then the heating cycle will be initiated immediately, even if the cooling cycle is already operating (cooling stages at one or higher). The ML will issue a forced value to the Cooling Submaster Loop (CSL) (at high limit value). This will drive cooling stages back to zero stages (at minimum time delay between stages). Simultaneous operation of heating and cooling cycles may be observed during transition. Once OHSP is satisfied by RAT, heating will terminate and cooling cycle will restart. The Reheat function will activate Heating control with concurrent operation of compressor stages.

CV Units Occupied Heating — If Auto Fan mode has been configured, the fan will be OFF when there is no demand for heating. When space temperature falls below OHSP, the following conditions will occur:

1. If the fan is configured for AUTO, the fan relay will be energized, and Air Switch contacts will close, confirming fan operation.
2. The ML compares SPT to OHSP, calculates SHSR value and issues it to HSL.
3. The HSL compares SHSR to actual SAT, and calculates number of heating stages required to satisfy space temperature.
4. The HSL initiates heating stages.
5. Heating stages are deactivated as SPT approaches, then equals OHSP.
6. If the fan is configured for AUTO, the fan contactor will be deenergized when SPT equals OHSP and the fan is deenergized.

Unoccupied Heating (VAV and CV Units) — During unoccupied heating:

1. The fan will be OFF when there is no demand for heating.
2. Demand is initiated when the RAT falls below UHSP (VAV units) or when space temperature falls below UHSP (CV units).
3. The fan contactor will be energized, and Air Switch contacts will close, confirming fan operation.
4. The ML compares RAT (VAV) or SPT (CV) to UHSP, calculates SHSR value, and issues it to the HSL.
5. The HSL compares SHSR to actual SAT, and then calculates number of heating stages required to satisfy space temperature.
6. The HSL initiates the heating stages.
7. The heating stages are deactivated as SPT approaches, then equals UHSP.
8. The fan contactor will deenergize when RAT (VAV) or SPT (CV) equals UHSP, then the fan stops.

Configuration of Electric Heat — If accessory electric heat has been installed (50ZJ,ZL,ZW only), the control configuration must be reconfigured for electric heat. See Table 18.

NOTE: Electric heat is not available on 50ZK,ZM,ZZ units.

Configuration of Heating Set Points — To configure heating set points, enter the Set Point function and the Set Point subfunction by pressing [1] and [SET]. To select the Occupied Heating Set Point, scroll down to OHSP. The current set point value will be displayed. The default is 68 F. The range of acceptable values is 55 to 80 F. To change the set point, press the numbers of the new set point (example: [7][4]) and then press [ENTER].

To select the Unoccupied Heating Set Point, scroll down to UHSP. The current set point value will be displayed. The default is 55 F. The range of acceptable values is 40 to 80 F. To change the set point, press the numbers of the new set point (example: [5][0]) and then press [ENTER].

To enable Occupied Heating (VAV units) press [1] [SRVC]. Enter the password. Press [6] [SRVC] to enter into the User Configuration subfunction. Scroll down to OHEN (Occupied Heating Enable). The current configuration will be displayed (0 = disabled, 1 = enabled). The default is disabled. To change the configuration, press the number of the new configuration (example: [1]) and then press [ENTER]. See Table 18.

Heating Algorithms — SRV Formula:

SHSR = PID function on (Demand term)

where

VAV: (Demand term)

= Heating set point – Return-Air Temperature

CV: (Demand term)

= Heating set point – Space Temperature

Service Group — This group includes Alerts and Alarms, and Quick Test.

ALERTS AND ALARMS — Alerts and alarms are features of the unit controls that facilitate diagnostics and troubleshooting activity.

Alerts — Alerts are initiated by the unit control when it detects that a sensor condition has gone outside user-configured criteria for acceptable range. Alerts are available for:

- Space Temperature/Occupied
- Space Temperature/Unoccupied
- Supply-Air Temperature
- Return-Air Temperature
- Outdoor-Air Temperature
- Relative Humidity
- Outdoor Air Relative Humidity
- Static Pressure
- Building Pressure
- Outdoor Air CFM
- Indoor Air Quality/Service Maintenance (accrued run time since last service call)

To view Alerts, press [2] [STAT]. Scroll for active alerts. Alerts will be reset when the actual value returns to a value between the high limit and low limit range (shown in Table 19), according to the reset value criteria in Table 20.

Configuration — To configure Alert set points, press [1] [9] [SRVC] to enter the Alert Limits subfunction. Scroll to the desired alert. Enter new value. See Table 19 for default values and available ranges. See Table 20 for alert reset criteria.

Alarms — Alarms are initiated by the unit control when it detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation), that an output has not functioned as expected, or that a safety device has tripped. Current (still active) alarms are maintained in the Status function (subfunction 1). Up to 9 of the last (current and reset) alarms are stored in the History function.

Alarms are also broadcast to the CCN Building Supervisor. There are 42 separate Alarms possible from the unit controls. For a detailed explanation of each alarm, refer to the Troubleshooting section.

QUICK TEST — The Quick Test mode permits service technician to initiate a test of all inputs and outputs from the unit control system. The test, initiated and controlled from the HSIO, forces all outputs with a service priority. All service priorities are removed on exit from the Quick Test. Quick Test is Mode 40. An accessory HSIO module must be connected to the unit to initiate Quick Test.

Sequence of Operation

1. Place unit in Standby mode (displays STBY YES).
2. Enter desired TEST subfunction.
3. Scroll down to desired test.
4. Press [ENTER] to initiate test.
5. Input test will display the current sensor input value (if analog-type) or contact status (if discrete-type).
6. Individual Output tests will cause discrete outputs to be enabled, or will cause analog outputs to be cycled to specific output values. Each output will be disabled by selecting next output using the [▲] or [▼] keys. To enable an output test, press [ENTER].
7. Exiting TEST will remove all previously applied forces.

Table 18 — Configuring Heating (VAV/CV)

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Type of Heat	[3] [SRVC]	HEAT	Electric = 2* Gas = 3 Hydronic = 1 None = 0
Enable Occupied Heating (VAV only)	[6] [SRVC]	OHEN	Enable = 1; Disable = 0
Occupied Heating Set Point	[1] [SET]	OHSP	55 to 80 F (13 to 27 C)
Unoccupied Heating Set Point	[1] [SET]	UHSP	40 to 80 F (4 to 27 C)

*If value changed, enable Data Reset before leaving [3] [SRVC].

NOTE: Occupied Heating Set Point serves as "Morning Warm-Up Set Point."

Table 19 — Sensor Set Point Alert Limits, Ranges, and Default Values

NAME	DESCRIPTION	STAT SUBFUNCTION	OCCUPIED SPACE STATUS	ALERT DEFAULT (LOW)	ALERT DEFAULT (HIGH)	LOW LIMIT	HIGH LIMIT
BP	Building pressure	7 Pressure	Occupied	–0.25 in.wg	0.25 in.wg	–0.5 in.wg	0.5 in.wg
IAQ	Indoor-Air Quality	8 Inputs	Occupied	0 ppm	800 ppm	0 ppm	5000 ppm
OAC	Outdoor-Air Cfm	8 Inputs	Occupied	0 cfm	50,000 cfm	0 cfm	50,000 cfm
OARH	Outdoor-Air Relative Humidity	8 Inputs	Occupied/ Unoccupied	0%	100%	0%	100%
OAT	Outdoor-Air Temp	6 Temps	Occupied/ Unoccupied	–40 F	125 F	–40 F	245 F
RAT*	Return-Air Temp	6 Temps	Occupied	60 F	90 F	–40 F	245 F
			Unoccupied	35 F	120 F	–40 F	245 F
RH*	Relative Humidity	8 Inputs	Occupied/ Unoccupied	0%	100%	0%	100%
SAT*	Supply-Air Temp	6 Temps	Occupied	45 F	180 F	–40 F	245 F
			Unoccupied	35 F	180 F	–40 F	245 F
SP*	Static Pressure	7 Pressure	Occupied/ Unoccupied	0.0 in. wg	2.0 in. wg	0.0 in. wg	5.0 in. wg
SPT*	Space Temperature	6 Temps	Occupied	65 F	80 F	–10 F	245 F
			Unoccupied	45 F	100 F	–10 F	245 F

LEGEND
ppm — parts per million

*Once the unit changes from Unoccupied to Occupied mode, a programmed delay of 30 minutes takes place before any alert will be generated.

Table 20 — Alert Criteria Reset Value for Return to Normal

NAME	DESCRIPTION	RESET VALUE
BP	Actual Space Pressure	None
IAQ	Indoor-Air Quality	None
OAC	Constant Outdoor-Air Cfm	None
OARH	Outdoor-Air Relative Humidity	2%
OAT	Outdoor-Air Temperature	1 F
RAT	Return-Air Temperature	1 F
RH	Space Relative Humidity	2%
SAT	Supply-Air Temperature	2 F
SP	Static Pressure	0.2 in. wg
SPT	Space Temperature	1 F

NOTE: Alert will automatically reset when the actual value equals the Alert High Limit minus the Reset Value or the actual value equals the Alert Low Limit plus the reset value.

Schedules Group — This group includes Schedule I and II, Discrete Timeclock Control, Timed Override, Adaptive Optimal Start, and Adaptive Optimal Stop (available on CV units only).

TIME SCHEDULES — Time Schedule function provides two separate schedules from the unit controls. Schedule I is provided for unit operation as a means to automatically switch back and forth from Unoccupied to Occupied modes. Schedule II provides a means to automatically change the Discrete Timeclock Control (for control of outdoor building or parking lot lights).

Each schedule consists of 1 to 8 occupied time periods that are set by the user through the function on the HSIO.

NOTE: A control relay for external device control (see Discrete Timeclock Control) is required for Schedule II.

Sequence of Operation

Schedule I — When the schedule changes from Unoccupied to Occupied modes (or vice versa), the Master Loops will change their priorities and control the submaster reference values according to user configuration instructions for unit Unoccupied or Occupied mode.

Schedule II — See the Discrete Timeclock Control section below.

Configuration — To configure Time Schedule set points, enter the Set Point function and the Date and Time subfunction by pressing [3] and [SET]. To set the Day of the Week and Time, scroll down to DOW. The current day, hour, and minute will be displayed (where 1 = Monday, 2 = Tuesday, and so on). To change the day and time, press the numbers of the new time and day of the week (example: [1] [·] [1] [4] [·] [3] [0] would be Monday, 2:30 PM) and then press [ENTER].

To set the Month, Day, and Year, scroll down to MDY. The current month, day, and year will be displayed (mm.dd.yy). To change the month, day, and year, press the numbers of the new date (example: [0] [5] [·] [1] [4] [·] [0] [0] which would be May 14, 2000) and then press [ENTER].

To Set Daylight Savings Time and Set Occupancy Schedules, Schedule I, see the Program Time Sequences section on page 61. See Table 21.

DISCRETE TIMECLOCK CONTROL (DTCC) — The unit control can be programmed with a unique time schedule (separate and different from the unit Occupied/Unoccupied schedule) that may be used to control an external function or device (such as parking lot lights) without adding a separate timeclock device. This schedule is designated as "Schedule II."

A special relay (P/N HK35AB001) with a 20 vdc coil is required.

Sequence of Operation — From Schedule II, when time schedule indicates Unoccupied time, the control output is off. When time schedule indicates Occupied time, control output is on (relay energized).

Configuration — To configure:

1. Connect control wires from external controlled device at PSIO2 Channel 44 (terminals J6-41 and J6-42).
2. Enter Time Schedules. Press [1] [1] [SCHD]. (See Schedule Function section on page 61 for detailed instructions.) Define Period 1 (Occupied, Unoccupied). Define Periods 2 thru 8 (as required).

TIMED OVERRIDE — The Timed Override mode allows an occupant to return a system that is in Unoccupied status to Occupied status, for period of 1 to 4 hours (user-configured). Timed Override is Mode 38. The Timed Override Schedule function can be user-configured to return only the unit, the Discrete Timeclock Control, or both to Occupied status. A T-55 space sensor (factory-supplied, field-installed) or T-56 space sensor (field-supplied and -installed on constant volume units only) is required.

To activate Timed Override, press the button on the face of the space sensor. The unit control will recognize this signal and enable the Occupancy Schedule program to extend the Occupied period by the configured timed override amount.

To configure Timed Override, perform the following procedure:

Select which Time Schedules permit the use of override. Press [1] [SRVC] to enter into the Service function. Enter the password. Press [6] [SRVC] to enter into the User Configuration subfunction. Scroll down to TSCH. The current schedule configuration will be displayed. A 1 represents Unit schedule only (Time Schedule I). A 2 represents Discrete Timeclock Control only (Time Schedule II). A 3 represents both Schedules I and II. Press the number of the desired configuration and press [ENTER].

Configure the duration for Timed Override. Press [6] [SRVC] to enter in to the Service function and the Override subfunction. Scroll down to TOVR. The number of override hours will be displayed. The default is 1 hour. The range is 1 to 4 hours. To change the configuration, press a new number (example: [3]) and [ENTER].

One-Time Period Override — As an alternate way to initiate override, a service technician may initiate Timed Override from the HSIO, for a one-time period.

To initiate an override for Schedule I, press [1] [SCHD] to enter into the Schedule function. Scroll down to OVRD. The current override time will read 0. Press the number of the desired override time and press [ENTER]. The acceptable range of values is 0 to 4 hours. At end of this time override event, the entered OVRD values will be reset to zero.

To initiate an override for Schedule II, press [1] [0] [SCHD] to enter into the Schedule function. Scroll down to OVRD. The current override time will read 0. Press the number of the desired override time and press [ENTER]. The acceptable range of values is 0 to 4 hours. At end of this time override event, the entered OVRD values will be reset to zero.

Table 21 — Configuring Day of Week/Time of Day

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Set Day of Week	[3] [SET]	DOW	Monday = 1; Tuesday = 2; etc.
Set Time of Day	[3] [SET]	TIME	hh.mm (military time) (use [·] for":")
Set Daylight Savings Time	(see Table 67)		
Set Occupancy Schedules	(see Table 68)		

OPTIMAL START — The control will compute a time period (in minutes) to start Occupied Mode Warm-up prior to start of the Occupied Mode schedule, to arrive at Occupied set points just as Occupied period begins. Optimal Start is Mode 26.

Optimal Start is allowed only if the RAT is less than Occupied Heating Set Point (VAV units), or if the space temperature is less than the Occupied Heating Set Point (CV units). The control checks the return air/space temperature, the time for start of Occupied period (day, hr), and the time for last Unoccupied period (day, hr). The control computes a biased start time period to meet the needs of the Optimal Start. The control initiates the Occupied Heating function at the calculated time. The fan is energized and heating starts. If Warm-Up function is still required as Time Schedule changes to Occupied period, Warm-up Heating will continue until OHSP is satisfied (even in VAV system which has NOT been configured for Occupied Heating).

Configuration — To enable Optimal Start, press [1] [SRVC] to enter into the Service function. Enter the password. Press [6] [SRVC] to enter into the User Configuration subfunction. Scroll down to OSEN. The current configuration will be shown. The default is 0 (disabled). Press [1] [ENTER] to enable the Optimal Start. The acceptable range of values is 0 and 1, where 0 is disabled and 1 is enabled.

When Optimal Start is enabled, 3 other set points should be configured to allow Optimal Start to work correctly. They are Building Factor, 24-hr Unoccupied Factor, and Set Point Bias.

To set the Building Factor, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [3] [SRVC] to enter into the AOSS (Adaptive Optimal Start/Stop) subfunction. Scroll down to BLDF. The current set point will be shown. The default is 10%. The acceptable range of values is 1 to 100%. To change the set point, enter the new number (example: [2] [0]) and press [ENTER] .

To set the 24-Hr Unoccupied Factor, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [3] [SRVC] to enter into the AOSS (Adaptive Optimal Start/Stop) subfunction. Scroll down to UOCF. The current set point will be shown. The default is 15%. The acceptable range of values is 0 to 99%. To change the set point, enter the new number (example: [2] [0]) and press [ENTER] .

To set the Set Point Bias, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [3] [SRVC] to enter into the AOSS (Adaptive Optimal Start/Stop) subfunction. Scroll down to SETB. The current set point bias will be shown. The default is 2 F. The acceptable range of values is 1 to 10 F. To change the set point, enter the new number (example: [9]) and press [ENTER] . See Table 22.

OPTIMAL STOP (CV Units Only) — The control will compute a time period prior to end of the current Occupied period, then allow space temperature to drift up/down to the Expanded Occupied Set Point by end of scheduled Occupied period. Optimal Stop is Mode 29.

The control will calculate a bias time (in minutes) that will be subtracted from end-of-Occupied time. The control will allow the space temperature set point value to be adjusted by the Set Point Bias and then adjust required stages of capacity to permit drift in space temperature.

Configuration — To enable Optimal Stop, press [1] [SRVC] to enter into the Service function. Enter the password. Press [6] [SRVC] to enter into the User Configuration subfunction. Scroll down to OSEN. The current configuration will be shown. The default is 0 (disabled). Press [1] [ENTER] to enable the Optimal Stop. The acceptable range of values is 0 and 1, where 0 is disabled and 1 is enabled.

When Optimal Stop is enabled, 3 other set points should be configured to allow Optimal Stop to work correctly. They are Building Factor, 24-hr Unoccupied Factor, and Set Point Bias.

To set the Building Factor, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [3] [SRVC] to enter into the AOSS (Adaptive Optimal Start/Stop) subfunction. Scroll down to BLDF. The current set point will be shown. The default is 10%. The acceptable range of values is 1 to 100%. To change the set point, enter the new number (example: [2] [0] and press [ENTER] .

To set the 24-Hr Unoccupied Factor, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [3] [SRVC] to enter into the AOSS (Adaptive Optimal Start/Stop) subfunction. Scroll down to UOCF. The current set point will be shown. The default is 15%. The acceptable range of values is 0 to 99%. To change the set point, enter the new number (example [2] [0]) and press [ENTER] .

To set the Set Point Bias, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [3] [SRVC] to enter into the AOSS (Adaptive Optimal Start/Stop) subfunction. Scroll down to SETB. The current set point bias will be shown. The default is 2 F. The acceptable range of values is 1 to 10 F. To change the set point, enter the new number (example [9]) and press [ENTER] . See Table 22.

An optional Maximum Allowable Stop Time function is available. Service Tool, CCN Building Supervisor, or ComfortWORKS® is required to change this parameter. The set point name is OSMT. The default is 60 minutes. The range is 10 to 120 minutes. The Maximum Allowable Stop Time will limit how long Optimal Stop can be active.

Economizer and Power Exhaust Group — This group includes Economizer, Nighttime/Unoccupied Free Cooling, and Modulating Power Exhaust.

Table 22 — Configuring Adaptive Optimal Start-Stop (AOSS) (Stop available only on CV)

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Enable AOSS	[6] [SRVC]	OSEN	Enable = 1; Disable = 0
Set Building Factor	[1] [3] [SRVC]	BLDF	1 to 100%
Set 24-Hr Unoccupied Factor	[1] [3] [SRVC]	UOCF	0 to 99%
Select Set Point Bias	[1] [3] [SRVC]	SETB	1 to 10 F (.6 to 5.6 C)

ECONOMIZER — Economizer control is used to control the outdoor and return air dampers of the unit, to satisfy space cooling demand using all outdoor air (when permitted), and to satisfy cooling in conjunction with compressor operation (when conditions permit). During Occupied periods, the outdoor air dampers will be at the user-configured Minimum Damper Position. During Unoccupied periods, the outdoor air dampers will be closed. The Economizer function is also used for Indoor Air Quality (IAQ), Outdoor Air Control (OAC), and Building Pressurization modes. See Table 23. Economizer is available as a factory-installed option only.

The user can install the following field-supplied devices to enhance economizer control:

- Differential enthalpy sensor accessory
- Outdoor air humidity sensor accessory
- Return air humidity sensor accessory
- Freezestat accessory

Table 23 — Economizer Operation Definitions

ITEM	DEFINITION
CV	Constant Volume
DPSP	Damper Position Set Point
ECSO	Economizer Set Point Offset
ECONSR	Economizer Submaster Reference
ESL	Economizer Submaster Loop
NTLO	Nighttime/Unoccupied Free Cooling Lockout
OAT	Outdoor-Air Temperature
OCSP	Occupied Cooling Set Point
OHSP	Occupied Heating Set Point
SASP	Supply Air Set Point Temperature (VAV only)
SAT	Supply-Air Temperature
SPT	Space Temperature
SPTRESET	Space Temperature Reset
SRV	Submaster Reference Value
VAV	Variable Air Volume

Enthalpy Control

48ZJ and 50ZJ,ZK — Outdoor air enthalpy control is standard with the factory-installed economizer option. Enthalpy is sensed by a controller located behind the end outside air hood. The control can be accessed by removing the upper hood filter. See Fig. 12.

48ZW and 50ZW,ZZ Units — The control is located on the metal upright between the two economizer hoods, on the right hand side of the unit. The control can be accessed by removing the filter on either economizer hood.

The outdoor enthalpy controller permits selection of four different enthalpy settings, reflecting different temperature-humidity ranges. See Fig. 13 for available ranges. Adjust setting on the enthalpy controller (see Fig. 14).

NOTE: Replace the outdoor air filter before restarting the unit.

Integrated Economizer with Differential Enthalpy Control — Integrated economizer operation can be enhanced by adding a differential enthalpy control feature.

Differential enthalpy control adds a measurement for return-air heat and moisture content conditions and compares these conditions to those of the outdoor air. When the control determines that the outdoor air conditions are cooler and drier than those of the return air, it opens the outdoor air dampers on a demand for cooling and permits integrated economizer operation (outdoor air with mechanical cooling stages) since using the outdoor air at these conditions (instead of the warmer return air) will result in more economical cooling operation.

The 48ZJ,ZL,ZW and 50ZJ,ZK,ZL,ZM,ZW,ZZ units have two methods of accomplishing differential enthalpy control: Enhanced enthalpy switch control operation and base unit control logic enhancement.

Accessory 50DJ-902---321, Differential Enthalpy Sensor, provides differential enthalpy sensing control via the existing enthalpy switch. This sensor (Part Number HC57AC078) is installed in the return air duct and is wired directly to the factory-installed enthalpy switch (see Fig. 12). When the enthalpy control determines that the outdoor air enthalpy is lower than the return air enthalpy, the enthalpy switch closes (at Channel 10), signaling the base unit control to use the economizer as first stage of cooling control immediately.

Adding two relative humidity sensors (one in the outdoor air hood and one in the space or in the return air duct) allows the base unit control to sense RH in both airstreams directly. (See Fig. 15 for field wiring connections.) The base unit control calculates enthalpy in both air streams (using dry bulb temperatures and RH at each sensor location). When the control determines the outdoor air enthalpy is lower than the enthalpy of the return air, the control will use the economizer as the first stage of cooling control. (The addition of the RH sensors also increases condition monitoring, possible alert messages and permits enabling of Dehumidification mode and control of field-installed Humidifiers.)

Sequence of Operation — The Master Loop will be delayed 2 minutes after the supply fan is turned ON, to allow all system statuses and temperatures to stabilize before starting control. When coming out of Standby or Heating mode, a 4-minute delay will occur before the economizer damper is controlled. During this delay, damper position is limited to closed or minimum position (depending on current unit occupancy status).

If the fan status is OFF, the outside air dampers will remain closed (return air dampers will be open).

If fan status is ON, the Master Loop will check for forced status on the Damper Position Set Point (DPSP). If a forced condition exists, the sequence is terminated.

Economizer operation is permitted if all of the following conditions exist:

- System is NOT in Heating mode
- Outdoor air enthalpy (via switch or humidity differential) is acceptable
- Outdoor air temperature is less than Space Temperature

If economizer operation is permitted, Master Loop checks for Cooling System operation. If cooling is ON, the economizer Submaster Reference (ECONSR) will be set to the minimum position. The Economizer Submaster Loop (ESL) responds by driving outdoor air dampers to maximum position.

If Cooling is not on, in VAV operation, the Master Loop calculates DPSP, compares it to SAT, computes ECONSR, and outputs the value to the ESL. If Cooling is not on, in CV operation, the Master Loop calculates the DPSP, compares it to the Space Temperature (SPT), computes ECONSR, and outputs the value to the ESL. The ESL will compare ECONSR to the actual supply air temperature, compute the required damper position to satisfy ECONSR, and output the position requirement (at Channel 14) to economizer motor. Economizer motor will open Outdoor Air dampers (and close Return Air dampers) and modulate to maintain supply air temperature at DPSP.

If economizer operation is NOT permitted, the ECONSR will be set to maximum value. The ESL will respond by driving outdoor air dampers to minimum position (Occupied period) or closed position (Unoccupied period).

For VAV units, economizer operation is also not permitted when Occupied Heating is enabled and Return Air Temperature is less than (OHSP + 1).

Economizer Configuration — To configure the economizer, press [1] [SRVC] to login. Enter the password. Press [1] [0] [SRVC] to enter the Economizer subfunction of the Service function. Scroll down to Minimum Damper Position (MDP). The default is 20%. The range of acceptable values is 0 to 100%. To change the set point, enter the new number (example: [3] [5]) and press [ENTER]. See Table 24.

RH Sensor Configuration for Differential Enthalpy — To configure the RH sensors for differential enthalpy, press [1] [SRVC] to enter into the Service function. Enter the password. Press [6] [SRVC] to enter into the User Configuration subfunction. Scroll down to HUSN. The current configuration will be shown. The default is 0 (no sensor). Press [2] [ENTER] to configure the control for two sensors.

Economizer Algorithms — See Table 23 for economizer operation definitions.

SRV Formula:

ECONSR = PID function on (Demand term)

where

VAV: (Demand term) = DPSP – SAT

DPSP = SASP + SPT RESET – ECSO

CV: (Demand term) = DPSP – Space Temperature

DPSP = (see chart below)

DPSP Determination (CV):

Zone A	Zone B	Zone C
Decreasing ... NTLO	... 68 F	Increasing

Outdoor Air Temp

Zone A: OAT ≤ NTLO
Control assumes heating is required.
DPSP = OCSP –1
Outdoor air damper position will be mostly closed.

Zone B: NTLO < OAT < 68 F
DPSP = (OCSP + OHSP)/2

Zone C: OAT ≥ 68 F
Control assumes cooling is required.
DPSP = OHSP + 1
Outside air damper position will be mostly open.

NOTE: For more information on NTLO, refer to Nighttime/Unoccupied Free Cooling section below.

NIGHTTIME/UNOCCUPIED FREE COOLING (NTFC) — Nighttime/Unoccupied Free Cooling will start the supply fan on cool nights to pre-cool the structure mass by using only outdoor air. Nighttime Free Cooling is mode 33. See Table 25.

Nighttime Free Cooling is not permitted if the system is already in Unoccupied Heating mode, Unoccupied Cooling mode, or Optimal Start mode; or if space temperature reading or outdoor-air temperature readings are not available.

Nighttime Free Cooling is permitted if the mode is Unoccupied, if the OAT > NTLO, the time is between 3 A.M. and 7 A.M. (except sizes 090,105), and if the outdoor enthalpy conditions are suitable. Nighttime Free Cooling is initiated when:

Space Temperature > (NTSP + 2 F)

AND

Space Temperature > (Outside Air Temperature + 8 F)

where the NTSP is

NTSP = OCSP (VAV Units)
NTSP = (OCSP + OHSP)/2 (CV Units)

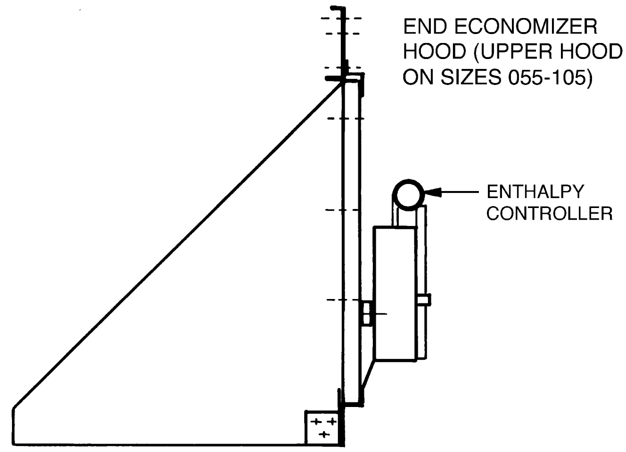
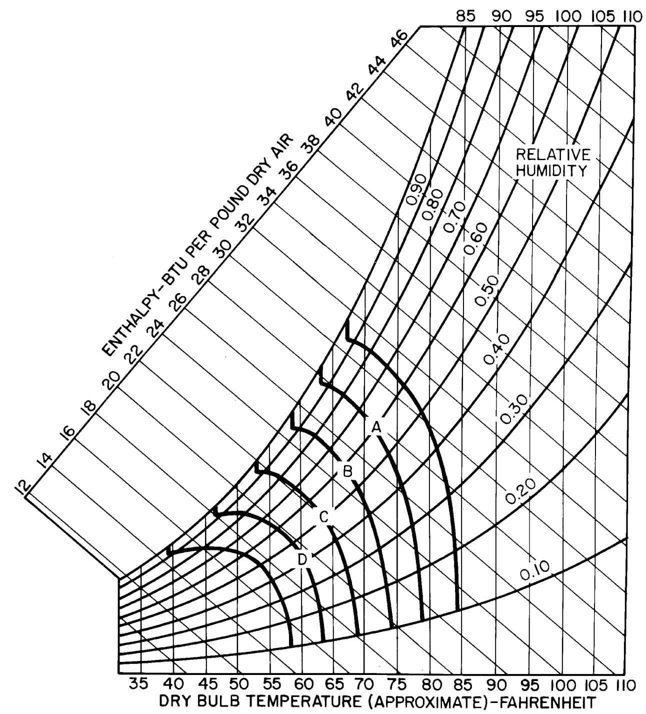


Fig. 12 — Enthalpy Controller Location



CONTROL CURVE	CONTROL POINT (approx Deg) AT 50% RH
A	73
B	68
C	63
D	58

Fig. 13 — Psychrometric Chart for Enthalpy Control

Table 24 — Configuring Economizer

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Configure Economizer	[3] [SRVC]	ECON	Air = 1; None = 0*
Specify Minimum Damper Position	[1] [0] [SRVC]	MDP	0 to 100%

*If value changed, enable Data Reset before leaving [3] [SRVC] .

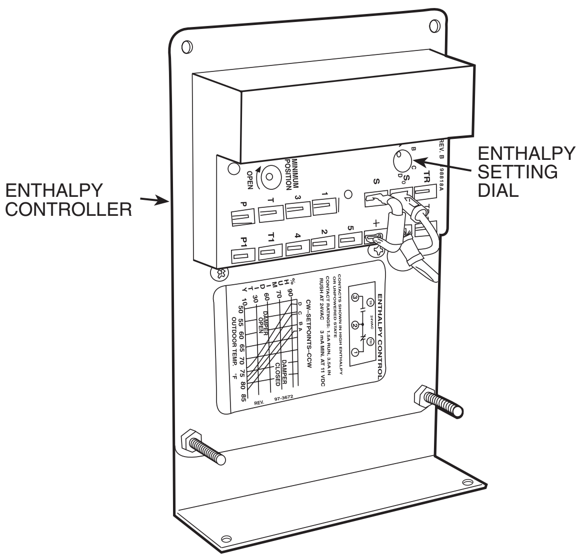
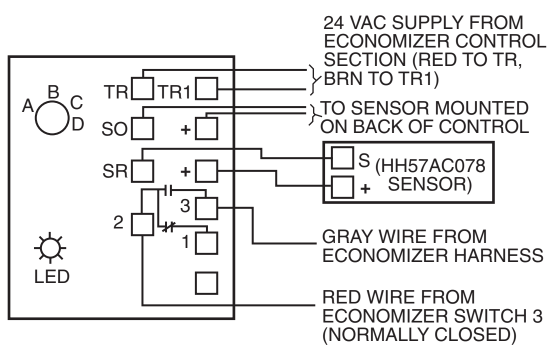


Fig. 14 — Enthalpy Controller



NOTES:
1. Remove factory-installed jumper across SR and + before connecting wires from HH57AC078 sensor.
2. Switches shown in high outdoor air enthalpy state. Terminals 2 and 3 close on low outdoor air enthalpy relative to indoor air enthalpy.

Fig. 15 — Wiring Connections for Differential Enthalpy Control (HH57AC077 and HH57AC078)

Table 25 — Unoccupied Free Cooling Definitions

ITEM	DEFINITION
NTEN	Nighttime Free Cooling Enable/Disable
NTLO	Nighttime Free Cooling Lockout Temperature
NTSP	Nighttime Free Cooling Set Point
OAT	Outdoor-Air Temperature
OCSP	Occupied Cooling Set Point
OHSP	Occupied Heating Set Point

When Nighttime Free Cooling is initiated, the economizer dampers drive full open. The supply fan runs until the space temperature drops below NTSP or space temperature drops below (OAT + 3 F). When the conditions are met, the economizer dampers close and the fan shuts off.

Configuration — To enable Nighttime Free Cooling, press 1 SRVC to enter into the Service function. Enter the password. Press 6 SRVC to enter into the User Configuration subfunction. Scroll down to NTEN. The current configuration will be shown. The default is 0 (disabled). Press 1 ENTER to enable the Nighttime Free Cooling. The acceptable range of values is 0 and 1, where 0 is disabled and 1 is enabled.

To set the Lockout Temperature, press 1 SRVC to enter into the Service function. Enter the password. Press 1 2 SRVC to enter into the NTFC (Nighttime Free Cooling) subfunction. Scroll down to NTLO. The current lockout temperature will be shown. The default is 50 F. The acceptable range of values is 40 to 70 F. To change the set point, enter the new number (example: 6 0) and press ENTER . See Table 26.

RETURN/EXHAUST FAN — Building pressure control is used to modulate the Return/Exhaust function to maintain a building static pressure set point. The factory-installed economizer option, factory-installed modulating power exhaust option, and field-provided and installed tubing and space pressure pickup are required.

The supply fan must be on for the power exhaust fan routine to operate. See Table 27 for fan operation definitions.

Sequence of Operation (48ZL and 50ZL,ZM) — Return/exhaust fan is equipped with a variable position discharge damper located in the end of the unit. This damper is controlled by an actuator (PEDM), based on signals from the Building Pressure Differential Pressure Submaster Loop (PSIO-1, Channel 15). Building pressure is sensed by a pick up (field-supplied and -installed) located in the occupied space.

Return/exhaust fan is always turned on simultaneously with the supply fan, through PSIO-1 Channel 28.

Capacity of the exhausted air is controlled by the position of the outlet damper. As building pressure increases above set point, the control output from PSIO-1, Channel 15 drives the power exhaust damper motor (PEDM) open until set point is achieved.

MODULATING POWER EXHAUST — Building pressure control is used to modulate the Power Exhaust function to maintain a building static pressure set point. The factory-installed economizer option, factory-installed modulating power exhaust option, and field-provided and installed tubing and space pressure pickup are required.

The supply fan must be on for the power exhaust fan routine to operate. See Table 27 for fan operation definitions.

Sequence of Operation (48ZJ and 50ZJ,ZK) — If the PWRX is set at 'modulating,' the following logic applies when the supply fan is turned on:

Fan no. 1 is equipped with a variable position discharge damper located in the outlet of the fan housing. This damper is controlled by an actuator (PEDM), based on signals from the Building Pressure Differential Pressure Submaster Loop (PSIO-1, Channel 15). Building pressure is sensed by a pick up (field-supplied and -installed) located in the occupied space.

Operation of the Modulating Power Exhaust is a combination modulating/staged control, with fan no. 1 providing modulating control from 0 to 100%, and fan no. 2 being staged On/Off according to damper position on fan no. 1.

Table 26 — Configuring Nighttime Free Cooling (NTFC)

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Enable NTFC	6 SRVC	NTEN	Enable = 1; Disable = 0
Select Lockout Temperature	1 2 SRVC	NTOL	40 to 70 F (4 to 21 C)

Table 27 — Power Exhaust Fan and Return/Exhaust Fan Operation Definitions

ITEM	DEFINITION
BP	Actual Space Pressure
BPSO	Building Pressure Set Point Offset
BPSP	Building Pressure Set Point
BPSR	Building Pressure Submaster Reference
EF	Discrete Output to Cycle Fan
ECON	Economizer Position
PED	Analog Damper/Inverter Output
PWRX	Power Exhaust Type

If building pressure is greater than BPSP, PSIO-1, Channel 28 energizes fan contactor PEC1. Fan motor no. 1 starts and runs.

Capacity of fan no. 1 is controlled by the position of the outlet damper. As building pressure increases above set point, the control output from PSIO-1, Channel 15 drives the power exhaust damper motor (PEDM) open until set point is achieved.

When space demand moves PEDM to 90% of full-open position, auxiliary switch PEDM2 closes, energizing fan contactor PEC2 and auxiliary control relay PER. Fan motor no. 2 starts and runs. Increased exhaust airflow will lower space pressure, causing DPS to drive PEDM back toward its closed position, until the set point is achieved.

If space pressure decreases until PEDM position is reduced to 10% of open position, PEDM2 will open, deenergizing fan contactor PEC2 and auxiliary control relay PER, and shutting off fan no. 2.

Sequence of Operation (48ZW and 50ZW,ZZ Units) — Fan no. 1 is equipped with a variable frequency drive, matched to the motor size. The VFD output is determined by the base unit's PIC control Building Pressure function in response to actual space pressure as monitored by the Building Pressure (BP) transducer. Set point for BP control (Building Pressure Set Point [BPSP]) is established at the PIC control via keypad (HSIO, accessory) or via CCN control. Available set point range is –0.50 to +0.50 in. wg. Building Pressure is sensed by a pick-up (field-supplied and -installed) located in the occupied space and connected to the BP transducer by 1/4-in. tubing (field-supplied and -installed).

Operation of the modulating power exhaust is a combination modulating/staged control, with fan no. 1 providing modulating control from 0 to 50% of total exhaust capability, and fan no. 2 being staged On/Off (for a step of 50% of total exhaust capability) according to VFD output level on fan no. 1.

If building pressure is greater than BPSP, the unit PIC control energizes fan contactor PEC1 (Channel 28). The PE (power exhaust) VFD and fan no. 1 start and run.

Capacity of fan no.1 is controlled by the output level from the PE VFD, which is determined by demand output from the base unit PIC system (Channel 15, 4 to 20 mA signal) to the BP VFD. As building pressure increases above set point, the PIC logic will increase the output level to PE VFD and the PE VFD will in turn increase its output to fan no. 1 until set point is reachieved.

When space demand moves the PE VFD output to 100% (60 Hz), VFD internal relay closes, energizing fan contactor PEC2. Fan motor no. 2 starts and runs. Increased exhaust airflow will lower space pressure, causing PIC logic to reduce its output to the PE VFD and thus causing the PE VFD to reduce its output to fan no. 1 until set point is reachieved.

If space pressure decreases until PE VFD output is reduced to 25% of maximum output (15 Hz), VFD internal relay will PEC2 and shutting off fan no. 2.

All Units — If BP is less than BPSP – BPSO for 4 to 6 minutes, with the power exhaust damper at minimum position, the exhaust fan will be turned off and the BPSR will be set to its minimum value. See Table 28.

NOTE: Power exhaust has a 2-minute minimum off-time to minimize cycling.

If the supply fan is off, then exhaust fan will be turned off and BPSR set to minimum value. The exhaust fan is then off, the discharge damper is closed, and the control input is set to 0.

Configuration — To configure the modulating power exhaust, Select Exhaust Fan Type. See Table 28.

To select the exhaust fan type, press [1] [SRVC] to enter into the Service function. Enter the password. Press [3] [SRVC] to enter into the Factory Configuration subfunction. Scroll down to PWRX. The current configuration will be shown. Press [2] [ENTER] to set the configuration to modulating power exhaust. The acceptable range of values is 0 to 2, where 0 is no exhaust system, 1 is non-modulating, and 2 is modulating.

To set the Building Pressure Set Point, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [8] [SRVC] to enter into the Building Pressure subfunction. Scroll down to BPSP. The current pressure set point will be shown in inches water gage. The default is 0.05 in. wg. The acceptable range of values is 0.00 to 0.50 in. wg. To change the set point, enter the new number (ex. [0] [·] [2] [0]) and press [ENTER] .

To set the Building Pressure Set Point Offset, press [1] [SRVC] to enter into the Service function. Enter the password. Press [1] [8] [SRVC] to enter into the Building Pressure subfunction. Scroll down to BPSO. The current offset set point will be shown in inches water gage. The default is 0.05 in. wg. The acceptable range of values is 0.05 to 0.50 in. wg. To change the set point, enter the new number (example: [0] [·] [2] [0]) and press [ENTER] .

Table 28 — Configuring Modulating Power Exhaust

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Select Exhaust Fan Type	[3] [SRVC]	FANT	Modu Pow Exh = 2*
Select Building Pressure Set Point	[1] [8] [SRVC]	BPSP	0.00 to 0.50 in. wg (0.0 to 125 Pa)
Select Building Pressure Set Point Offset	[1] [8] [SRVC]	BPSO	0.05 to 0.50 in. wg (12 to 125 Pa)

*If value changed, enable Data Reset before leaving [3] [SRVC] .

Optional Staged Gas Unit Control (48 Series Units Only)

ACCESSORY NAVIGATOR™ DISPLAY — The accessory Navigator display module provides the user interface to the Staged Gas control system and is required for all staged gas control units. See Fig. 16. The display has up and down arrow keys, an ESC key, and an ENTER key. These keys are used to navigate through the different levels of the display structure. See Table 29. Press the ESC key until the display is blank to move through the top 11 mode levels indicated by LEDs on the left side of the display.

Pressing the ESC and ENTER keys simultaneously will scroll a text description across the display indicating the full meaning of each display acronym. Pressing the ESC and ENTER keys when the display is blank (Mode LED level) will return the display to its default menu of rotating display items. In addition, the password will be disabled requiring that it be entered again before changes can be made to password protected items.

When a specific item is located, the display will flash showing the operator, item, item value, and then followed by the item units (if any). Press the ENTER key to stop the display at the item value. 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 4 digits of the password. The default password is 1111.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press the ENTER key to stop the display at the item value. Press the ENTER key again so that the item value flashes. Use the arrow keys to change the value or state of an item and press the ENTER key to accept it. Press the ESC key and the item, value, or units display will resume. Repeat the process as required for other items. See Tables 30-41 for further details.

CLEARING UNIT ALARMS — The unit alarms can be cleared through Navigator display. To check the current alarms, enter the Alarms menu. The first submenu is the CRNT submenu. The CRNT function displays the list of current alarms (maximum of 25). The second submenu item is the RCRN (Reset All Current Alarms) function. Press ENTER to reset the current alarms. The next submenu item, HIST, displays the list of cleared alarms (maximum of 20). HIST function can be cleared with the RHIS function.

Smoke Control Group — This group includes Pressurization, Evacuation, Smoke Purge, and Fire Shutdown.

PRESSURIZATION — Pressurization mode is used to prevent entrance of smoke into the conditioned space in the event of fire or other emergency condition. The pressurization function activates in response to closure of external signal contact set. The function also initiates an alarm signal to CCN Building Supervisor. Pressurization is Mode 34. See Table 42. The PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function. In addition, the factory-installed economizer option is required.

An external signal contact set (normally open, close on initiation of mode, 24-vac pilot duty, connect to PSIO-2, Channel 37) is also required on all units.

For units equipped with Inlet Guide Vanes or Variable Frequency Drive, a second contact set is required to bypass the unit HIR function and force the room terminals to Minimum Heating position. This contact set (SPDT, pilot duty, 115-v), designated SW-5A/B and powered by external signal, must be connected to the HIR terminals.

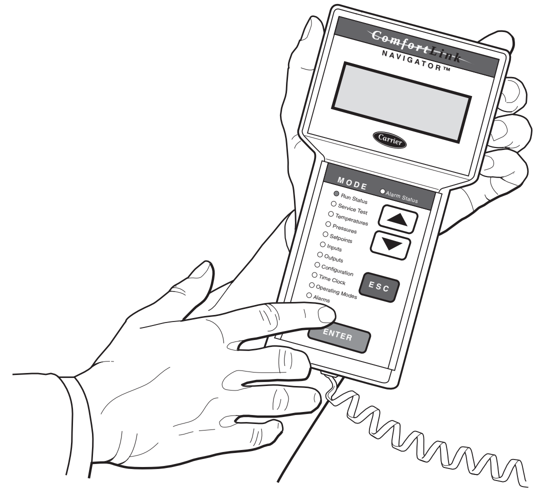


Fig. 16 — Accessory Navigator Display Module

Sequence of Operation — Normally Open contact set closes for minimum 2 seconds. The economizer opens and the HIR energizes. The supply fan is energized (Exhaust Fan OFF). The supply fan runs and delivers outdoor air to space (with no exhaust capability). Pressurization mode will be overridden by simultaneous closure of any of signal contacts for Evacuation, Smoke Purge, or Fire Shutdown and system will be placed in Fire Shutdown mode. To configure, make the field connection at Channel 37.

EVACUATION — Evacuation mode is used to remove smoke from the occupied space in response to closure of emergency signal contact set. Alarm is also initiated through CCN Building Supervisor. Evacuation is Mode 35. See Table 42.

The PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function. In addition, the factory-installed economizer and factory-installed power exhaust options are required.

An external signal contact set (normally open, close on initiation of mode, 24-vac pilot duty) connect to PSIO-2, Channel 39 is also required.

Sequence of Operation — Normally Open contact set closes for minimum 2 seconds. The economizer opens. The supply fan is deenergized. The exhaust fan is energized. The exhaust fan runs and extracts air from the space. Evacuation mode will be overridden by simultaneous closure of any of signal contacts for Pressurization, Smoke Purge, or Fire Shutdown and the system will be placed in Fire Shutdown mode. To configure, make the field connection at Channel 39.

SMOKE PURGE — Smoke Purge mode allows the system to remove smoke from the space and fill the space with fresh air, in response to closure of external signal contact set. Smoke Purge is Mode 36. See Table 42.

The PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function. In addition, the factory-installed economizer and factory-installed power exhaust options are required.

An external signal contact set (normally open, close on initiation of mode, 24-vac pilot duty) connect to PSIO-2, Channel 38 is also required on all units.

For units equipped with Inlet Guide Vanes or Variable Frequency Drive, a second contact set is required to bypass the unit HIR function and force the room terminals to Minimum Heating position. This contact set (SPDT, pilot duty, 115-v), designated SW-5A/B and powered by external signal, must be connected to the HIR terminals.

Table 29 — Navigator Display Menu Structure

RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SET POINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
Auto Display (VIEW)	SERVICE TEST	SUPPLY AIR TEMPERATURE	N/A	SETPOINT SELECT	COOL INPUT#1	HEAT OUTPUT 1	Display Configuration (DISP)	Time (DAY)	N/A	Currently Active Alarms (CRNT)
Software Version (VERS)	HEAT OUTPUT#1	SUPPLY AIR TEMPERATURE 1		COOLING SETPOINT 1	COOL INPUT#2	HEAT OUTPUT 2	CCN Configuration (CCN)	Date (DATE)		Reset all Current Alarms (RCRN)
	HEAT OUTPUT#2	SUPPLY AIR TEMPERATURE 2		COOLING SETPOINT 2	HEAT INPUT#1	HEAT OUTPUT 3	Stage Gas Configuration (CNFG)	Occupancy and Unoccupancy Schedule Number (SCH.D)		Alarm History (HIST)
	HEAT OUTPUT#3	SUPPLY AIR TEMPERATURE 3		HEATING SETPOINT 1	HEAT INPUT#2	HEAT OUTPUT 4				Reset Alarm History (RHIS)
	HEAT OUTPUT#4	LIMIT SWITCH TEMPERATURE		HEATING SETPOINT 2	SUPPLY FAN STATUS	HEAT OUTPUT 5				
	HEAT OUTPUT#5				DEHUMIDIFY INPUT	HEAT OUTPUT 6				
	HEAT OUTPUT#6									

Table 30 — “Run Status” Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
VIEW	ENTER			Auto View of Run Status	
	▼	SAT	XXX.X	Supply Air Temperature	
	▼	SETP	XXX.X	Control Setpoint	
	▼	MODE		Control Mode	
	▼	CAPA	XXX	Current Running Capacity	%
	▼	HEAT	X	Current Heat Stage	
	▼	H.MAX	X	Maximum Heat Stages	
	▼	LIM.M	ON/OFF	Hi Limit Switch Tmp Mode	
	▼	LIM.S	ON/OFF	Sat Cutoff Mode	
	▼	LIM.C	ON/OFF	Capacity Clamp Mode	
	▼	OCC	YES/NO	Occupied	
	▼	ALRM	XX	Current Alarms & Alerts	
	▼	TIME	XX.XX	Time of Day	00.0-23.59
	▼	MNTH		Month of Year	1=Jan, 2=Feb, etc.
	▼	DATE	XX	Day of Month	Range 1-31
	▼	YEAR	XXXX	Year	
VERS	ENTER			Software Version Numbers	
	▼	MBB		CESR131274-XX-YY	
	▼	NAVI		CESR130227-XX-YY	

Sequence of Operation — Normally Open contact set closes for minimum 2 seconds. The economizer opens. The HIR is energized. The supply fan is energized. The exhaust fan is energized. The supply fan runs and delivers outdoor air to the space. The exhaust fans run and extract air from the space. Evacuation mode will be overridden by simultaneous closure of any of signal contacts for Pressurization, Evacuation, or Fire Shutdown and the system will be placed in Fire Shutdown mode. To configure, make the field connection at Channel 38.

FIRE SHUTDOWN — Fire Shutdown mode will end all fan and system operations and close outside air and exhaust dampers, in response to closure of external signal contact set. Fire Shutdown is Mode 37. See Table 42.

The PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function.

An external signal contact set (normally open, close on initiation of mode, 24-vac pilot duty) connects to PSIO-2, Channel 40 is also required.

Sequence of Operation — Normally Open contact set closes for minimum 2 seconds. The economizer closes. The supply fan is deenergized. The Exhaust Fan is OFF. To configure, make a field connection at Channel 40.

Table 31 — “Service Test” Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
	▼	TEST	YES/NO	Field Service Test Mode	Use to Enable/Disable Manual Mode
	▼	OUT.1	ON/OFF	Heat output #1	
	▼	OUT.2	ON/OFF	Heat output #2	
	▼	OUT.3	ON/OFF	Heat output #3	
	▼	OUT.4	ON/OFF	Heat output #4	
	▼	OUT.5	ON/OFF	Heat output #5	
	▼	OUT.6	ON/OFF	Heat output #6	

Table 32 — “Temperatures” Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
	▼	SAT	XXX.X	Supply Air Temperature	
	▼	SAT.1	XXX.X	Supply Air Temperature 1	
	▼	SAT.2	XXX.X	Supply Air Temperature 2	
	▼	SAT.3	XXX.X	Supply Air Temperature 3	
	▼	LIMT	XXX.X	Limit Switch Temperature	

Table 33 — “Pressures” Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
	ENTER	N/A	N/A	N/A	N/A

Table 34 — “Set points” Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
	▼	SP.SL	X	Setpoint Select	0= Setpoint Adjust 1= Single 2=Dual 7 Day 3=Dual CCN
	▼	CSP.1	XXX.X	Cooling Setpoint 1	Default: 45.0
	▼	CSP.2	XXX.X	Cooling Setpoint 2	Default: 47.0
	▼	HSP.1	XXX.X	Heating Setpoint 1	Default: 102.5
	▼	HSP.2	XXX.X	Heating Setpoint 2	Default: 100.5

Table 35 — “Inputs” Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
	▼	CL.1	ON/OFF	Cool Input #1	
	▼	CL.2	ON/OFF	Cool Input #2	
	▼	HT.1	ON/OFF	Heat Input #1	
	▼	HT.2	ON/OFF	Heat Input #2	
	▼	FAN.I	ON/OFF	Supply Fan Status	
	▼	DEHU	ON/OFF	Dehumidify Input	

Table 36 — "Outputs" Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
	▼	HT_1	ON/OFF	Heat Output 1	
	▼	HT_2	ON/OFF	Heat Output 2	
	▼	HT_3	ON/OFF	Heat Output 3	
	▼	HT_4	ON/OFF	Heat Output 4	
	▼	HT_5	ON/OFF	Heat Output 5	
	▼	HT_6	ON/OFF	Heat Output 6	

Table 37 — "Configuration" Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
DISP	ENTER			Display Configuration	
	▼	TEST	ON/OFF	Test Display LEDs	
	▼	METR	ON/OFF	Metric Display	Default: OFF ON = Metric OFF = English
	▼	LANG	X	Language Selection	Default: 0 0 = English 1 = Espanol 2 = Francais 3 = Portuguese
	▼	PAS.E	Enable/Disable	Password Enable	Enable
	▼	PASS	XXXX	Service Password	Default = 1111
CCN	ENTER			CCN Configuration	
	▼	CCN.A	XXX	CCN Address	Default: 1 Range: 1 to 239
	▼	CCN.B	XXX	CCN Bus Number	Default: 0 Range: 1 to 239
	▼	BAUD	X	CCN Baud Rate	Default: 3 1 = 2400 2 = 4800 3 = 9600 4 = 19,200 5 = 38,400
CNFG	ENTER			Stage Gas Configuration	
	▼	TYPE	X	Heat Stage Type	
	▼	CAP.M	XX.X	Max Cap Change Per Cycle	%
	▼	RATE	XXX	PID Algorithm Rate	Range: 60-300 Default: 90
	▼	P	X.X	Proportional Gain	Range: 0.5-1.5 Default: 1
	▼	D	X.X	Derivative Gain	Range: 0.5-1.5 Default: 1
	▼	UP.DB	X.X	Upper Temp Deadbnd Limit	Range: 0-5 Default: 2
	▼	LO.DB	X.X	Lower Deadband Limit	Range: -5-0 Default: -2
	▼	MR.DB	X.X	Abs.Min Rate for Deadbnd	%, Range: 0-5 Default: 0.5
	▼	HI.HT	XXX.X	Limit Switch High Temp	
	▼	LO.HT	XXX.X	Limit Switch Low Temp	
	▼	SAT.C	XX.X	SAT Limit Config	Range: 0-20 Default: 10
	▼	HT.RS	X.XX	Heat Rise dF/sec Clamp	Range: 0.05-0.2 Default: 0.06

Table 38 — "Time Clock" Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
TIME	ENTER	TIME	XX.XX	Hour and Minute	Military (00.00-23.59)
DATE	ENTER			Current Date	
	▼	MNTH	XX	Month of Year	1=Jan, 2=Feb, etc.
	▼	DOM	XX	Day of Month	Range 1-31
	▼	DAY	XX	Day of Week	1=Mon, 2=Tue, etc.
	▼	YEAR	XXXX	Year	
SCH.D	ENTER			Local Occupancy Schedule	
	▼	MON.O	XX.XX	Monday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	MON.U	XX.XX	Monday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	TUE.O	XX.XX	Tuesday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	TUE.U	XX.XX	Tuesday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	WED.O	XX.XX	Wednesday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	WED.U	XX.XX	Wednesday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	THU.O	XX.XX	Thursday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	THU.U	XX.XX	Thursday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	FRI.O	XX.XX	Friday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	FRI.U	XX.XX	Friday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	SAT.O	XX.XX	Saturday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	SAT.U	XX.XX	Saturday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	SUN.O	XX.XX	Sunday In Occupied Time	Range: 00.00 to 23.59; Default: 00.00
	▼	SUN.U	XX.XX	Sunday in Unoccupied Time	Range: 00.00 to 23.59; Default: 00.00

Table 39 — "Operating Modes" Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	COMMENT
	N/A	N/A	N/A	N/A

Table 40 — "Alarms" Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	ITEM EXPANSION	COMMENT
CRNT	ENTER	AXXX or TXXX	Currently Active Alarms	Alarms are shown as AXXX Alerts are shown as TXXX
RCRN	ENTER	YES/NO	Reset All Current Alarms	
HIST	ENTER	AXXX or TXXX	Alarm History	Alarms are shown as AXXX Alerts are shown as TXXX
RHIS	ENTER	YES/NO	Reset Alarm History	

Table 41 — Example of Changing the CCN Configuration

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CCN	ENTER	CCN.A	1	CCN Address	Default: 1
	ENTER		1		Scrolling Stops
	ENTER				Value flashes
	▲				Select 2
	ENTER				Change accepted
	ESCAPE	CCN.A			Item/Value/Units scroll again
	▼	CCN.B		CCN Bus Number	No change
	▼	BAUD		CCN Baud Rate	Default:3 = 9600
	ENTER	BAUD	3	CCN Baud Rate	Default: 75
	ENTER		3		Scrolling Stops
	ENTER		3		Value flashes
	▲				Select 5 = 38,400
	ENTER		5		Change accepted
	ESCAPE	BAUD	5	CCN Baud Rate	Item/Value/Units scroll again

Table 42 — Smoke Control Operating Mode Details

MODE	PRESSURIZATION	EVACUATION	SMOKE PURGE	FIRE SHUTDOWN
DISPLAY CODE (MODE)	34	35	36	37
POWER EXHAUST FANS	Off	On	On	Off
SUPPLY-AIR FAN	On	Off	On	Off
ECONOMIZER DAMPER	Open	Open	Open	Close
RETURN-AIR DAMPERS	Close	Close	Close	Open
POWER EXHAUST DISCHARGE DAMPER*	Close	Open	Open	Close
POWER EXHAUST VFD†	Off	On (Max Speed)	On (Max Speed)	Off
SUPPLY-AIR FAN IGV OR VARIABLE FREQUENCY DRIVE	Open, Control To Static Pressure Set Point	Close	Open, Control To Static Pressure Set Point	Close
HEAT INTERLOCK RELAY BYPASS**	On	Off	On	Off
GAS OR ELECTRIC HEAT — ALL STAGES	Off	Off	Off	Off
HUMIDIFIER 1 AND 2	Off	Off	Off	Off

LEGEND

IGV — Inlet Guide Vanes

*ZJ,ZK units only.
†ZL,ZM,ZW,ZZ units only.
**Required only if unit equipped with IGV or VFD on supply fan.

Special Ventilation Group — This group includes Indoor Air Quality (IAQ), IAQ (Pre-Occupancy) Purge, Outdoor Air CFM Control (OAC), and IAQ/OAC Reheat.

INDOOR AIR QUALITY (IAQ) — Indoor Air Quality function will admit fresh air into the space whenever space air quality sensors detect unsuitable space conditions. Fresh air is admitted by overriding the Economizer Minimum Damper position. The IAQ mode is permitted only during Occupied periods. See Table 43.

When IAQ is active, Mode 42 will be displayed (sizes 090,105 only). When OAC is active, Mode 42 will be displayed (sizes 090,105 only).

The IAQ mode also permits and controls analog-type reheat system (hydronic or a modulating control electric heater).

Priority for IAQ can be selected by user. The IAQ mode can be selected to override the economizer damper position at any time that IAQ mode is active (and IAQ requires a more open economizer position to satisfy the space air quality criteria). The IAQ mode can also be configured so that it will only dictate economizer position when no space heating or cooling mode is active (active comfort mode will dictate position for economizer outdoor air dampers) and/or be overridden by Comfort Overrides.

Occupied Cooling (including Economizer Cooling) and Occupied Heating are permitted during IAQ and will function normally (except when IAQ mode priority is HIGH; then active IAQ mode may dictate a more open economizer position).

An IAQ sensor (field-supplied and installed), factory-installed economizer option, and control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) are required.

NOTE: The unit control is factory-configured for IAQ sensors with a 0 to 10 vdc signal representing an air quality of 0 to 2000 ppm. Sensors with other characteristic curves will require user reconfiguration (see Step 5 of configuration instructions below).

Sequence of Operation

1. If the supply fan is off, the outside air dampers will be closed.
2. The IAQ is available when the VENT Option is 1 or 3, the unit is in Occupied mode, IAQ Priority Level is 1 (High) or 2 (Medium), and supply fan is on.
3. The Master Loop will evaluate the IAQ set point and IAQ sensor value, then calculate IAQ Minimum Damper Position (IMP).
4. If the IAQ Priority Level is 1 (High), the economizer Submaster Loop will determine economizer damper position based on the higher of calculated IAQ minimum damper position or Minimum Damper Position (Minimum Damper Position determined by economizer mode or active comfort modes).
5. If the IAQ Priority Level is 2 (Medium) and Cooling (including Economizer Cooling) or Heating mode is active, then the Economizer Submaster Loop will determine Minimum Damper Position and the economizer will close to Minimum Damper Position (MDP).

   Comfort Overrides:

   VAV: If (SAT < SASP – 8 F) or (SAT > SASP + 5 F) for 4 minutes, then IMP = 0 and economizer will close to MDP.

   CV: If (SPT > (OCSP + SPHO)/2) or (SPT < (OHSP + SPLO)/2), then IMP = 0 and economizer will close to MDP.

   Once CV Space Temp Override has been initiated, it will remain in effect until SPT ≤ OCSP and SPT ≥ OHSP.

   High Humidity:
   If unit is equipped with humidity sensors and RH > HHL, the IMP = 0 and economizer will close to MDP.

   The Economizer Submaster Loop will determine economizer damper position (IQMP) based on higher of IMP or MDP.
6. If IAQ not required, then the unit control sets IMP at 0. The economizer remains at MDP position.
7. If IAQ is Priority 3 (low) and an IAQ sensor is connected, the control will evaluate IAQ sensor value. If the IAQ sensor value exceeds the user-configured alert limits, an alert will be generated (viewed at the HSIO), and broadcast to the CCN ComfortWORKS® software (if applicable). The economizer damper position is not affected.

Table 43 — Indoor-Air Quality Definitions

ITEM	DEFINITION
CV	Constant Volume
HHL	High Humidity Limit
IAQ	Indoor-Air Quality
IAQG	IAQ Gain
IAQP	IAQ Priority
IAQS	IAQ Set Point
IMP	IAQ Minimum Damper Position
IQMP	IAQ Final Minimum Damper Position
IQMX	IAQ Maximum Damper Position
IRH	IAQ Sensor High Reference
IRL	IAQ Sensor Low Reference
IVH	IAQ Sensor High Voltage Point
IVL	IAQ Sensor Low Voltage Point
LEVEL	IAQ Priority Level (090,105 only)
MDP	Economizer Minimum Damper Position
OCSP	Occupied Cooling Set Point
OHSP	Occupied Heating Set Point
PRTY	IAQ Priority Level (030-075 Only)
RH	Relative Humidity
SASP	Supply-Air Set Point
SAT	Supply-Air Temperature
SPHO	Space Temperature High Alert Limit (Occupied)
SPLO	Space Temperature Low Alert Limit (Occupied)
SPT	Space Temperature
VAV	Variable Air Volume
VENT	Ventilation Mode Configuration

Configuration — See Table 44. To configure:

1. Enable IAQ by selecting vent option. Press [6] [SRVC] to enter the subfunction. Scroll down to VENT. A VENT value of 1 indicates algorithm will use MDP and IAQ modes. A value of 3 indicates algorithm will use MDP, IAQ, and Outdoor Air Control (OAC) modes. A 0 indicates the algorithm will only use MDP mode.
2. Select IAQ Priority. Press [1] [6] [SRVC] to enter the subfunction. Scroll down to PRTY (030-075 only) or LEVEL (090,105 only). A PRTY or LEVEL value of 1 indicates High (IAQ mode has priority over active comfort modes). A value of 2 indicates Medium (Active comfort mode or Comfort Overrides may determine economizer damper position, IAQ position overridden).
3. Select IAQ Set Point. Press [1] [6] [SRVC] to enter the subfunction. Scroll down to IAQS. Enter the new value. The default is 650 ppm. The range is 1 to 5000 ppm.
4. Specify IAQ Maximum Damper Position. Press [1] [6] [SRVC] to enter the subfunction. Scroll down to IQMX. Enter the new value. The default is 50%. The range is 0 to 100%.

5. If non-Carrier sensor used (see Fig. 17):
   a. Specify IAQ sensor curve. Press [1] [6] [SRVC] to enter the subfunction.
   b. Configure Low Voltage Point. Scroll down to IVL. Default is 0 v. Range is 0 to 10 v.
   c. Configure Low Reference. Scroll down to IRL. Default is 0 ppm. Range is 0 to 5000 ppm.
   d. Configure High Voltage Point. Scroll down to IVH. Default is 10 v. Range is 0 to 10 v.
   e. Configure High Reference. Scroll down to IRH. Default is 2000 ppm. Range is 0 to 5000 ppm.

<u>IAQ Algorithms</u>

IMP = ECON + 100 x IAQG x (Demand)/IAQS

Where: ECON = Current position of economizer damper
(Demand) = IAQS – IAQ

NOTE: IMP will not be recalculated until (Demand) exceeds 3% of IAQS.

IAQ (Pre-Occupancy) PURGE — If outdoor air conditions permit, IAQ Pre-Occupancy Purge will open economizer and energize supply fan 2 hours before next Occupied period, to provide complete exchange of indoor air with fresh air. Duration of purge mode is user-configured (typically 5 minutes). The IAQ Purge is Mode 28. See Table 45. The factory-installed economizer option is required.

<u>Sequence of Operation</u> — The IAQ Purge will operate only if the following conditions exist:

- Economizer installed and enabled.
- Current Time and next Occupied Time are valid.
- Purge option is enabled.
- Unit is in Unoccupied state.
- Time is within 2 hours of next Occupied period.
- Time is within Purge Duration.
- Outdoor-Air Temperature reading is available.

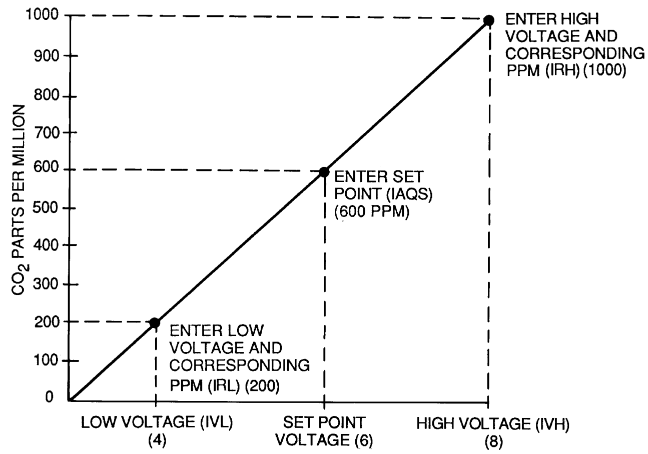
If all the conditions above are satisfied, then IAQ Pre-Occupancy Purge is enabled. The supply fan and Heat Interlock Relays are energized. The economizer minimum position is set to PURGEMP. The economizer opens to PURGEMP. The purge continues until Purge Duration expires or Occupied period begins.

NOTE: IAQ Purge is limited to one per Unoccupied period. If PURGEMP = 0% then IAQ Purge is not enabled.

The control determines PURGEMP in the following manner:

NTLO OCSP
OAT <-------------|-----------------------------|--------------->Incr

PURGEMP = LTMP | If Enthalpy Good: PURGEMP - 100% ------------------------------ If Enthalpy Not Acceptable: PURGE MP = HTMP | PURGEMP = HTMP



LEGEND

IAQ	— Indoor Air Quality
IAQS	— IAQ Set Point
IRH	— IAQ Sensor High Reference
IRL	— IAQ Sensor Low Reference
IVH	— IAQ Sensor High Voltage Point
IVL	— IAQ Sensor Low Voltage Point

NOTE: Voltage range is 0 to 10.

Fig. 17 — Sensor Use Example

Table 45 — Indoor-Air Quality Purge Definitions

ITEM	DEFINITION
ENTH	Enthalpy
HTMP	High Temperature Minimum Position
IAQPG	IAQ Pre-Occupancy Purge Mode
IQPD	Purge Duration
LTMP	Low Temperature Minimum Position
NTLO	Nighttime Lockout Temperature
OAT	Outdoor-Air Temperature
OCSP	Occupied Cooling Set Point
PURG	Purge Option
PURGEMP	Purge Minimum Damper Position

<u>Configuration</u> — See Table 46. To configure:

1. Enable Purge option. Press [6] [SRVC] to enter the subfunction. Scroll down to PURG. Set to 1 to Enable. (Set to 0 to disable.)

   NOTE: The following user-configured options require use of Service Tool or CCN ComfortWORKS® software to change.
2. Select Purge Duration period. Change IQPD set point. Default is 5 minutes. Range is 5 to 60 minutes.
3. Select Low Temperature Minimum Position. Change LTMP set point. Default is 10%. Range is 0 to 100%.
4. Select High Temperature Minimum Position. Change HTMP set point. Default is 35%. Range is 0 to 100%.

Table 44 — Configuring Indoor Air Quality (IAQ)

DESCRIPTION	HOW TO CONFIGURE AT HISO	SET POINT	RANGE
Enable by selecting VENT option	[6] [SRVC]	VENT	1 = Use IAQ only 3 = Use IAQ and OAC
Select IAQ Priority	[1] [6] [SRVC]	PRTY (030-075) LEVEL (090, 105)	1 = High 2 = Medium (Space Comfort Overrides) 3 = Low (Alert only)
Select IAQ Set Point	[1] [6] [SRVC]	IAQS	1 to 5000 ppm
Specify IAQ Max Damper Position	[1] [6] [SRVC]	IQMX	0 to 100%

Table 46 — Configuring IAQ (Pre-Occupancy) Purge

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Enable Purge	6 SRVC	PURG	Enable = 1; Disable = 0

OUTDOOR AIR CONTROL (OAC) — The Outdoor Air Control function will maintain a minimum quantity of outdoor airflow into an occupied space, regardless of space comfort load conditions. The OAC is permitted only during Occupied periods. Occupied Cooling (including Economizer Cooling) and Occupied Heating are permitted during OAC and will function normally, except when OAC mode is active, then OAC mode may dictate a more open economizer position. See Table 47. The factory-installed economizer option and control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) are required.

Table 47 — Outdoor Air Control Definitions

ITEM	DEFINITION
ECON	Economizer Position
IAQ	Indoor-Air Quality Function
IQMP	Final Minimum Damper Position
OAC	Outdoor-Air Control CFM
OAC	Outdoor-Air Control Function
OACG	Outdoor-Air Control Gain
OCS	Outdoor-Air Control Set Point
OCMX	OAC Maximum Damper Position
VENT	Ventilation Mode Configuration

An OAC Accessory package (consists of velocity sensor and pressure transducer) (P/N 50DJ-902---791) is required.

Sequence of Operation — OAC is available when the VENT Option is 2 or 3, unit is in Occupied status, and supply fan is on. The control will calculate a Minimum Damper Position based on the Outside Air CFM set point and the Outside Air CFM (current delivered value).

The current delivered CFM value (OAC) is determined by interpolating from a unit-size-specific table relating airflow rate to voltage drop at the outdoor cfm velocity sensor, via pressure transducer in the outdoor cfm accessory package. The actual damper position (IQMP) will be determined by highest value demanded by available functions (OAC function, IAQ function, Minimum Economizer Damper position, or active comfort mode). The output signal from the economizer Submaster Loop to the economizer damper actuator drives the damper to the desired position. If the economizer position has been dictated by another function but this controlling function is driving economizer closed, economizer position will not be permitted to move to a value below the OAC control required position.

Configuration — See Table 48. To configure the function:

1. Enable the OAC function. Press 6 SRVC to enter the subfunction. Scroll down to VENT. Enable the function by pressing 2 or 3 and ENTER . A 2 configures the function for Minimum Damper Position and OAC control only. A 3 configures the function for Minimum Damper Position, IAQ, and OAC control.
2. Select the OAC set point. Press 1 6 and SRVC to enter the subfunction. Scroll down to OCS. The default is 1 cfm. The range is 1 to 50,000 cfm.
3. Select the OAC Maximum Damper Position. Press 1 6 SRVC to enter the subfunction. Scroll down to OCMX. The default is 50%. The range is 0 to 100%.

Algorithms

OAC Minimum Position = ECON + 100 x OACG x (Demand term)/OCS

where: (Demand term) = OCS – OAC

IAQ/OAC REHEAT — When the IAQ/OAC routine has priority over comfort conditions, it is possible to introduce outside air at temperatures well below typical space temperatures. The IAQ/OAC Reheat function will modulate a unit- or duct-mounted steam or hydronic heating coil (equipped with modulating control valve) via a 4 to 20 mA control signal to raise supply-air temperature of outside air delivered to ductwork. See Table 49.

A heating coil (field-supplied/installed) with control valve connected to Channel 43 and a supply air sensor located downstream of heating coil (will require relocation of sensor if coil is mounted in duct) are required.

Table 48 — Configuring Outdoor Air CFM Control (OAC)

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Enable OAC Function (select VENT option)	6 SRVC	VENT	2 = Use OAC only 3 = Use IAQ and OAC
Select OAC Set Point	1 6 SRVC	OCS	1 to 50,000 CFM (1 to 23596 L/s)
Select OAC Max Damper Position	1 6 SRVC	OCMX	0 to 100%

Sequence of Operation — If the supply fan is off, all modes are deactivated and the heating control valves are closed. For IAQ Reheat to be active: IQMP > MDP and OAT < SASP. When IAQ Reheat is active, control will issue 4 to 20 mA signal (at Channel 43) to hydronic heat control valve, to maintain SAT control temp (IAQRR) at Supply Air sensor location.

Configuration — To configure, enable IAQ Mode (see IAQ section for configuration) or enable OAC Mode (see OAC section for configuration). Connect Hydronic Heat control valve to Channel 43.

Algorithms — When IAQ/OAC is active and OAT < SASP, then IAQRR = SASP + (Space Temp Reset) – ECSO – 5.0. In all other conditions, IAQRR = 0.

Table 49 — Indoor-Air Quality/ Outdoor-Air Control Reheat Definitions

ITEM	DEFINITION
ECSO	Economizer Set Point Offset
IAQ	Indoor-Air Quality Function
IAQRR	IAQ Reheat Reference Value
IQMP	Final Minimum Damper Position
MDP	Minimum Damper Position
OAC	Outdoor-Air Control Function
OAT	Outdoor-Air Temperature
SASP	Supply-Air Set Point Temperature

Dehumidification and Humidifier Group — This group includes Dehumidification and Reheat, and Humidifier Controls.

DEHUMIDIFICATION AND REHEAT — Dehumidification will override comfort condition set points in order to deliver cooler air to the space and satisfy a humidity set point at the space or return air humidity sensor. Reheat will energize a gas heating section concurrent with compressor operation should the dehumidification operation result in cooling of the space down to Occupied Heating set point. Reheat is not available on units equipped with factory-installed electric heaters. Dehumidification and Reheat (High Humidity Override) is Mode 41. The unit must be equipped with the control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units). A humidity sensor (field-supplied and -installed) is also required for operation. See Table 50.

Dehumidification — The Master Loop (ML) reads the Return Air or Space Humidity sensor. When the relative humidity (RH) value exceeds the High Humidity limit set point, the ML will issue CCSR value at low limit (typically 40 F) to the CSL. The CSL will initiate steps of cooling operation to maintain supply air temperature leaving unit at CCSR value. Cooling operation will continue until the RH value at sensor location equals the HHL set point. The ML will return CCSR value to maintain set point SAT. Stages of cooling capacity will be reduced until SAT rises back to the set point.

Reheat — For units with gas heat, when return air temperature (VAV) or space temperature (CV) drops below the Occupied Heating set point, the Master Loop issues a SHSR value to the SHSL (while maintaining Dehumidification CCSR at CSL). The SHSL initiates the staged heating cycle operation (operating simultaneously with Dehumidification/Cooling operation). During reheat, HIR relay will be energized, forcing the room terminals to minimum heating position. Reheat via staged heating continues until OHSP is satisfied. When satisfied, the ML issues minimum value SHSR and the SHSL terminates heating cycle. If the humidity level at sensor location continues to exceed the set point, Dehumidification/Cooling operation will continue.

For units with electric heaters, simultaneous operation of cooling and electric heaters is never permitted on 50ZJ,ZL,ZW units. If the unit control detects that a compressor stage is active, then electric heater operation is blocked. When the last compressor stage is turned off, then Occupied Heat mode will be permitted. Heating will continue until either the OHSP is satisfied or RH exceeds the HHL set point. If RH, again, exceeds the HHL set point, reheat will be terminated immediately and Dehumidification will be re-initiated.

For units with hydronic heating coil, when return-air temperature (VAV) or space temperature (CV) drops below the Occupied Heating Set Point, the Master Loop calculates a required Leaving-Air Temperature value (HCSR) required to maintain return air or space temperature at Occupied Set Point. The Master Loop issues an HCSR to the HCSL (while maintaining Dehumidification CCSR at CSL). The HCSL will modulate heating coil control valve to maintain desired HCSR at the Supply-Air Temperature sensor location. Reheat will be terminated when RAT (CV) or SPT (CV) returns to Occupied Set Point.

Configuration — To configure for a humidity sensor, press [1] [SRVC] to enter into the Service function. Enter the password. Press [6] [SRVC] to enter into the User Configuration subfunction. Scroll down to HUSN. The current configuration will be shown. The default is 0 (no sensor). The acceptable range of values is 0 to 2, where 0 is no sensor, 1 is differential humidity (2 sensors), and 2 is one return air or space sensor. Press [1] or [2] [ENTER] to enable the humidity sensors.

To set the high humidity limit value, press [1] [SRVC] to enter into the Service function. Enter the password. Press [8] [SRVC] to enter into the Cooling subfunction. Scroll down to HHL. The current configuration will be shown. The default is 99% (relative humidity). The acceptable range of values is 0 to 100%. To change the set point, press the new number (example [8] [5]) and press [ENTER] . See Table 51.

NOTE: To permit Reheat on VAV unit, unit must be configured for Occupied Heating. Simultaneous heating-cooling operation is permitted only on units with gas heating section or hydronic heating system.

Table 50 — Dehumidification and Reheat Definitions

ITEM	DEFINITION
CCSR	Cooling Submaster Reference
CSL	Cooling Submaster Loop
CV	Constant Volume
HCSL	Heating Coil Submaster Loop
HCSR	Heating Coil Submaster Reference
HHL	High Humidity Limit (Set Point)
HIR	Heat Interlock Relay
HUSN	Humidity Sensor(s) Option
ML	Master Loop
OHSP	Occupied Heating Set Point
RAT	Return-Air Temperature
RH	Relative Humidity
SAT	Supply-Air Temperature
SHSL	Staged Heating Submaster Loop
SHSR	Staged Heating Submaster Reference
SPT	Space Temperature
VAV	Variable Air Volume

Table 51 — Configuring Dehumidification and Reheat

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Set Dehumidification Set Point (“High Humidity Override”)	8 SRVC	HHL	0 to 100%

NOTE: If Unit Type is VAV, unit must be configured for Occupied Heating Enabled (see Table 18, Configuring Heating).

HUMIDIFIER CONTROL — There are 2 types of Humidifier control functions available with these units: Analog-output control or Discrete-output control. Analog-output control is used to control a proportional steam valve serving a steam grid humidifier (field-supplied and -installed). Discrete-output is used to control a single-stage humidifier with a spray pump (field-supplied and -installed). See Table 52.

A humidifier system (control connects to PSIO-2, Channel 45) and a humidity sensor are required. The control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required for humidifier control.

Table 52 — Humidifier Control Definitions

ITEM	DEFINITION
HUEN	Humidifier Type Configuration
HUM	Humidifier Position (Analog)
HUSN	Humidity Sensor(s) Configuration
HUSP	Humidity Set Point
HUSR	Humidity Submaster Reference
RH	Relative Humidity

Sequence of Operation (Analog-Output Device)

1. If the supply fan is off, the humidifier will be off.
2. If the Occupancy Schedule indicates Unoccupied mode, the humidifier will be off.
3. When the humidity level at the sensor drops below the set point, and if the supply fan is ON and unit is in Occupied mode, then an output signal will open the steam valve until the set point is satisfied.
4. When the humidity level at the sensor exceeds the set point, the steam valve will be closed.

Sequence of Operation (Discrete-Output Device)

1. If the supply fan is off, then the humidifier will be off.
2. If the Occupancy Schedule indicates Unoccupied mode, the humidifier will be off.
3. When the humidity level at the sensor drops below the set point, the output signal will energize the spray pump control until the set point is satisfied.
4. When the humidity level at the sensor exceeds the set point, the spray pump control will be deenergized.

Configuration — To configure:

1. Identify the sensor type. Press 6 SRVC to enter the subfunction. Scroll down to HUSN. Press 1 or 2 and ENTER. If differential humidity sensors are installed, configuration should be set to 1. If a single humidity sensor is installed (space or return air), configuration should be set to 2.
2. Identify Humidifier control type. Press 3 SRVC to enter the subfunction. Scroll down to HUEN. Configuration can be set to 1 or 2. For analog applications, select 1. For discrete applications, select type 2. Enable Data Reset.
3. Set Humidity Set Point. Press 1 SET to enter the subfunction. Scroll down to HUSP. The default is 40% rh (relative humidity). The range is 0 to 100% rh.

Algorithms

HUSR = PID function on (Demand term)
where (Demand term) = Humidity Set Point – Humidity

Supply Fan Duct Pressure and VAV Control Group — This group includes Duct Pressure Control (IGV/VFD control), Supply Air Temperature (SAT) Reset from Space Temperature, and SAT Reset from External Signal.

SUPPLY FAN DUCT PRESSURE CONTROL (VAV Only) — The control will modulate control output to an Inlet Guide Vane (IGV) option or a Variable Frequency Drive (VFD) option, in a VAV system, to maintain duct static pressure at user-configured set point. See Table 53.

The following items are required for supply fan duct pressure control:

- IGV or VFD Option
- $^{1}/_{4}$-in. tubing (flame-retardant plenum duty)
- static pressure probe

Table 53 — Supply Fan Duct Pressure Control Definitions

ITEM	DEFINITION
DPEN	Duct Pressure Control Option
DSPSR	Duct Static Pressure Submaster Reference
SL	Submaster Loop
SPSP	Static Pressure Set Point
SR	Submaster Reference Value

Sequence of Operation — The status of the supply fan is determined. If the fan status is on, the control reads the duct static pressure and calculates the Duct Static Pressure SR (value required to satisfy conditions). The control outputs this value to the IGV/VFD SL. The SL compares DSPSR to actual duct pressure and determines the required IGV position or VFD speed. The required position/speed is sent to the IGV actuator or VFD via Channel 16. The IGV responds to the position signal by opening or closing the supply fan inlet guide vanes; the VFD responds to the speed signal by increasing or decreasing supply fan motor speed.

If the fan status is not on within 1 minute of the fan start, the fan relay commanded state is evaluated. If the state is on, the ML control will check if the fan failure alarm has been tripped. If the alarm has not tripped, algorithm will continue controlling supply fan volume until the alarm is set (adding a 1 minute delay). If the alarm has tripped, then the fan state is considered off and the IGV actuator will be driven closed or VFD will be turned off.

Algorithm — DSPSR = PID function on (demand term) where (demand term) = Static Pressure Set Point – Static Pressure.

Configuration — To enable Duct Pressure mode, press 1 SRVC to enter into the Service function. Enter the password. Press 6 SRVC to enter into the User Configuration subfunction. Scroll down to DPEN. The current configuration will be shown. The default is 0 (disabled). Press 1 ENTER to enable the Duct Pressure mode. The acceptable range of values is 0 and 1, where 0 is disabled and 1 is enabled.

To set the SPSP, press [1][SET] to enter into the Set Point function and the Set Point subfunction. Scroll down to SPSP. The current set point will be shown. The default is 1.5 in. wg. The acceptable range of values is 0.0 to 5.0 in. wg. To change the set point, enter the new number (example: [2][.][0]) and press [ENTER] . See Table 54.

SUPPLY-AIR SET POINT RESET FROM SPACE TEMPERATURE (VAV Units Only) — The SASP reset from space temperature allows the Supply-Air Temperature set point of a VAV system to be adjusted up as the space temperature falls below the Occupied Set point, in order to maintain ventilation to the occupied space and minimize cooling stage operation. Supply Air Temperature Reset is Mode 21. See Table 55.

As space temperature falls below the cooling set point, the supply air set point control value will be reset upward as a function of the Reset Ratio (RTIO).

RTIO = degrees change in SASP per degree of Space Temperature change

The Reset Limit (LIMT) will limit maximum number of degrees the SASP may be raised.

Space Temperature (SPT) is compared to Occupied Cooling set point (OCSP). If the SPT is below OCSP, the reset value is calculated. If the reset value is greater than Reset Limit, then Reset Limit will be used as the reset value. The CSL uses an adjusted control value for determining stages of cooling control during the reset function.

SRV Formula: RESET = (OCSP – SPT) x RTIO

To enable Supply Air Set Point Reset, press [1][SRVC]. Enter the password. Press [6][SRVC] to enter into the User Configuration subfunction. Scroll down to RSEN (Reset Enable). The current configuration will be displayed (0 = disabled, 1 = enabled). The default is disabled. To change the configuration, press the number of the new configuration (example: [1]) and then press [ENTER] .

To configure the Supply Air Set Point Reset Ratio, press [1][4][SRVC] to enter into the Space Temperature Reset Configuration subfunction. Scroll down to RTIO (Reset Ratio). The current configuration will be displayed.

The default is 3 F. The range of acceptable values is 0 to 10 F. To change the set point, press the number of the new configuration (example: [1]) and then press [ENTER] .

To configure the Supply Air Temperature Reset Limit, press [1][4][SRVC] to enter into the Space Temperature Reset Configuration subfunction. Scroll down to LMIT (Reset Limit). The current configuration will be displayed.

The default is 10 F. The range of acceptable values is 0 to 20 F. To change the set point, press the number of the new configuration (example: [1][5]) and then press [ENTER] . See Table 16.

Table 55 — Space Temperature Reset Definitions

ITEM	DEFINITION
CSL	Cooling Submaster Loop
LIMT	Reset Limit
OCSP	Occupied Cooling Set Point
RSEN	Reset Enable
RTIO	Reset Ratio
SASP	Supply-Air Set Point
SAT	Supply-Air Temperature
SPT	Space Temperature
SRV	Submaster Reference Value

SUPPLY-AIR SET POINT RESET (External Signal) — Building/energy management systems can initiate a reset of the unit Supply-Air Set Point temperature by up to 20 F, based on external space or energy control system requirements.

An external source analog signal, 2 to 10 vdc, is required. Connect signal leads at PSIO-2, Channel 42 (control options module is available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units).

Sequence of Operation

VAV Units — An input signal at Channel 42 will be scaled to 0º to 20 F range, representing reset value. The reset value will be added to the cooling set points and subtracted from heating set points. If (internal) Space Temperature Reset is enabled, the reset value will be the higher of the external reset and the Space Temperature Reset value.

CV Units — The input signal at Channel 42 will be scaled to 0º to 20 F range, representing reset value. The reset value will be added to the cooling set points and subtracted from heating set points. If unit is equipped with a T-56 Space Sensor and is using the Space Temperature Offset function, SASP Reset from remote signal is NOT AVAILABLE.

Configuration — To configure, connect the external signal input to Channel 42.

Table 54 — Configuring Supply Fan Duct Pressure Control (IGV/VFD)

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Enable Duct Pressure Function	[6][SRVC]	DPEN	Enable = 1; Disable = 0
Select Duct Pressure Set Point	[1][SET]	SPSP	0.0 to 5.0 in. wg (0 to 1246 Pa)

Remote Controls Group — This group includes Remote Start (Occupied/Unoccupied status control) and Space Temperature Offset (CV only).

REMOTE START — The Remote Start function allows a general-purpose building/energy management system to signal the unit to switch between Unoccupied and Occupied modes from a remote location. This function will also override a Standby command status by initiating an Occupied mode. Upon removal of remote signal, unit will switch to Unoccupied mode. An external control signal (24-vac) is required.

NOTE: Unit cannot be returned to Standby mode from a remote signal. Standby can **only** be re-entered via HSIO command.

Application of the 24-v signal will switch the unit from current mode (Standby or Unoccupied) to Occupied. The unit will initiate Occupied modes as determined by set points. Removal of the 24-v signal will return control to Unoccupied mode.

Install a LOCAL/REMOTE (SPST-OFF/ON) manual switch in the 24-v signal input. A setting of LOCAL (OFF) prevents accidental start caused by remote control system during service or maintenance. A setting of REMOTE (ON) allows the remote system to start unit with a 24-v signal.

Configuration — Connect remote signal leads to Channel 49 (DSIO no. 2, J3-1, J3-2). To ensure unit returns to Unoccupied mode whenever signal is removed, provide Time Schedule for Unoccupied periods as 24 hr per day (zero hours for Occupied period).

SPACE TEMPERATURE OFFSET (CV Only) — The Space Temperature Offset (STO) function permits occupants to adjust the space temperature set point by ±5 F, using a T-56 sensor (equipped with sliding scale adjustment).

A T-56 Space Sensor (field-supplied and -installed) is required.

Sequence of Operation — The STO channel provides analog input to the control, indicating desired shift in space set point. The control scales the voltage to –5 to +5 F range. The configured Space Temperature Set Point is altered by the offset value.

Configuration — To configure, connect the T-56 lead from "SW" terminal to PSIO1 Terminal 33 (via TB3-3).

Special Systems Group — This group includes Hydronic Heating Control, Freezestat, Lead/Lag, Head Pressure Control (Motormaster® Control), and Transducers and Thermistors feature.

HYDRONIC HEATING — The Hydronic Heating function will modulate a control valve in a steam or hydronic heat system (field-supplied and -installed), to maintain building temperature at user configured set point. Analog output is 4 to 20 mA. See Table 56.

Table 56 — Hydronic Heating Definitions

ITEM	DEFINITION
HCFO	Heating Coil Fan Off Value
HCSCV	Heating Coil Submaster Center Value
HCSMG	Heating Coil Submaster Gain
HCSR	Heating Coil Submaster Reference
HCV	Heating Coil Value (Analog)
IAQ	Indoor Air Quality Function
OHEN	Occupied Heating Enable/Disable
OHSP	Occupied Heating Set Point
RAT	Return-Air Temperature
SAT	Supply-Air Temperature
SPT	Space Temperature
UHSP	Unoccupied Heating Set Point

A heating coil with proportional control valve (field-supplied and -installed) is required. A field-supplied connection from the control valve to Channel 43 is also required. The control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required for hydronic heating.

NOTE: The HCV output signal is a direct-acting signal. No demand for heating is a 4-mA signal. A maximum demand for heating is a 20-mA signal. Select heating control valve actuator accordingly.

Sequence of Operation

1. If the supply fan is OFF, or if Unoccupied Free Cooling is active, the heating value is modulated to maintain desired minimum supply-air temperature (HCFO).
2. If the supply fan is on, unit is in Occupied mode, or Optimal Start or Unoccupied heat modes are active:

   VAV Units — The control will determine if heating is required. Heating is required if the return-air temperature (RAT) is less than the heating set point and the unit is one of the following: in Unoccupied mode, performing warm-up, or Occupied Heating is enabled. When heating is required, control will modulate heating coil control valve to maintain desired supply-air temperature.

   CV Units — The control reads the space temperature sensor value and calculates the required heating coil control value (the supply-air temperature required to satisfy load conditions). The control will modulate heating coil control valve to maintain desired SAT control value.
3. When heating is activated, the HIR relay will be energized.
4. A possible override of the Hydronic Heating function may occur if the IAQ Reheat function is active.

Configuration — See Table 57. To configure:

1. Select Heat Type. Press 3 SRVC to enter the subfunction. Scroll down to HEAT. Set Type to 1 (water/steam-hydronic). Enable Data Reset.
2. Enable Occupied Heating (optional). Press 6 SRVC to enter the subfunction. Scroll down to OHEN. Press 1 ENTER to enable Occupied heating.
3. Select Heating set points. Press 1 SET to enter the subfunction.
   a. Set the Occupied Heating Set Point. Scroll down to OHSP. The default is 68 F. The range is 55 to 80 F.
   b. Set the Unoccupied Heating Set Point. Scroll down to UHSP. The default is 55 F. The range is 40 to 80 F.
4. Select Heat Coil Fan Off set point. Use the ComfortWORKS® software to select the Heat Coil Fan Off set point. The default is 40 F. The range is 35 to 65 F.

Algorithms

HCSR = PID function on (Demand term)

where:
VAV: (Demand term)
= Heating set point – Return Air Temperature

CV: (Demand term)
= Heating set point – Space Temperature

FREEZESTAT — The Freezestat function will attempt to prevent freezing at the Hydronic Coil by raising temperature in the coil (by opening control valve on low temperature signal). The function also turns the supply fan off and returns economizer dampers to minimum position.

A contact set (Normally Open, 24-vac pilot duty) is required. Contact set will close on fall in temperature at freezestat set point. The control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required for operation.

Table 57 — Configuring Hydronic Heating

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Select Heat Type	3 SRVC	HEAT	Gas = 3, Electric = 2, Hot water/Steam = 1*, None = 0
Opt: Enable Occupied Heating	6 SRVC	OHEN	Enable = 1; Disable = 0
Select Heating Set Points:			
Occupied Heating Set Point	1 SET	OHSP	55 to 80 F (13 to 27 C)
Unoccupied Heating Set Point	1 SET	UHSP	40 to 80 F (4 to 27 C)
Select Heat Coil Fan Off Set Point	(Use ComfortWORKS® software)	HCFO	35 to 65 F (2 to 18 C)

*If value changed, enable Data Reset before leaving. 3 SRVC

NOTE: Occupied Heating Set point serves as "Morning Warm-Up Set Point."

Sequence of Operation

1. Freezestat signal contacts close on temperature drop.
2. A 24-v signal applied to Channel 41.
3. After 2 to 10 second delay, the control will turn the supply fan off, direct the heating control valve to fully open, and return the economizer to the Minimum Damper Position.
4. An alarm is initiated (alarm 88).
5. Alarm status maintained until control is manually reset.

Configuration — To configure, configure the unit for Hydronic Heating. See Hydronic Heat section for more information. Connect switch contacts (NO) and 24-vac power supply to Channel 41.

LEAD/LAG OPERATION — Lead/lag operation will distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits. Lead/lag is factory-enabled except when the Hot Gas Bypass (HGBP) option is ordered. The HGBP function is available on designated lead circuit (circuit A) only, so lead/lag function is disabled.

To disable lead/lag, press 6 SRVC . Scroll down to LLAG. Press 0 ENTER to disable.

To enable lead/lag, press 6 SRVC . Scroll down to LLAG. Press 1 ENTER to enable.

HEAD PRESSURE/FAN CYCLING CONTROL (Motormaster® Head Pressure Control) — The control will cycle condenser-fan motors on each refrigeration circuit at low ambient temperatures in order to maintain proper head pressure and liquid temperature for refrigeration system operation. See Table 58.

Table 58 — Head Pressure Control Definitions

ITEM	DEFINITIONS
HPSP	Head Pressure Set Point
MMAS	Motormaster Function Configuration
SCT	Saturated Condensing Temperature

Sequence of Operation — Motormaster head pressure control option enabled (default):

Sizes 030-075: On standard unit (without transducers), the first stage of Outdoor Fan(s) operation (on each circuit) will turn on when the Saturated Condensing Temperature on either circuit is greater than (HPSP – 15 F).

NOTE: The default for HPSP is 113 F.

On units with transducer accessory, first stage of Outdoor Fan operation (on each circuit) will turn on when Saturated Condenser Temperature is greater than 138 F.

The first stage of outdoor fan operation will turn off when Saturated Condensing Temperatures on both circuits are less than (HPSP – 37 F) for 90 seconds.

Sizes 090,105: On standard unit (without transducers), the first stage of Outdoor Fan(s) operation (on each circuit) will turn on when the Saturated Condensing Temperature on that circuit is greater than (HPSP – 15 F).

NOTE: The default for HPSP is 113 F.

On units with transducer accessory, first stage of Outdoor Fan operation (on each circuit) will turn on when Saturated Condenser Temperature is greater than 138 F.

The first stage of outdoor fan operation will turn off when Saturated Condensing Temperature is less than (HPSP – 37 F) for 90 seconds.

All Units: The second stage of outdoor fan operation will be off whenever compressors on its circuit are off. The second stage of outdoor fan operation will be delayed for 60 seconds after start of compressor (or until SCT is greater than 143 F, when the second stage of outdoor fan operation will start immediately). The control will energize the second stage of outdoor fan operation whenever the SCT exceeds the HPSP. The control will deenergize the second stage of outdoor fan operation when the SCT has been less than (HPSP – 35 F) for period of 2 minutes.

NOTE: The second stage of outdoor fan operation on a circuit may be added as rapidly as 2 seconds but may not be removed during two minutes of minimum ON time.

Motormaster option disabled: The first stage of outdoor fan operation for a refrigerant circuit will be on whenever mechanical cooling is on for that circuit. Outdoor fan motor no. 1 is off when mechanical cooling is OFF.

The second stage of outdoor fan operation will be off whenever compressors on its circuit are off. The control will energize the second stage of outdoor fan operation whenever the SCT exceeds the HPSP. The control will deenergize the second stage of outdoor fan operation when the SCT has been less than (HPSP – 35 F) for period of 2 minutes.

NOTE: The second stage of outdoor fan operation on a circuit may be added as rapidly as 2 seconds but may not be removed during 2 minutes of minimum ON time.

Configuration — See Table 59. To disable the Motormaster function, press 6 SRVC to enter the subfunction. Scroll down to MMAS. Press 0 ENTER to disable. The default is enabled.

To enable the Motormaster function, press 6 SRVC to enter the subfunction. Scroll down to MMAS. Press 1 ENTER to enable.

To adjust the default Head Pressure Set Point, press 3 SRVC . Scroll down to HPSP. Enter the new value. Default is 113 F. Range is 80 to 150 F. Enable Data Reset.

Table 59 — Configuring Head Pressure Control (Motormaster® Control)

DESCRIPTION	HOW TO CONFIGURE AT HSIO	SET POINT	RANGE
Disable "Motormaster"	6 SRVC	MMAS	Disable = 0; Enable = 1
Adjust Head Pressure Set Point	3 SRVC	HPSP	80 to 150 F (27 to 65 C)*

*If value changed, enable Data Reset before leaving 3 SRVC .

TRANSDUCERS AND SUCTION THERMISTORS — The Transducers and Suction Thermistors function allows the control to read pressure transducers as valid inputs, replacing the condenser coil thermistor and low pressure switch inputs at Channels 3, 4, 5, and 6.

The control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) and pressure transducers are required.

Sequence of Operation — The control will read Channels 3 and 4 as Discharge Pressure Transducer inputs. Alarms 76 and 77 (High Discharge Pressure) will be permitted. The control will read Channels 5 and 6 as Suction Pressure Transducer inputs. Alarms 74 and 75 (Low Pressure), Alarms 80 and 81 (Low Saturated Suction Temperature), Alarms 82 and 83 (High Superheat), and Alarms 84 and 85 (Low Superheat) will be permitted.

Configuration — To configure:

1. Enable Transducer Inputs. Press 3 SRVC to enter the subfunction. Scroll down to TRNS. Press to 1 ENTER enable. Enable Data Reset.
2. Enable Suction Thermistors. Press 6 SRVC to enter the subfunction. Scroll down to SUSN. Press 1 ENTER to enable.

Carrier Comfort Network (CCN) Group — This group includes Demand Limit control and Digital Air Volume (DAV) application.

DEMAND LIMIT — The Demand Limit mode limits stages of cooling capacity, resulting from a signal ("Redline Alert" or "Loadshed") from the CCN. The "Network Loadshed" option with CCN is required. Demand Limit is Mode 22.

The CCN ComfortWORKS® package is required.

Sequence of Operation

Redline Alert — When a Redline alert is received from the CCN, the maximum stage of capacity is set equal to the current stage of operation. If the unit is not operating when alert signal is received, capacity stage will be set at zero for 15 minutes, then restart permitted as normal.

Loadshed — At a Loadshed command from the CCN, the control will reduce present maximum stage (determined at Redline Alert) to user-defined percentage of present maximum stage. If unit at zero already, unit will remain at zero for 15 minutes, then control will permit unit to climb to user-defined percentage of maximum.

Example — Maximum stages for unit size is 11 and Demand Limit set point is 40%. At a Redline Alert signal, the unit is currently operating at 10 stages (this becomes the new maximum stages value). At a Demand Limit signal, the maximum number of stages is reduced by the user-defined set point limit (0.40 x 10 = 4 stages permitted). Unit operation will continue with the number of stages limited to reduced value until the Loadshed signal is cleared (removed) by CCN.

The Loadshed mode is limited to 1 hour. If the Loadshed mode is not cleared by the Loadshed option before the 1-hour limit expires, the mode is automatically cleared and unit operation will return to normal.

Configuration — To configure:

1. Enable Demand Limit. Press 6 SRVC to enter the subfunction. Scroll down to DLEN. Press 1 ENTER to enable.
2. Select Loadshed Groups. Press 1 5 SRVC to enter the subfunction. Scroll down to LSGP. Coordinate Group selection with CCN Loadshed Module equipment schedules. Default is group 1. Range is 1 to 16.
3. Specify Demand Limit Set Point. Press 2 SET to enter the subfunction. Scroll down to LSP. The default is 50%. The range is 0 to 100%.

DIGITAL AIR VOLUME (DAV) — Carrier rooftop units with PIC may also have a communication linkage with the VAV terminal units in a particular application. This linkage is called the DAV linkage. The DAV mode indicates the unit is being controlled through a CCN network and is connected to DAV system. Digital Air Volume (DAV) is Mode 39. The ComfortWORKS software system is required. The CCN must be connected to PSIO1, COMM1 port.

Linkage Data and Operation — The values from the Terminal System Manager (TSM) which are used as linkage data by the rooftop PIC control are found in Table 60.

Table 60 — TSM Linkage Codes

EM	DEFINITION
AOCS	Average Occupied Cool Set Point
AOHS	Average Occupied Heat Set Point
AOZT	Average Occupied Zone Temperature
AUCS	Average Unoccupied Cool Set Point
AUHS	Average Unoccupied Heat Set Point
AZT	Average Zone Temperature
NEXTOCCD	Next Occupied Day
NEXTOCCT	Next Occupied Time
NEXTUNOD	Next Unoccupied Day
NEXTUNOT	Next Unoccupied Time
OCCSTAT	Occupancy Status
PREVUNOD	Previous Unoccupied Day
PREVUNOT	Previous Unoccupied Time

Cooling/Heating Routines — When the rooftop unit PIC is part of a DAV system, the rooftop unit PIC utilizes information supplied by the TSM to control cooling, heating, and economizer routines instead of using its own return air and space temperature sensors. The AOHS, AOCS, AUHS, and AUCS from the TSM are used instead of the rooftop unit PIC configured set points. The rooftop unit uses the occupancy status information through the communication linkage, such as NEXTOCCT and NEXTUNOT, instead of its internal occupancy schedule.

VAV Systems — During occupied and biased occupied periods on VAV systems, the rooftop unit PIC uses the AOZT from the TSM to replace the rooftop unit PIC return-air temperature sensor value. During unoccupied periods, the rooftop unit PIC uses the AZT from the TSM instead of the rooftop unit PIC space temperature and return-air temperature sensor values.

Optimal Start Routine — The following TSM points are used in the optimal start portion of the rooftop unit PIC adaptive optimal start/stop routine (AOSS): AZT, NEXTOCCT, NEXTOCCD, PREVUNOT, and PREVUNOD from the TSM. The rooftop PIC uses this information to calculate a bias time that is then used by both the rooftop PIC and the TSM. When the current time of day is greater than the biased start time, the rooftop PIC uses the AOZT from the TSM to determine when the occupied set point has been achieved.

Unoccupied Free Cooling — When the unoccupied free cooling is configured, the rooftop PIC uses the AZT from the TSM instead of the space temperature to determine if unoccupied free cooling should operate.

Supply-Air Set Point (SASP) — When supply-air set point reset from space temperature is configured, the rooftop unit PIC uses the AOZT and the AOCS from the TSM instead of the space temperature to determine the amount of reset required.

Linkage Alarms — If the rooftop unit PIC which had previously been operating as part of a DAV system detects a communication failure between the rooftop unit and the TSM, the rooftop unit PIC continues to operate for 5 minutes using the last information it received from the TSM. If communication resumes within the 5-minute period, normal system operation continues. If the communication failure persists beyond 5 minutes, the rooftop unit PIC generates a linkage failure alarm. At that time, the rooftop unit PIC will return to stand-alone operation using its own sensors and set points.

If the internal occupancy schedule for the rooftop unit PIC has not been configured, the controls will maintain the same occupancy state as prior to the linkage failure. If the occupancy schedule is configured on the rooftop unit PIC, the controls will maintain the same occupancy state as prior to the linkage failure until the next scheduled occupancy transition. At that time, the rooftop unit PIC will revert to its own internal occupancy schedule.

If communication is restored, normal DAV system operation resumes, and the rooftop unit PIC generates a linkage return-to-normal message.

INSTALLATION INFORMATION

Control Wiring — See Fig. 18-33 for connections to unit. The recommended types of control wiring for unit devices are listed in Table 61.

SENSORS — Sensors should be wired using single twisted pairs of 20 AWG (American Wire Gage) conductor cable rated for the application, except for the T-56 accessory sensor which requires 3-conductor cable.

NOTE: Humidity and CO_2 sensors must each be powered from an isolated 24-v power supply.

HUMIDITY CONTROL AND HOT WATER AND STEAM VALVES — These devices require 20 AWG twisted pair conductor cables rated for the application for the 4 to 20 mA signal.

SPACE TEMPERATURE SENSOR (T-55, Part No. CEC0121448-01) — The space temperature sensor is shipped standard with every unit, and is located in the main control box. Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (TB1), a jumper between pins E2 and E3, and an RJ11 female connector. The RJ11 connector is used to tap into the Carrier Comfort Network (CCN) at the sensor. See RJ11 Plug Wiring section on page 53 to connect the RJ11 connector to the CCN.

⚠ CAUTION

Jumper **MUST** be in place between pins E2 and E3 or inaccurate readings could result.

To connect the space temperature sensor (Fig. 18):

1. Connect 1 wire of the twisted pair to terminal T1 and connect the other wire to terminal T2 on terminal block 1 (TB1) located on the cover of the space temperature sensor using a 20 AWG twisted pair conductor cable rated for the application.
2. Connect the other ends of the wires to terminals T1 and T3 on TB3 (sizes 030-050) or terminals T1 and T2 on TB2 (sizes 055-105), located in the unit main control box.

NOTE: This sensor should be installed for all applications. For VAV applications, it is used to control heating and cooling during unoccupied periods. For DAV applications, it is used to maintain control of the space during linkage failures with the TSM (terminal system manager).

SPACE TEMPERATURE SENSOR (T-56, Part No. CEC0121503-01) (CV Applications Only) — Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (TB1), a jumper between pins E2 and E3, and an RJ11 female connector. The RJ11 connector is used to tap into the CCN at the sensor. See RJ11 Plug Wiring section on page 53 to connect the RJ11 connector to the CCN.

⚠ CAUTION

Jumper **MUST** be in place between pins E2 and E3 or inaccurate readings could result.

To connect the space temperature sensor (Fig. 18):

1. Connect 1 wire of the 3-conductor cable to terminal TH, 1 wire to terminal COM, and the other wire to terminal SW on terminal block 1 (TB1) located on the cover of the space temperature sensor using a 20 AWG twisted 3-conductor cable rated for the application.
2. Connect the other ends of the wires to terminals 1, 3, and 7 on TB3 (sizes 030-050) or terminals 1, 2, and 7 on TB2 (sizes 055-105), located in the unit main control box. The wire from terminal SW MUST be connected to terminal 7 for all sizes.

NOTE: Either the T-55 or the T-56 sensor must be connected for CV applications to function.

Table 61 — Recommended Sensor and Device Non-Shielded Cable

MANUFACTURER	PART NO.	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhattan	M13402	M64430
Quabik	6130	—

Return/Exhaust Fan Variable Frequency Drive (48ZL and 50ZL,ZM) — The return/exhaust fan VFD (RE VFD) is used to modulate return/exhaust fan airflow to maintain return air pressure set point at the mixing box. The RE VFD is located at the return end of the unit of the opposite side from the auxiliary control box and can be accessed by opening the access door. The return/exhaust fan VFD is controlled directly by a pressure transducer and is independent from the PIC control.

The unit is supplied with a pressure transducer capable of measuring from –0.5 to +0.5 in. wg. The pressure transducer will send a 4 to 20 mA signal to the RE VFD to modulate the speed of the return/exhaust fan motor to precisely control the fan to the desired static pressure set point. The RE VFD is factory set at –0.15 in. wg. Refer to Operating Sequence section for more information on the RE VFD.

The RE VFD has been programmed and wired at the factory for this application. No further adjustments should be necessary at start-up. Factory jumper wire configurations are shown in the Return/Exhaust Variable Frequency Drive section in the Troubleshooting section on page 101.

A separate service manual for the factory-installed RE VFD is supplied with each unit. Refer to the RE VFD manual for more information on the RE VFD controls.

Smoke Control — Four functions are provided by the base unit control to provide space smoke control in response to discrete input signals from a building fire alarm system. Each mode must be energized individually from the approved building fire alarm system, and the corresponding alarm is then generated at the HSIO keypad or building supervisor. The 4 modes are Fire Shutdown mode, Evacuation mode, Pressurization mode, and Smoke Purge mode.

For Fire Shutdown mode, the PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function.

For Pressurization mode, the PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function. In addition, the factory-installed economizer option is required.

For Evacuation and Smoke Purge modes, the PSIO-2 module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required to initiate this control function. In addition, the factory-installed economizer and factory-installed power exhaust options are required.

The building fire alarm system must provide 4 normally open contact closures (rated for 24-vac). These contacts must be wired between TB2-6 and the PSIO-2 plug J7 (bottom) appropriate connection. Refer to the unit wiring diagram for the corresponding connection point on PSIO-2, plug J7 (bottom).

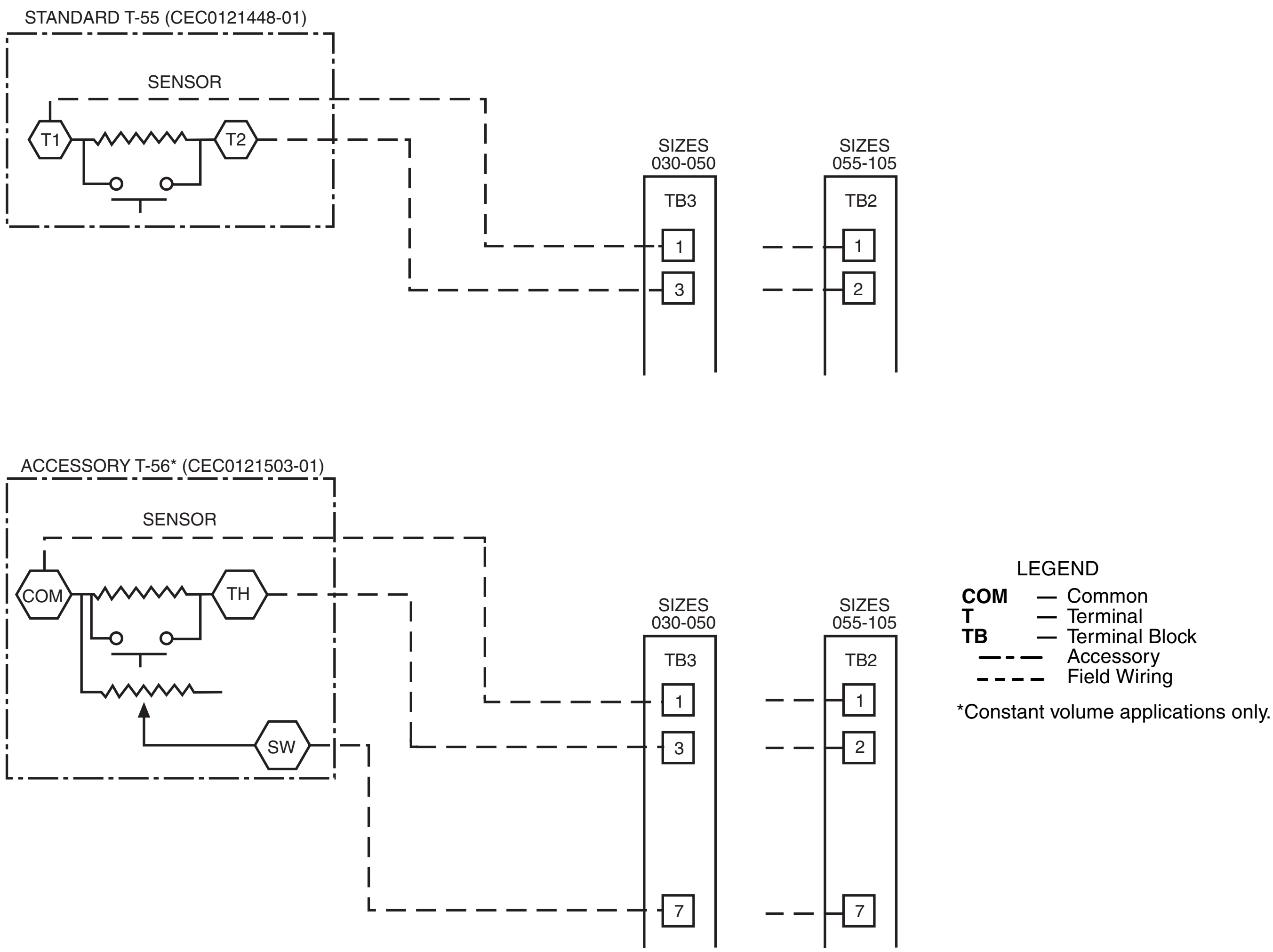


Fig. 18 — Space Temperature Sensor Wiring

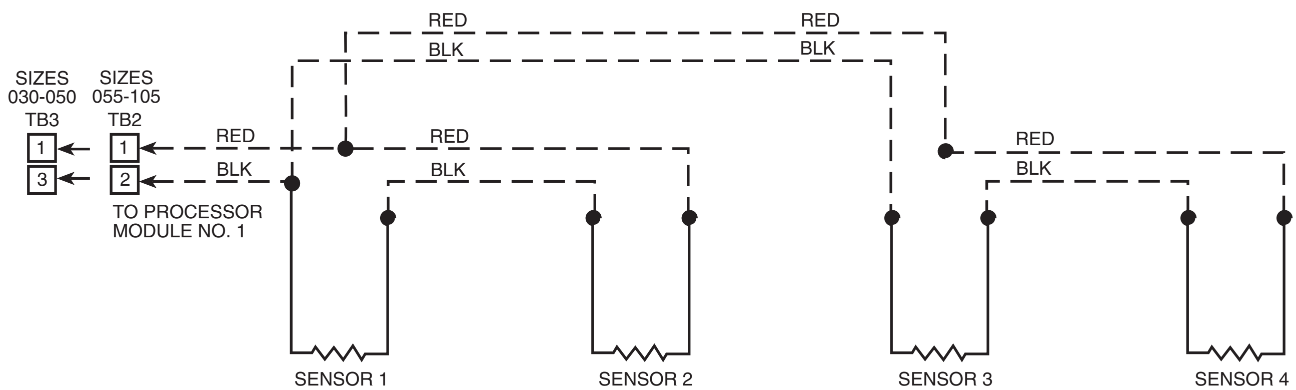
Heat Interlock Relay (HIR) Function Wiring (VAV Units Only — Not Necessary for DAV Applications) — Variable-air volume units which provide staged heating (for morning warm-up, unoccupied heat, or occupied heat modes) require that room terminals be controlled to go to the Minimum Heating position when the unit goes into Heating mode. The HIR function is provided for this control. When the unit goes into Heating mode, the contact set at Channel 60 (DSIO-2) is energized to provide switch closure or opening (depending on how the field-supplied power source is set up) to open the room terminals. The field-supplied connections for interlock function are:

HEAT INTERLOCK RELAY	TERMINALS	
	Sizes 030-050 — TB-3	Sizes 055-105 — TB2
Normally Closed	2 and 4	8 and 10
Normally Open	4 and 5	8 and 9

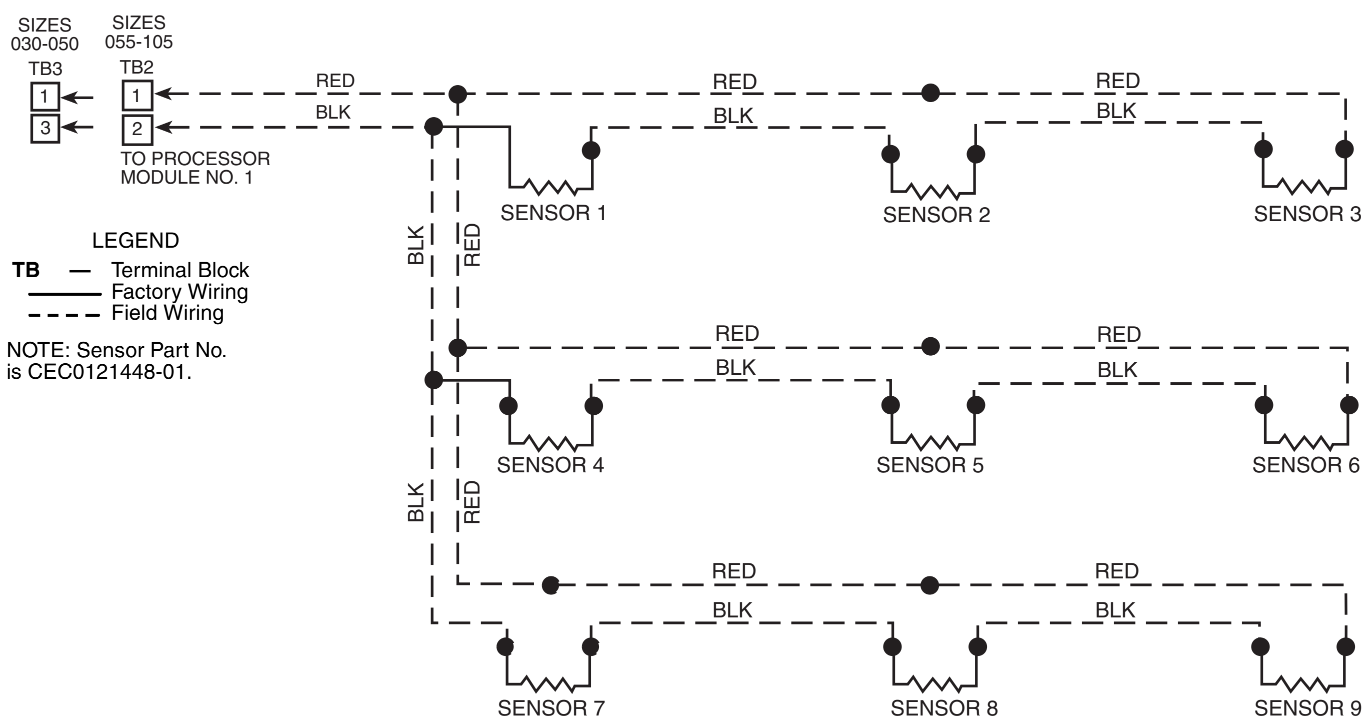
NOTE: A field-supplied power source is required. See Fig. 20 and unit wiring schematic for wiring details.

Remote SASP Reset — The unit controls allow for remote input from an energy management system (EMS) or some other input to offset the space temperature set point on CV applications or to reset the supply-air set point on VAV applications. A remote, isolated, 2 to 10 vdc signal may be used to achieve this purpose. See Fig. 31 for wiring details.

Remote START/UNOCCUPIED Control — This control is for applications where it is necessary to control the unit occupancy mode from a remote timeclock or switch. See Fig. 22 for appropriate field wiring. When signal (24-v) is applied to Channel 49, unit will enter occupied mode. Removal of signal returns unit to unoccupied mode. Place LOCAL/REMOTE switch in REMOTE (ON) position.



SPACE TEMPERATURE AVERAGING — 4 SENSOR APPLICATION



SPACE TEMPERATURE AVERAGING — 9 SENSOR APPLICATION

Fig. 19 — Space Temperature Sensor Averaging

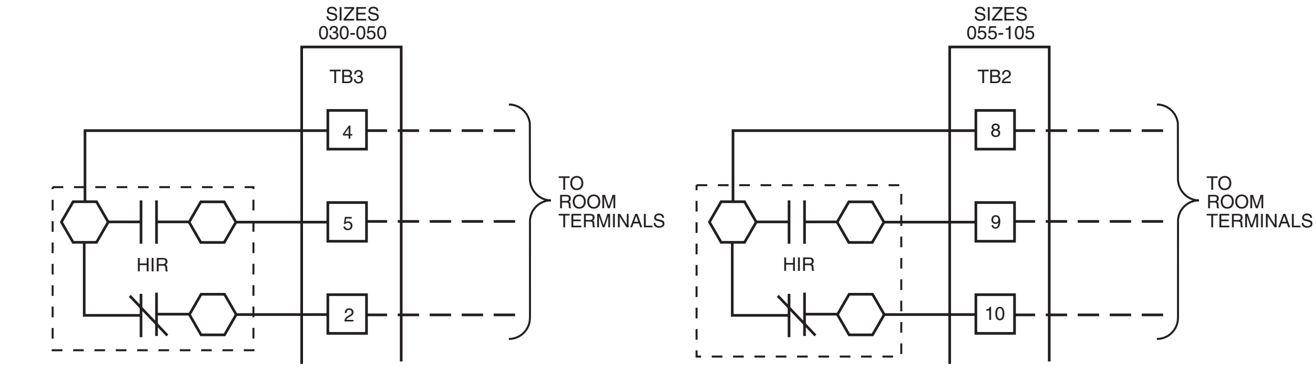


Fig. 20 — Heat Interlock Relay Wiring

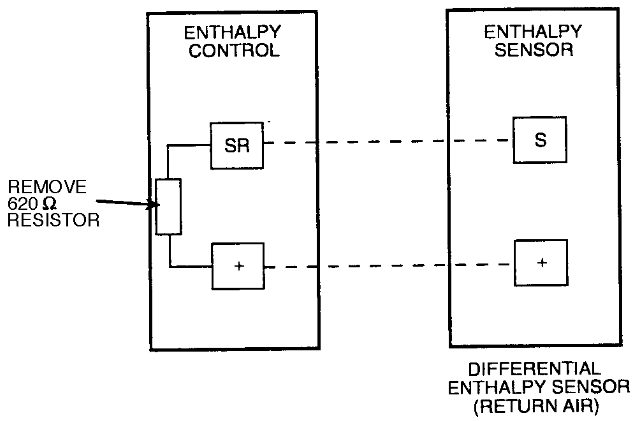
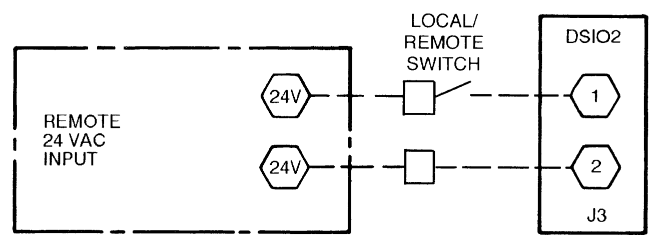


Fig. 21 — Differential Enthalpy Sensor



LEGEND
DSIO — Relay Module

Fig. 22 — Remote START/UNOCCUPIED Control

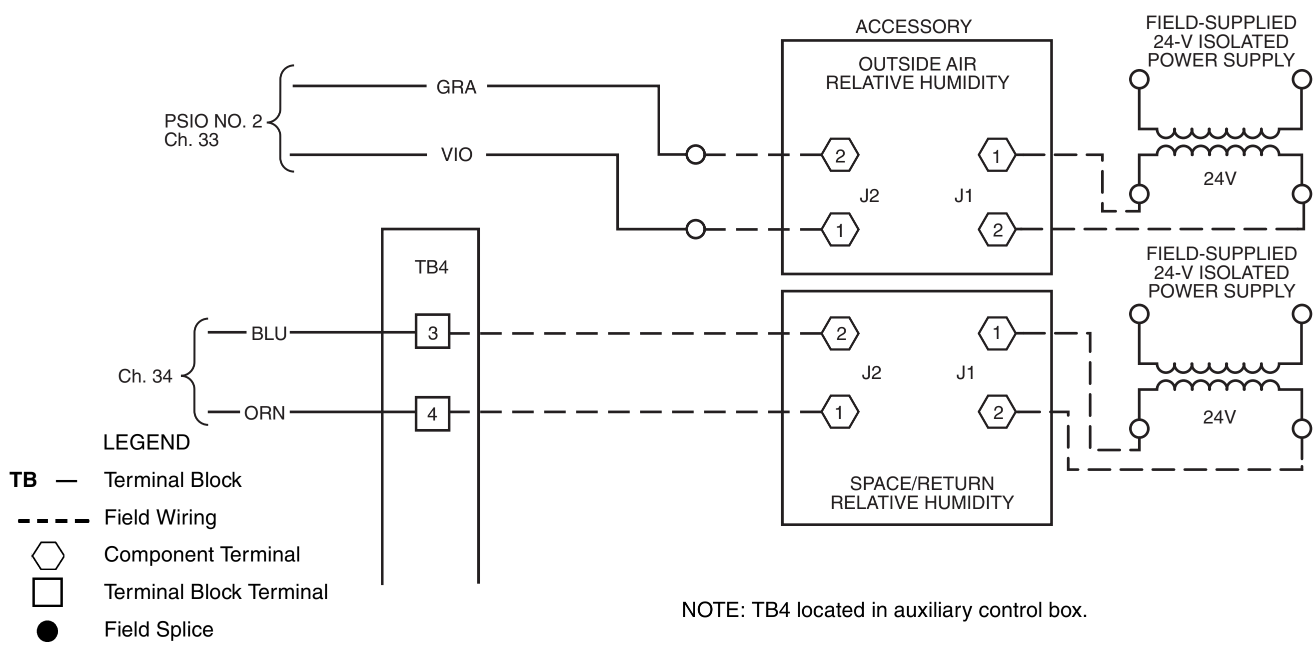
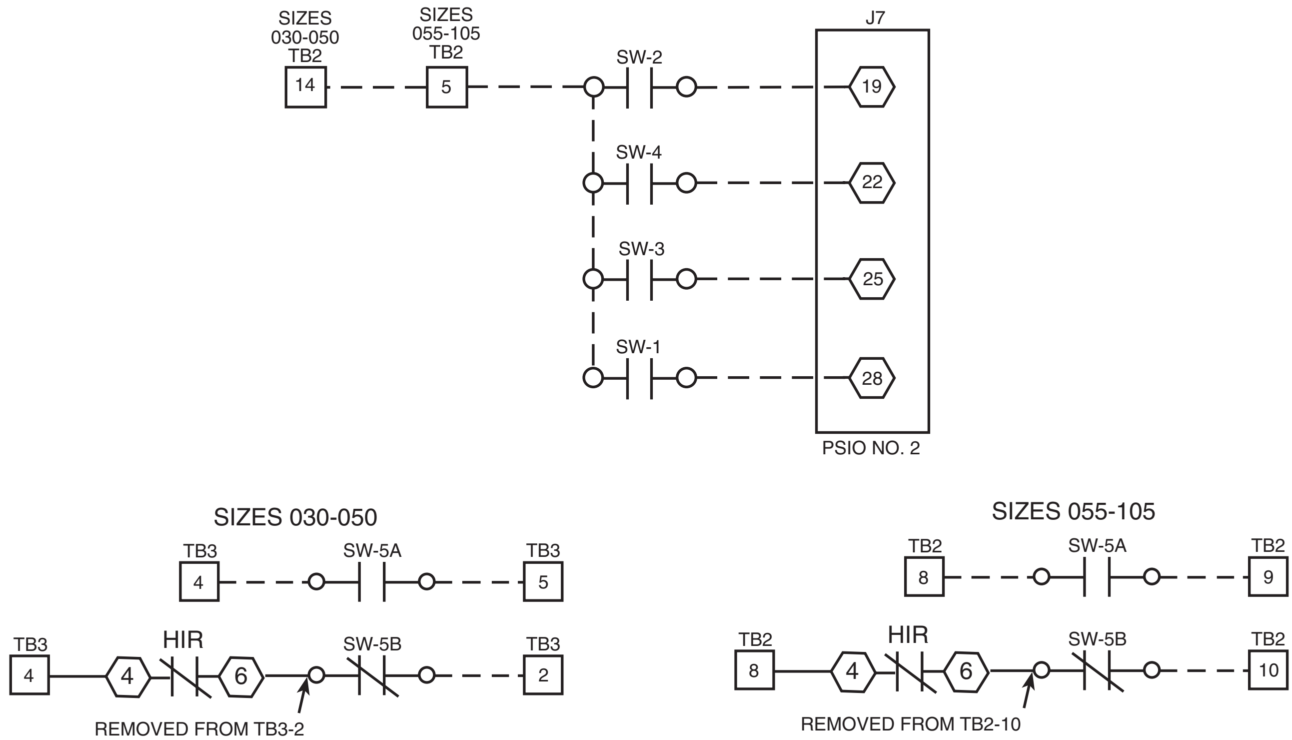


Fig. 23 — Accessory Humidity Control



SWITCH NUMBER	SWITCH CONFIGURATION	VOLTAGE	FUNCTION
SW-1	N.O.	24	Activate Fire Shutdown Mode
SW-2	N.O.	24	Activate Pressurization Mode
SW-3	N.O.	24	Activate Evacuation Mode
SW-4	N.O.	24	Activate Smoke Purge Mode
SW-5 A/B	A: N.O. B: N.C.	115	Signal Room Terminals to Open (HIR1)

LEGEND

HIR — Heat Interlock Relay
N.C. — Normally Closed
N.O. — Normally Open
SW — Switch
TB — Terminal Block

Fig. 24 — Smoke Control

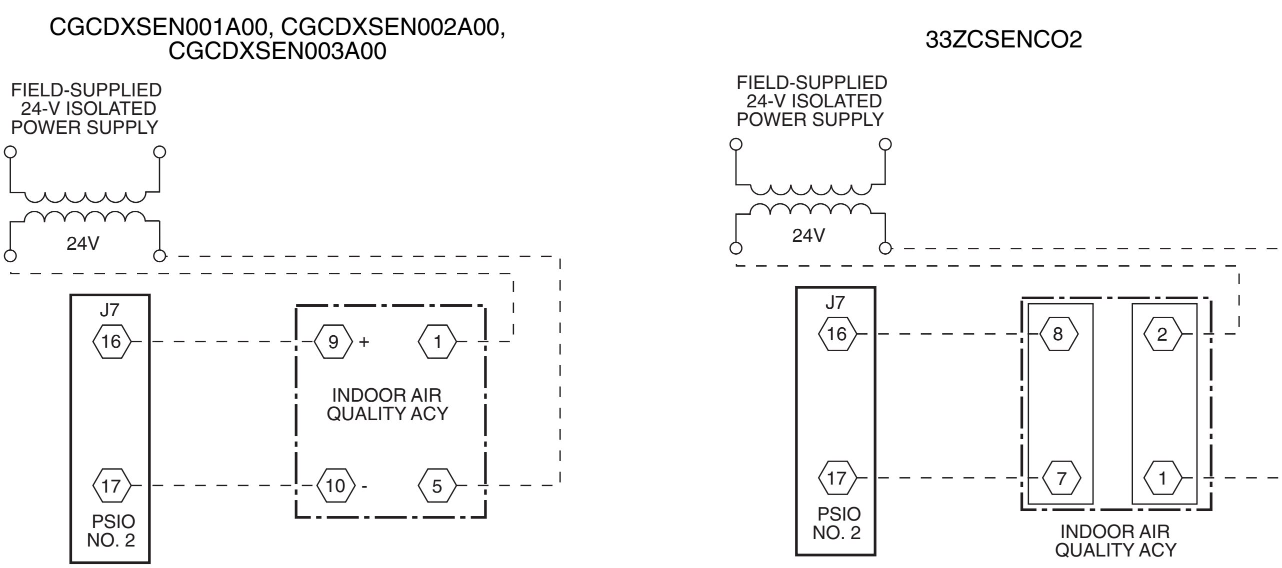
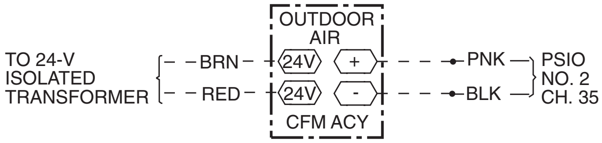


Fig. 25 — Indoor-Air Quality



LEGEND

TB — Terminal Block

- - - - Field Wiring

⬡ Component Terminal

□ Terminal Block Terminal

Fig. 26 — Outdoor Airflow Control

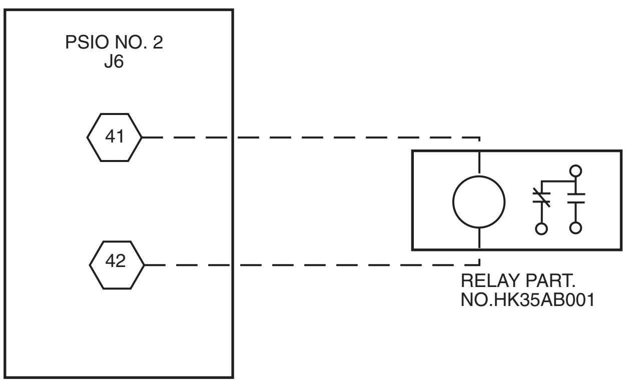
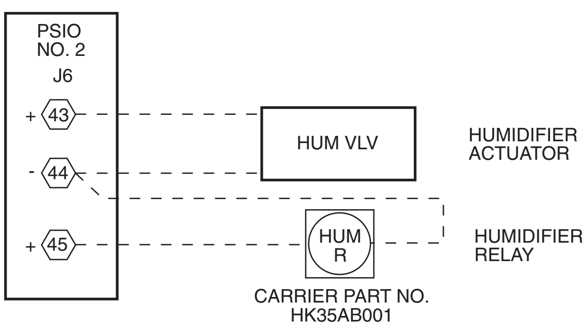


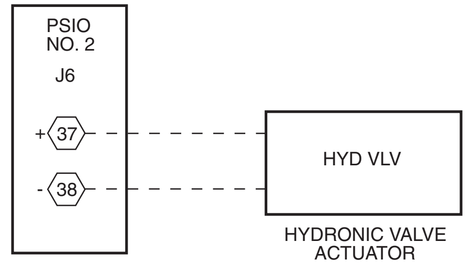
Fig. 27 — Discrete Timeclock Control



LEGEND

⬡ Component Terminal

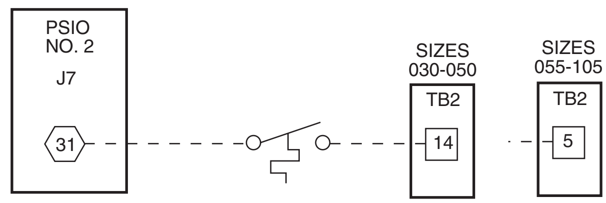
Fig. 28 — Humidifier



LEGEND

⬡ Component Terminal

Fig. 29 — Hydronic Heating



LEGEND

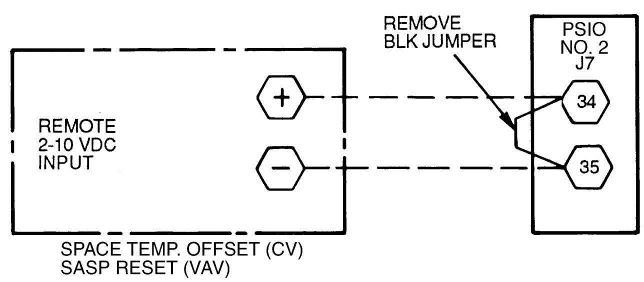
TB — Terminal Block

- - - - Field Wiring

⬡ Component Terminal

□ Terminal Block Terminal

Fig. 30 — Freezestat



LEGEND

CV — Constant Volume

SASP — Supply-Air Set Point

VAV — Variable Air Volume

Fig. 31 — Remote Supply Air Temperature Reset/Space Temperature Offset

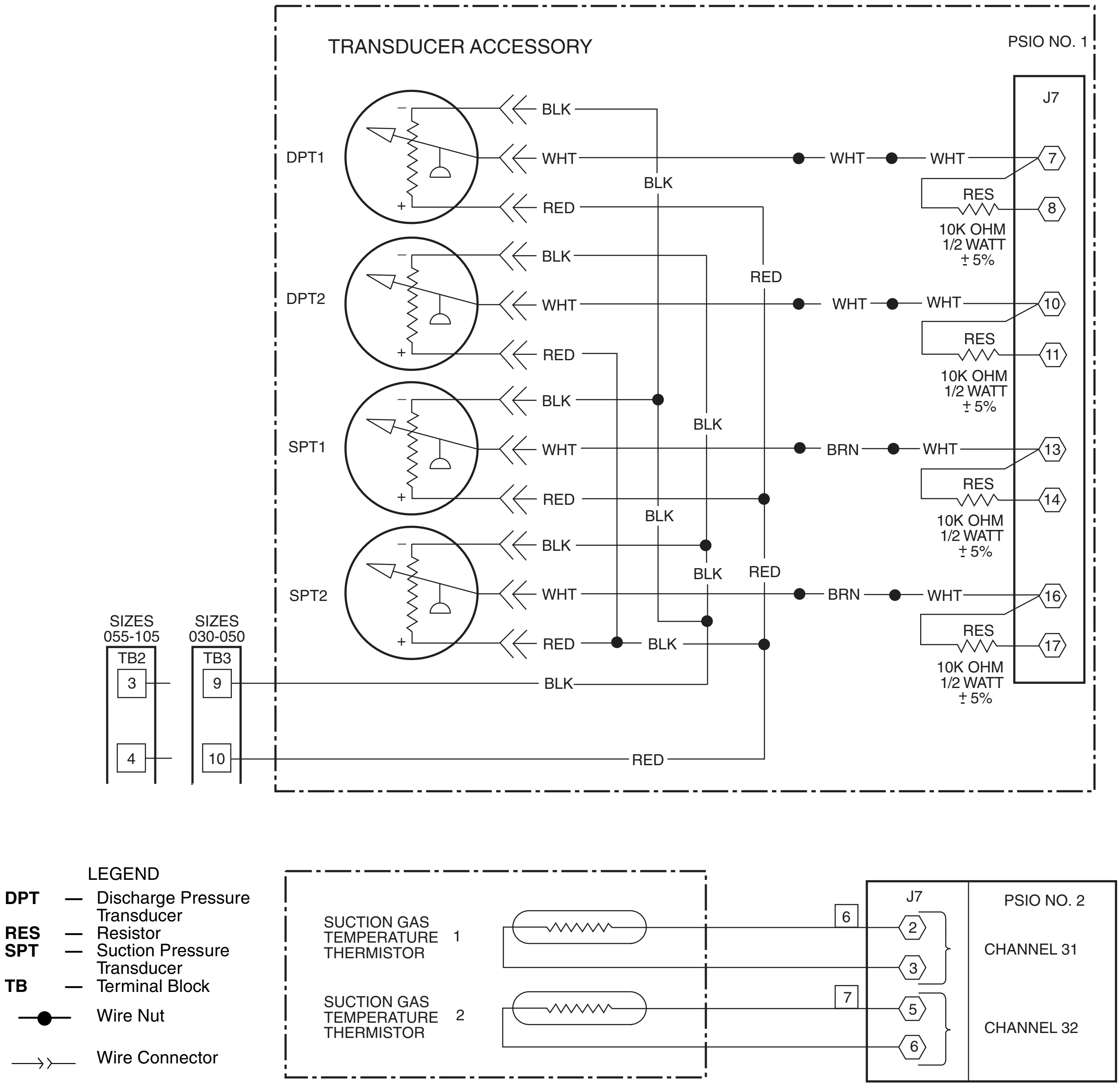
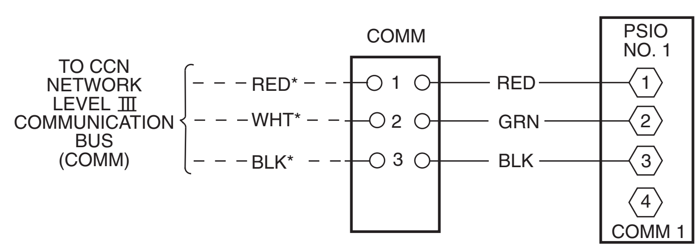


Fig. 32 — Transducer/Thermistor Wiring



*Recommended wire colors for field-supplied cable.

Fig. 33 — CCN ComfortWORKS® Connection

Timed Discrete Output — A timed discrete output is available for switching on and off items such as parking lot lights. Time Schedule II ([1][1] SCHD to [1][8] SCHD) operates this function. A special relay (part no. HK35AB001) with a 20 vdc holding coil must be field wired. See Fig. 27.

Air Pressure Tubing — Before options such as inlet guide vanes (IGV), variable frequency drive (VFD), and/or modulating power exhaust can operate properly, the pneumatic tubing for pressure sensing must be installed. Use fire-retardant plenum tubing (field-supplied). Tubing size is $^1/_4$ in. for all applications. Tubing must be run from the appropriate sensing location (in the duct or in the building space) to the control device location in the unit.

INLET GUIDE VANES — The tubing for the duct pressure (DP) control option should sample supply duct pressure about 2/3 of the way out from the unit in the main trunk duct, at a location where a constant duct pressure is desired.

The duct pressure is sensed by a pressure transducer. The output of the pressure transducer is directed to the unit control module. On all sizes, the DP transducer is located in the unit auxiliary control box. See Fig. 34 and 35. Use a nominal $^1/_4$-in. plastic tubing. Control box details are shown in Fig. 36 and 37.

VARIABLE FREQUENCY DRIVE — The tubing for the duct pressure (DP) control option should sample supply duct pressure about 2/3 of the way out from the unit in the main trunk duct, at a location where a constant duct pressure is desired.

The duct pressure is sensed by a pressure transducer. The pressure transducer output is directed to the unit control module. On all sizes the DP transducer is located in the unit auxiliary control box. See Fig. 34 and 35. Use a nominal $^1/_4$-in. plastic tubing. Control box details are shown in Fig. 36 and 37.

MODULATING POWER EXHAUST AND RETURN/ EXHAUST — The tubing for the building pressure control (achieved via the modulating power exhaust option or high-capacity modulating power exhaust units) should sample building pressure in the area near the entrance lobby (or other appropriate and sensitive location) so that location is controlled as closely to design pressures as possible.

These units use a pressure transducer for sensing building pressure. The BP transducer is located in the unit auxiliary control box. See Fig. 34 and 35. Use a nominal $^1/_4$-in. plastic tubing. Control box details are shown in Fig. 36 and 37.

Space Temperature Sensors

STANDARD SPACE TEMPERATURE SENSOR (T-55) — The T-55 (part no. CEC0121448-01) sensor is a wall-mounted device used to measure space temperature and for unoccupied heating and cooling operation. It should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor). It can also be used to override the occupancy schedule in the unit by pushing the button on the front. Refer to Space Temperature Sensor (T-55) section on page 43 for wiring details.

ACCESSORY SPACE TEMPERATURE SENSOR (T-56) — The T-56 sensor (part no. CEC0121503-01) operates the same as the standard T-55 sensor but has an additional feature of allowing the user to change the set point ± 5º F. The T-56 sensor is applicable to CV applications only. A slide potentiometer is used to provide the space temperature offset and is located on the face of the device. The sensor is a wall-mounted device and should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor). It can also be used to override the occupancy schedule in the unit by pushing the button on the front.

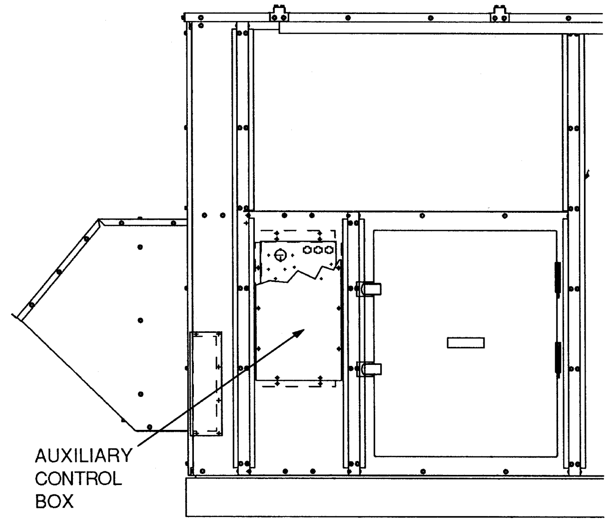


Fig. 34 — Auxiliary Control Box Location; Size 030-050 Units

SPACE TEMPERATURE AVERAGING — Applications that require averaging using multiple space temperature sensors can be satisfied using either 4 or 9 sensors as shown in Fig. 19. Single space temperature reset wiring is discussed in detail in Space Temperature Sensor sections on page 43.

NOTE: Only Carrier T-55 sensors may be used for standard T-55 space temperature averaging. Sensors must be used in multiples of 1, 4 and 9 only, with total sensor wiring not to exceed 1000 ft.

NOTE: Do not use T-56 sensor for space temperature averaging because 5º F offset function will not work in a multiple sensor application.

NOTE: When the T-55 sensor is wired in a 4- or 9-sensor application, the unoccupied schedule Timed Override function button on the sensor will no longer operate.

Humidity Sensors

RELATIVE HUMIDITY (RH) SENSOR (Wall Mounted) — The accessory field-installed, wall-mounted type RH sensor (part no. HL39ZZ001) measures the relative humidity of the air within the occupied space. Use a junction box to accommodate the wiring when sensor is mounted in the occupied space. Sensor must be mounted with terminals ACIN and OUT + located at the top of the sensor. Supply 24 vac to this sensor from an isolated power supply. The control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required for operation.

RELATIVE HUMIDITY (RH) SENSOR (Duct Mounted) — The accessory field-installed, duct-mounted RH sensor (part no. HL39ZZ002) can be installed either in the return-air ductwork or the outdoor-air ductwork. If 2 relative humidity sensors are ordered for differential enthalpy control, then the sensors will be installed in the conditioned space (CV applications) or the return air (VAV applications) and outdoor airstream. If the sensor is to be used for control of a humidifier, install the sensor in the return-air duct. Supply 24 vac to this sensor from an isolated power supply. The control options module (available as a factory-installed option or field-installed accessory on size 030-070 units and is standard on 075-105 units) is required for operation.

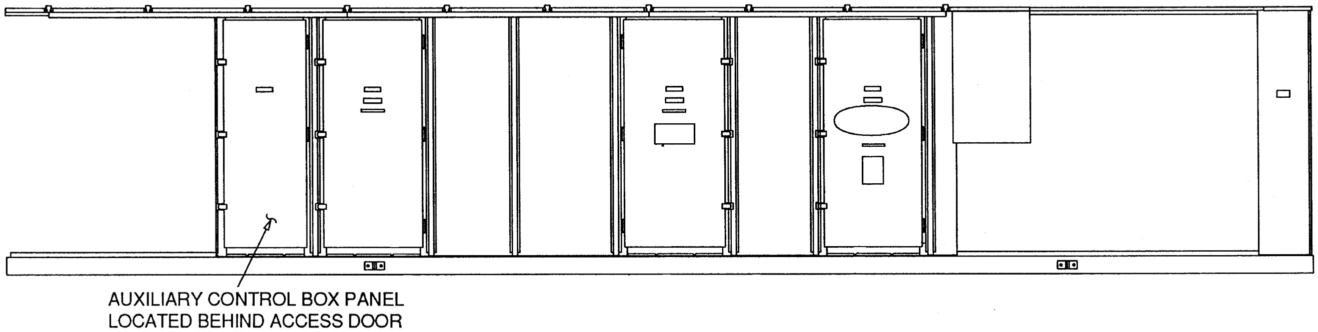


Fig. 35 — Auxiliary Control Box Location; Size 055-105 Units

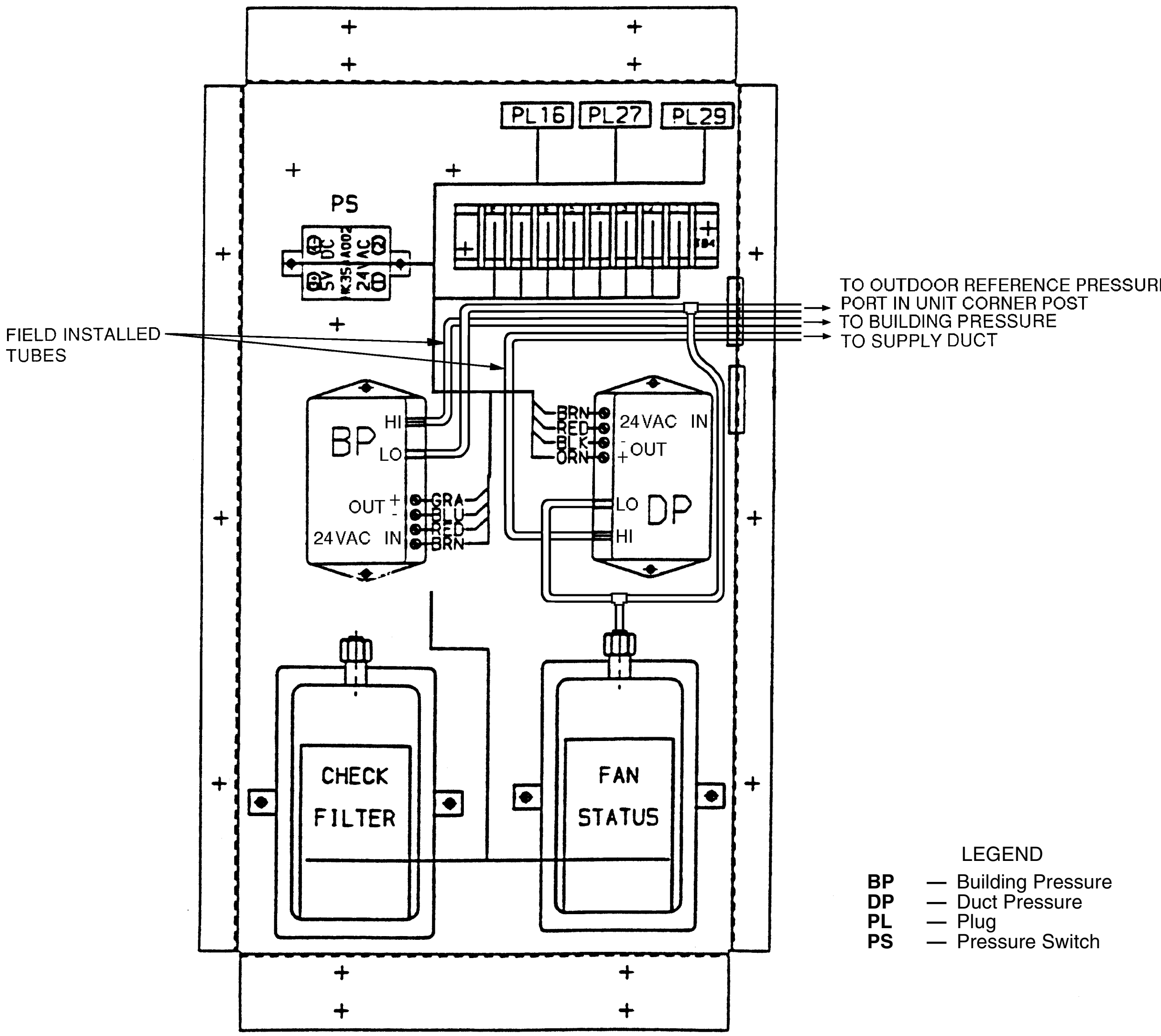
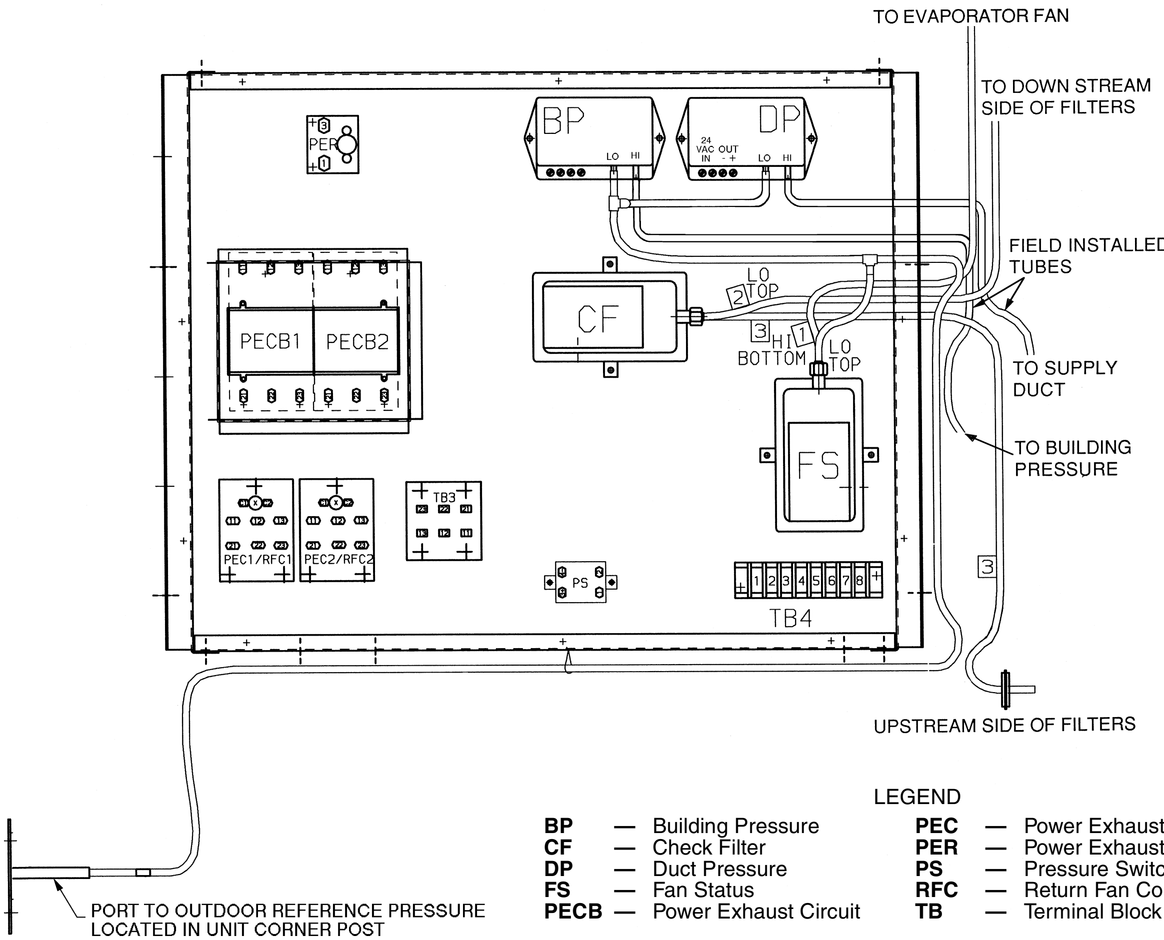


Fig. 36 — Auxiliary Control Box Details; Size 030-050 Units



LEGEND

BP	— Building Pressure	**PEC**	— Power Exhaust Contactor
CF	— Check Filter	**PER**	— Power Exhaust Relay
DP	— Duct Pressure	**PS**	— Pressure Switch
FS	— Fan Status	**RFC**	— Return Fan Contactor
PECB	— Power Exhaust Circuit	**TB**	— Terminal Block

Fig. 37 — Auxiliary Control Box Details; Size 055-105 Units

CARRIER COMFORT NETWORK INTERFACE

The units can be connected to the CCN if desired. The communication bus wiring is supplied and installed in the field. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it, the negative pins must be wired to the negative pins, and the signal pins must be wired to signal ground pins. Wiring connections for CCN should be made at the 4-pin plug (COMM) located at the bottom right side of the fuse bracket in the main control box. Consult CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG 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 Table 62 for cables that meet the requirements.

Table 62 — CCN Connection Approved Shielded Cables

MANUFACTURER	CABLE PART NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

> IMPORTANT: When connecting the CCN communication bus to a system element, use a color coding system for the entire network to simplify installation and checkout.

The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	COMM1 PLUG PIN NO.
+	RED	1
GROUND	WHITE	2
—	BLACK	3

NOTE: If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (1 point per building only). See Fig. 38.

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. (If a different network color scheme is used, substitute appropriate colors.)
3. Remove the 4-pin female plug from the fuse and control circuit breaker bracket in the main control box, and connect the wires as follows:
   a. Insert and secure the red (+) wire to terminal 1 of the 4-pin plug.
   b. Insert and secure the white (ground) wire to terminal 2 of the 4-pin plug.
   c. Insert and secure the black (–) wire to terminal 3 of the 4-pin plug.
4. Insert the plug into the existing 4-pin mating connector on the fuse or control circuit breaker bracket in the main control box.

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

RJ-11 Plug Wiring — Units on the CCN can be monitored from the space at the space temperature sensor through the RJ-11connector, if desired. To wire the RJ-11 connector into the CCN (Fig. 39):

> IMPORTANT: The cable selected for the RJ-11 connector wiring MUST be identical to the CCN communication bus wire used for the entire network. Refer to Table 62 for acceptable wiring.

1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to pin J2 of the space temperature sensor terminal block (TB1).
3. Insert and secure the white (ground) wire to pin J3 of the space temperature sensor TB1.
4. Insert and secure the black (–) wire to pin J5 of the space temperature sensor TB1.
5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus at the COMM1 plug located on the fuse and control circuit breaker bracket in the unit main control box.

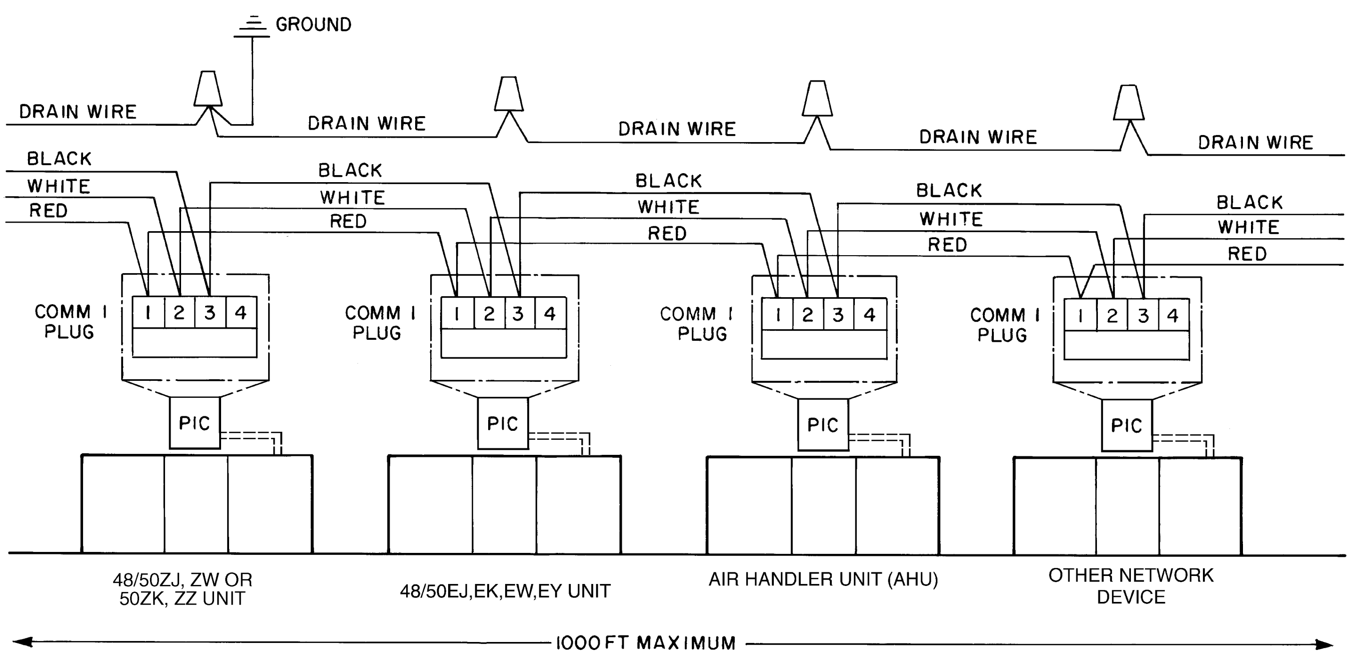
Monitor and/or Control from Non-CCN Building Management System — Carrier offers three additional means for accessing the unit control system for purposes of remotely monitoring and/or controlling the unit from a non-Carrier (not a CCN) building management system. These are:

- DataPort: Monitor (read-only) using ASCII data stream conversion
- DataLink: Monitor and control (read/write) using ASCII data stream conversion
- BAClink: Monitor and control (read/write) using BACnet protocol

DATAPORT™ AND DATALINK™ — DataPort and DataLINK are interface devices that permit a non-Carrier device to read and change (DataLINK only) values in CCN system elements (such as units with PIC controls), either to individual units or to multiple units connected to a CCN communication bus. Types of off-network (non-CCN) devices that can be connected to a DataPort or DataLINK device are: personal computers (running a user application or terminal emulation program), dumb terminals, and HVAC control systems (proprietary building management or energy management systems).

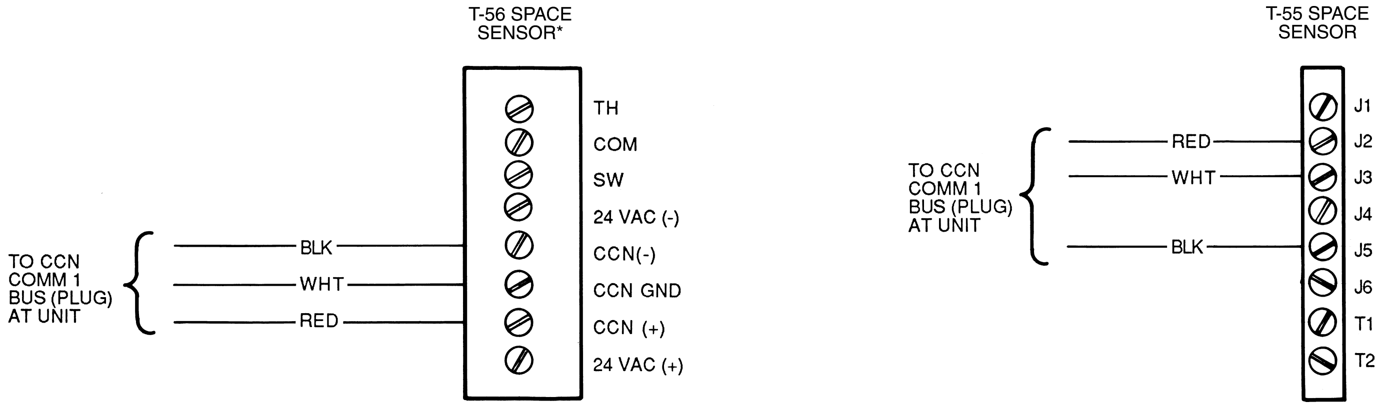
The DataPort and DataLINK devices request data from the PIC control in the unit, translate the data into ASCII characters, and output the characters off-network. When a DataLINK device is used, data from the off-network device is also sent to the PIC control or CCN communication bus through the DataLINK device.

The DataPort and DataLINK devices allow the user to read values in the unit control's Display, Occupancy and Set Point tables and CCN variables in up to 15 system elements. DataLINK device allows the user to modify the values of certain data points in the Occupancy and Set Point tables and CCN variables.



LEGEND
PIC — Product Integrated Control

Fig. 38 — CCN Communication Wiring



LEGEND

CCN — Carrier Comfort Network
COM — Common
COMM — Communications
GND — Ground
SW — Switch
T — Terminal
TH — Thermostat, Heating

*Constant volume applications only.

Fig. 39 — Space Sensor to Communication Bus Wiring

Appendix C contains a list of all available points that are accessible via DataPort™ and DataLINK™ devices.

BACLINK — The BACnet is a data communication protocol for building management and control networks which establishes industry-wide standards for the computer exchange of unit and system data and information.

BAClink is the interface between Carrier's CCN and a BACnet Local Area Network (LAN). BAClink responds to requests for data and receives and processes commands and data from a BACnet device. BAClink allows user to access CCN status and unit Set Point and Occupancy tables data. BAClink will also pass selected alarm, alert and return-to-normal messages from selected CCN controllers to the BACnet network.

BAClink conforms to the ASHRAE Class 3 BACnet standard (ANSI/ASHRAE Standard 135-1995) and supports the following BACnet standard application services:

- Read and write properties to supported objects
- Device management services
- Alarm messaging via confirmed message services
- Device re-initialization
- Time synchronization

BAClink supports the following BACnet object types:

- Analog In, Analog Out, Analog Value
- Binary In, Binary Out, Binary Value
- Device Object, Schedule Object
- Multi-State Input, Multi-State Output
- Calendar Object
- Notification Class Object

Appendix D contains the points of information available to the BACnet network through the BAClink. This table can be edited into the protocol implementation conformance statement required by the BACnet administrator on the job.

START-UP

Initial Check

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

1. Verify unit has been installed per the Installation Instructions included in the unit installation packet.
2. Verify that all auxiliary components (thermostats, sensors, controls, etc.) have been installed and wired to the unit control boxes per these instructions, the unit Installation Instructions, and the unit wiring label diagrams.
3. Verify that air pressure hoses (static, duct, etc.) are properly attached, routed, and free from pinches or crimps that may affect proper control operation.
4. Set any control configurations that are required (field-installed accessories, etc.). The unit is factory configured for all appropriate factory-installed options with the applicable controls, pre-programmed to the default values. See Adjusting Set Points section on page 56 for configuration values.
5. Enter unit set points. The unit is shipped with the set point default values shown in Adjusting Set Points section on page 56. If a different set point is required, change per the example shown under Set Point Function section on page 56.
6. Configure schedule subfunctions: occupied, unoccupied, and holiday periods. See Program Time Sequences section on page 61 for details on setting periods.
7. Verify that control time periods programmed meet current requirements.
8. Check all electrical connections to be sure they are tight.
9. Perform quick test (see Quick Test section on page 103).

Set Fan Status and Check Filter Switches

SUPPLY FAN STATUS SWITCH (FS) — A snap-acting single-pole, double-throw (SPDT) differential pressure switch is factory mounted in the unit auxiliary control box. The switch senses the change in pressure across the supply-air fan and provides the fan status. A length of fire-retardant control (plenum) tubing connects the switch to the probe located in the fan discharge plenum.

The switch must be set prior to unit operation. To set the switch, turn the adjustment screw on top (center) of switch clockwise to increase set point, or counterclockwise to decrease set point. The set point switch range is 0.05 to 2.0 in. wg with a deadband of 0.02 in. wg at minimum set point and 0.1 in. wg at maximum set point.

Set switch so that contact makes to Normally Closed when supply-air fan is energized. Adjust switch with VFD at slow speed on VAV units. If IGVs are used, adjust switch with IGVs closed. The switch should make (fan on) within 1 minute after supply-air fan is energized and break (fan off) within 1 minute after the fan is deenergized.

CHECK FILTER SWITCH (CFS) — A snap acting SPDT switch is factory mounted in the unit auxiliary control box. The switch senses the differential pressure and provides the microprocessor module with a signal for filter status. Two lengths of plenum tubing connect the switch to probes located both upstream and downstream of the unit filters.

The switch must be set prior to unit operation. To set the switch, turn the adjustment screw on top (center) of switch slowly clockwise to find the “pivot” point where the filter status still reads clean under [8] [STAT] in the HSIO display.

Check the switch operation with the supply-air fan running, the VFD at slow speed (if applicable), and nominal cfm delivery. If IGVs are used, adjust switch with IGVs closed. See Table 63 for clean filter pressure drops for help in locating the “pivot” point. Once this point is found, turn the screw clockwise to obtain the set point at which the filter status will be dirty. Use Table 63 as a guide.

Table 63 — Filter Switch Set Point

FILTER TYPE	INCREASED PRESSURE DROP TO “DIRTY” FROM PIVOT POINT	APPROXIMATE CLOCKWISE TURNS
2-in. Throwaway	0.30 in. wg	2
2-in. Pleated	0.75 in. wg	5
Bag With Pre-Filters	0.75 in. wg	5

Auxiliary Switch, Power Exhaust (48/50ZJ Units Only) —

All units with the modulating power exhaust option have 2 auxiliary switches mounted on the cams inside the power exhaust damper motor. The switch cam is factory set to energize the second power exhaust motor. A pointer is printed on the red cam and the numbers 35 and 63 are both printed on the blue cam. See Fig. 40.

If the damper motor has been replaced or improper operation is suspected, perform the following test before attempting to adjust the switch cams:

1. Put the unit into the standby mode.
2. a. For size 030-050 units: Remove damper motor top cover and verify that pointer points at number 35. If installing new motor, use screwdriver to turn blue cam so pointer lines up with the number 35. See Fig. 41.

   b. For size 055-105 units: Remove damper motor top cover and verify that pointer points at number 63. If installing new motor, use screwdriver to turn blue cam so that pointer lines up with the number 63. See Fig. 41.
3. Enter quick test function ([2] [TEST ALRM]) and press [▼] until you reach the PERD display.
4. Press the [ENTER] key once and wait 30 seconds. Was power exhaust motor no. 2 energized? Yes/No
5. Press the [ENTER] key again and wait 30 seconds. Was power exhaust motor no. 2 energized? Yes/No
6. Press the [ENTER] key again and wait 30 seconds. Was power exhaust motor no. 2 deenergized? Yes/No
7. Press the [ENTER] key again and wait 30 seconds. Was power exhaust motor no. 2 deenergized? Yes/No
8. Exit the quick test. See Quick Test section on page 103 for details.
9. Proceed with evaluation below.

If the answers in Step 5 and Step 7 above were both yes, the switch cams are properly adjusted. If the answers to either Step 4 or Step 6 above were yes, the switch cams need adjustment. To adjust auxiliary switch cams:

1. Remove damper motor top cover.

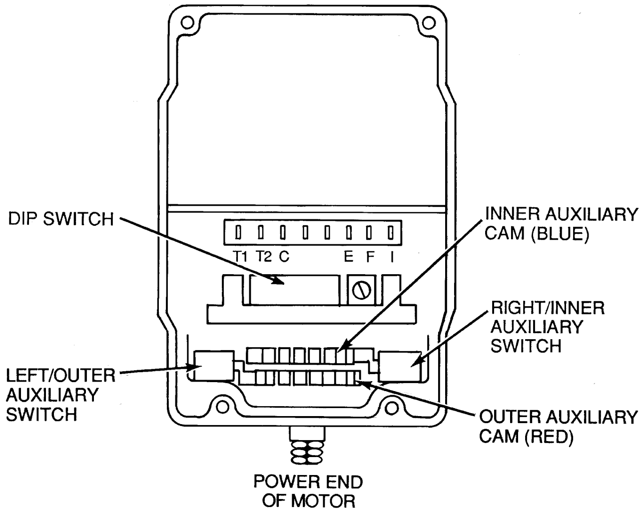


Fig. 40 — Auxiliary Switch Stroke Adjustment

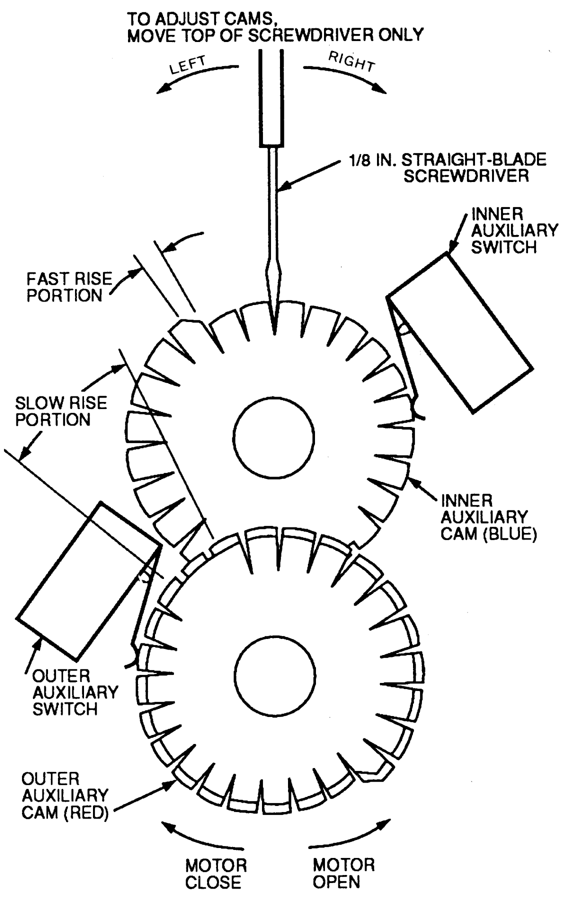


Fig. 41 — Auxiliary Switch Adjustment

2. Use 1/8-in. straight blade screwdriver to make adjustments.

⚠ CAUTION

Do not turn motor shaft by hand or with wrench. Damage to the gear train will result.

3. Adjustments should be made to the blue cam only. The pointer on the red cam should remain centered and at the top, as this will deenergize motor no. 2 properly.
4. Each click of the blue cam changes the switch setting by approximately 3 degrees of travel.
5. If motor no. 2 was energized too soon (Step 4 of the test above was yes), turn blue cam one click to left (see Fig. 41). If motor no. 2 was not energized (Steps 4 and 5 of the test above were no), turn blue cam one click to the right (see Fig. 41).
6. Repeat the quick test.
7. Repeat Steps 5 and 6 as necessary until proper operation is observed.
8. Replace damper motor top cover.

Adjusting Set Points

SET POINT FUNCTION — The Set Point function allows the user to view the current values set for the unit. From this function, the user can change the values. See Table 64.

Reading and Changing Set Points — To change the set point of a particular feature, enter the appropriate subfunction and scroll to the variable desired. Once the desired variable has been reached, type in the new value and press [ENTER]. The new value will appear in the display.

For example, the occupied cool set point is currently set at the default value of 78 F. To change the occupied set point to 72 F:

1. Press [1] [SET] [▼] [▼] to enter the occupied cool set point function. The display will read OCSP 78.
2. Press [7] [2] [ENTER] and the display will read OCSP 72.

Set points can be changed by the user provided that the values are within the allowable range for the input. If the input is not within the allowable range, the original value will remain displayed. See Tables 65A and 65B for allowable ranges and default values.

To change the demand limit set points, the functions must first be enabled in the field configuration subfunction. (See Table 66 for more details on operation modes.)

[1] [SET] (Set point) — The system set point subfunction displays the occupied and unoccupied heat and cool set points, as well as the static pressure, supply air, and humidity set points.

[2] [SET] (Loadshed set point) — This subfunction displays the loadshed set point (in percent of unit capacity).

The demand limit/loadshed feature is activated by a redline alert and loadshed commands from the CCN loadshed option. Before any set points can be changed for demand limit, the user must first log into the system. Refer to example below for details on how to log in.

To disable demand limit:

1. Press [6] [SRVC] for the user configuration.
2. Press [▼] to scroll down until the display reads DLEN.
3. Press [·] [ENTER] to disable the demand limit option. The display now reads DLEN DSB.

To use demand limit, first enable the demand limit option (see example below), and then enter the loadshed set point.

NOTE: The demand limit function must be enabled in order to function and may be turned off when its operation is not desired.

In the following example, demand limit will be enabled, and the loadshed set point will be set at 60% of available capacity.

1. Press [1] [SRVC] .
2. Press [1] [1] [1] [1] [ENTER] . (This is the login command.)
3. Press [6] [SRVC]. The display will read USER CONFIGURATION.
4. Press [▼] to scroll down until the display reads DLEN DSB.
5. Press [1] [ENTER] to change the demand limit selection. This will change the display to DLEN ENB; enabling loadshed control.
6. Press [2] [SET] to change to the demand limit set point (LSP) function.
7. Press [▼] once to change the display to LSP 50 (the default value).
8. Press [6] [0] [ENTER] , and the display will change to LSP 60. The unit will reduce capacity to 60% when the loadshed command is in effect.

[3] [SET] (Time) — The current time is displayed once the subfunction has been accessed. Press the [▼] key to scroll to the next display which will be the day of week and time. The day of the week is entered as a number:

1 = Monday
2 = Tuesday
3 = Wednesday
4 = Thursday
5 = Friday
6 = Saturday
7 = Sunday

Time is entered in military time format using a 24-hour clock (9:00 PM = 21:00), with [·] used as a colon.

Press [▼] to scroll to the next display (the current date in month, date, and year format). The month is also entered as a number: 1 = January, 2 = February...12 = December.

In the following example, the day, time, and date will be set. Assume the current date is May 12, 2000, the day is Friday, and the time is 4:45 p.m.

1. Press [3] [SET] to enter the day, date, and time subfunction. The display will read TIME.
2. Press [▼] to scroll down until the current day of the week and time programmed into the processor is displayed.
3. Press [5] [·] [1] [6] [·] [4] [5] [ENTER] for Friday at 4:45 p.m. The display should read, FRI 16.45.
4. Press [▼] to scroll down until the current date programmed into the processor is displayed.
5. Press [0] [5] [·] [1] [2] [·] [0] [0] for May 12, 2000. The display should read MAY 12 00.

[4] [SET] (Daylight savings time) — This subfunction reads and displays daylight savings time.

The month, the day of week, and the time of the day are entered as explained in [3] [SET] above. Refer to Table 67.

[5] [SET] (Holiday periods) — The holiday configuration can set up to 18 Holiday periods for one calendar year. When the calendar year changes, the holidays must be reconfigured for the new year.

> IMPORTANT: Because each new year has different holiday and daylight savings time dates, the holiday and daylight savings time periods must be reprogrammed each year.

Table 64 — Set Point Directory

SET POINT			
Subfunction	**Keypad Entry**	**Display**	**Comment**
1 SET POINTS	1 SET	SET POINT	System set points
	▼	OHSP X	Occupied heat set point X
	▼	OCSP X	Occupied cool set point X
	▼	UHSP X	Unoccupied heat set point X
	▼	UCSP X	Unoccupied cool set point X
	▼	SPSP X	Static pressure set point X
	▼	SASP X	Supply air set point X
	▼	HUSP X	Humidity set point X
2 DEMAND SETPOINTS	2 SET	DEMAND	Demand limit set points
	▼	LSP X	Loadshed set point X
3 DATE AND TIME	3 SET	TIME	Current time
	▼	dow.hh.mm	Day of Week and Time
	▼	mm.dd.yy	Month, Day and Year
4 DAYLIGHT SAVINGS TIME	4 SET	DAYLIGHT	Daylight savings time
	▼	ENM X	Daylight enter month X
	▼	END X	Daylight enter day X
	▼	ENT hh.mm	Daylight enter time X
	▼	LVM X	Daylight leave month X
	▼	LVD X	Daylight leave day X
	▼	LVT hh.mm	Daylight leave time X
5 HOLIDAY TIMES	5 SET	HOLIDAY	Holiday configuration
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
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	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long
	▼	mm.dd.dur	Holiday mm.dd.dur days long

LEGEND

dd — Day
dur — Duration
mm — Month

Table 65A — Set Point Ranges and Defaults (English Units)

DISPLAY	SET POINT DESCRIPTION	DEFAULT VALUE	ALLOWABLE RANGE
BPSP	Building pressure set point	0.05 in. wg	0 to .50 in. wg
ECSO*	Economizer set point offset	3 F	1 to 10 F
HHL†	High humidity override (percent)	99%	0 to 100%
HTMP	High temperature minimum position	35%	0 to 100%
HUSP	Humidity set point (percent)**	40%	0 to 100%
IAQS†	IAQ set point	650 ppm	0 to 5000 ppm
LIMT†	Reset limit (F)	10 F	0 to 20 F
LSP	Loadshed set point (percent)	50%	0 to 100%
LTMP	Low temperature minimum position	10%	0 to 100%
MDP†	Minimum damper position (percent)	20%	0 to 100%
NTLO†	NTFC lockout temperature (F)	50 F	40 to 70 F
OACS† (OCS††)	Outdoor-air cfm set point	1 cfm	0 to 50,000 cfm
OCSP	Occupied cool set point (F)**	78 F	55 to 80 F
OHSP	Occupied heat set point (F)**	68 F	55 to 80 F
PES1† (PES††)	Power exhaust on-set point 1 (percent)	90%	30 to 100%
PES2†	Power exhaust on-set point 2 (percent)	90%	30 to 100%
RTIO†	Reset ratio	3	0 to 10
SASP	Supply air set point (F)	55 F	45 to 70 F
SPSP	Static pressure set point***	1.5 in. wg	0 to 5.0 in. wg
UCDB*	Unoccupied cooling deadband	1 F	0 to 10 F
UCSP	Unoccupied cool set point (F)**	90 F	75 to 95 F
UHDB*	Unoccupied heating deadband	1 F	0 to 10 F
UHSP	Unoccupied heat set point (F)**	55 F	40 to 80 F

LEGEND

IAQ — Indoor-Air Quality
NFTC — Nighttime Free Cooling
ppm — Parts Per Million
VAV — Variable Air Volume

*These items are found under the Service function, and can only be accessed using either the ComfortWORKS® software or Service Tool.

†These items are found under the Service function.
**Occupied space.
††Sizes 090,105 only.
***Supply duct.

NOTE: For VAV applications, the OHSP provides the morning warm-up set point.

Table 65B — Set Point Ranges and Defaults (SI Units)

DISPLAY	SET POINT DESCRIPTION	DEFAULT VALUE	ALLOWABLE RANGE
BPSP	Building pressure set point	12.44 Pa	0 to 125 Pa
ECSO*	Economizer set point offset	1.7 C	0.6 to 5.6 C
HHL†	High humidity override (percent)	99%	0 to 100%
HTMP	High temperature minimum position	35%	0 to 100%
HUSP	Humidity set point (percent)**	40%	0 to 100%
IAQS†	IAQ set point	650 ppm	0 to 5000 ppm
LIMT†	Reset limit (F)	5.6 C	0 to 11.1 C
LSP	Loadshed set point (percent)	50%	0 to 100%
LTMP	Low temperature minimum position	10%	0 to 100%
MDP†	Minimum damper position (percent)	20%	0 to 100%
NTLO†	NTFC lockout temperature (F)	10.0 C	4.4 to 21.0 C
OACS† (OCS††)	Outdoor-air cfm set point	1 cfm	0 to 50,000 cfm***
OCSP	Occupied cool set point (F)**	25.6 C	13 to 27 C
OHSP	Occupied heat set point (F)**	20 C	13 to 27 C
PES1† (PES††)	Power exhaust on-set point 1 (percent)	90%	30 to 100%
PES2†	Power exhaust on-set point 2 (percent)	90%	30 to 100%
RTIO†	Reset ratio	3	0 to 10
SASP	Supply air set point (F)	12.8 C	7.2 to 21 C
SPSP	Static pressure set point†††	373 Pa	0 to 1246 Pa
UCDB*	Unoccupied cooling deadband	0.6 C	0 to 5.6 C
UCSP	Unoccupied cool set point (F)**	32.2 C	24 to 35 C
UHDB*	Unoccupied heating deadband	0.6 C	0 to 5.6 C
UHSP	Unoccupied heat set point (F)**	12.8 C	4.4 to 27 C

LEGEND

IAQ — Indoor-Air Quality
NFTC — Nighttime Free Cooling
ppm — Parts Per Million
VAV — Variable Air Volume

*These items are found under the Service function, and can only be accessed using either the ComfortWORKS software or Service Tool.

†These items are found under the Service function.
**Occupied space.
††Sizes 090,105 only.
***HSIO display reads in units of CFM. Service tool will read in units of cubic meters/minute; default is 0.03 m^3/m with range of 0 to 1416 m^3/m.
†††Supply duct.

NOTE: For VAV applications, the OHSP provides the morning warm-up set point.

Table 66 — Operating Modes

MODE NO.	OPERATING MODE	TO CONFIGURE OPTION		TO ENABLE MODE	
		Press	Display	Press*	Display
21	Space Temperature Reset	[1] [4] [SRVC]	SPCRESET	[6] [SRVC]	RSEN ENB
22	Demand Limit	[1] [5] [SRVC]	LOADSHED	[6] [SRVC]	DLEN ENB
23	Unoccupied Heating	[7] [SRVC]	HEATCOIL (MODULATING)	—	—
		[1] [1] [SRVC]	HEAT (STAGED)		
24	Unoccupied Cooling	[8] [SRVC]	COOLING	—	—
		[1] [0] [SRVC]	ECONMIZR		
25	Standby	—	—	[1] [1] [STAT]	STBY YES
26	Optimal Start	[1] [3] [SRVC]	AOSS	[6] [SRVC]	OSEN ENB
27	Unoccupied	[2] [SCHD]	PERIOD 1	—	—
28	IAQ Purge	[1] [6] [SRVC]	IAQ	[6] [SRVC]	PURG ENB
29	Optimal Stop	[1] [3] [SRVC]	AOSS	[6] [SRVC]	OSEN DSB
30	Occupied Heating	[7] [SRVC]	HEATCOIL (MODULATING)	[6] [SRVC]	OHEN ENB
		[1] [1] [SRVC]	HEAT (STAGED)		
31	Occupied Cooling	[8] [SRVC]	COOLING	—	—
32	Occupied Fan Only	[2] [SCHD]	PERIOD 1	—	—
33	Nighttime Free Cooling	[1] [2] [SRVC]	NTFC	[6] [SRVC]	NTEN ENB
34	Pressurization	See Table 42 for details.			
35	Evacuation				
36	Smoke Purge				
37	Fire Shutdown				
38	Timed Override	From: HSIO or Building Supervisor		[1] [SCHD]	OVRD XHR
		From: T-55 or T-56		[6] [SRVC]	TSCH v TOVR v
39	DAV Control	—	—	—	—
40	Factory/Field Test	[1] through [6] TEST	—	—	INPUTS through EXIT
41	High Humidity Override	[8] [SRVC] [▼] [▼]	HHL X	[6] [SRVC]	HUSN X
42†	IAQ/OAC Control	[1] [6] [SRVC]	IAQ/OAC CONTROL	[6] [SRVC]	VENT X

LEGEND

— — Not Applicable
DSB — Disabled
ENB — Enable

*Press [▼] until desired display appears once you have accessed the correct function.
†Mode 42 is displayed only on sizes 090 and 105. For sizes 030-075, configuration and enabling instructions are the same as 090 and 105 sizes.

Table 67 — Setting Daylight Savings Time

KEYBOARD ENTRY	DISPLAY	COMMENTS
4 SET	DAYLIGHT	Daylight savings time field configuration of set point function
▼	ENM X	Month when daylight savings time begins
4 ENTER	ENM 4	Daylight savings time configured to start month 4 (April)
▼	END X	Day of month when daylight savings time begins
2 ENTER	END 2	Daylight savings time configured to start on the 2nd of the month
▼	ENT X	Time of day when daylight savings time begins
2 . 0 0 ENTER	ENT 2.00	Daylight savings time configured to start at 2:00 a.m.on the 2nd of April
▼	LVM X	Month when daylight savings time ends
1 0 ENTER	LVM 10	Daylight savings time configured to end month 10 (October)
▼	LVD X	Day of month when daylight savings time ends
2 9 ENTER	LVD 29	Daylight savings time configured to end on the 29th of October
▼	LVT X	Time of day when daylight savings time ends
2 . 0 0 ENTER	LVT 2.00	Daylight savings time configured to end at 2:00 a.m. on October 29

Program Time Sequences

SCHEDULE FUNCTION — Two schedules are provided with the unit controls. Schedule I provides a means to automatically switch the unit from an Occupied mode to an Unoccupied mode. Schedule II provides a means to automatically change the optional discrete output (such as outdoor building or parking lot lights) from occupied to unoccupied mode. See Table 68.

Each schedule consists of from 1 to 8 occupied time periods set by the operator. These time periods can be flagged to be in effect or not in effect on each day of the week.

1. To flag a day for operation on that schedule, press 1 ENTER.
2. To change a flag to NO, press . ENTER.

The day begins at 00.00 and ends at 24.00. The unit is in Unoccupied mode unless a scheduled time period is in effect or an override period is in effect.

> IMPORTANT: If an Occupied mode is to extend past midnight, it must be programmed in the following manner: occupied period must end at 24.00 hours (midnight), and a new occupied period must be programmed to begin at 00.00 hours.

1 SCHD (Override) — The time schedule can be overridden to keep the unit in the occupied mode for between 1 and 4 hours on a one-time basis.

To override the unoccupied schedule, press 1 SCHD and the display will read OVRD OHR. Press the number of hours of override desired followed by ENTERr example, for 3 hours of override, press 3 ENTER ; changing the display to OVRD 3HR.

NOTE: Only whole numbers can be used.

To cancel the override, press . ENTER and the display will change back to the default display (OVRD OHR).

2 SCHD through 9 SCHD (Occupied and Unoccupied schedules) — In this subfunction, the occupied and unoccupied times and days are scheduled.

In the following example, the building occupancy is on a set point schedule. There are 5 periods of time that must be programmed.

1. Period 1 is a 3-hour off-peak cool-down period from midnight to 3:00 a.m. following the weekend shutdown.
2. Period 2 is scheduled for Monday and Tuesday from 7:00 a.m. to 6:00 p.m.
3. Period 3 is scheduled for Wednesday, 7:00 a.m. to 9:30 p.m.
4. Period 4 is scheduled for Thursday and Friday from 7:00 a.m. to 5:00 p.m.
5. Period 5 is scheduled for Saturday from 7:00 a.m. to 12:00 p.m.

To program this schedule:

NOTE: This is an example of a schedule. Each application will require its own schedule that should be determined by the building load.

To Program Period 1:

1. Press 2 SCHD to enter the period 1 subfunction. The display will read PERIOD 1.
2. Press ▼ to scroll down to OCC (occupied time).
3. Press 0 0 0 0 ENTER for midnight.
4. Press ▼ to scroll down to UNO (unoccupied time).
5. Press 3 . 0 0 ENTER for 3:00 a.m.
   Next are the flags for each day.
6. Press ▼ to move to MON (Monday). Suppose that the display reads MON NO. To change the flag so that this period will be in effect, press 1 ENTER , and the display will change from MON NO to MON YES.

7. Scroll through the rest of the days (press [▼]) to be sure that no other days have been flagged. Suppose, for this example, Tuesday was flagged for this period. To change this period from YES to NO, press [·][ENTER], and the display will change to TUE NO.

To Program Period 2:

1. Press [3][SCHD] to enter the period 2 subfunction. The display will read PERIOD 2.
2. Press [▼] to scroll down to OCC.
3. Press [7][·][0][0][ENTER] for 7:00 a.m.
4. Press [▼] to scroll down to UNO.
5. Press [1][8][·][0][0][ENTER] for 6:00 p.m. Next are the flags for each day.
6. Press [▼] to move to MON. Suppose that the display reads MON NO. To change the flag so that this period will be in effect, press [1][ENTER] , and the display will change to MON YES.
7. Scroll through the rest of the days to flag Tuesday for this schedule and be sure that no other days have been flagged.

To Program Period 3:

1. Press [4][SCHD] to enter the period 3 subfunction. The display will read PERIOD 3.
2. Press [▼] to scroll down to OCC.
3. Press [7][·][0][0][ENTER] for 7:00 a.m.
4. Press [▼] to scroll down to UNO.
5. Press [2][1][·][3][0][ENTER] for 9:30 p.m. Next are the flags for each day.
6. Press [▼] to move to MON. Suppose the display reads MON YES. To change the flag so that this period will not be in effect, press [1][ENTER] , and the display will change to MON NO. Do the same for Tuesday. Scroll through the rest of the days to flag Wednesday for this schedule and be sure that no other days have been flagged.

To Program Periods 4 and 5: These can be programmed in the same manner as above, flagging Thursday and Friday yes for period 4 and Saturday yes for period 5.

To Program Periods 6, 7, and 8: Since these schedules are not used in this example, they should be programmed for OCC 00.00 and UNO 00.00.

NOTE: When a day is flagged yes for 2 overlapping periods, occupied time will take precedence over the unoccupied time. Occupied times can overlap in the schedule with no consequence.

The same scheduling procedures can be used to set Discrete Timeclock Control schedule II. Subfunction [1][0][SCHD] provides the override for schedule II. Subfunctions [1][1][SCHD] through [1][8][SCHD] define schedule of Discrete Timeclock Control (schedule II).

NOTE: If the unit is connected to a DAV system, the unit time schedule is ignored. The time schedule should still be entered into the unit in case communications are lost with the network.

Start Unit

1. Put the ON/OFF switch in the ON position. Close the control circuit breaker (CCB), which will energize the control circuit and the crankcase heaters.
2. Using the HSIO keypad or CCN ComfortWORKS® software, verify that no alarms have been detected.
3. Ensure that quick test has been performed to make sure controls are operating properly. Refer to Quick Test section on page 103 for instructions on quick test.
4. Using the HSIO keypad, put unit into the run mode:
   a. Press [1][1][STAT] .
   b. Press [▼] .
   c. Press [CLEAR]. This will put unit in "RUN" mode.

Press [3][STAT] and the unit changes status from mode 25 (standby) to mode 32 (occupied) or mode 27 (unoccupied), depending on the programmed time schedule. When the unit receives a call for cooling or heating (either from the internal control or the CCN Network command), the unit will initiate activity to meet the respective set point value.

Operating Sequences

SUPPLY FAN

VAV Units — During Occupied periods, the control will energize the supply fan contactor. The contactor will close, energizing supply fan motor. Fan wheel will turn. Airflow Switch (differential pressure switch) contacts close, providing discrete input (DI) to Channel 12 (Closed = Fan ON). Fan operation will continue through the Occupied period.

During Unoccupied period with demand, the control will energize fan contactor when demand is sensed. After fan status is confirmed, operating routines will start. When demand is removed, routines will end and fan will shut off.

CV Units, Continuous Fan — During Occupied periods, the control will energize the supply fan contactor. The contactor will close, energizing supply fan motor. Fan wheel will turn. Airflow Switch (differential pressure switch) contacts close, providing discrete input (DI) to Channel 12 (Closed = Fan ON). Fan operation will continue through the Occupied period.

During Unoccupied period with demand, the control will energize fan contactor when demand is sensed. After fan status is confirmed, operating routines will start. When demand is removed, routines will end and fan will shut off.

CV Units, Automatic Fan — Fan will be turned OFF during Occupied period when there is no demand for heating or cooling operation. When demand is sensed, control will energize fan contactor and initiate cooling cycle. Fan status will be confirmed. When demand is removed, routines will terminate and fan will be shut off.

Table 68 — Schedule Directory

SCHEDULE			
Subfunction	**Keypad Entry**	**Display**	**Comments**
1 OVERRIDE	[1][SCHD]	OVRD xHR	Number of Override Hours (0 to 4 Hours); Schedule I
2 PERIOD 1	[2][SCHD]	PERIOD 1	Period 1; Time Schedule I
	▼	OCC HH.MM	Occupied Time
	▼	UNO HH.MM	Unoccupied Time
	▼	MON X	Monday Flag
	▼	TUE X	Tuesday Flag
	▼	WED X	Wednesday Flag
	▼	THU X	Thursday Flag
	▼	FRI X	Friday Flag
	▼	SAT X	Saturday Flag
	▼	SUN X	Sunday Flag
	▼	HOL X	Holiday Flag
3 PERIOD 2	[3][SCHD]	PERIOD 2	Period 2; Time Schedule I Same as Period 1 Subfunction
4 PERIOD 3	[4][SCHD]	PERIOD 3	Period 3; Time Schedule I Same as Period 1 Subfunction
5 PERIOD 4	[5][SCHD]	PERIOD 4	Period 4; Time Schedule I Same as Period 1 Subfunction
6 PERIOD 5	[6][SCHD]	PERIOD 5	Period 5; Time Schedule I Same as Period 1 Subfunction
7 PERIOD 6	[7][SCHD]	PERIOD 6	Period 6; Time Schedule I Same as Period 1 Subfunction
8 PERIOD 7	[8][SCHD]	PERIOD 7	Period 7; Time Schedule I Same as Period 1 Subfunction
9 PERIOD 8	[9][SCHD]	PERIOD 8	Period 8; Time Schedule I Same as Period 1 Subfunction
10 OVERRIDE	[1][0][SCHD]	OVRD XHR	Number of Override Hours (0 to 4 Hours); Schedule II
11 through 18 PERIOD 1 through PERIOD 8	[1][1][SCHD] — [1][8][SCHD]	PERIOD 1 — PERIOD 8	Period 1 through Period 8; Time Schedule II Configure same as Period 1 subfunction, Time Schedule 1

ECONOMIZER — The economizer control loop will be delayed 2 minutes after the supply fan is turned ON, to allow system and temperatures to stabilize before starting control. When coming out of STANDBY or Heating mode, a 4-minute delay will occur before the economizer damper is controlled. During this delay, damper position is limited to CLOSED or MINIMUM position (depending on current unit occupancy status).

If fan status is OFF, the outdoor air dampers will remain closed (return air dampers will be open). If fan status is ON, the outdoor air dampers will normally be at minimum damper position.

Economizer operation is permitted if the system is not in Heating mode, if outdoor air enthalpy (via switch or humidity differential) is acceptable, and if outdoor-air temperature is less than space temperature

If economizer operation is permitted, the economizer control loop checks for Cooling System operation. If ON, the outdoor air dampers will be driven to maximum position.

If cooling is not on, for VAV units, the economizer will modulate to satisfy the supply air set point.

If cooling is not on, for CV units, the economizer will modulate to satisfy the space temperature set point.

If Economizer operation is not permitted, the outdoor air dampers will be driven to minimum position (during Occupied period) or closed (during Unoccupied period).

For VAV units, Economizer operation is not permitted when Occupied Heating is enabled and the Return Air Temperature is LESS THAN (OHSP + 1° F).

COOLING (All Units) — The controls try to control the supply-air temperature (SAT) to the value specified by the supply-air temperature set point by cycling the compressors and the unloader(s). Both the supply- and return-air temperature sensors are used to adjust the cycling deadband to match the actual load. The control system provides cooling capacity control of cooling stages to maintain supply-air temperature (VAV) or space temperature (CV) to an occupied or unoccupied set point. Automatic lead-lag circuit switching occurs (if configured) to equalize run times per circuit for increased total service life. The compressor to start first is changed every time stage equals zero.

NOTE: Automatic lead/lag should be disabled if optional hot gas bypass (HGBP) is employed because the unit only contains hot gas bypass on one circuit.

The VAV control system sequence uses the modified supply-air set point (MSAT = modified supply-air set point + reset value) as the supply-air temperature required to satisfy conditions (submaster reference value [CSSR]) and outputs this value to the submaster loop.

The submaster loop uses the modified supply-air set point compared to the actual supply-air temperature to determine the required number of capacity stages to satisfy the load. The logic for determining when to add or subtract a stage is a time-based integration of the deviation from the set point plus the rate of change of the supply-air temperature.

The CV control system sequence reads the space sensor and performs a calculation to determine the supply-air temperature required (a cooling coil submaster reference [CCSR] value) to satisfy conditions and outputs this value to the submaster loop.

OCCUPIED COOLING

General — Economizer cycle must not be usable or outside air damper position must be open to 90% or higher.

VAV Units — Supply fan must be ON for cooling control to operate. Sequence is as follows:

1. Unit must not be in heating mode.
2. Master Loop will survey occupancy status, Supply-Air Set Point (SASP), and any Supply Air Temperature Reset command, then issue Cooling Coil Submaster Reference (CCSR) to Cooling Submaster Loop (CSL).
3. The CSL surveys actual SAT, then calculates number of capacity stages required to produce the CCSR leaving the unit.
4. Stages of cooling capacity are initiated. From zero stages, there will be a 1.5 to 3 minute delay before the first stage is initiated. The time delay between stages in increasing demand is 90 seconds.
5. As actual SAT approaches CCSR value, stages are released. The minimum time delay between stages on decreasing demand is 90 seconds.

NOTE: Demand for heating has priority and Master Loop will either terminate existing or prevent initiation of Cooling Cycle by issuing a CCSR at the maximum limit. This will cause the CSL to select zero stages of cooling capacity, initiating a stoppage of an existing cooling cycle.

CV Units — Supply fan must be ON for cooling control to operate. Sequence is as follows:

1. Master Loop will survey space temperature and space temperature offset inputs, then calculate CCSR value.
2. The CSL surveys actual SAT, then calculates number of capacity stages required to satisfy space load.
3. Stages of cooling capacity are initiated. (From zero stages, there will be a 1.5 to 3 minute delay before first stage is initiated.)

UNOCCUPIED COOLING — The unoccupied cooling sequence of operation is similar to Occupied Cooling (see above) except for the following:

1. Supply Fan will be OFF as demand is initiated.
2. The Master Loop will start Supply Fan and cooling cycle. Fan status must be proved as ON within 2 minutes to continue with cooling operation.
3. Control set point will be Unoccupied Cooling Set Point (UCSP).
4. At end of cooling cycle, Supply Fan will be turned OFF.

RETURN/EXHAUST FAN (48ZL AND 50ZL,ZM UNITS) — The return/exhaust fan power exhaust assembly consists of one belt-drive plenum fan. The fan, motor and drive are located over the return air opening of the unit, in a plenum beneath the outside air intake plenum. The plenum fan pressurizes the plenum section so that the air can either be discharged horizontally out the back of the unit through motorized exhaust damper with hood, and/or discharged through the return air section of the economizer.

The return/exhaust fan is equipped with a variable frequency drive (RE VFD), matched to the motor size. The VFD output is determined by the VFD's internal PID logic in response to the actual space pressure as monitored by the Mixing Box Pressure Transducer (MBPT). Set point for MBPT control is established at the PE VFD (factory set up). Mixing box pressure is sensed by a pick-up located in the filter section and connected to the transducer by ¼-in. tubing (factory installed).

The return/exhaust fan will be turn on/off simultaneously with the supply fan, and the fan speed will modulate automatically to meet the return/exhaust air volume needs.

Operation of the return/exhaust fan is controlled by the MBPT through the RE VFD. The MBPT will maintain the plenum fan to run at certain speed in order to keep the mixing box pressure set point. When the power exhaust damper is closed, all return air will be discharged through the economizer into the mixing box. The set point is a slightly negative pressure in the mixing box so that certain amount of outside air can brought in. During the situation when the supply fan speed is increased, or when economizer opens, the MBPT will command the RE VFD to increase the return/exhaust fan speed in order to maintain the set point. When the power exhaust is open, the return air will be discharged partially through the power exhaust damper to the outside and returned partially through the economizer. The return/exhaust fan usually will increase speed during the situation when the power exhaust damper is open.

OVERRIDES

First Stage and Slow Change Override — The first stage override reduces cycling on the first stage of capacity, and the slow change override prevents the addition or subtraction of another stage of capacity if the SAT is close to the set point and gradually moving towards the set point.

Low Temperature Override — This override function protects against rapid load decreases by removing a stage every 30 seconds when required based on temperature and the temperature rate of change.

High Temperature Override — This override function protects against rapid load increases by adding a stage once every 60 seconds as required, based on temperature and temperature rate of change.

ADAPTIVE OPTIMAL START — Optimal start is used to heat up or cool down the space prior to occupancy. The purpose is to have the space temperature approach and then achieve the occupied set point by the time of occupancy. The control utilizes outdoor-air temperature, space temperature, occupied set point, and a "K" factor. The "K" factor is expressed in minutes per degree, and calculates a start time offset, which is the time in minutes that the system shall be started in advance of the occupied time. The control monitors its results and adjusts the "K" factor to ensure that the occupied set point is achieved at time of occupancy rather than too early or too late.

ADAPTIVE OPTIMAL STOP (CV Applications Only) — Optimal stop is used to allow space temperature to drift to an expanded occupied set point during the last portion of an occupied period. The control calculates a stop time offset, (the time in minutes prior to the scheduled unoccupied time) during which expanded heating and cooling set points can be used. Adaptive optimal stop utilizes space temperature, an expanded occupied set point, and a "K" factor to calculate stop time offset. The amount (F) to expand the occupied set point is user configurable. Like adaptive optimal start, the control corrects itself for optimal operation by adjusting the "K" factor as required.

HEATING

NOTE: The heating algorithms on the units will only run when the supply-air (evaporator) fan is on. Two-stage factory-installed gas heat is standard on the 48ZJ,ZL,ZW units.

When the unit is in the Heating mode, room terminals must be fully open. The room terminals should be controlled by the heat interlock relay (HIR) function on VAV applications.

NOTE: HIR not applicable on units using DAV applications.

During heating, the economizer dampers will be at the minimum damper position during Occupied Heating mode, and will be fully closed during unoccupied heating.

Occupied VAV Operation — Heating is primarily used for morning warm-up or occupied space heating with the heater being staged to maintain desired return-air temperature. If the unit is in morning warm-up, the return-air temperature is read and compared to the occupied heating set point. The unit controls will compare the calculated supply-air temperature set point to the actual supply-air temperature to compute the number of stages required to satisfy the conditions. Once morning warm-up is completed and the unit is in Occupied mode, heat will not be activated again unless the Occupied Heating mode has been selected.

Occupied CV Operation — The heater is staged to prevent the occupied space temperature from falling below the desired set point. The control reads the space temperature and computes the supply-air temperature necessary to heat the space to the heating set point. The unit controls will compare the calculated supply-air temperature set point to the actual supply-air temperature to compute the number of stages required to satisfy the conditions.

Morning Warm-Up (VAV Only) — Morning warm-up occurs when the adaptive optimal start (AOS) algorithms start the unit before the occupied start time, and the unit has a heating demand. The morning warm-up control uses the occupied heating set point for controlling heat stages. Once the return air reaches the set point, heating will be shut off.

When the heating demand is satisfied, the warm-up condition will terminate. The unit may reenter morning warm-up if there is another call for heat before the start of the occupied period. Morning warm-up can continue into the occupied period as long as there is a need for heat, even if occupied heating is not enabled.

NOTE: The economizer dampers will be fully closed during morning warm-up, except when morning warm-up continues into the occupied period. If morning warm-up continues into the occupied period, the dampers will open to the minimum position to provide ventilation air.

Room terminals must go to the fully open position when the unit enters the heating mode. The terminals should be controlled by the HIR function. When the unit goes into heating mode, the HIR contacts are energized which open the room terminals.

NOTES:

1. Morning warm-up is initiated before the unit schedule designated occupied time. Unit must have a valid occupancy schedule program or be connected to the network or DAV with occupancy schedules.
2. HIR is not applicable on units using DAV applications.

Economizer Minimum Position — The control has the capability of maintaining the minimum economizer position based on 3 inputs. The 3 inputs are minimum position, outdoor-air cfm, and IAQ set points. The 6 SRVC VENT function is used to configure the control for the minimum position of the economizer.

Indoor-Air Quality (IAQ) — The unit may be configured to control the occupied space indoor-air quality by maintaining a constant cfm of outdoor air and/or an allowable level of undesirable gases or vapors (CO_2, CO, formaldehyde, etc.) with installation of appropriate sensors and/or accessories. The economizer dampers will modulate to maintain the user-defined set points.

An alert will be generated after 10 minutes if the air quality level has not been reduced below the set point.

The indoor air quality feature has 3 priority levels as follows (Refer to Indoor Air Quality [IAQ] and Outdoor Air Control [OAC] sections on pages 25 and 27 for more details):

Priority Level 1 — This is the highest level of priority for indoor air quality. When the IAQ set point is exceeded, the IAQ algorithms adjust the economizer damper position to purge the controlled space of CO_2 or other contaminants.

Priority Level 2 — This is a medium level priority and provides for some occupied space comfort overrides. The IAQ algorithms adjust the economizer damper position to purge the controlled space of CO_2 or other contaminants. However, the following comfort overrides may take precedence:

- space temperature
- supply-air temperature (VAV)
- space humidity

Priority Level 3 — This is the lowest priority level. When the IAQ set point is exceeded, an alert is generated. Alert can be viewed at the HSIO and is broadcast on the CCN network (if applicable), but no other action is taken.

NOTE: Consult the latest updated issue of ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Standard 62 when determining required set points for indoor air quality (ASHRAE 62, Ventilation for Acceptable Indoor-Air Quality section).

Staged Gas Control Heating (Units with Optional Staged Gas Only) — The Staged Gas Control option adds the capability to control the gas heating system to a specified Supply Air Temperature Set Point for purposes of tempering a cool mixed-air condition. The gas heating systems employ multiple heating sections. Each section is equipped with a two-stage gas valve. The gas valves are sequenced by a factory-installed staged gas controller (SGC) as required to maintain the user-specified Supply Air Set Point. Up to nine stages of heating control are available, based on quantity and heating capacity sizes of the individual heat exchanger sections provided in the base unit. In addition to providing system control for tempering heat operation, the SGC also controls Demand Heat sequences for both First-Stage (W1) and Second-Stage (W2 or full-fire) operation.

Tempering of supply air is desirable when rooftop units are operating in ventilation mode (economizer only operation) at low outdoor temperatures. At low outdoor temperatures, the mixed-air temperature (combination of return-from-space temperature and outdoor/ventilation air temperature) may become too low for the comfort of the occupants or for the terminal reheat systems. The tempering function adds incremental steps of heat capacity to raise the temperature of the mixed air up to levels suitable for direct admission into the occupied space or to levels consistent with reheat capabilities of the space terminals.

The SGC outputs consist of six relays (K1 through K6) which control the individual gas valves. See Table 69.

OPERATING MODES — The SGC will operate the unit in one of the following operating modes:

- no mode
- Cool Mode
- Heat1 Mode
- Heat2 Mode

No Mode — In this mode, none of the heat stages are turned on. No mode occurs if the Cool, Heat or Fan inputs are off or the Cool input(s) are on.

Tempering (Cool) Mode — In this mode, the SGC tempers in incoming supply air to maintain the cooling supply air set point. Tempering mode occurs if the Fan input is ON or if the dehumidify input is selected, and all Cool and Heat inputs are off.

When the SGC determines that the fan is on and the base unit control is not calling for heat or mechanical cooling, the SGC will stage heat to maintain the cooling set point which is set on the CLSASP potentiometer of the SGC. This set point should be slightly below the supply air set point of the base unit VAV control. Note that the supply-air temperature will still be in the “cooling range”.

Heat1 Mode — In this mode, heat is staged to control supply air temperature to HTSASP. Heat1 mode occurs only if Heat1 is ON and Heat2 is OFF and Cool1 and Cool2 are OFF.

When the base unit control calls for first stage of heat the SGC will stage heat to maintain the heating set point set on the potentiometer of the SGC. The HIR will be energized to command the zone terminals to open to maintain minimum heating airflow.

Heat2 Mode — Heat2 mode would only be used on CV (Constant Volume) and PIC (Product Integrated Controls) applications as they have 2 heat stages on the base unit control. VAV units have only 1 heat stage and will not operate under Heat2 mode.

CONTROL LOGIC OF STAGED GAS UNITS

The following are the general descriptions of the control logic for staged gas units sequences of operation.

1. Set Point Determination — The set point determination task is responsible for assigning the correct set point to the control set point variable SETP.

Inputs:
Set point select (SETPTSEL)
Cool set point #1 (COOLSP1)
Cool set point #2 (COOLSP2)
Heat set point #1 (HEATSP1)
Heat set point #2 (HEATSP2)
Occupancy (OCC)

Outputs:
Set point (SETP)

Process (Algorithm)

In all of the cases below, the heating set point will be assigned in Heat1 mode and the cooling set point will be assigned in Cool mode.

If SETPTSEL=0

Set point adjustment is accomplished via the control potentiometers. Both the heat and cool set points are calculated from these potentiometers.

If SETPTSEL=1

The set points are HEATSP1 and COOLSP1. Adjustment is accomplished via the Navigator or network tool.

If SETPTSEL=2

The set points are HEATSP1, HEATSP2, COOLSP1 and COOLSP2. The selection of set point one or two is based on the state determined by the 7-day occupancy schedules. If state is occupied, then use set point 1. If state is unoccupied use set point 2.

If SETPTSEL=3

The set points are HEATSP1, HEATSP2, COOLSP1 and COOLSP2. The selection of set point one or two is based on the state determined by the CCN time schedules.

2. Capacity Calculation — The heat control loop is a PID design with exceptions, overrides and clamps. Capacity rises and falls based on set point and supply-air temperature.

Inputs:
Control Mode (MODE)
Set point (SETP)
Supply Air Temperature (SAT)
Max Capacity Change per Cycle (CAPMXSTG)
PID rate (HEATPIDR)
Proportional Gain (P_GAIN)
Rate Gain (D_GAIN)
Upper Deadband Temperature (UPPER_DB)
Lower Deadband Temperature (LOWER_DB)
Minimum Rate required in deadband (MINRT_DB) in %

Outputs:

Capacity desired (CAP_CALC) in %

Process (Algorithm)

When the staged gas control is in Heat1 mode or Cool mode (MODE), this algorithm shall calculate the desired heat capacity.

The basic factors that govern the controlling technique are:

1. How fast this algorithm is run (HEATPIDR) (integral effect)
2. The amount of proportional and derivative gain applied (P_GAIN, D_GAIN)
3. The maximum allowed capacity change each time algorithm is run (CAPMXSTG)
4. Deadband hold off range when rate is low (UPPER_DB,LOWER_DB, MINRT_DB)

The routine is run once every “HEATPIDR” seconds. Every time the routine is run, the calculated sum is added to the control output value (CAP_CALC). In this manner, the integral effect is achieved. Every time this algorithm is run, the following calculation performed:
error=SETP-SAT
error_last= error calculated previous time through
P=P_GAIN*(error)
D=D_GAIN*(error-error_last)

P override:

```
If
   error < UPPER_DB AND
   error >LOWER_DB AND
   D< MINRT_DB AND
   D>MINRT_DB
Then
    P=0
End If
```

“P+D” are then clamped. This sum can be no larger or no smaller than CAPMXSTG or CAPMXSTG respectively.

Finally, the desired capacity is calculated:

CAP_CAL=“P+D” +CAP_CAL_old

Table 69 — Staged Gas Control Specifications

HEATING STAGES	% FULL-FIRE	OUTPUT CAPACITY (MBtuh)	OUTPUT CPACITY PER SECTION (MBtuh)			FIRING STAGE			HEATING STAGES	SGC RELAY SEQUENCE					
			Sect 1	Sect 2	Sect 3	Sect 1	Sect 2	Sect 3		K1	K2	K3	K4	K5	K6
48Z030-050 LOW HEAT															
1	75	197.0	197.0	N/A	N/A	LF	N/A	N/A	1	On	Off	N/A	N/A	N/A	N/A
2	100	263.5	263.5	N/A	N/A	HF	N/A	N/A	2	On	On	N/A	N/A	N/A	N/A
48Z030-050 HIGH HEAT															
1	37	197.0	197.0	N/A	N/A	LF	N/A	N/A	1	On	Off	Off	Off	N/A	N/A
2	50	263.5	263.5	N/A	N/A	HF	N/A	N/A	2	On	On	Off	Off	N/A	N/A
3	75	394.0	197.0	197.0	N/A	LF	LF	N/A	3	On	Off	On	Off	N/A	N/A
4	87	460.5	263.5	197.0	N/A	HF	LF	N/A	4	On	On	On	Off	N/A	N/A
5	100	527.0	263.5	263.5	N/A	HF	HF	N/A	5	On	On	On	On	N/A	N/A
48Z055-070 LOW HEAT															
1	37	197.0	197.0	N/A	N/A	LF	N/A	N/A	1	On	Off	Off	Off	N/A	N/A
2	50	263.5	263.5	N/A	N/A	HF	N/A	N/A	2	On	On	Off	Off	N/A	N/A
3	75	394.0	197.0	197.0	N/A	LF	LF	N/A	3	On	Off	On	Off	N/A	N/A
4	87	460.5	263.5	197.0	N/A	HF	LF	N/A	4	On	On	On	Off	N/A	N/A
5	100	527.0	263.5	263.5	N/A	HF	HF	N/A	5	On	On	On	On	N/A	N/A
48Z055-070 HIGH HEAT															
1	25	197.0	197.0	N/A	N/A	LF	N/A	N/A	1	On	Off	Off	Off	Off	Off
2	33	263.5	263.5	N/A	N/A	HF	N/A	N/A	2	On	On	Off	Off	Off	Off
3	50	394.0	197.0	197.0	N/A	LF	LF	N/A	3	On	Off	On	Off	Off	Off
4	58	460.5	263.5	197.0	N/A	HF	LF	N/A	4	On	On	On	Off	Off	Off
5	67	527.0	263.5	263.5	N/A	HF	HF	N/A	5	On	On	On	On	Off	Off
6	75	591.0	197.0	197.0	197.0	LF	LF	LF	6	On	Off	On	Off	On	Off
7	83	657.5	197.0	263.5	197.0	LF	HF	LF	7	On	Off	On	On	On	Off
8	92	724.0	263.5	263.5	197.0	HF	HF	LF	8	On	On	On	On	On	Off
9	100	790.5	263.5	263.5	263.5	HF	HF	HF	9	On	On	On	On	On	On
48Z075-105 LOW HEAT															
1	37	197.0	197.0	N/A	N/A	LF	N/A	N/A	1	On	Off	Off	Off	N/A	N/A
2	50	263.5	263.5	N/A	N/A	HF	N/A	N/A	2	On	On	Off	Off	N/A	N/A
3	75	394.0	197.0	197.0	N/A	LF	LF	N/A	3	On	Off	On	Off	N/A	N/A
4	87	460.5	263.5	197.0	N/A	HF	LF	N/A	4	On	On	On	Off	N/A	N/A
5	100	527.0	263.5	263.5	N/A	HF	HF	N/A	5	On	On	On	On	N/A	N/A
48Z075-105 HIGH HEAT															
1	25	197.0	197.0	N/A	N/A	LF	N/A	N/A	1	On	Off	Off	Off	Off	Off
2	33	263.5	263.5	N/A	N/A	HF	N/A	N/A	2	On	On	Off	Off	Off	Off
3	50	394.0	197.0	197.0	N/A	LF	LF	N/A	3	On	Off	On	Off	Off	Off
4	58	460.5	263.5	197.0	N/A	HF	LF	N/A	4	On	On	On	Off	Off	Off
5	67	527.0	263.5	263.5	N/A	HF	HF	N/A	5	On	On	On	On	Off	Off
6	75	591.0	197.0	197.0	197.0	LF	LF	LF	6	On	Off	On	Off	On	Off
7	83	657.5	197.0	263.5	197.0	LF	HF	LF	7	On	Off	On	On	On	Off
8	92	724.0	263.5	263.5	197.0	HF	HF	LF	8	On	On	On	On	On	Off
9	100	790.5	263.5	263.5	263.5	HF	HF	HF	9	On	On	On	On	On	On

LEGEND

HF — High Fire
LF — Low Fire

3. Staging — Different rooftop units will "heat stage" differently based on the amount of heating capacity included. See Table 69. These "staging patterns" are known and are selected based on the model numbers. The selection of a set of staging patterns is controlled via the heat stage type configuration parameter (HTSTGTYP). As the heating capacity desired (CAP_CALC) rises and falls based on demand, the gas control will stage the heat relay patterns up and down, respectively.

Inputs:
Capacity desired (CAP_CALC) in %
Heating Stage Type (HTSTGTYP)
Maximum Heating Stages (HTMAXSTG)

Outputs:
Heat Stage (HT_STAGE)
Capacity generated by selected heat stage pattern (CAPACITY)
Heat Relay Outputs (HEATOUT1, HEATOUT2, HEATOUT3, HEATOUT4, HEATOUT5, HEATOUT6)

Process (Algorithm)

As the staged gas control's desired capacity rises, it is continually checked against the capacity of the next staging pattern. When the desired capacity is greater than or equal to the capacity of the next staging pattern, the next heat stage is selected. (HT_STAGE=HT_STAGE+1). Similarly, as the capacity of the control drops, the desired capacity is continually checked against the next lower stage. When the desired capacity is less than or equal to the next lower staging pattern, the next lower heat stage pattern is selected (HT_ STAGE=HT_STAGE-1).

The heat stage selected (HT_STAGE) is clamped between 0 and the maximum number of stages possible for the chosen set of staging patterns (HTMAXSTG).

4. Limit Switch Temperature Monitoring — VAV applications in the tempering mode can experience low airflow and as a result it is possible for the radiant heat of the gas units to trip the installed limit switch, thereby shutting off all gas stages. At certain times when the unit is in heat1 mode, the application can experience low airflow. Therefore Limit Switch Temperature Monitoring will be ON during Heat1 mode as well as tempering mode. In order to accomplish consistent heating in a tempering mode and Heat1 mode, a thermistor (LIMTTEMP) is placed next to the limit switch and monitored for overheating.

Inputs:
Supply-Air Temperature (SAT)
Supply-Air Temperature above supply air control point configuration (LIMT_SAT)
Limit Switch (LIMTTEMP)
Limit Switch Trip Point Temperature Configuration (LIMHIHT)
Limit Switch Return to Normal Operation Temperature (LIMTLOHT)

Outputs:
Desired heating Capacity (CAP_CALC)
Limiting Mode Active Flag (LIMTMODE)
SAT Limiting Mode Active Flag (SATCMODE)
Capacity Clamping Mode Active Flag (CAPMODE)
Internal heat staging timer (heat_staging_timer)

Process (Algorithm)

In order to control a tempering application where the limit switch temperature has risen above either the upper or lower configuration parameters (LIMTLOHT, LIMTHIHT), the staged gas control will respond to clamp or drop all gas stages.

If LIMTTEMP rises above LIMTLOHT or

If (SAT-SAT the last time through the capacity calculation) is greater than 0.06 °F per second, the capacity routine will not add stages and turn on the CAPMODE.

If LIMTTEMP rises above LIMTHIHT, the capacity routine will be run immediately and drop all heat stages and turn on the LIMTMODE.

If LIMTTEMP falls below LIMLOHT, CAPMODE and LIMTMODE will be turned OFF with one exception. If (SAT-SAT the last time through the capacity calculation) is greater than 0.06 ˚F per second, CAPMODE will stay ON.

If LIMTMODE is ON and ten LIMTTEMP fell below LIMTLOHT, and SAT is not rising quickly, which is unlikely, the capacity calculation routine will be run immediately and allow a full stage to come back on if desired the first time through upon recovery. This shall effectively override the “max capacity stage” clamp.

In addition to the above checks, it is also possible at low CFM for the supply air temperature to rise and fall radically between capacity calculations, thereby exacerbating the limit switch temperature. In the case where supply air temperature (SAT) rises above the control point (SETP)+ the cutoff point (LIMT_SAT) the capacity calculation routine will be run immediately and drop a stage of heat. Thereafter, every time the capacity calculation routine runs, provided the SATCMODE will be ON, a stage will dropped each time through. Falling back below the cutoff point will turn off the SATCMODE.

Head Pressure Control — The microprocessor controls the condenser fans to maintain the lowest condensing temperature and the highest operating efficiency possible. The condenser fan stages are configured to react to either saturated condensing temperatures (SCT) or refrigerant pressure sensors, or can be controlled by the lead compressor.

Unit sizes 030,035 have 2 stages of fan control. The stage 2 fan contactor OFC1 will cycle in response to the higher SCT of the 2 circuits. Unit sizes 040-075 have 3 fan stages. Fan contactors OFC1 and OFC2 will respond to their associated circuit SCT. Unit sizes 090 and 105 have 4 fan stages with individual circuit stage control.

A low ambient head pressure control option is also included standard on all units as an additional feature to allow fan cycling on the first stage. The first stage of head pressure control is cycled in the same manner as the Motormaster® II control. See Tables 70A and 70B.

Sizes 030-075: The highest SCT is used to control the condenser (outdoor) fan motor(s) (OFM) controlled by the head pressure control relay (MMR). See Table 71 for fan control points. If either stage 2 contactor (OFC1 or OFC2) is energized in addition to MMR, then MMR will be locked in the energized mode.

Sizes 090 and 105: The SCT is used to control the condenser (outdoor) fan motor(s) (OFM) controlled by the head pressure control relay (MMR) for each circuit. See Table 71 for fan control points. If outdoor fan is energized in addition to Motormaster® control, then Motormaster control will be locked in the energized mode.

All Sizes: The 2 other stages of head pressure control are controlled by the SCT on standard units, or the SCT and suction transducers on units equipped with suction pressure transducers and suction sensors. Table 71 shows the fan configurations and lists the on and off points for OFC1 and OFC2 (OFCA and OFCB on sizes 090 and 105).

Table 71 also describes the fan sequence of operation and defines the particular fans controlled by stage.

Table 70A — Head Pressure/Fan Cycling Control (030-075 Sizes)

CONTROL LOGIC

UNIT CONFIGURATION	STAGE	OFM ON	OFM OFF
STANDARD (with standard SCT sensors) (MMAS = Yes) (TRNS = No)	1	SCT > (HPSP – 15 F)	SCT < (HPSP – 37 F) for 90 secs AND Stage 2 motors OFF
	2	SCT > HPSP (start delayed 60 secs after start of compressor, unless SCT > 143 F)	SCT < (HPSP – 35 F) for 120 secs
With Accessory Sensors (Pressure Transducers) (MMAS = Yes) (TRNS = Yes)	1	SCT > 138 F	SCT < (HPSP – 37 F) for 90 secs AND Stage 2 motors OFF
	2	SCT > HPSP (start delayed 60 secs after start of compressor, unless SCT > 143 F)	SCT < (HPSP – 35 F) for 120 secs
Motormaster Control Disabled (MMAS = No)	1	On with compressor	Off with compressor
	2	SCT > HPSP	SCT < (HPSP – 35 F) for 120 secs

CONTROL OUTPUTS

UNIT SIZES	FAN STAGE/CIRCUIT NO.	DEVICE/CHANNEL	RELAY	CONTACTOR
030,035	Stage 1/Common	PSIO-1/13	MM	MMC
	Stage 2/Common	DSIO-1/29	—	OFC1
040,050	Stage 1/Common	PSIO-1/13	MM	MMC
	Stage 2/Circuit 1	DSIO-2/29	—	OFC1
	Stage 2/Circuit 2	DSIO-2/30	—	OFC2
055-075	Stage 1/Common	PSIO-1/13	MM	MMC1, MMC2
	Stage 2/Circuit 1	DSIO-2/29	—	OFC1
	Stage 2/Circuit 2	DSIO-2/30	—	OFC2

LEGEND

DSIO — Discrete Sensor Input/Output Module
HPSP — Head Pressure Set Point
MM — Motormaster Device
MMC — Motormaster Contactor
OFC — Outdoor-Fan Contactor
PSIO — Processor Sensor Input/Output Module
SCT — Saturated Condensing Temperature

Table 70B — Head Pressure/Fan Cycling Control (090 and 105 Sizes)

UNIT CONFIGURATION	MOTOR LOCATION CIRCUIT: MOTOR ID NO.	OFM ON	OFM OFF
Standard (with standard SCT sensors) (MMAS = Yes) (TRNS = No)	First Stage A: 1 B: 2	SCT > (HPSP – 15 F)	SCT < (HPSP – 37 F) for 90 secs AND Second Stage motors OFF
	Second Stage A: 3, 5 B: 4, 6	SCT > HPSP (start delayed 60 secs after start of compressor, unless SCT > 143 F)	SCT < (HPSP – 35 F) for two minutes
With Accessory Sensors (Pressure Transducers and Suction Thermistors) (MMAS = Yes) (TRNS = Yes) (SUSN = Yes)	First Stage A: 1 B: 2	SCT > 138 F	SCT < (HPSP – 37 F) for 90 secs AND Second Stage motors OFF
	Second Stage A: 3, 5 B: 4, 6	SCT > HPSP (start delayed 60 secs after start of compressor, unless SCT > 143 F)	SCT < (HPSP – 35 F) for two minutes AND superheat greater than 30 F for two minutes
Motormaster® Disabled (MMAS = No)	First Stage A: 1 B: 2	On with compressor	Off with compressor
	Second Stage A: 3, 5 B: 4, 6	SCT > HPSP	SCT < (HPSP – 35 F) for two minutes

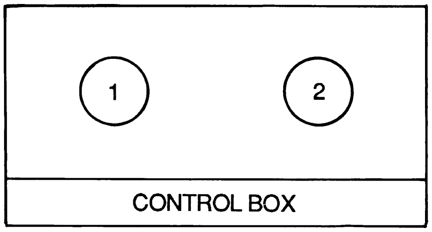
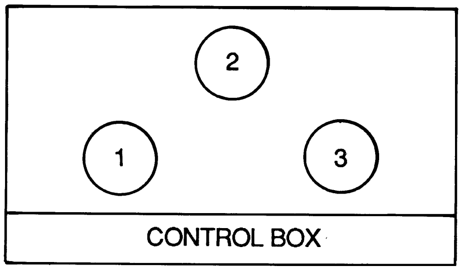
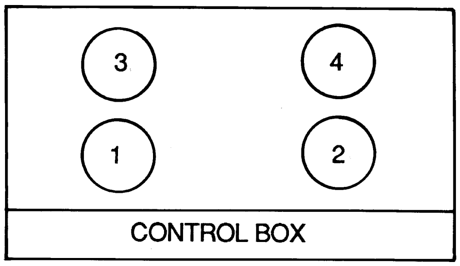
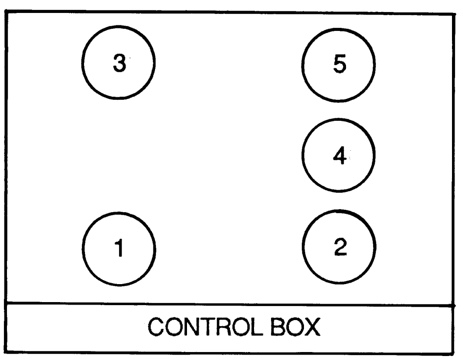
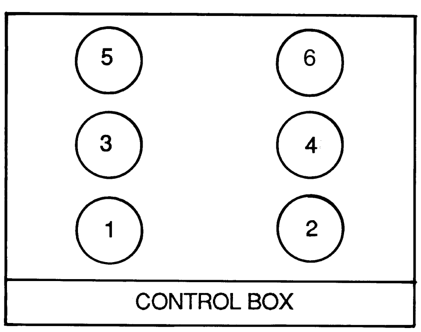
CONTROL OUTPUTS

MOTOR GROUP/CIRCUIT	CHANNEL	RELAY	CONTACTOR
First Stage/A	PSIO2 47	MMR-A	MMC-A
First Stage/B	PSIO2 46	MMR-B	MMC-B
Second Stage/A	DSIO1 29	—	OFC-A
Second Stage/B	DSIO2 30	—	OFC-B

LEGEND

DSIO — Discrete Sensor Input/Output Module
HPSP — Head Pressure Set Point
MMC — Motormaster® Contactor
MMR — Motormaster Relay
OFC — Outdoor-Fan Contactor
PSIO — Processor Sensor Input/Output Module
SCT — Saturated Condensing Temperature

Table 71 — Fan Sequence of Operation

UNIT SIZES	FAN ARRANGEMENT	STAGE	CIRCUIT	FAN RELAY OUTPUT	RELAY CONTROLLED	FAN(S) CONTROLLED
030,035		1	Com	MM	MMC	OFM1
		2	Com	OFC1	—	OFM2
040,050		1	Com	MM	MMC	OFM2
		2	1	OFC1	—	OFM1
			2	OFC2	—	OFM3
055,060		1	Com	MM	MMC1 MMC2	OFM3 OFM4
		2	1	OFC1	—	OFM1
			2	OFC2	—	OFM2
070,075		1	Com	MM	MMC1 MMC2	OFM3 OFM5
		2	1	OFC1	—	OFM1
			2	OFC2	—	OFM2, OFM4
090,105		1	1	MMR-A	MMC-A	OFM5
			2	MMR-B	MMC-B	OFM6
		2	1	OFCA	—	OFM1, OFM3
			2	OFCB	—	OFM2, OFM4

LEGEND

MM — Head Pressure Control Function
MMC — Head Pressure Control Function Contactor
MMR — Head Pressure Control Function Relay
OFC — Outdoor (Condenser) Fan Contactor
OFM — Outdoor (Condenser) Fan Motor
SCT — Saturated Condensing Temperature

NOTE: “Com” indicates that control of this stage is “common” to both circuits. To start this stage, EITHER circuit’s SCT must satisfy the ON criteria; to stop this stage, BOTH circuits’ SCT must satisfy the OFF criteria.

Control Loop Checkout

⚠ CAUTION

The checkout and adjustment of control loops should only be done by certified Carrier Comfort Network (CCN) technicians. The following checkout procedure is offered as a guide and presumes the user has obtained basic knowledge of controls through CCN training.

TO CHECK OPERATION OF ANALOG OUTPUTS — The control algorithms of the unit controls utilize the master/submaster loop concept. The master loop monitors the master sensor (the sensor which tries to maintain the desired set point), and calculates the submaster reference required to do so. The submaster loop monitors the submaster sensor and controls the actual output to the controlled device.

These algorithms require the adjustment of a number of gain values to function properly. The PIC units come with preset default values. However, it may be necessary to adjust several of these values to achieve stabled control. These values are submaster loop gain (SMG), submaster loop center value (SCV), and master loop gain (MLG). In addition, proportional, integral, and derivative multiplier values can be accessed through the Building Supervisor, Service Tool, or ComfortWORKS® software.

To verify or adjust submaster default values, perform the following for each controlled device (control loop):

1. Verify that the system is in the Occupied mode and the supply-air fan is running.
2. Verify that the supply-air fan status indicates ON. If the fan status is OFF, the unit control algorithms will disable all routines.
3. Verify that all forced values have been removed.
4. Table 72 indicates recommended starting values for MLG and SMG. Verify that these values have been entered by checking the service function.
5. Verify/adjust the SMG. If the SMG is too large, the loop will tend to oscillate (hunt). If it is too small, the loop will react too slowly.

   Verify or adjust the SMG as follows:

   Using the HSIO keypad, force the submaster reference of the control loop to a value above or below the actual sensor reading. Verify that the actuator responds correctly. If the actuator drives in the wrong direction, go to the submaster gain (SMG) for the control loop and reverse the sign of the gain.

   For example: If the submaster loop gain is 5.0, change it to –5.0.
6. Observe the operation of the controlled device for a few minutes. If the device oscillates every few seconds around the forced value, then lower the SMG by small amounts until the output steadies. If the output to the device responds to a change in the temperature in small increments, then increase the SMG in small amounts until the output steadies.

   NOTE: Do not be alarmed if the submaster sensor stabilizes at a value greater or less than the forced value. This is called the submaster droop offset and is normal.
7. It is not necessary to adjust the submaster loop center value, as the master loop will adjust the submaster reference as required to satisfy its set point. However, it may be desirable to keep the submaster droop to a minimum. This is most often required for economizer loops.

   If the submaster droop is too large, adjust the SCV as follows:

   If the submaster droop is positive (actual value greater than reference value), the SCV should be decreased for HCV (heating coil) and IGV (supply fan IGV and VFD) loops and increased for CC (cooling control) and ECON (economizer) loops.

Table 72 — SMG, SCV and MLG Recommended Starting Values

FUNCTION/GAIN OR SCV	SERVICE SUBFUNCTION (HSIO)	GAIN VALUE	
		CV Application	VAV Application
Cooling Control			
MLG	8	1.0	1.0
Economizer			
MLG	10	1.0	1.0
SMG	10	–7.5	–7.5
SCV	10	50	50
Duct Pressure (VFD)			
MLG	9	N/A	1.0
SMG	9	N/A	5.0 (030-075), 2.0 (090,105)*
SCV	9	N/A	50 (030-075), 35 (090,105)*
Building Pressure			
MLG	18	1.0	1.0
SMG	18	–5.0	–5.0
SCV	18	50	50
Staged Heat			
MLG†	11	1.0	1.0
SMG†	11	5.0	5.0
Heating Coil			
MLG	7	1.0	1.0
SMG	7	7.5	7.5
SCV	7	50	50
Humidifier			
MLG	17	1.0	1.0
SMG	17	7.5	7.5
SCV	17	50	50

LEGEND

CV — Constant Volume
MLG — Master Loop Gain
SCV — Submaster Center Value
SMG — Submaster Loop Gain
VAV — Variable Air Volume
VFD — Variable Frequency Drive

*Factory setting; differs from replacement control default setting.
†50ZJ,ZL with optional or accessory electric heaters only.

If the submaster droop is negative (actual value less than reference value), the SCV should be increased for HCV and IGV loops and decreased for CC and ECON loops.

8. Once the submaster loop is adjusted, remove all forced values and proceed with verification and adjustment of master loop.
9. To check the master loop:

   Create a demand in the master loop. For example: Force the actual space temperature to a value less than the heating set point or greater than the cooling set point.
10. Observe system (loop) response for 10 to 20 minutes to verify stable control. After 10 minutes, if the output continues to swing from full open to full closed, lower than MLG and observe again.
11. Do this until the loop operation is stable. After 10 minutes, if the loop does not seem to respond (little change in submaster reference), increase the MLG and observe again. Do this until stable operation is achieved.
12. Once satisfied with loop operation, remove all forced values which may have been initiated during this procedure.
13. Repeat Steps 1-12 until all loops have been checked.

NOTE: For better tuning, the CCN ComfortWORKS® software or Service Tool should be used to adjust the proportional and integral terms. Contact your Carrier representative for more details.

UNIT OPERATION

Unit Operation information can be accessed through the HSIO keypad and display (field-installed accessory). See the Keypad and Display Module section on page 13 for information on using the HSIO. The Status Function is provided to allow the user to access unit operation information.

Status Function — This function shows the current status of the alarm and alert codes, operating modes, capacity stages, operating set point, all measured system temperatures and pressures, superheat and saturated condensing temperature values, pressure switch positions, analog inputs, switch inputs, system component status, and unit standby/run (disable/enable) capability. See Table 73.

[1] [STAT] (Alarms) — Alarms are signals sent by the processor that one or more faults have been detected. Each fault is assigned a code number which is reported as an alarm code. Refer to Alarms and Alerts section on page 83 for specific alarm information. These codes indicate a failure that causes the unit to shut down, terminate an option, or results in the use of a default value as a set point.

To view all current alarms, press [1] [STAT] to enter the alarm displays and then press [▼] to move to the individual alarm displays. Press [EXPN/EDIT] after a code has been displayed to expand the code into a full definition.

When a diagnostic code is stored in the display and the unit automatically resets, the code is entered into the alarm history. Codes for safeties, which do not automatically reset, are not deleted until the problem is corrected and the machine is switched to standby, and then back to run mode.

[2] [STAT] (Alerts) — There are over 20 input channels of alerts which are compared against their configured alert limits. If any channel is detected outside of these limits, the corresponding alert number will be displayed after pressing [2] [STAT] to determine if any alerts are present. The [▼] will display first alert. Press [EXPN/EDIT] after a code has been displayed to expand the code into a full definition.

Press [1] [9] [SRVC] on the keypad to determine a configured alert limit. Then access the [STAT] subfunction per Table 19 to determine the actual value being monitored. Table 19 also indicates the acceptable high and low limits (both Occupied and Unoccupied modes) for the configured alerts and defines the factory preset default values. The alert will return to normal once the alert channel meets the criteria. The criteria for return to normal is the high limit minus a constant or the low limit plus a constant. See Table 20 for the list of constants. Items having no constant return to normal as soon as the unit returns to the acceptable range (between low and high limits).

Certain analog alerts are only generated when the unit is in the Occupied mode. These alerts are IAQ (Indoor Air Quality), OAC (Outdoor Air Quality), and BP (building pressure). Alerts will not be generated when the controls are in the Unoccupied mode, even if the sensor value is outside the configured limits.

The OAT (outdoor-air temperature) and OARH (outdoor-air relative humidity) analog alerts are monitored at all times and generate alerts whenever the sensor value exceeds the corresponding alert limits.

The SAT (supply-air temperature), SPT (space temperature), RAT (return-air temperature), SP, and RH have alert limits for both the Occupied and Unoccupied modes (see Table 19). A 30-minute delay is used when changing from Unoccupied to Occupied mode for these alerts. If an alert condition exists in the Unoccupied mode, no alert will be generated. If the alert condition still exists 30 minutes after unit enters Occupied mode, an alert will be generated at that time.

[3] [STAT] (Modes) — There are 21 different operating modes available. The operating mode codes are displayed to indicate the operating status of the unit at a given time. To enter the modes subfunction, press [3] [STAT] and use the [▼] to determine if more than 1 mode is in effect. See Table 66 for a list of the modes and mode names.

Refer to the Controls and Functions section on pages 12-43 for a detailed explanation of each mode.

[4] [STAT] (Stages) — This subfunction displays the information about the current stage. A capacity stage number, from 0 to 11 for cooling and 0 to 2 for heating is displayed to indicate the number of active stages. See Tables 74 and 75 for compressor loading sequences. To access the cooling stages function, press [4] [STAT] and press [▼] to display the number of cooling stages in operation (COOL). Press [▼] to display the following:

1. Cooling Percent Capacity (CPC) — Percent of total unit cooling capacity being utilized.
2. Heating Stages (HEAT) — The number of active heating stages.
3. Heating Percent Capacity (HPC) — Percent of total unit heating capacity being utilized.
4. Sum/Z Ratio (SMZ) — Load/unload factor is used to determine when compressors and unloaders will be staged. This factor indicates when the addition or subtraction of a step of capacity will occur.

[5] [STAT] (Set Point) — This subfunction displays the operating set points that are currently in effect, either occupied or unoccupied. To access the control set point function, press [5] [STAT] and press [▼] to display the current control set point.

NOTE: If unit is programmed for CV operation, this will be the cooling submaster reference value for cooling and the heating set point for heating. For units programmed for VAV operation, this will be the MSAS (modified supply-air set point + reset) for cooling and the heating set point for heating.

Press ▼ to display the control temperature. This display is the actual supply-air temperature leaving the unit.

6 STAT (Temperature) — The system temperature subfunction displays the readings at the temperature sensing thermistors. To read a temperature, press 6 STAT, then scroll to the desired temperature reading by pressing ▼ .

7 STAT (Pressure) — The system pressure subfunction displays suction, discharge, low-pressure switch status, building pressure, and static pressure.

8 STAT (Inputs) — This subfunction displays the rest of the system inputs. Press 8 STAT , then press ▼ . The compressor A1 status is displayed with either ON or OFF based on whether the compressor is running or not. Press ▼ to access additional system inputs. Some inputs can be used forced by entering a value to replace the actual value. For example, press ▼ until the ENT display appears. The display will show ENT LOW or ENT HGH, indicating that the enthalpy is good (LOW) or bad (HGH).

Table 73 — Status Directory

STATUS			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press EXPN/EDIT key)**
1 ALARMS	1 STAT	ALARMS	CURRENT ALARMS
	▼	ALARM 51	COMPRESSOR A1 FAULT
	▼	ALARM 52	COMPRESOR A2 FAULT (Sizes 090,105 Only)
	▼	ALARM 53	COMPRESSOR A1 STATUS
	▼	ALARM 55	COMPRESSOR B1 FAULT
	▼	ALARM 56	COMPRESSOR B2 FAULT (Sizes 090,105 Only)
	▼	ALARM 57	COMPRESSOR B1 STATUS
	▼	ALARM 59	THERMISTOR FAILURE SUPPLY AIR
	▼	ALARM 60	THERMISTOR FAILURE RETURN AIR
	▼	ALARM 61	OUTSIDE AIR THERMISTOR FAILURE
	▼	ALARM 62	CIRCUIT A CONDENSER THERMISTOR FAILURE
	▼	ALARM 63	CIRCUIT B CONDENSER THERMISTOR FAILURE
	▼	ALARM 64	COMPRESSOR A1 THERMISTOR FAILURE
	▼	ALARM 65	COMPRESSOR B1 THERMISTOR FAILURE
	▼	ALARM 66	SPACE THERMISTOR FAILURE
	▼	ALARM 67	CIRCUIT A DISCHARGE TRANSDUCER FAILURE
	▼	ALARM 68	CIRCUIT B DISCHARGE TRANSDUCER FAILURE
	▼	ALARM 69	CIRCUIT A SUCTION TRANSDUCER FAILURE
	▼	ALARM 70	CIRCUIT B SUCTION TRANSDUCER FAILURE
	▼	ALARM 71	LOSS OF COMMUNICATION WITH DSIO1
	▼	ALARM 72	LOSS OF COMMUNICATION WITH DSIO2
	▼	ALARM 73	LOSS OF COMMUNICATION WITH OPTION BOARD 1 (PSIO2)
	▼	ALARM 74	LOW PRESSURE CIRCUIT A
	▼	ALARM 75	LOW PRESSURE CIRCUIT B
	▼	ALARM 76	HIGH PRESSURE CIRCUIT A
	▼	ALARM 77	HIGH PRESSURE CIRCUIT B
	▼	ALARM 78	SUPPLY FAN FAILURE
	▼	ALARM 80	LOW CIRCUIT A SATURATED SUCTION TEMP
	▼	ALARM 81	LOW CIRCUIT B SATURATED SUCTION TEMP
	▼	ALARM 82	HIGH CIRCUIT A SUCTION SUPERHEAT
	▼	ALARM 83	HIGH CIRCUIT B SUCTION SUPERHEAT

See legend and notes on page 78.

Table 73 — Status Directory (cont)

STATUS			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press EXPN/EDIT key)**
1 ALARMS (cont)	▼	ALARM 84	LOW CIRCUIT A SUCTION SUPERHEAT
	▼	ALARM 85	LOW CIRCUIT B SUCTION SUPERHEAT
	▼	ALARM 86	ILLEGAL CONFIGURATION (Sizes 030-075 Only)
	▼	ALARM 88	HYDRONIC COIL FREEZE STAT
	▼	ALARM 89	PRESSURIZATION
	▼	ALARM 90	EVACUATION
	▼	ALARM 91	SMOKE PURGE
	▼	ALARM 92	FIRE SHUTDOWN
	▼	ALARM 93	LINKAGE FAILURE
	▼	ALARM 94	BUILDING PRESSURE
	▼	ALARM 95	DUCT STATIC PRESSURE
	▼	ALARM 97	IAQ SET POINT MISCONFIGURED
2 ALERTS	2 STAT	ALERTS	CURRENT ALERTS
	▼	ALERT 150	SUPPLY AIR TEMP LOW LIMIT
	▼	ALERT 151	SUPPLY AIR TEMP HIGH LIMIT
	▼	ALERT 152	RETURN AIR TEMP LOW LIMIT
	▼	ALERT 153	RETURN AIR TEMP HIGH LIMIT
	▼	ALERT 154	OUTSIDE AIR TEMP LOW LIMIT
	▼	ALERT 155	OUTSIDE AIR TEMP HIGH LIMIT
	▼	ALERT 156	SPACE TEMP LOW LIMIT
	▼	ALERT 157	SPACE TEMP HIGH LIMIT
	▼	ALERT 158	STATIC PRESSURE LOW LIMIT
	▼	ALERT 159	STATIC PRESSURE HIGH LIMIT
	▼	ALERT 160	RELATIVE HUMIDITY LOW LIMIT
	▼	ALERT 161	RELATIVE HUMIDITY HIGH LIMIT
	▼	ALERT 162	OUTSIDE AIR RELATIVE HUMIDITY LOW LIMIT
	▼	ALERT 163	OUTSIDE AIR RELATIVE HUMIDITY HIGH LIMIT
	▼	ALERT 164	FILTER STATUS
	▼	ALERT 165	BUILDING PRESSURE LOW LIMIT
	▼	ALERT 166	BUILDING PRESSURE HIGH LIMIT
	▼	ALERT 167	OUTSIDE AIR CFM LOW LIMIT
	▼	ALERT 168	OUTSIDE AIR CFM HIGH LIMIT
	▼	ALERT 169	INDOOR AIR QUALITY LOW LIMIT
	▼	ALERT 170	INDOOR AIR QUALITY HIGH LIMIT
	▼	ALERT 173	RUN HOURS EXCEED SERVICE/MAINT LIMIT
3 MODES	3 STAT	MODES	CURRENT OPERATING MODES
	▼	MODE 21	MODE IS SPACE TEMP RESET
	▼	MODE 22	MODE IS DEMAND LIMIT
	▼	MODE 23	MODE IS UNOCCUPIED HEAT
	▼	MODE 24	MODE IS UNOCCUPIED COOL
	▼	MODE 25	MODE IS STANDBY
	▼	MODE 26	MODE IS OPTIMAL START

Table 73 — Status Directory (cont)

STATUS (cont)			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press EXPN EDIT key)**
3 MODES (cont)	▼	MODE 27	MODE IS UNOCCUPIED
	▼	MODE 28	MODE IS IAQ PURGE
	▼	MODE 29	MODE IS OPTIMAL STOP
	▼	MODE 30	MODE IS OCCUPIED HEAT
	▼	MODE 31	MODE IS OCCUPIED COOL
	▼	MODE 32	MODE IS OCCUPIED
	▼	MODE 33	MODE IS NIGHT TIME FREE COOL
	▼	MODE 34	MODE IS PRESSURIZATION
	▼	MODE 35	MODE IS EVACUATION
	▼	MODE 36	MODE IS SMOKE PURGE
	▼	MODE 37	MODE IS FIRE SHUTDOWN
	▼	MODE 38	MODE IS TIMED OVERRIDE
	▼	MODE 39	MODE IS DAV CONTROL
	▼	MODE 40	MODE IS FACTORY-FIELD TEST
	▼	MODE 41	MODE IS HIGH HUMIDITY OVERRIDE
	▼	MODE 42	MODE IS IAQ/OAC CONTROL (Sizes 090,105 Only)
4 STAGES	4 STAT	STAGES	CURRENT STAGES
	▼	COOL X	COOLING STAGES X
	▼	CPC X	COOLING PERCENT CAPACITY X
	▼	HEAT X	HEATING STAGES X
	▼	HPC X	HEATING PERCENT CAPACITY X
	▼	SMZ X	SUM/Z RATIO X
5 SET POINT	5 STAT	SETPOINT	CURRENT OPERATING SETPOINT
	▼	CLSP X	CONTROL SETPOINT X
	▼	CLTP X	CONTROL TEMP X
6 TEMPERATURE	6 STAT	TEMPS	SYSTEM TEMPERATURES
	▼	SCTA X	CIRCUIT A SATURATED CONDENSING TEMP X
	▼	STA X	CIRCUIT A SUCTION TEMP X
	▼	SSTA X	CIRCUIT A SATURATED SUCTION TEMP X
	▼	SHA X	CIRCUIT A SUCTION SUPERHEAT
	▼	SCTB X	CIRCUIT B SATURATED CONDENSING TEMP X
	▼	STB X	CIRCUIT B SUCTION TEMP X
	▼	SSTB X	CIRCUIT B SATURATED SUCTION TEMP X
	▼	SHB X	CIRCUIT B SUCTION SUPERHEAT
	▼	SAT X	SUPPLY AIR TEMP X
	▼	RAT X	RETURN AIR TEMP X

See legend and notes on page 78.

Table 73 — Status Directory (cont)

STATUS (cont)

Subfunction	Keypad Entry	Display	Expansion (Press EXPN/EDIT key)
6 TEMPERATURE (cont)	▼	SPT X	SPACE TEMP X
	▼	OAT X	OUTSIDE AIR TEMP X
	X ENTER *	OAT X	OUTSIDE AIR TEMP X (–40 F to 245 F)
7 PRESSURE	7 STAT	PRESSURE	SYSTEM PRESSURES
	▼	DPA X	CIRCUIT A DISCHARGE PRESSURE SENSOR X
	▼	SPA X	CIRCUIT A SUCTION PRESSURE SENSOR X
	▼	LPA X	CIRCUIT A LOW PRESSURE SWITCH X
	▼	DPB X	CIRCUIT B DISCHARGE PRESSURE SENSOR X
	▼	SPB X	CIRCUIT B SUCTION PRESSURE SENSOR X
	▼	LPB X	CIRCUIT B LOW PRESSURE SWITCH X
	▼	BP X	BUILDING PRESSURE X
	▼	SP X	STATIC PRESSURE X
8 INPUTS	8 STAT	INPUTS	SYSTEM INPUTS
	▼	CSA1 X	COMPRESSOR A1 STATUS X
	▼	CSB1 X	COMPRESSOR B1 STATUS X
	▼	CFA1 X	COMPRESSOR A1 SAFETY X
	▼	CFB1 X	COMPRESSOR B1 SAFETY X
	▼	CFA2 X	COMPRESSOR A2 SAFETY X (Sizes 090 and 105 Only)
	▼	CFB2 X	COMPRESSOR B2 SAFETY X (Sizes 090 and 105 Only)
	▼	OAC X	OUTSIDE AIR CFM X
	▼	IAQ X	INDOOR AIR QUALITY X
	▼	SFS X	SUPPLY FAN STATUS X
	▼	ENT X	ENTHALPY SWITCH X
	X ENTER *	ENT X	ENTHALPY SWITCH X (0 = High, 1 = Low)
	▼	RH X	RELATIVE HUMIDITY X
	X ENTER *	RH X	RELATIVE HUMIDITY X (0 to 100%)
	▼	FRZ X	FREEZE STAT X
	▼	OARH X	OUTSIDE AIR RELATIVE HUMIDITY X
	X ENTER *	OARH X	OUTSIDE AIR RELATIVE HUMIDITY X (0 to 100%)
	▼	FLTS X	FILTER STATUS X
	X ENTER *	FLTS X	FILTER STATUS X (0 = Clean, 1 = Dirty)
	▼	STO X	SPACE TEMP OFFSET X
	▼	EVAC X	EVACUATION X
	▼	PRES X	PRESSURIZATION X
	▼	PURG X	SMOKE PURGE X
	▼	FSD X	FIRE SHUTDOWN X
9 ANALOG	9 STAT	ANALOG	ANALOG OUTPUTS
	▼	IGV X	INLET GUIDE VANES X (Sizes 030-075)†

Table 73 — Status Directory (cont)

STATUS (cont)			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press [EXPN/EDIT] key)**
9 ANALOG (cont)	▼	INV X	INVERTER X (Sizes 090,105)†
	▼	ECON X	ECONOMIZER X
	▼	HCV X	HEATING COIL VALVE X
	X [ENTER] *	HCV X	HEATING COIL VALVE X (0 to 100%)
	▼	PERD X	POWER EXHAUST/RETURN DAMPER X (Sizes 030-075)**
	▼	PED X	POWER EXHAUST DAMPER X (Sizes 090,105)**
	▼	HUM X	HUMIDIFIER 4-20 X
	X [ENTER] *	HUM X	HUMIDIFIER 4-20 X (0 to 100%)
10 OUTPUTS	[1] [0] [STAT]	OUTPUTS	DISCRETE OUTPUTS
	▼	SF X	SUPPLY FAN X
	X [ENTER] *	SF X	SUPPLY FAN X (0 = On, 1 = Off)
	▼	EC2P X	ECONOMIZER 2 POSITION X (030-075 Only)
	X [ENTER] *	EC2P X	ECONOMIZER 2 POSITION X (0 = Open, 1 = Closed)
	▼	MM X	MOTOR MASTER/FAN STAGE 1 X (030-075 Only)
	▼	FR2 X	OUTDOOR FAN 2 X (030-075 Only)
	▼	FR3 X	OUTDOOR FAN 3 X (030-075 Only)
	▼	MMA X	CIRCUIT A MOTOR MASTER/FAN STAGE 1 X
	▼	OFA X	CIRCUIT A OUTDOOR FAN X
	▼	MMB X	CIRCUIT B MOTOR MASTER/FAN STAGE 1 X
	▼	OFB X	CIRCUIT B OUTDOOR FAN X
	▼	SF2S X	2 SPEED SUPPLY FAN X (030-075 Only)
	▼	EFRF X	EXHAUST/RETURN FAN X
	▼	CPA1 X	COMPRESSOR A1 X
	▼	CPB1 X	COMPRESSOR B1 X
	▼	CPA2 X	COMPRESSOR A2 X
	▼	CPB2 X	COMPRESSOR B2 X
	▼	ULA1 X	UNLOADER A1 X
	▼	ULB1 X	UNLOADER B1 X
	▼	ULA2 X	UNLOADER A2 X
	▼	ULB2 X	UNLOADER B2 X
	▼	HS1 X	HEAT STAGE 1 X
	▼	HS2 X	HEAT STAGE 2 X
	▼	HS3 X	HEAT STAGE 3 X (030-075 Only)
	▼	HS4 X	HEAT STAGE 4 X (030-075 Only)

See legend and notes on page 78.

Table 73 — Status Directory (cont)

STATUS (cont)			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press [EXPN EDIT] key)**
10 OUTPUTS (cont)	[▼]	HS5 X	HEAT STAGE 5 X (030-075 Only)
	[▼]	HIR X	HEAT INTERLOCK RELAY (030-075 Only)
	[▼]	HUM1 X	HUMIDIFIER 1ST STAGE X
	X [ENTER] *	HUM1 X	HUMIDIFIER 1ST STAGE X (0 = On, 1 = Off)
	[▼]	DTCC X	DISCRETE TIME CLOCK CONTROL X
	X [ENTER] *	DTCC X	DISCRETE TIME CLOCK CONTROL X (0 = On, 1 = Off)
	[▼]	PERD X	POWER EXHAUST/RETURN DAMPER X (030-075 Only)
11 STANDBY	[1] [1] [STAT]	STANDBY	STANDBY/RUN MODE (0 = Run, 1 = Standby)
	[▼]	STBY X	UNIT IN STANDBY X
	[▼]	EXT X	EXTERNAL CLOCK INPUT (Remote on/off) X (0 = On, 1 = Off)

LEGEND

DAV — Digital Air Volume
IAQ — Indoor-Air Quality
TEMP — Temperature

*An "X [ENTER] " in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing [ENTER] . The valid force ranges are listed in the Expansion column.

†Applies to both inlet guide vanes and inverter (variable frequency drive).
**Applies to both discharge dampers and variable frequency drive.

NOTES:
1. Alarm no. will only be displayed if ALARM is present.
2. Alert no. will only be displayed if ALERT is present.
3. If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

If the display is ENT HGH and the user wants to use outdoor air, pressing [1] [ENTER] will change the display to ENT LOW/FORCE 4; overriding or "forcing" the enthalpy status to be good. This allows economizer operation.

Refer to Table 73 for more information on "forcible" displays. To discontinue a forced command, press the [CLEAR] key. This removes the forced value and allows the unit to accept input from the controlling device.

The forced values are useful for problem diagnosis, and as a preliminary step before running the test function.

[9] [STAT] (Analog outputs) — This subfunction displays the status of the various analog outputs. Press [▼] to access additional analog outputs. Some outputs can be user forced by entering a value for the output. For example, press [▼] until the HCV display appears. The display will indicate an output value describing the heating coil valve percent open. If the display reads HEATING COIL VALVE 0 (valve closed) and the user wants to use the heating coil, pressing [1] [0] [0] [ENTER] will change the display to HEATING COIL VALVE 100/ FORCE 4; overriding or forcing the heating coil valve to 100% open. This is useful for problem diagnosis and as a preliminary step before running the test function.

[1] [0] [STAT] (Outputs) — This subfunction displays the various system discrete outputs. These displays indicate the ability of the component or device to operate. It does not indicate that the component or device is functioning, but that the component or device has been energized by the control. Press [▼] to access additional discrete outputs. Some outputs can be user forced.

[1] [1] [STAT] (Standby) — The Standby/Run mode indicates the current capability of the unit. Press [▼] to access Standby. This displays either a STBY NO (unit is in the run configuration) or STBY YES (unit is in standby and is not capable of operating). To change from STBY YES to STBY NO, either press [CLEAR] or [·] [ENTER] . To change from STBY NO to STBY YES, press [1] [ENTER]. This change to STBY YES will clear any alarms present on the unit.

Press [▼] to view external clock input status. This status indicates when the Remote Start/Unoccupied control of unit is in effect. A 0 is displayed when there is no external input. A 1 is displayed when an external clock input is present.

Table 74 — Compressor Loading and Unloading Sequences (60 Hz Units)

COOLING STAGE	SIZE 030 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp 1	Unload U1	Unloader U1A	Comp 2	Unloader U2	Unloader U2A		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	17
2	ON	ON	OFF	OFF	OFF	OFF	4	33
3	ON	OFF	OFF	OFF	OFF	OFF	6	50
4	ON	OFF	OFF	ON	ON	ON	8	67
5	ON	OFF	OFF	ON	ON	OFF	10	83
6	ON	OFF	OFF	ON	OFF	OFF	12	100

COOLING STAGE	SIZE 035 UNITS						
	Lead Circuit			Lag Circuit		Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader U1A	Comp 2	Unloader U2		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	2	14
2	ON	ON	OFF	OFF	OFF	4	28
3	ON	OFF	OFF	OFF	OFF	6	42
4	ON	OFF	OFF	ON	ON	8	71
5	ON	OFF	OFF	ON	OFF	10	100

COOLING STAGE	SIZE 040 UNITS					
	Lead Circuit		Lag Circuit		Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Comp 2	Unloader U2		
0	OFF	OFF	OFF	OFF	0	0
1	ON	ON	OFF	OFF	2	25
2	ON	OFF	OFF	OFF	4	50
3	ON	OFF	ON	ON	6	75
4	ON	OFF	ON	OFF	8	100

COOLING STAGE	SIZE 050 UNITS						
	Lead Circuit			Lag Circuit		Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader U1A	Comp 2	Unloader U2		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	2	19
2	ON	ON	OFF	OFF	OFF	4	38
3	ON	OFF	OFF	OFF	OFF	6	58
4	ON	OFF	OFF	ON	ON	8	79
5	ON	OFF	OFF	ON	OFF	10	100

COOLING STAGE	SIZE 055 UNITS						
	Lead Circuit			Lag Circuit		Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader U1A	Comp 2	Unloader U2		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	2	20
2	ON	ON	OFF	OFF	OFF	4	40
3	ON	OFF	OFF	OFF	OFF	6	60
4	ON	OFF	OFF	ON	ON	8	80
5	ON	OFF	OFF	ON	OFF	10	100

Table 74 — Compressor Loading and Unloading Sequences (60 Hz Units) (cont)

COOLING STAGE	SIZE 060 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader U1A	Comp 2	Unloader U2	Unloader U2A		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	17
2	ON	ON	OFF	OFF	OFF	OFF	4	33
3	ON	OFF	OFF	OFF	OFF	OFF	6	50
4	ON	OFF	OFF	ON	ON	ON	8	67
5	ON	OFF	OFF	ON	ON	OFF	10	83
6	ON	OFF	OFF	ON	OFF	OFF	12	100

COOLING STAGE	SIZE 070,075 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader U1A	Comp 2	Unloader U2	Unloader U2A		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	14
2	ON	ON	OFF	OFF	OFF	OFF	4	29
3	ON	OFF	OFF	OFF	OFF	OFF	6	43
4	ON	OFF	OFF	ON	ON	ON	8	62
5	ON	OFF	OFF	ON	ON	OFF	10	81
6	ON	OFF	OFF	ON	OFF	OFF	12	100

COOLING STAGE	SIZE 090 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp A1	Unloader UA1	Unloader UA2	Comp B1	Unloader UB1	Unloader UB2		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	17
2	ON	ON	OFF	OFF	OFF	OFF	4	33
3	ON	OFF	OFF	OFF	OFF	OFF	6	50
4	ON	OFF	OFF	ON	ON	ON	8	67
5	ON	OFF	OFF	ON	ON	OFF	10	83
6	ON	OFF	OFF	ON	OFF	OFF	12	100

COOLING STAGE	SIZE 105 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp A1	Unloader UA1	Comp A2	Comp B1	Unloader UB1	Comp B2		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	OFF	OFF	OFF	OFF	4	20
2	ON	OFF	OFF	OFF	OFF	OFF	6	30
3	ON	ON	OFF	ON	OFF	OFF	8	40
4	ON	ON	OFF	ON	OFF	OFF	10	50
5	ON	OFF	OFF	ON	OFF	OFF	12	60
6	ON	ON	ON	ON	ON	OFF	12	60
7	ON	ON	ON	ON	OFF	OFF	14	70
8	ON	OFF	ON	ON	OFF	OFF	16	80
9	ON	ON	ON	ON	ON	ON	16	80
10	ON	ON	ON	ON	OFF	ON	18	90
11	ON	OFF	ON	ON	OFF	ON	20	100

Table 75 — Compressor Loading and Unloading Sequences (50 Hz Units)

COOLING STAGE	SIZE 030 UNITS						
	Lead Circuit		Lag Circuit			Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Comp 2	Unloader U2	Unloader U2A		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	OFF	OFF	OFF	2	29
2	ON	OFF	OFF	OFF	OFF	4	58
3	ON	OFF	ON	ON	OFF	8	86
4	ON	OFF	ON	OFF	OFF	10	100

COOLING STAGE	SIZE 040 UNITS						
	Lead Circuit			Lag Circuit		Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader U1A	Comp 2	Unloader U2		
0	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	2	19
2	ON	ON	OFF	OFF	OFF	4	38
3	ON	OFF	OFF	OFF	OFF	6	58
4	ON	OFF	OFF	ON	ON	8	79
5	ON	OFF	OFF	ON	OFF	10	100

COOLING STAGE	SIZE 055 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader UA1	Comp 2	Unloader U2	Unloader U2A		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	17
2	ON	ON	OFF	OFF	OFF	OFF	4	38
3	ON	OFF	OFF	OFF	OFF	OFF	6	57
4	ON	OFF	OFF	ON	ON	ON	8	71
5	ON	OFF	OFF	ON	ON	OFF	10	86
6	ON	OFF	OFF	ON	OFF	OFF	12	100

COOLING STAGE	SIZE 060 UNITS							
	Lead Circuit			Lag Circuit			Active Cyls	Percent Capacity
	Comp 1	Unloader U1	Unloader UA1	Comp 2	Unloader U2	Unloader U2A		
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	ON	ON	OFF	OFF	OFF	2	17
2	ON	ON	OFF	OFF	OFF	OFF	4	33
3	ON	OFF	OFF	OFF	OFF	OFF	6	50
4	ON	OFF	OFF	ON	ON	ON	8	67
5	ON	OFF	OFF	ON	ON	OFF	10	83
6	ON	OFF	OFF	ON	OFF	OFF	12	100

TROUBLESHOOTING

By using the accessory keypad and display module and the status function, actual operating conditions of the unit are displayed while it is running. Test function allows proper operation of compressors, compressor unloaders, fans, and other components to be checked while unit is stopped. Service function displays how configurable items are configured. If an operating fault is detected, an alarm is generated and an alarm code(s) is displayed under the subfunction [1] [STAT], along with an explanation of the fault. All current alarm codes are stored under this subfunction. For checking specific items, see Table 76.

Checking Display Codes — To determine how the unit has been programmed to operate, check diagnostic information ([1] [STAT] and [2] [STAT]) and operating mode displays ([3] [STAT]). If no display appears, follow procedures in Control Modules section on page 93. If display is working, continue as follows:

1. Note all alarm and alert codes displayed, [1] [STAT] and [2] [STAT] .
2. Note all operating mode codes displayed, [3] [STAT] .
3. Note control temperature set point in effect and current control temperature, [5] [STAT] .

   If unit is running, compare the "in effect" control set point with current temperature. Check the programming of schedule function to see if occupied or unoccupied set point should be in effect.

Unit Standby — To place the unit in Standby mode, place LOCAL/REMOTE selection switch in the LOCAL (OFF) position and then use the HSIO and press [1] [1] [STAT] . Press [▼] until the display reads STBY YES or STBY NO. If display reads STBY NO, press [1] [ENTER] to place the unit in Standby mode. If display reads STBY YES, the unit is already in the Standby mode. To remove the unit from Standby mode, press [·] [ENTER] .

Any compressors and condenser fans which are operating will take several seconds to shut down once the unit is placed in Standby mode. The evaporator fan will take approximately 15 seconds to shut down.

NOTE: When unit is in Standby mode (display reads STBY YES), no commands will be accepted from the CCN communications bus.

Complete Unit Stoppage — If the unit is off, there are several conditions that can cause this situation to occur:

1. Cooling load satisfied.
2. Programmed schedule.
3. General power failure.
4. Blown fuse in the control power feed.
5. Open control circuit fuse.
6. Unit ON/OFF switch moved to OFF position.
7. Loss of communications between the processor module and other control modules.
8. Operation of the unit blocked by the demand limit function.
9. Unit is in Standby mode.
10. Unit is turned off through the CCN network.
11. Unit supply-air temperature (SAT) thermistor failure.
12. Supply-air fan is not operating.
13. High duct static pressure.
14. Remote on-off circuit open (off).

Table 76 — Controls Troubleshooting

SYMPTOM(S)	PROBABLE CAUSE(S)	SOLUTION(S)
Evaporator fan does not run.	1. Circuit breaker open. 2. Fan configured for automatic operation. 3. Inverter overload.	1. Find cause and reset circuit breaker. 2. Reconfigure Evaporator Fan from Automatic to Constant using [6] [SRVC] on HSIO. 3. Find cause and reset.
Compressor does not run.	1. Fan interlock does not sense evaporator fan is operating. 2. Circuit breaker is open. 3. There is no demand for cooling. 4. The control is locking out cooling operation.	1. Check fan status switch and pressure tubing. 2. Find cause and reset circuit breaker. 3. Correct operation. 4. Check rotating display for alarm codes. Resolve alarm cause and reset control by changing to Standby and back to Run mode.
Condenser fans do not turn on.	1. Unit is equipped with transducers and service valves are backseated. 2. Circuit breaker is open.	1. Turn service valve at least one turn from backseated position. 2. Find cause and reset circuit breaker
Heating and cooling occur simultaneously.*	Occupied heating is configured as on and occupied heat set point is set higher than the cooling set point.	Turn off occupied heating, or lower heating set point.
Evaporator fan runs, but cooling or heating will not operate.	Fan interlock does not sense that evaporator fan is operating.	Check fan status switch and pressure tubing.
Economizer does not appear to control to the discharge air set point.	Economizer is probably working correctly.	Economizer controls to a modified set point to maximize free cooling. See Economizer section on page 24.
Cooling demand exists and economizer modulates, but compression is not operating.	Compression cannot be initiated until economizer damper is 90% open.	Correct operation.
Controls do not seem to be operating.	Remote on-off function may be keeping controls off.	Remote switch or jumper must short DSIO-1, terminals 1 and 2 on Channel 49.

*Simultaneous operation of cooling and heating may occur on VAV units as the Occupied Heating function begins. Check the unit operating mode.
Simultaneous operation of cooling and heating is permitted during Dehumidification/Reheat. Check unit operating mode.

Single Circuit Stoppage — If a single circuit stops, there are several potential causes:

1. Open contacts in the compressor high-pressure switch.
2. Low refrigerant pressure.
3. Thermistor failure
4. Transducer failure.
5. High suction superheat.
6. Low suction superheat.
7. Unit supply-air temperature thermistor (SAT) failure.
8. Compressor circuit breaker trip.
9. Operation of the circuit blocked by the demand limit function.
10. Loss of communications between the processor module and DSIO-1 module.

Restart Procedure — Before attempting to restart the machine, check the alarms and alerts subfunctions to determine the cause of the shutdown. If the unit, circuit, or compressor stops more than once as a result of a safety device, determine and correct the cause before attempting to start the unit again.

After the cause of the shutdown has been corrected, unit restart may be automatic or manual depending upon the fault. A manual restart requires a recycle of STANDBY/RUN modes from the HSIO or cycling OFF/ON of the control power via control switch in the unit control box. To recycle the STANDBY/RUN modes, enter the [1][1][STAT] subfunction. Scroll down to STBY function. Press [1][ENTER] to enter STANDBY, then press [CLEAR][ENTER] to exit STANDBY (re-enter RUN). Manual reset conditions may also be cleared through the ComfortWORKS® or Service Tool software by selecting Modify, Controller, Configuration and downloading “Unit Reset YES” from the configuration screen. All of the fault conditions are described in the Diagnostics Alarm Codes and Possible Causes section.

Alarms and Alerts — Alarms and alerts are warnings of abnormal or fault conditions, and may cause either one circuit or the whole unit to shut down. They are assigned code numbers as described below. The alarm descriptions are displayed on the HSIO when the [1][STAT] subfunction is entered. When a communication loss occurs to a hardware point, an alert or alarm may be generated. Refer to Table 19 for Alert Limits. The PSIO also recognizes illegal configurations.

Table 77 contains a detailed description of each alarm and alert code error and possible cause.

To determine how a unit is operating, check the diagnostic information available ([6][STAT] through [1][0][STAT]) and the operating mode displays ([3][STAT]). If no display appears, see Control Modules section on page 93. If the display is working:

1. Note all alarm codes displayed under [1][STAT].
2. Note all operating mode codes displayed under [3][STAT].
3. Note the modified supply-air set point in effect and the current supply-air temperature under [5][STAT] and [6][STAT].
   a. If reset is in effect, the modified set point may be different from the supply-air set point because the space temperature is below the reset set point.
   b. If demand limit is in effect, the unit may be incapable of producing the desired supply-air set point due to the decreased capacity of the unit.
   c. Check the programming of the schedule function to see if occupied or unoccupied set point should be in effect.

NOTE: To disable unit operation, press [1][STAT] and put the unit in Standby mode.

DIAGNOSTIC ALARM CODES AND POSSIBLE CAUSES (See Table 77):

Alarm Codes 51 and 55 (Compressor Fault) — Alarm code 51 is for a fault on compressor A1, and alarm code 55 is for a fault on compressor B1. If the DSIO-1 relay module fails or a compressor safety circuit switch opens during the operation of the compressor, the microprocessor detects this fault, stops the compressor, signals the alarm, and deenergizes the DSIO-1 relay to lock the compressor off. To reset the alarm, use the manual method. The possible causes are:

1. High-pressure switch open (code 51 or 55, then code 76 and/or 77 if pressure transducers are installed). The high-pressure switch is wired in series with the 24-v supply that energizes the load side of the DSIO-1 module. If the high-pressure switch opens during compressor operation, the compressor stops, and the stop is detected by the DSIO-1, terminal strip J3.
2. Wiring error. A wiring error in the control safety circuit will cause the modules to malfunction, and an error will be indicated.

To check out alarm codes 51 or 55:

1. Scroll through the subfunction [4][TEST ALRM] to the proper compressor number using the [▼] key.
2. Energize the step (press [ENTER]). If the compressor does not start, the cause is most likely related to one of the following: HPS (high-pressure switch) open, tripped compressor circuit breaker or incorrect wiring in either the safety circuit or compressor contactor coil circuit. To follow the circuit alarm, see the unit wiring diagram.

If the compressor starts, verify that all stages of condenser fans are operational.

For sizes 030-075, use [3][TEST ALRM] and [ENTER] to confirm operation of outputs MM, FR2, and FR3.

For sizes 090 and 105, use [3][TEST ALRM] and [ENTER] to confirm operation of outputs MMA, OFA, MMB, and OFB.

Return unit to run mode and observe compressor operation to verify that compressor lockout circuit is working and condenser fans are energized after compressor starts.

NOTE: With head pressure control option enabled ([6][SRVC], MMAS = YES), a short delay will occur before the first stage of condenser fan(s) is energized. Check location of SCT on condenser coil or pressure transducer wiring and pressure (if equipped) if condenser fans do not start.

Alarm Codes 52 and 56 (Compressor Fault) — Alarm code 52 is for compressor A2. Alarm code 56 is for compressor B2. Alarm codes 52 and 56 are a combination of the separate compressor fault and compressor status codes used for compressors A1 and B1. If the DSIO module fails, a compressor safety circuit switch opens, a circuit breaker trips, or the compressor contactor fails to energize, the microprocessor detects the fault.

Alarm Codes 53 and 57 (Compressor Status) — If the commanded state of the compressor does not match compressor status for 3 seconds, the corresponding compressor stops and the proper alarm trips. This alarm will detect circuit breaker failures, and failure of the compressor contactor to be energized. If a compressor circuit breaker trips due to compressor overcurrent or a short or ground between the circuit breaker and compressor, an alarm for that compressor will be indicated. This will only affect that circuit; the other circuit will continue to operate. The microprocessor is also programmed to indicate a compressor failure if the CLO (compressor lockout) circuit to the DSIO1, terminal J3, receives a voltage when a compressor is not supposed to be operating. Other possible causes include a failed contactor or DSIO module.

Alarm Code 59 (Supply-Air Thermistor Failure) — If the temperature measured by this thermistor is outside the range of –40 to 245 F (–40 to 118 C), heating, cooling, and economizer use are disabled. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Table 77 — Alarm Codes

DISPLAY	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
51	Compressor A1 Failure	Compressor A1 shut off	Manual	High-pressure switch open. Wiring error.
52	Compressor A2 Failure	Compressor A2 shut off	Manual	High-pressure switch open. Wiring error. Failed contactor. Failed DSIO module. Circuit breaker tripped.
53	Compressor A1 Status Failure	Compressor A1 shut off	Manual	Voltage on DSIO-1 J3 when compressor off. Failed contactor. Failed DSIO module. Circuit breaker tripped.
54	Not used	—	—	—
55	Compressor B1 Failure	Compressor B1 shut off	Manual	High-pressure switch open. Wiring error.
56	Compressor B2 Failure	Compressor B2 shut off	Manual	High pressure switch open. Wiring error. Failed contactor. Failed DSIO module. Circuit breaker tripped.
57	Compressor B1 Status Failure	Compressor B1 shut off	Manual	Voltage on DSIO-1 J3 when compressor off. Failed contactor. Failed DSIO module. Circuit breaker tripped.
58	Not Used	—	—	—
59	Supply-Air (leaving air) Thermistor Failure	Heating, cooling, and economizer disabled	Automatic	Bad, shorted, or open thermistor caused by a wiring error or loose connection.
60	Return-Air (entering air) Thermistor Failure	Heating and economizer disabled	Automatic	Bad, shorted, or open thermistor caused by a wiring error or loose connection.
61	Outdoor-Air Thermistor Failure	NTFC disabled and economizer uses enthalpy input only. If unit has humidity sensors, economizer dampers close.	Automatic	Bad thermistor, wiring error, or loose connection.
62	Saturated Condensing Thermistor Failure, Circuit A	Circuit A shut off	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit does not have pressure transducers.
63	Saturated Condensing Thermistor Failure, Circuit B	Circuit B shut off	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit does not have pressure transducers.
64	Suction Thermistor Failure, Circuit A	Superheat alarms disabled. Unit will operate as if there are no suction sensors.	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit is configured for suction sensors.
65	Suction Thermistor Failure, Circuit B	Superheat alarms disabled. Unit will operate as if there are no suction sensors.	Automatic	Bad thermistor, wiring error, or loose connection. This alarm is only valid when unit is configured for suction sensors.
66	Space Thermistor Failure	Temperature reset, NTFC, cooling and heating functions disabled (CV applications only).	Automatic	Bad thermistor, wiring error, or loose connection.
67	Compressor A1 Discharge Pressure Transducer Failure	Circuit A shuts off	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
68	Compressor B1 Discharge Pressure Transducer Failure	Circuit B shuts off	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
69	Compressor A1 Suction Pressure Transducer Failure	Circuit A shuts off	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
70	Compressor B1 Suction Pressure Transducer Failure	Circuit B shuts off	Automatic	Bad transducer, bad 5-v power supply, or a wiring error.
71	Loss of Communications with DSIO-1	All DSIO-1 outputs turned off	Automatic	Faulty or improperly connected plug, faulty DSIO-1 module, or wiring error.
72	Loss of Communications with DSIO-2	All DSIO-2 outputs turned off	Automatic	Faulty or improperly connected plug, faulty DSIO-2 module, or wiring error.
73	Loss of Communications with PSIO-2	All PSIO-2 outputs turned off	Automatic	Faulty or improperly connected plug, faulty PSIO-2 module, or wiring error.
74	Low Pressure, Circuit A	Circuit A compressor(s) shut off	Automatic or Manual	Low refrigerant charge, dirty filters, evaporator fan turning backwards, inlet guide vanes not opening properly, plugged filter drier, or faulty transducer.
75	Low Pressure, Circuit B	Circuit B compressor(s) shut off	Automatic or Manual	Low refrigerant charge, dirty filters, evaporator fan turning backwards, inlet guide vanes not opening properly, plugged filter drier, or faulty transducer.
76	High Pressure, Circuit A	Circuit A compressor(s) shut off	Manual	An overcharged system, high outdoor ambient temperature coupled with a dirty outdoor coil, plugged filter drier, partially closed liquid line service valve, or a faulty transducer. This alarm is only valid when the unit has refrigerant pressure transducers.

Table 77 — Alarm Codes (cont)

DISPLAY	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
77	High Pressure, Circuit B	Circuit B compressor(s) shut off	Manual	An overcharged system, high outdoor ambient temperature coupled with a dirty outdoor coil, plugged filter drier, partially closed liquid line service valve, or a faulty transducer. This alarm is only valid when the unit has refrigerant pressure transducers.
78	Supply-Air Fan State and Status	All unit outputs (except supply fan) turned off. Supply fan output remains energized.	Automatic	Fan status switch failure, tubing not properly connected, or fan status switch set incorrectly.
79	Not used	—	—	—
80	Low Saturated Suction Temperature, Circuit A	Circuit A shut off	Manual	Low entering outdoor-air temperature, low evaporator-fan cfm, low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or pressure transducer failure.
81	Low Saturated Suction Temperature, Circuit B	Circuit B shut off	Manual	Low entering outdoor-air temperature, low evaporator-fan cfm, low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or pressure transducer failure
82	High Suction Superheat, Circuit A	Circuit A shut off	Manual	Low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or a faulty thermistor or transducer.
83	High Suction Superheat, Circuit B	Circuit B shut off	Manual	Low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or a faulty thermistor or transducer.
84	Low Suction Superheat, Circuit A	Circuit A shut off	Manual	Faulty TXV, thermistor, or transducer.
85	Low Suction Superheat, Circuit B	Circuit B shut off	Manual	Faulty TXV, thermistor, or transducer.
86*	Illegal Configuration	Unit will not start	Manual	Configuration code error.
87	Not used	—	—	—
88	Hydronic Coil Freezestat	Economizer at minimum position, heating coil valve fully open, supply-air fan shut off	Automatic	Low temperature outdoor-air used with minimum airflow. Unit is in IAQ purge mode with low temperature outdoor air. Outdoor-air damper is jammed open.
89	Pressurization	Initializes pressurization mode. See Table 42 for hardware state details.	Automatic	Pressurization alarm tripped. Space being overpressurized to prevent smoke from entering zones.
90	Evacuation	Initializes evacuation mode. See Table 42 for hardware state details.	Automatic	Smoke alarm tripped. Power exhaust fans clear smoke from space.
91	Smoke Purge	Initializes smoke purge mode. See Table 42 for hardware state details.	Automatic	Purge alarm tripped. Outdoor air is being supplied and return air is being exhausted.
92	Fire Shutdown	Unit shuts down. See Table 42 for hardware state details.	Automatic	Fire alarm tripped.
93	Linkage Failure	Unit returns to stand-alone operation.	Automatic	Loose connection, a broken wire, or a loss of communication with the TSM.
94	Building Pressure	Alarm generated.	Automatic	Power exhaust fan failure in either the $^1/_4$-in. plastic tubing routed to the area to be controlled or the tubing routed to the atmosphere from the building pressure control. This alarm is only valid when the unit is configured for modulating power exhaust or return-air fan.
95	Duct Static Pressure	The supply-air fan shuts off for 5 minutes.	Automatic	Inlet guide vane actuator motor failure; or VFD failure; A leak or obstruction in the $^1/_4$-in. plastic tubing routed from the inlet guide vane or VFD duct pressure transducer to the ductwork connection; All the terminals are closed.
96	Not used	—	—	—
97	Indoor-Air Quality Failure	Alarm generated	Automatic	IAQ set point is less than the IAQ low reference generated, or the IAQ priority is configured as low and the IAQ sensor reading exceeds the IAQ set point.

LEGEND

CCN — Carrier Comfort Network
CV — Constant Volume
DSIO — High-Voltage Relay Module
IAQ — Indoor-Air Quality
NTFC — Nighttime Free Cool
PSIO — Processor Module
TSM — Terminal System Manager
TXV — Thermostatic Expansion Valve
VFD — Variable Frequency Drive

*Code is only available on sizes 030-075.

NOTE: Alarms 89-92 are level zero on the CCN Network. All other alarms are level 2.

Alarm Code 60 (Return-Air Thermistor Failure) — If the temperature measured by this thermistor is outside the range of –40 to 245 F (–40 to 118 C), the cooling capacity algorithm will use a default of 8º F per stage drop. Heating and economizer will be disabled. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alarm Code 61 (Outdoor-Air Thermistor Failure) — If the temperature measured by this thermistor is outside the range of –40 to 245 F (–40 to 118 C), the economizer routine will use enthalpy input only. If the unit is equipped with humidity sensors, then the enthalpy will also be considered bad and the economizer will close the dampers. Nighttime free cooling will also be disabled. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

Alarm Codes 62 and 63 (Saturated Condensing Thermistor Failure) — If the SCT fails (temperature is out of the range of –40 F to 245 F), the alarm will trip and the appropriate circuit will shut off. Reset of this alarm is automatic once the problem is corrected. The unit performs a complete restart when the SCT sensor resets. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

NOTE: This alarm is only valid when the unit is configured for suction sensors.

Alarm Codes 64 and 65 (Suction Thermistor Failure) — If the temperature measured by this thermistor is outside the range of –40 to 245 F (–40 to 118 C), the high and low superheat alarms will be disabled and the head pressure algorithm will operate as if the unit did not have suction sensors. Reset of this alarm is automatic once the problem is corrected. Start-up follows the normal sequence. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

NOTE: This alarm is only valid when the unit is configured for suction sensors.

Alarm Code 66 (Space Thermistor Failure) — This alarm applies to all units. If the temperature measured by this thermistor is outside the range of –10 to 245 F (–23 to 118 C), the temperature reset, nighttime free cooling, and cooling and heating (CV applications only) functions are disabled. Reset of this alarm is automatic once the problem is corrected, and the reset function will be enabled. The cause of the alarm is usually a bad thermistor, a wiring error, or a loose connection.

Alarm Codes 67,68,69,70 (Transducer Failure) — If the voltage ratio of a transducer is less than 2% or greater than 98% for 3 seconds, the transducer has failed and the affected circuit shuts down.

Code 67 — Compressor A1 Discharge Pressure Transducer Failure

Code 68 — Compressor B1 Discharge Pressure Transducer Failure

Code 69 — Compressor A1 Suction Pressure Transducer Failure

Code 70 — Compressor B1 Suction Pressure Transducer Failure

The reset of this alarm is automatic if the voltage ratio returns within range. Start-up of this circuit follows a normal sequence. The cause of this error is usually a bad transducer, a bad 5-v power supply, or a wiring error. The failed transducer should be recalibrated by the control using the service function before the transducer is considered bad.

Alarm Code 71 (Loss of Communications With DSIO-1) — If communication is lost with the DSIO-1 module, all outputs controlled by this module will be turned off. This alarm will reset automatically when the communication is restored. The outputs will turn on normally after the alarm condition has been reset. The probable cause for this condition is a faulty or improperly connected plug, a wiring error, or a faulty module.

Alarm Code 72 (Loss of Communications With DSIO-2) — If communication is lost with the DSIO-2 module, all outputs controlled by this module will be turned off. This alarm will reset automatically once the communication is restored. The outputs will turn on normally after the alarm condition has been reset. The probable cause for this condition is a faulty or improperly connected plug, a wiring error, or a faulty module.

Alarm Code 73 (Loss of Communications With Control Options Board [PSIO-2]) — If communication is lost with the PSIO-2 module, all outputs controlled by this module will be turned off. Reset of this alarm is automatic when the communication is restored.

Start-up after this alarm has been remedied follows a normal sequence. The probable cause for this condition is a faulty or improperly connected plug, a wiring error, or a faulty module.

Alarm Codes 74 and 75 (Low Pressure Circuit A or B)

With low-pressure switches installed — If a circuit is on and the low-pressure switch is open (opens at 27 psig ± 4 psig) for 15 seconds, the compressor in that circuit will stop and the alarm will trip.

NOTE: During initial start-up of a circuit, the low pressure input will be ignored for 2 minutes.

With a suction transducer installed — If a circuit is on and the suction pressure drops below 28 psig for 15 seconds, the compressor in that circuit will stop and the alarm will trip.

Alarm code 74 signals a circuit A failure, and code 75 signals a circuit B failure. The reset for this alarm can be automatic if the pressure reaches 67 ± 7 psig (switch) or 65 psig (transducer) within 5 minutes after the alarm has tripped. The circuit will not be reset if it trips again after 3 consecutive failures. The possible causes for the alarm are low refrigerant charge, dirty filters, evaporator fan turning backwards, inlet guide vanes not opening properly, plugged filter drier, or faulty transducer.

Alarm Codes 76 and 77 (High Pressure Circuit A or B) — If a compressor trips on compressor fault alarm 51 or 55 and the discharge pressure for that circuit is greater than 410 psig, then the high pressure alarm will trip. If the discharge pressure ever exceeds 440 psig, then the alarm will trip and the appropriate circuit will be shut off.

Alarm code 76 signals a circuit A failure, and alarm code 77 signals a circuit B failure. Reset of this alarm is manual. The circuit will start normally after the alarm condition has been corrected. Possible causes for this alarm are an overcharged system, high outdoor ambient temperature coupled with a dirty outdoor coil, plugged filter drier, partially closed liquid line service valve, or a faulty transducer.

NOTE: This alarm is only valid when the unit has refrigerant pressure transducers.

Alarm Code 78 (Supply-Air Fan) — If the commanded state and status of the supply-air fan do not match for 60 seconds, the alarm trips. (The control circuit does not detect circuit breaker failures due to motor overcurrent, shorts or grounds between the evaporator-fan circuit breaker and motor, circuit breaker trips, or broken belts.) Other possible causes are fan status switch failure, tubing not properly connected, or switch set improperly. All other unit outputs except the supply-air fan are turned off when this alarm is generated. The supply-air fan output remains energized.

Reset of this alarm is automatic once the problem is corrected.

Alarm Codes 80 and 81 (Low Saturated Suction Temperature) — If the saturated suction temperature is less than 20 F (–6.7 C) for 5 minutes, the alarm trips and the circuit shuts off.

If the unit is configured for 2-speed fan operation, the fan must be on high speed for this alarm to be generated. If the fan is at low speed, the speed will be set to high and the 5-minute timer will be restarted. The fan will be locked on high speed until the saturated suction temperature exceeds 65 F.

Alarm code 80 signals a circuit A failure, and alarm code 81 signals a circuit B failure. Reset is manual, and start-up of the circuit is normal after the alarm has been cleared. Possible causes of the fault condition are a combination of low entering outdoor-air temperature, low evaporator-fan cfm, low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or pressure transducer failure.

NOTE: This alarm is valid only when the unit has refrigerant pressure transducers.

Alarm Codes 82 and 83 (High Suction Superheat) — This alarm is valid only when unit is configured for pressure transducers and suction sensors (thermistors), and mechanical cooling is on.

If the suction superheat is greater than 45 F (7 C) for more than five minutes, the alarm trips and the circuit shuts down. Alarm code 82 signals a circuit A failure, and alarm code 83 signals a circuit B failure. Reset of this alarm is manual. The circuit will start normally after the alarm condition has been corrected. Possible causes for this alarm are low refrigerant charge, plugged filter drier, partially closed liquid line service valve, or a faulty thermistor or transducer.

Alarm Codes 84 and 85 (Low Suction Superheat) — This alarm is valid only when the unit is configured for pressure transducers and suction sensors (thermistors), and mechanical cooling is on.

If the suction superheat is less than 3 F (–16 C) for more than five minutes, the alarm trips and the affected circuit shuts down. Alarm code 84 signals a circuit A failure, and alarm code 85 signals a circuit B failure. Reset of this alarm is manual. Start-up of the circuit is normal after the alarm has been corrected. Possible causes of the alarm include a faulty thermostatic expansion valve (TXV), thermistor, or transducer.

Alarm Code 86 (Illegal Configuration) (Sizes 030-075 Only) — This fault indicates a configuration code error, and the unit is not allowed to start. Refer to Service Function section and [3][SRVC] on page 104 for factory configuration values and [6][SRVC] on page 105 for user configuration variables. Check all configuration codes and set points and correct any errors.

Alarm Code 88 (Hydronic Coil Freezestat) — The hydronic coil freezestat alarm requires a field-supplied, normally open, temperature actuated switch connected to PSIO-2 at plug J7 (bottom). The alarm is activated by a 24-v signal provided through the switch when it closes. The economizer will be set at minimum position during occupied mode or closed during unoccupied mode, heating coil valve will be fully open, and supply-air fan will be shut off. This may be caused by low temperature outdoor-air used with minimum airflow, during IAQ purge mode with low temperature outdoor air, or because the outdoor-air damper is jammed open.

Reset of this alarm is automatic once the 24-v input signal is removed.

Alarm Code 89, 90, 91, (Pressurization, Evacuation, Smoke Purge, and Fire Shutdown, respectively) — When the unit is equipped with an optional smoke control and a fire system is installed, these 4 modes are provided to control smoke within areas serviced by the unit. The unit must be equipped with an economizer, power exhaust fan options, and the control option module to support these modes. The building fire alarm system closes field supplied, normally open, dry contacts connected to PSIO-2 at plug J7 (bottom) to activate the alarms.

Reset of this alarm is automatic once the 24-v input signal is removed.

Alarm Code 93 (Linkage Failure — DAV System Only) — A linkage failure alarm is generated when the linkage has stopped updating the TSM linkage tables within the last 5 minutes.

NOTE: This alarm can only be generated after linkage has updated the table at least one time since initialization.

The unit controls enter the linkage default mode if the linkage is enabled, but the communications link has been lost. With the controls having reverted back to stand-alone operation, the existing sensors, previously overridden by linkage, will be used. This may be caused by a loose connection or a broken wire.

Reset of this alarm is automatic once the problem is corrected.

Alarm Code 94 (Building Pressure) — If the building pressure is greater than the building pressure set point plus 0.25 in. wg for 30 seconds, the alarm will be generated. This may be caused by a power exhaust fan failure or a leak or obstruction in either the $^1/_4$-in. plastic tubing routed to the area to be controlled or the tubing routed to atmosphere from the building pressure control. This alarm is valid only when the unit is configured for modulating power exhaust or return-air fan.

Reset of this alarm is automatic once the problem is corrected.

Alarm Code 95 (Duct Static Pressure) — If the duct pressure is greater than the static pressure set point plus 1.0 in. wg for 30 seconds, or equal to or greater than 5.0 in. wg for 15 seconds, then the alarm will trip, and the supply-air fan will shut off for 5 minutes. This may be caused by variable frequency drive (VFD) or IGV actuator motor failure or a leak or obstruction in the $^1/_4$-in. plastic tubing routed from the VFD or IGV duct pressure control to the ductwork connection, or all the terminals are closed.

Reset of this alarm is automatic once the problem is corrected.

Alarm Mode 97 (Indoor-Air Quality Failure) — This alarm is valid only when the unit is configured with the PSIO2 control option module, the unit is equipped with field-supplied IAQ sensors, and the VENT option is set at either “1” or “3”.

If the IAQ set point (IAQS) is less than the IAQ low reference value or greater than the high reference value, an alarm will be generated. An alarm will also occur when the IAQ priority is configured as low and the IAQ sensor reading exceeds the IAQ set point.

Reset of this alarm is automatic once the problem is corrected.

Staged Gas Units Troubleshooting

The Navigator display shows the actual operating conditions of the unit while it is running. If there are alarms or there have been alarms, they will be displayed in either the current alarm list or the history alarm list. See Table 78.

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 schedule.
- General power failure.
- Tripped CB6 (24-Volt transformer circuit breaker).
- Unit is turned off through the CCN network.

RESTART PROCEDURE — Before attempting to restart the machine, check the alarm list to determine the cause of the shutdown. If the shutdown alarm for a particular function has occurred, determine and correct the cause before allowing the unit to run under its own control again.

ALARMS AND ALERTS — Alarms and alerts are warnings of abnormal or fault conditions, and may cause either one function or the entire unit to shut down. They are assigned code numbers and descriptions as described below. A prefix of A denotes an alarm. A prefix of T denotes an alert. See Table 78. The description for an alarm can be viewed from Navigator display by pressing [ESCAPE] and [ENTER] keys simultaneously while displaying the alarm code number.

Thermistor Troubleshooting (Staged Gas Units) — The electronic control uses five 5K-Ω thermistors to sense temperatures used to control operation of the unit. See Fig. 8 and 9. Resistances at various temperatures are listed in Table 79. Thermistor pin connection points are shown in Table 3.

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

1. To determine temperatures at the various thermistor locations, disconnect the thermistor from SGC board at the J8 terminal strip (see Fig. 8 and 9) and measure the resistance across the appropriate thermistor.
2. Using the resistance reading obtained, read the sensor temperature from Table 79.
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 resistance reading should be close, 5° F (3° C) if care was taken in applying thermocouple and taking readings.

If a thermistor has failed or the wire is damaged, replace the complete assembly. Do not attempt to splice the wires or repair the assembly.

VERIFY SUPPLY AIR TEMPERATURE (SAT) SENSOR AND LIMIT SWITCH TEMPERATURE (LIMTTEMP) THERMISTOR PERFORMANCE — Verify that SAT thermistors and LIMTTEMP thermistor are reading correctly. The SAT and LIMTTEMP values can be accessed through Navigator display in the Temperatures menu.

Thermistor Troubleshooting — The unit control system uses thermistors to measure temperatures of the supply and return air, outdoor air and space temperature, and the saturated condensing and suction temperatures of the refrigerant circuits. See Table 1 and Fig. 42-44 for thermistor locations.

The resistance versus temperature and electrical characteristics for thermistors in the system (except space temperature) are identical. To obtain an accurate reading, a high-impedance meter (such as a digital meter) must be used.

Thermistors in the unit control system have a 5-vdc signal applied across them any time the unit control circuit is energized. The voltage drop across the thermistor is directly proportional to the temperature and resistance of the thermistor.

To determine temperatures at the various thermistor locations:

1. Disconnect the thermistor from the processor board.
2. Measure the resistance across the appropriate thermistor using a high quality digital ohmmeter.
3. Use the resistance reading to determine the thermistor temperature using Tables 80 and 81.

Table 79 — 5K Thermistor Temperature (°C, °F) vs Resistance (Staged Gas Units)

TEMP (C)	TEMP (F)	RESISTANCE (Ohms)
–40	–40	168,250
–35	–31	122,350
–30	–22	88,500
–25	–13	65,200
–20	–4	48,535
–15	5	36,476
–10	14	27,665
–5	23	21,165
0	32	16,325
5	41	12,695
10	50	9,950
20	68	6,245
25	77	5,000
30	86	4,208.5
35	95	3,265.0
40	104	2,663.3
45	113	2,185.0
50	122	1,801.5
55	131	1,493.0
60	140	1,224.0
65	149	1,041.5
70	158	876.0
75	167	739.5
80	176	627.5

Table 78 — SGC Alarm Codes

ALARM CODE	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
A152	Unit down	Unit Shutdown*	Automatic	Unit down due to failure. Check for alarm A700. Check for alerts 705 or 706. If SETPSEL=0, check for alarm A157.
A152	Critical Serial EEPROM Failure Error	Unit Shutdown*	Automatic	Hardware problem.
T153	Real Time Clock Hardware Failure	None	Automatic	Hardware problem.
A154	Serial EEPROM Hardware Failure	Unit Shutdown*	Automatic	Hardware problem.
T155	Serial EEPROM Failure Error	None	Automatic	Hardware problem.
A157	A/D Hardware Failure	Unit Shutdown*	Automatic	Hardware problem.
A700	Supply Air Temperature-All Thermistors have failed	Unit Shutdown*	Automatic	All supply air thermistors have failed
T701	Supply Air Temperature Thermistor 1 Failure	None	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T702	Supply Air Temperature Thermistor 2 Failure	None	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T703	Supply Air Temperature Thermistor 3 Failure	None	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T705	Cooling Setpoint Ratio Input Error	Unit Shutdown	Automatic	Faulty potentiometer or incorrect wiring.
T706	Heating Setpoint Ratio Input Error	Unit Shutdown	Automatic	Faulty potentiometer or incorrect wiring.
T707	Limit Switch Thermistor Failure	None†	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.

*Alarm generated.
†No limit switch monitoring will occur.

The microprocessor has been programmed to check the operation of the thermistors. If the measured temperature is outside the range of –40 to 245 F (–40 to 118.3 C) and 168,250 to 203.75 ohms (outdoor-air temperature, supply-air temperature, saturated condensing temperature, suction gas temperature, and return-air temperature only), it will be treated as a sensor failure and a diagnostic code will be displayed. It is also possible to check the operation of the thermistors using the test function.

To check the thermistors:

1. Use the temperature subfunction of the status function (6 STAT) to determine if the thermistors are reading correctly.
2. Check the thermistor calibration at a known temperature by measuring actual resistance and comparing the value measured with the values listed in the thermistor tables (Tables 80 and 81).
3. Make sure that the thermistor leads are connected to the proper pin terminals at the PSIO-1 and PSIO-2 terminal strip J7 on the processor boards, and that the thermistors are properly located in the refrigerant circuit.

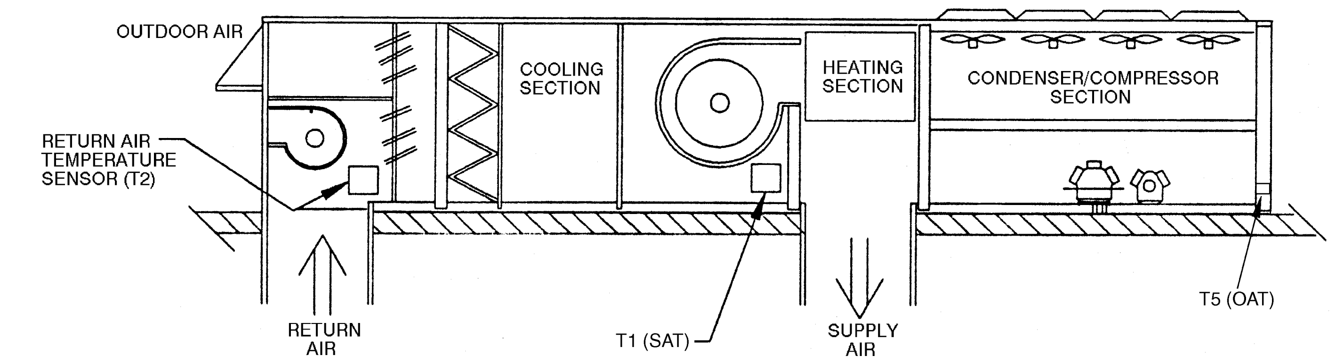
If a thermistor has failed or the wire is damaged, replace the complete assembly. Do not attempt to splice the wires or repair the assembly.

Table 80 — Thermistor Resistance vs Temperature Values for Thermistors T1-T7 (5 K at 25 C Resistors)

TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)
–25	98010	74	5361	125	1715	176	602
–20	82627	75	5229	126	1680	177	591
–15	69790	76	5101	127	1647	178	581
–10	59081	77	4976	128	1614	179	570
–5	50143	78	4855	129	1582	180	560
0	42678	79	4737	130	1550	181	551
5	36435	80	4622	131	1519	182	542
10	31201	81	4511	132	1489	183	533
15	26804	82	4403	133	1459	184	524
20	23096	83	4298	134	1430	185	516
25	19960	84	4195	135	1401	186	508
30	17297	85	4096	136	1373	187	501
35	15027	86	4000	137	1345	188	494
36	14614	87	3906	138	1318	189	487
37	14214	88	3814	139	1291	190	480
38	13833	89	3726	140	1265	191	473
39	13449	90	3640	141	1239	192	467
40	13084	91	3556	142	1214	193	461
41	12730	92	3474	143	1189	194	456
42	12387	93	3395	144	1165	195	450
43	12053	94	3318	145	1141	196	444
44	11730	95	3243	146	1118	197	439
45	11416	96	3170	147	1095	198	434
46	11111	97	3099	148	1072	199	429
47	10816	98	3031	149	1050	200	424
48	10529	99	2964	150	1028	201	419
49	10250	100	2898	151	1007	202	415
50	9979	101	2835	152	986	203	410
51	9717	102	2774	153	965	204	405
52	9461	103	2713	154	945	205	401
53	9213	104	2655	155	925	206	396
54	8973	105	2598	156	906	207	391
55	8739	106	2542	157	887	208	386
56	8511	107	2488	158	868	209	382
57	8291	108	2436	159	850	210	377
58	8076	109	2385	160	832	211	372
59	7868	110	2335	161	815	212	366
60	7665	111	2286	162	798	213	361
61	7468	112	2238	163	782	214	356
62	7277	113	2192	164	765	215	350
63	7091	114	2147	165	749	216	344
64	6911	115	2103	166	734	217	338
65	6735	116	2060	167	719	218	332
66	6564	117	2018	168	705	219	325
67	6399	118	1977	169	690	220	318
68	6237	119	1937	170	677	221	311
69	6081	120	1898	171	663	222	304
70	5929	121	1860	172	650	223	297
71	5781	122	1822	173	638	224	289
72	5637	123	1786	174	626	225	282
73	5497	124	1750	175	614		

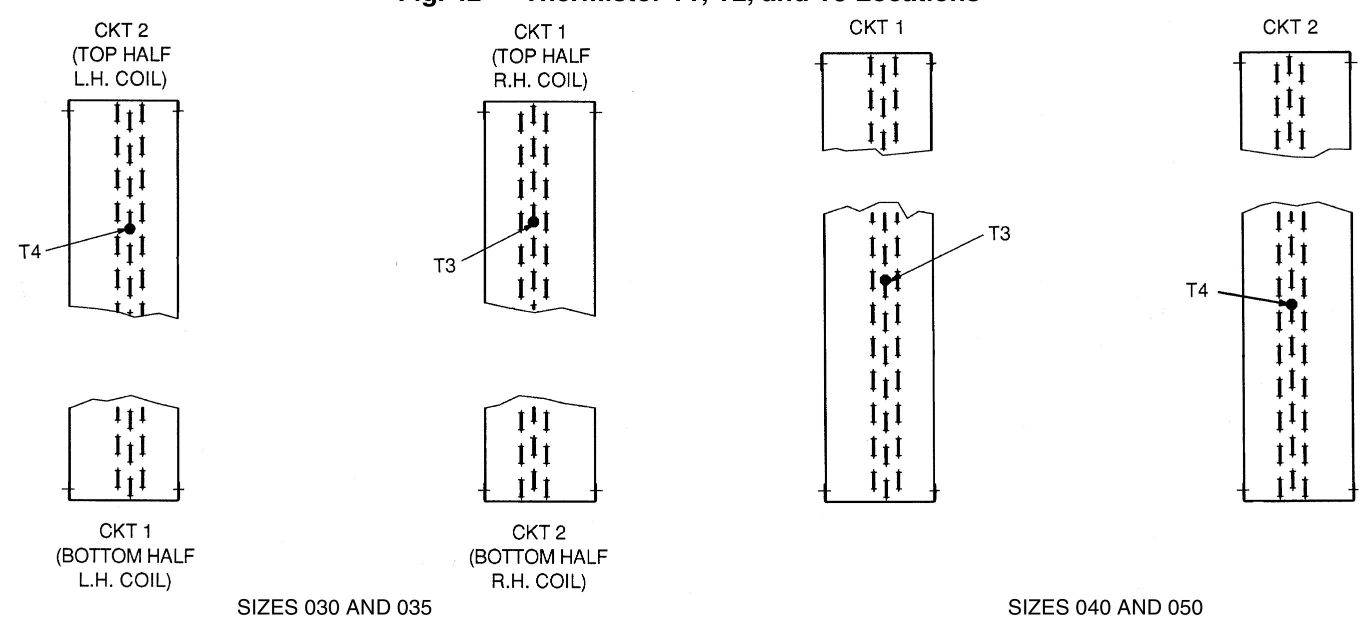
Table 81 — Thermistor Resistance vs Temperature Values for Space Temperature Thermistors T-55 and T-56 (10 K at 25 C Resistors)

TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)	TEMP (F)	RESISTANCE (Ohms)
40	24051	**62**	14101	**84**	8563	**106**	5369
41	23456	**63**	13775	**85**	8378	**107**	5260
42	22877	**64**	13457	**86**	8197	**108**	5154
43	22313	**65**	13148	**87**	8021	**109**	5050
44	21766	**66**	12846	**88**	7849	**110**	4948
45	21234	**67**	12553	**89**	7681	**111**	4849
46	20716	**68**	12267	**90**	7517	**112**	4752
47	20212	**69**	11988	**91**	7357	**113**	4657
48	19722	**70**	11717	**92**	7201	**114**	4564
49	19246	**71**	11452	**93**	7049	**115**	4474
50	18782	**72**	11194	**94**	6900	**116**	4385
51	18332	**73**	10943	**95**	6755	**117**	4299
52	17893	**74**	10698	**96**	6613	**118**	4214
53	17466	**75**	10459	**97**	6475	**119**	4132
54	17050	**76**	10227	**98**	6340	**120**	4051
55	16646	**77**	10000	**99**	6209	**121**	3972
56	16253	**78**	9779	**100**	6080	**122**	3895
57	15870	**79**	9563	**101**	5954	**123**	3819
58	15497	**80**	9353	**102**	5832	**124**	3745
59	15134	**81**	9148	**103**	5712	**125**	3673
60	14780	**82**	8948	**104**	5595		
61	14436	**83**	8754	**105**	5481		



NOTE: Thermistors T6 and T7 are located in the compressor suction service valves. Sufficient detail is not shown in this figure to include their precise locations.

Fig. 42 — Thermistor T1, T2, and T5 Locations

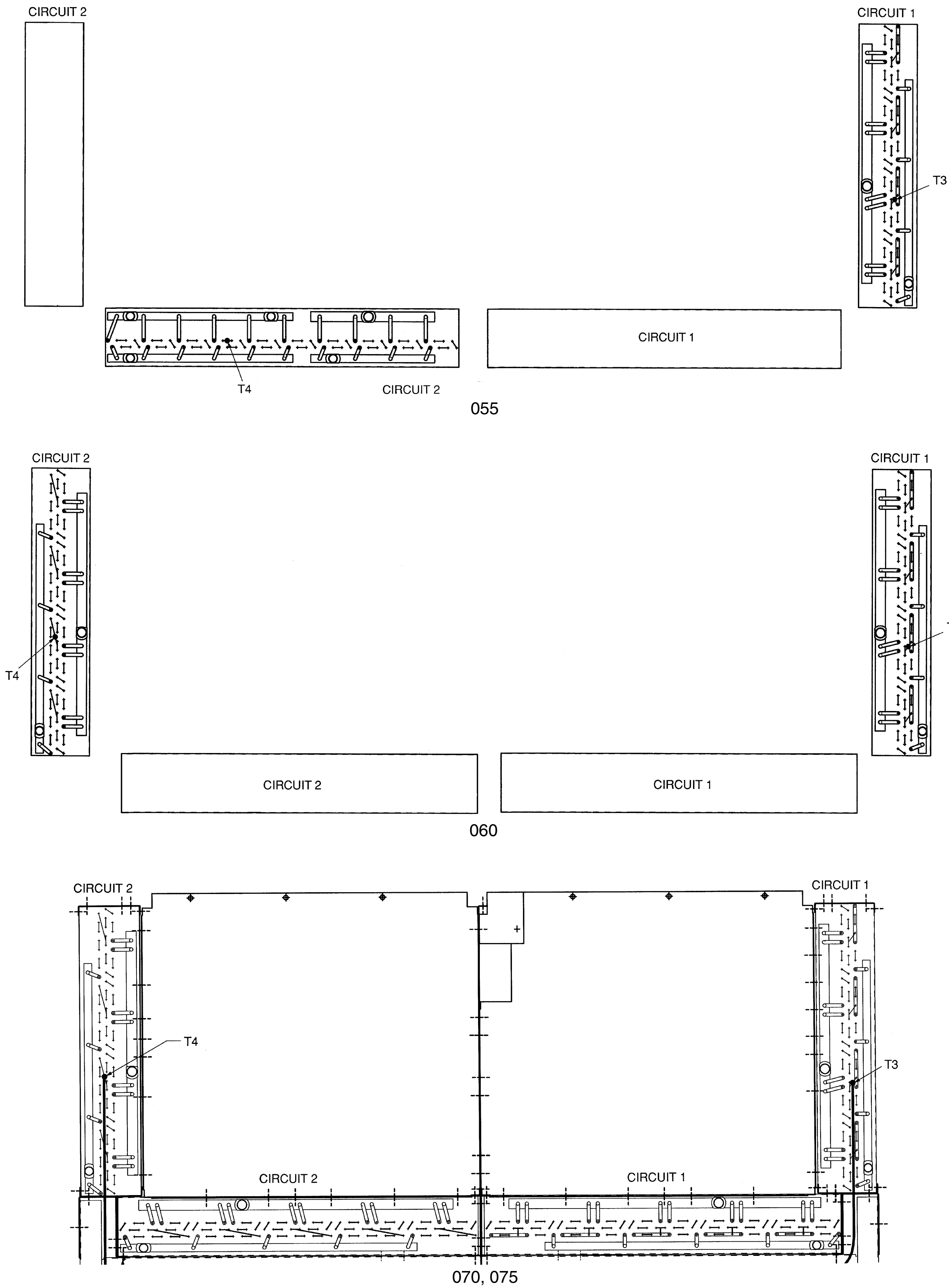


LEGEND

CKT — Circuit
L.H. — Left Hand
R.H. — Right Hand

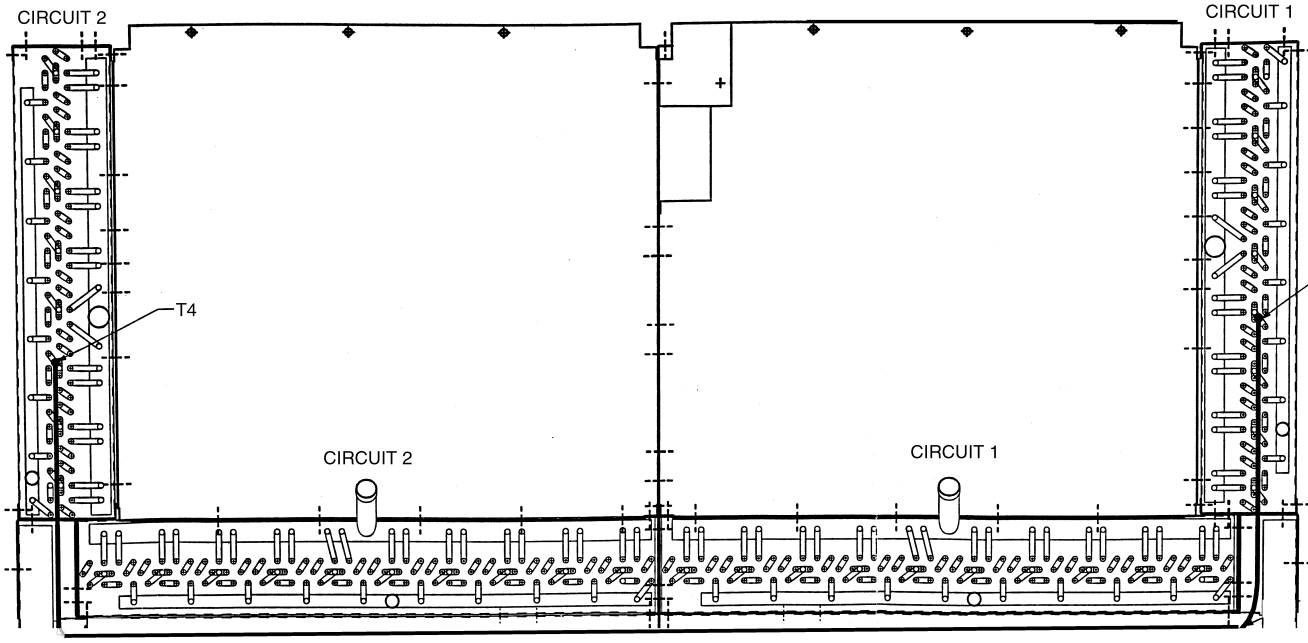
NOTE: T3 — Saturated Condensing Temperature (SCT1)
T4 — Saturated Condensing Temperature (SCT2)

Fig. 43 — Thermistor T3 and T4 Locations, Size 030-050 Units; Hairpin End of Coil



NOTE: Blank coils are included on size 055, 060 units only for relative position. Detail is provided for coils where thermistors are located.

Fig. 44 — Thermistor T3 and T4 Locations, Size 055-105 Units; Header End of Coil



090, 105

Fig. 44 — Thermistor T3 and T4 Locations, Size 055-105 Units; Header End of Coil (cont)

Transducer Troubleshooting — The unit control system may use transducers to measure pressures around the system. See Table 1 for pressure transducer locations and Fig. 45 for typical refrigerant pressure transducer. If a transducer is suspected of being faulty, check the voltage to the transducer. The refrigerant pressure transducer supply voltage should be 5 vdc ± 0.2 v. These transducers convert the measured refrigerant pressure to a voltage. This voltage is then evaluated as a ratio to the 5 vdc ± 0.2 v supply voltage. Read the voltage on Channel 12. If the check filter switch is open, then 5 v is used for the ratio. If the supply voltage is correct, compare the pressure reading displayed on the HSIO keypad and the pressure obtained on a calibrated pressure gage.

NOTE: A 24-vac isolation transformer is required for proper operation of each field-installed IAQ and humidity sensor. One transformer is required for each sensor to avoid damage to refrigerant pressure transducers.

> IMPORTANT: Compressor service valves shut off the pressure port when backseated. Be sure that service valves with transducers installed on the pressure port are not backseated to ensure proper transducer operation.

To check the refrigerant pressure transducers:

1. Use the pressure subfunction of the status function (7 STAT and 8 STAT) to determine if the pressure transducers are reading correctly. Connect a calibrated gage to the lead compressor suction or discharge pressure connection to check transducer reading.
2. Make sure that the transducer leads are properly connected in the junction box and to the PSIO-1. Check the transformer TRAN4 output. Check the transducer supply voltage from PSIO-1. It should be 5 vdc ± 0.2 v. Check the supply voltage to PSIO-1 Channel 12.

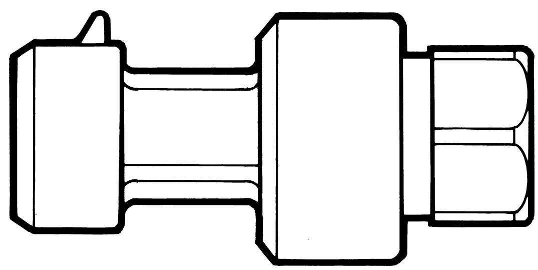


Fig. 45 — Refrigerant Pressure Transducer

Refrigerant Pressure Transducer Replacement and Calibration — Remove the transducers from the compressor and allow them to be exposed to atmospheric pressure. Refrigerant ports under transducers have Schrader-type ports. Follow the steps in Table 82 to calibrate (zero) the transducers.

After calibration, the results may be checked by following the steps outlined in Table 83. Pressure readings other than 0.0 psig indicate that the calibration was unsuccessful. Repeat the calibration procedure for any value that is greater than ± 1.0 psig.

After satisfactory calibration of the transducers, reinstall them on the compressors.

Table 82 — Refrigerant Pressure Transducer Configuration

HSIO ENTRY	KEYPAD DISPLAY	ACTION BEING TAKEN
1 SRVC	LOG ON	Enter login function
1 1 1 1 ENTER	LOGGED ON	Logging in
3 SRVC	FACT CFG	Enter factory configuration function
▲	SPB CALB	
1 ENTER	SPB CALB	Calibrate SPB transducer
▲	SPA CALB	
1 ENTER	SPA CALB	Calibrate SPA transducer
▲	DPB CALB	
1 ENTER	DPB CALB	Calibrate DPB transducer
▲	DPA CALB	
1 ENTER	DPA CALB	Calibrate DPA transducer

LEGEND

DPA — Discharge Pressure, Circuit A
DPB — Discharge Pressure, Circuit B
SPA — Suction Pressure, Circuit A
SPB — Suction Pressure, Circuit B

Table 83 — Verification of Refrigerant Pressure Transducer Calibration

HSIO ENTRY	KEYPAD DISPLAY	READING NAME (EXPECTED DISPLAY)
7 STAT	PRESSURE	System pressures
▼	DPA X	Discharge pressure, circuit A (0.0 psig)
▼	SPA X	Suction pressure, circuit A (0.0 psig)
▼ ▼	DPB X	Discharge pressure, circuit B (0.0 psig)
▼	SPB X	Suction pressure, circuit B (0.0 psig)

Control Modules

⚠ CAUTION

Turn controller power off before servicing controls. This ensures safety and prevents damage to controller.

PROCESSOR MODULE (PSIO-1), CONTROL OPTION MODULE (PSIO-2), AND HIGH-VOLTAGE RELAY MODULES (DSIO-1 and DSIO-2) — The PSIO and DSIO modules all perform continuous diagnostic evaluations of the condition of the hardware. Proper operation of these modules is indicated by LEDs (light-emitting diodes) on the front surface of the DSIOs, and on the top horizontal surface of the PSIOs.

RED LED — If the red LED is blinking continuously at a 3- to 5-second rate, it indicates proper operation. If it is lighted continuously, there is a problem requiring replacement of module. If it is off continuously, power should be checked. If there is no input power, check fuses. If fuse is bad, check for shorted secondary of transformer or for bad module. On the PSIO-1 module, if the light is blinking at a rate of twice per second, the module should be replaced.

GREEN LED — On the PSIOs, this is the green LED closest to COMM connectors. The other green LED on the module indicates external communications, when used. Green LED should always be blinking when power is on. It indicates modules are communicating properly. If green LED is not blinking, check red LED. If red LED is normal, check module address switches. See Fig. 46. Proper addresses are:

PSIO-1 (Processor Module) — 01 (may be different when CCN connected)
DSIO-1 (High-Voltage Relay Module) — 19
DSIO-2 (High-Voltage Relay Module) — 49
PSIO-2 (Control Options Module) — 31

If *all* modules indicate communication failure, check COMM plug on PSIO-1 module for proper seating. If a good connection is assured and condition persists, replace PSIO-1 module.

If only DSIO(s) or PSIO-2 module indicates communication failure, check COMM plug on that module for proper seating. If a good connection is assured and condition persists, replace DSIO or PSIO-2 module(s).

All system operating intelligence rests in PSIO-1 module, the module that controls unit. This module monitors conditions through input and output ports and through DSIO modules.

The machine operator communicates with microprocessor through keypad and display module (HSIO). Communication between PSIO-1 and other modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module.

On sensor bus terminal strips, terminal 1 of PSIO-1 module is connected to terminal 1 of each of the other modules. Terminals 2 and 3 are connected in the same manner. See Fig. 47. If a terminal 2 wire is connected to terminal 1, system does not work.

Internal communications between control modules in the rooftop unit is carried out through the COMM3 communications bus. A 3-wire bus is routed between the COMM3 plugs of each module.

The COMM1 communications bus (Fig. 48) is for external communications to other equipment on the bus or to a computer running ComfortWORKS® or Service Tool software. A connection is usually made between the PSIO-1 COMM1 plug on the rooftop unit, the air terminals, and the other rooftop units. A plug is provided in the control panel for connecting the external bus to the rooftop units. The external connection plug is factory wired to the PSIO-1 COMM1 plug.

The PSIO-1, DSIO-1, and HSIO are all powered from a common 21-vac power source which connects to terminals 1 and 2 of power input strip on each module. A separate source of 21-vac power is used to power the DSIO-2 module and PSIO-2 options module through terminals 1 and 2 on power input strip.

PROCESSOR MODULE (PSIO-1) (Fig. 49)

Inputs — Each input channel has 3 terminals; only 2 of the terminals are used. Unit application determines which terminals are used.

Outputs — Output is 24 vdc. There are 3 terminals, only 2 of which are used, depending on application. Refer to unit wiring diagram.

NOTE: Address switches (see Fig. 49) must be set at 01 (different when CCN connected).

HIGH-VOLTAGE RELAY MODULES (DSIO-1 and DSIO-2) (Fig. 50)

Inputs — Inputs on strip J3 are discrete inputs (ON/OFF). When 24-vac power is applied across the 2 terminals in a channel it reads as an on signal. Zero v reads as an off signal.

Outputs — Terminal strips J4 and J5 are internal relays whose coils are powered-up and powered-off by a signal from microprocessor. The relays switch the circuit to which they are connected. No power is supplied to these connections by DSIO modules.

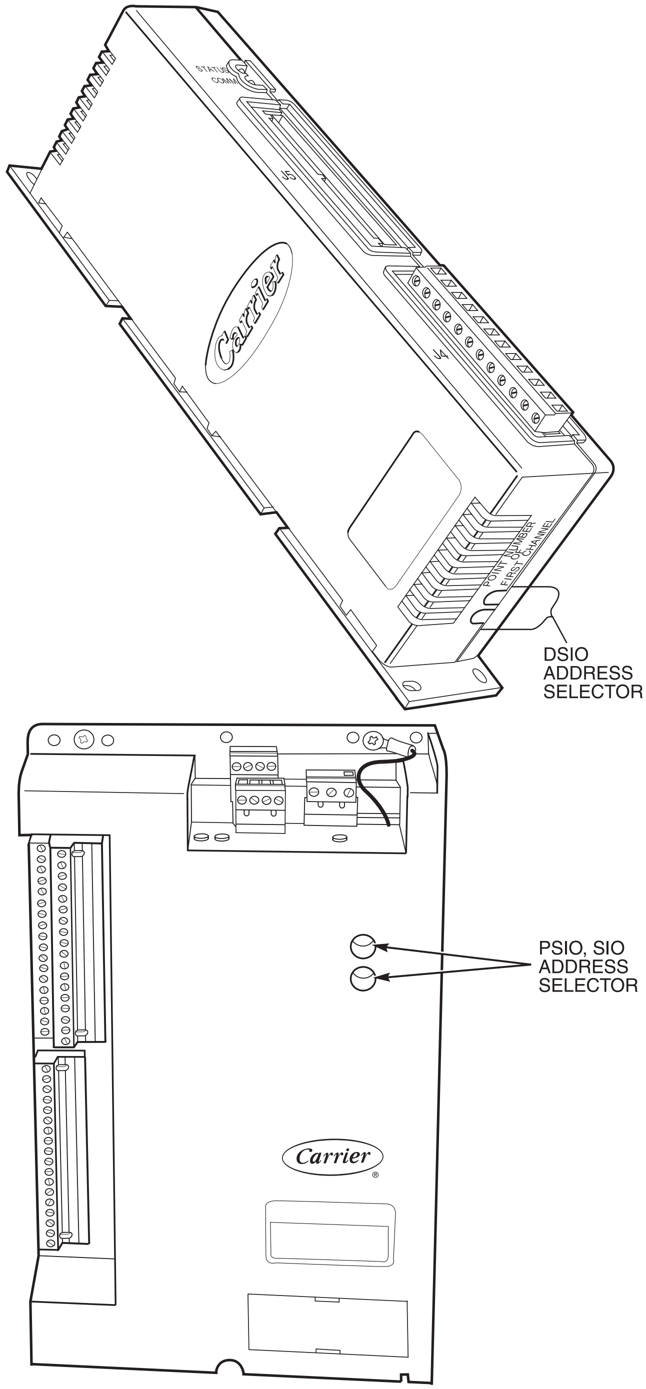
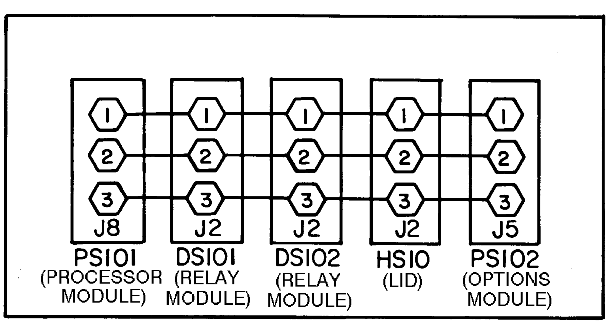


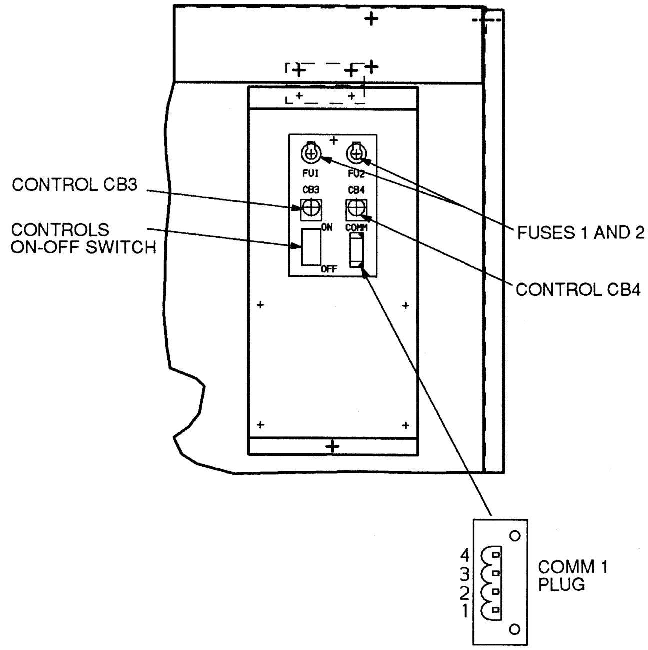
Fig. 46 — Module Address Selector Locations



LEGEND

HSIO — Keypad and Display Module (Local Interface Device)

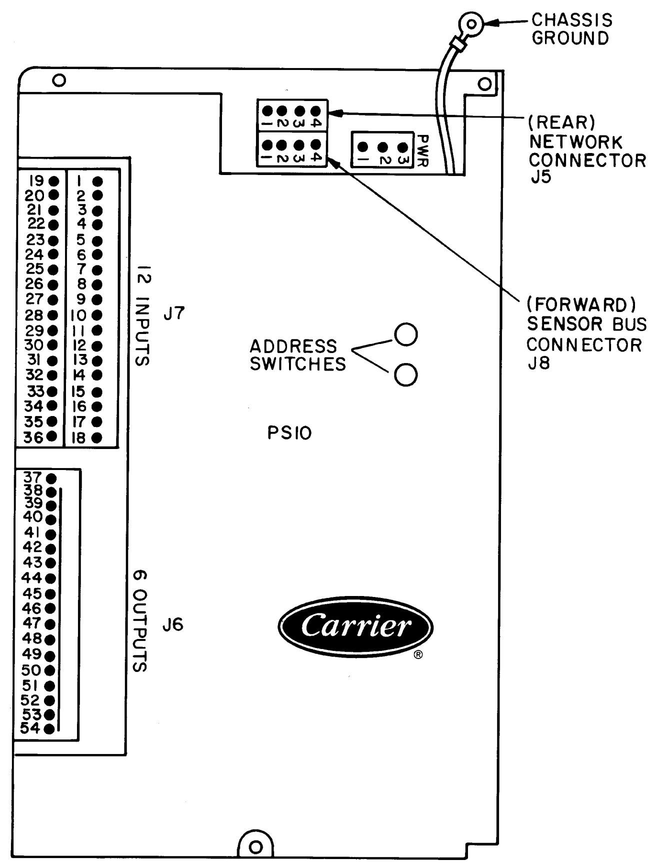
Fig. 47 — Sensor Bus Wiring (Communications)



LEGEND

CB — Circuit Breaker

Fig. 48 — COMM1 Communications Bus Plug



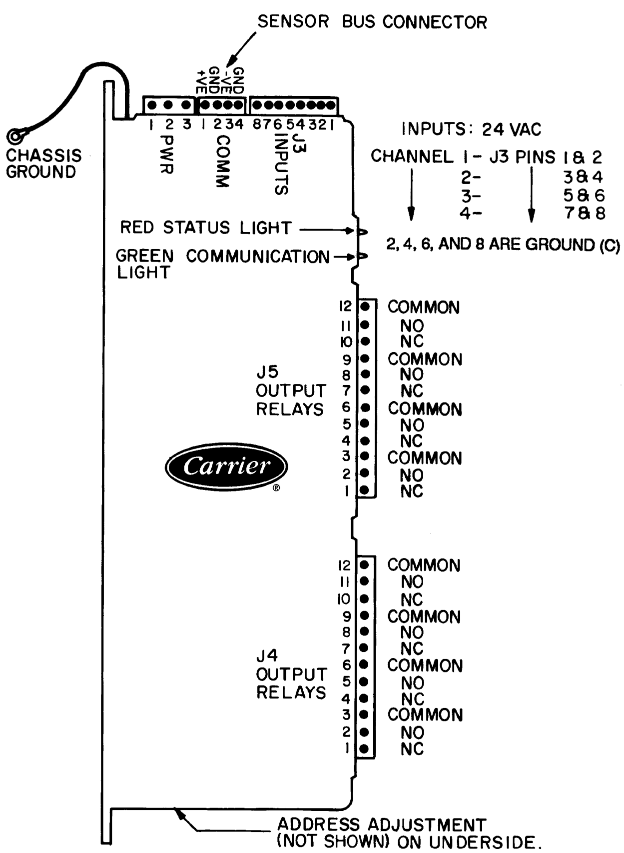
LEGEND

PWR — Power

Fig. 49 — Processor Module (PSIO-1)

CONTROL OPTIONS MODULE (PSIO-2) — See Fig. 51. The PSIO-2 allows for connection of additional input sensors and output devices. The sensors and controlled devices include:

- Relative humidity sensor. This feature requires a field-supplied, 4-wire, 2 to 10 v RH (relative humidity) sensor.
- Outdoor-air cfm sensor. This feature requires a 4-wire, field-supplied, mass flow sensor to input a 2 to 10 v signal.
- Indoor-air quality. This feature uses a field-supplied, 4-wire, carbon-dioxide sensor to input a 2 to 10 v signal.
- Fire and smoke routines. This is accomplished through field-supplied remote switch inputs.
- Humidifier function. This feature provides control of a field-installed humidifier.
- Discrete timer output. This output permits control of timed functions such as parking lot lights.
- Hydronic valve control. The PSIO-2 module provides outputs to control a field-installed hydronic coil valve.
- Suction gas thermistor input.
- Freezestat switch input.



LEGEND

COMM — Communications Bus
NC — Normally Closed
NO — Normally Open
PWR — Power

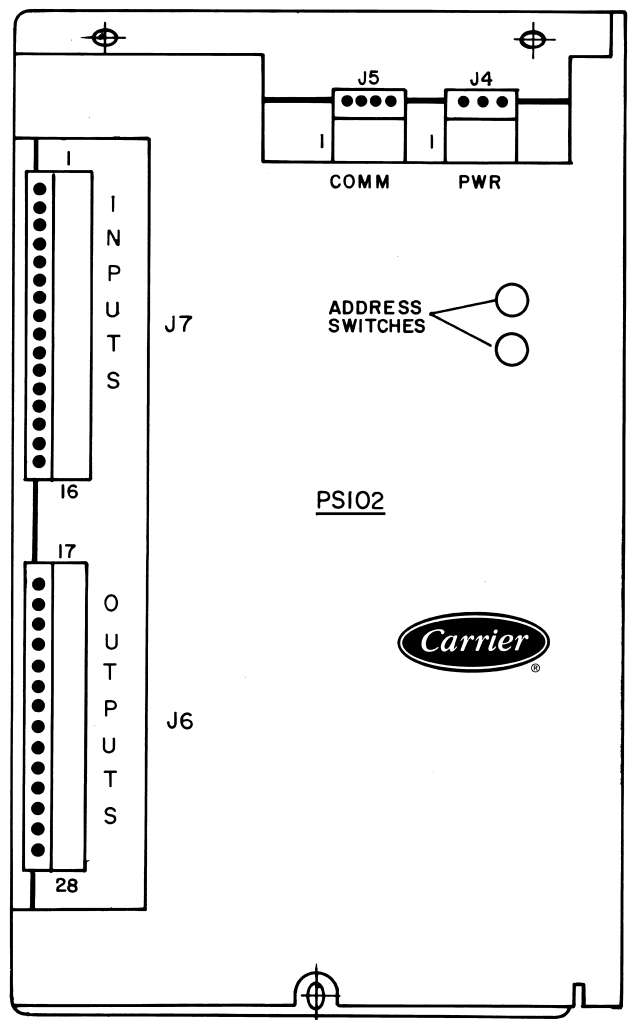
Fig. 50 — High-Voltage Relay Modules (DSIO-1 and DSIO-2)

- Supply Air Temperature Reset from external signal. Requires field-supplied 2 to 10 vdc signal.
- Motormaster® (Stage 1) controls (size 090 and 105 only).
- External alert signal contact (size 090 and 105 only).

ACTUATORS — The actuators for these units are positioned by a 4 to 20 mA signal from the microprocessor. The actuators contain a series of DIP (dual in-line package) switches that determine the maximum travel of the actuator.

See Table 84 for the degrees of travel and the correct DIP switch settings for each actuator.

When installing actuator linkage, actuator should be powered to its fully open position. The linkage should then be connected so that the actuator does not stall against a fully open damper.



LEGEND

COMM — Communications Bus
PWR — Power

Fig. 51 — Control Options Module (PSIO-2)

Table 84 — Actuator Degrees of Travel and DIP Switch Settings

ACTUATOR	DEGREES OF TRAVEL	DIP SWITCH(ES) OPEN	DIP SWITCHES CLOSED
Economizer	110	8 and 10	All Others
Inlet Guide Vanes (030-070)	45	6 and 10	All Others
Modulating Power Exhaust* and Return/Exhaust	70	5 and 10	All Others

*Except 48ZW and 50ZW,ZZ units.

Economizer Actuator

OPERATION — The motor feedback potentiometer and PIC control current input circuit form a bridge circuit. As long as the economizer damper remains at the position proportional to the input current from the controller, the circuit is balanced, and the motor does not run. When the value of the supply air temperature changes, the current from the PIC controller changes, and unbalance is amplified to energize the triac switching to run the motor in the proper direction to correct the change in the supply-air temperature. The motor turns the feedback potentiometer to rebalance the circuit and stop the motor.

CHECKOUT — After installation and linkage adjustment, operate the motor through the controller. Make sure that:

- The motor operates the dampers properly.
- The motor responds properly as the input is varied.
- The auxiliary switch, if used, operates at the desired point of motor rotation.

Inspect the motor, linkage, and damper to see that all mechanical connections are correct and secure. In damper installations, the pushrod should not extend more than a few inches past the ball joints. Check to see that there is adequate clearance for the linkage to move through its stroke without binding or striking other objects. See controller or system instructions for additional checkout procedures.

Motor Operation Checkout (Fig. 52) — Check motor operation as follows:

1. To close the motor, open terminals +, –, and F.
2. To open the motor, connect terminal F to either the positive (+) or negative (–) motor terminal.

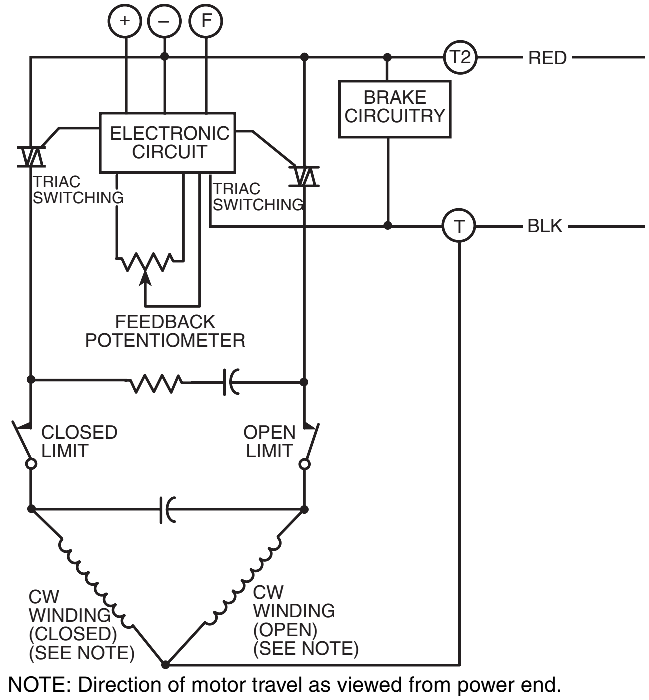


Fig. 52 — Economizer Actuator

Supply Fan Variable Frequency Drive (VFD) (Unit Serial Numbers 0799F or later)

⚠ WARNING

Factory-option VFD is located near the supply fan and motor. During any service work or programming at the VFD, operation of the fan and motor is not desirable. Either disable the supply fan or install the accessory VFD remote display package.

NOTE: Following section refers to factory-installed option VFDs. The VFD model number is TOSVERT130-E3. These VFDs are specially modified for use on Carrier equipment. Some specifications and control configuration defaults for Carrier applications will differ from standard ‘‘E3’’ product manual information supplied with unit. See Appendix E for listing of Carrier-specific default values.

SUPPLY FAN VFD CONTROL — On units with factory-installed option VFD, the VFD controls duct pressure (DP) in response to input signals received from the base unit PIC control module. The base unit control monitors duct pressure via a differential duct pressure transducer. The pressure transducer is located in the unit auxiliary control box (see Fig. 36 and 37). The pressure transducer's low pressure reference port is routed to the outside of the unit cabinet by a factory-installed tubing section. The pressure transducer's high pressure reference point must be field-routed to the duct pressure pick-up which is field-supplied and installed in the supply duct. See Air Pressure Tubing page 50 for recommended location.

The DP transducer monitors the static pressure in the supply duct and provides a 2 to 10 vdc signal to the base unit control module (PSIO-1, Channel 11). Refer to Table 85 for transducer output signal characteristics (static pressure vs. signal volts). The base unit control module compares this signal representing actual duct pressure to the user-configured DP set point and then signals required changes in VFD output to the VFD (via 4 to 20 mA signal at PSIO-1 Channel 16). The VFD then adjusts its output to the supply-fan motor to maintain the desired DP set point. When operating with the factory-standard PIC controls, the VFD's internal PID logic feature is disabled.

SUPPLY FAN MOTOR OVERLOAD PROTECTION — The VFD also provides operating overload protection for the supply-fan motor. The VFD's overload function matches the factory-installed motor (motor size and efficiency). If the supply-fan motor is changed from the original factory selection, the overload value may need to be changed by the service person. Contact your local Carrier representative for assistance in determining the proper overload setting.

NOTE: VFD size is matched to factory-installed motor size. Do not increase motor size without also changing to an equivalent VFD size.

Table 85 — Duct Pressure Transducer Output Characteristics

PRESSURE (in. wg)	CONTROL SIGNAL (vdc)	PRESSURE (in. wg)	CONTROL SIGNAL (vdc)
0.00	2.0	**2.75**	6.4
0.25	2.4	**3.00**	6.8
0.50	2.8	**3.25**	7.2
0.75	3.2	**3.50**	7.6
1.00	3.6	**3.75**	8.0
1.25	4.0	**4.00**	8.4
1.50	4.4	**4.25**	8.8
1.75	4.8	**4.50**	9.2
2.00	5.2	**4.75**	9.6
2.25	5.6	**5.00**	10.0
2.50	6.0		

VFD OPERATION TROUBLESHOOTING — When troubleshooting the VFD drives in these units, check first that all required conditions for VFD operation are satisfied.

The VFDs are set up to start when the base unit controls command the supply fan to start. To start the supply fan, the following conditions are required at the base unit controls:

1. Main power on.
2. Supply Fan circuit breaker (IFCB) closed.
3. Occupied status, or Unoccupied status with Heating or Cooling demand.
4. Indoor fan contactor (IFC) closed on command from base unit control.

For the VFD to run, the following conditions must be met at the VFD:

1. Drive enable jumper is installed from terminals ST-CC (factory supplied) (see Fig. 53).
2. Proper rotation jumper is installed at terminals R-CC (reverse rotation, factory supplied) or terminals F-CC (forward rotation, factory supplied). See Fig. 54 and 55.

UNIT SIZES	ROTATION	JUMPER
030-050	Reverse	R-CC
055-070	Forward	F-CC
075-105	Forward	F-CC

3. Emergency stop jumper is installed from terminals S4-CC (factory supplied).
4. A 4 to 20 mA signal is applied across terminals IV-CC (from PSIO-1, Channel 16).
5. DIP Switch SW1 (located on the VFD's printed circuit control panel) must be set to "I" (indicating usage of a 4 to 20 mA input signal at terminal "IV").
6. Speed Control (located on the VFD's keypad/display) set for "Remote" (press the "SPEED CTRL" button until LED "REMOTE" is illuminated).
7. Programmed according to Carrier defaults.
8. Duct Pressure set point established by user, or use factory default (1.50 in. wg).

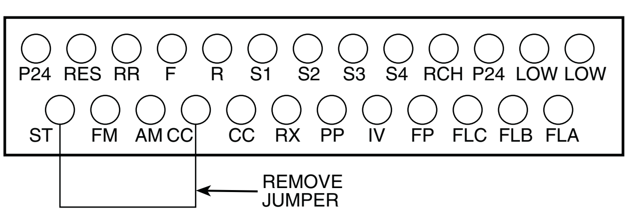


Fig. 53 — Jumper Removal to Disable Motor

VFD PROGRAMMING — To disable the supply fan motor and change programming of VFD, perform the following:

1. Turn off Indoor Fan Circuit Breaker (IFCB). This will remove power to the VFD.
2. Wait for the VFD display to go blank and remove VFD cover without touching any interior components.
3. Ensure that the charge indicator lamp is out which indicates that the VFD is discharged. The lamp is located on the upper right-hand corner of the terminal block. If still lit, wait until lamp goes completely out. This may take several minutes.
4. Remove jumper from terminals ST-CC (see Fig. 53) and replace VFD cover.
5. Turn on IFCB.
6. The drive output will now be disabled but the programming can be changed.
7. Once the program changes are completed, turn off IFCB.
8. Wait for the VFD display to go blank and remove VFD cover without touching any interior components.
9. Ensure that the charge indicator lamp is out which indicates that the VFD is discharged. The lamp is located on the upper right-hand corner of the terminal block. If still lit, wait until lamp goes completely out. This may take several minutes.
10. Replace jumper to terminals ST-CC.
11. Replace VFD cover.
12. Turn on IFCB to enable the drive.

VFD OPERATIONAL STATUS — The VFDs contain extensive self-diagnostic functions which are accessed via the VFD's display panel (located on the front of the VFD or at a remote location when the accessory remote display package has been installed). See Fig. 56.

⚠ CAUTION

If using the VFD's front-mounted display panel, **disconnect all power to the unit and the VFD before entering unit,** or use the accessory remote display module. Follow instructions above for disabling supply fan and motor operation before accessing VFD-mounted display module.

When power is first applied to the VFD, the display automatically starts with the frequency monitor function of its standard monitor mode. In the frequency monitor function, the output frequency is displayed. Pushing the **S/P/M** (Setup/Program/Monitor) key switches to the Mode Selection menu. Pushing the **S/P/M** key again toggles the display back to the standard monitor mode.

From the Mode Selection menu, the service person can view all of the monitored status variables, including up to four user-selected variables and any trip history in the memory.

Refer to the separate VFD Operation Manual included in the installation packet for detailed instructions on accessing diagnostic information, initiating troubleshooting, and clearing any cleared trip history.

CARRIER FACTORY DEFAULT VALUES — The VFDs have been specially programmed for use in Carrier units for both general Carrier use and for the specific unit. Tables of default values contained in the VFD Operation Manual included in the installation packet will NOT APPLY to this unit. For these specific models, refer to Appendix E for the VFD defaults.

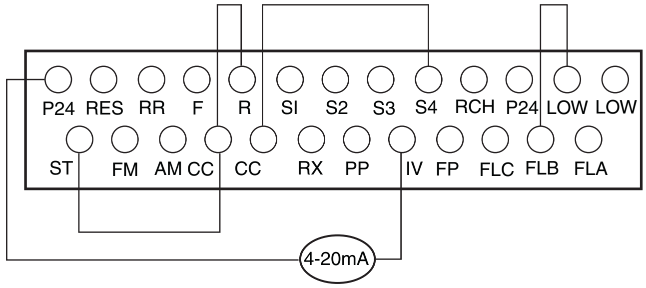


Fig. 54 — Supply Fan Variable Frequency Drive Terminal Block (Size 030-050 Units)

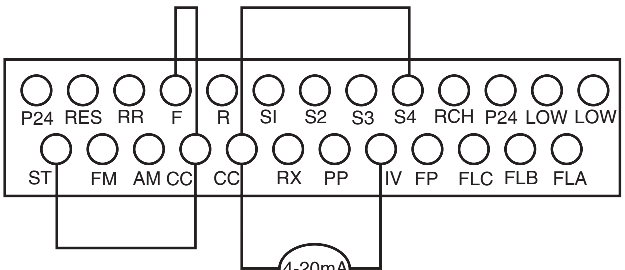


Fig. 55 — Supply Fan Variable Frequency Drive Terminal Block (Size 055-105 Units)

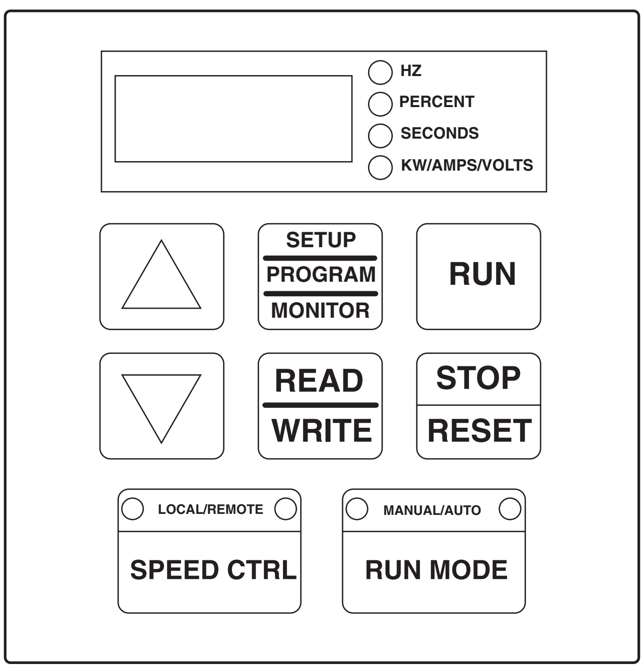


Fig. 56 — Variable Frequency Drive Keypad

⚠ WARNING

Factory-installed optional VFD is located near the supply fan and motor. During any service work or programming at the VFD, operation of the fan and motor is not desirable. Either disable the supply fan or install the accessory VFD remote display accessory.

RESTORING FACTORY DEFAULTS — The original factory configuration values are saved in the memory of the VFD and can be restored by the service person if deemed necessary. There are two types of saved file data: Carrier-factory settings (settings specific to the unit) and VFD manufacturer factory defaults (for general Carrier unit use).

The Carrier-factory settings are maintained as user settings. These can be restored by entering the Setup mode (in the Mode Selection menu) and setting parameter tYp to 6 on the keypad/display. This will recall the specific factory defaults for this unit.

Occasionally it may be necessary to restore the VFD defaults to the general Carrier use values. These are stored in an OPTION ROM (read-only memory chip). However, some variables may need to be manually changed to match the specific unit's factory default settings. To recall the general Carrier defaults, enter the Setup mode and set parameter tYp to 3. Then, check the Table 86-88 for items requiring manual entry.

Table 86 — Supply Fan VFD Required User Adjusted Defaults

SIZES	ITEM
All	Motor overload settings (see Table 87 and 88)
055-105	1. Check jumper CC-F 2. Gr.UT/bLSF = 1 3. Gr.SF/Sr.n = 1 4. Gr.SF/SrN1 = 0 5. SEtP/tYP = 5 (Save User Settings) 6. SEtP/LL = 10.0 7. Gr. Fb/FbP1 = 1 8. Gr. Pn/Fr = 0 9. Gr. Pr/UuC = 1 10. Gr. Ut/Cnod = 1 11. Gr. Ut/Fnod = 2 12. Gr. Ut/bLPn = 1

Table 87 — Supply Fan Motor Overload Settings (tHr1) — Sizes 030 to 070

MOTOR (hp)	HIGH EFFICIENCY				PREMIUM EFFICIENCY		
	IFM Letter*	230V	460V	575V	IFM Letter*	230V	460V
7.5	A†	96.0	80.0	76.0	H†	96.0	80.0
10	B†	96.6	97.3	90.9	J†	96.6	97.3
15	C	78.3	100.0	100.0	K	78.3	100.0
20	D	87.3	100.0	95.1	L	87.3	100.0
25	E	85.7	93.5	100.0	M	85.7	93.5
30	F	99.0	92.3	100.0	N	99.0	92.3
40	G**	88.7	84.6	100.0	P**	88.7	84.6

*IFM letter refers to the Supply Fan Motor Option of the unit model number in the 16th position.
†030-050 units only.
**055-070 units only.

Table 88 — Supply Fan Motor Overload Settings (tHr1) — Sizes 075 to 105

MOTOR (hp)	HIGH EFFICIENCY			PREMIUM EFFICIENCY	
	IFM Letter*	460V	575V	IFM Letter*	460V
30	A	92.3	100.0	F	92.3
40	B	84.6	90.1	G	84.6
50	C	92.2	—	H	92.2
60	D	86.0	—	J	86.0
30	L	92.3	100.0	R	92.3
40	M	84.6	90.1	S	84.6
50	N	92.2	—	T	92.2
60	P	86.0	—	V	86.0
75	Q	—	—	W	—

*Supply Fan Motor Option of the unit model number in the 15th Position.

High-Capacity Power Exhaust (48ZW and 50ZW,ZZ Units)

NOTE: Following section refers to factory-installed power exhaust VFDs. The VFD model number is TOSVERT130-E3. These VFDs are specially modified for use on Carrier equipment. Some specifications and control configuration defaults for Carrier applications will differ from standard "E3" product manual information supplied with unit. See Appendix F for listing of Carrier-specific default values.

POWER EXHAUST VFD CONTROL — On 48ZW and 50ZW,ZZ units with factory-installed power exhaust VFD, the power exhaust VFD controls building pressure (BP) in response to input signals received from the base unit PIC control module. The power exhaust VFD is located in the auxiliary control box located on the left hand side of the unit. See Fig. 57. The base unit control monitors building pressure via a different building pressure transducer. The pressure transducer is located in the unit auxiliary control box (see Fig. 57). The pressure transducer's low pressure reference port is routed to the outside of the unit cabinet by a factory-installed tubing section. The pressure transducer's high pressure reference point must be field-routed to the building pressure pick-up which is field-supplied and installed in the building. See Air Pressure Tubing page 50 for recommended location.

The BP transducer monitors the static pressure in the building and provides a 2 to 10 vdc signal to the base unit control module (PSIO1, Channel 9). Refer to Table 89 for transducer output signal characteristics (static pressure vs. signal volts). The base unit control module compares this signal representing actual building pressure to the user-configured BP set point and then signals required changes in VFD output to the VFD (via 4 to 20 mA signal at PSIO-1 Channel 15). The VFD then adjusts its output to the power exhaust fan motor to maintain the desired BP set point. When operating with the factory-standard PIC controls, the VFD's internal PID logic feature is disabled.

POWER EXHAUST FAN MOTOR OVERLOAD PROTECTION — The PE VFD also provides operating overload protection for the supply-fan motor. The power exhaust VFD's overload function matches the factory-installed motor (motor size and efficiency). If the power exhaust fan motor is changed from the original factory selection, the overload value may need to be changed by the service person. Contact your local Carrier representative for assistance in determining the proper overload setting.

NOTE: Power exhaust VFD size matched to factory-installed motor size. Do not increase motor size without also changing to an equivalent power exhaust VFD size.

Table 89 — Building Pressure Transducer Output Characteristics

PRESSURE (in. wg)	CONTROL SIGNAL (vdc)	PRESSURE (in. wg)	CONTROL SIGNAL (vdc)
–0.50	2.0	0.05	6.4
–0.45	2.4	0.10	6.8
–0.40	2.8	0.15	7.2
–0.35	3.2	0.20	7.6
–0.30	3.6	0.25	8.0
–0.25	4.0	0.30	8.4
–0.20	4.4	0.35	8.8
–0.15	4.8	0.40	9.2
–0.10	5.2	0.45	9.6
–0.05	5.6	0.50	10.0
0.00	6.0		

POWER EXHAUST VFD OPERATION — When troubleshooting the power exhaust VFD, check first that all required conditions for power exhaust VFD operation are satisfied.

For the power exhaust VFD to run, the following conditions must be met at the power exhaust VFD:

1. Drive enable jumper is installed from terminals ST-CC (factory supplied) (see Fig. 58).
2. Proper rotation jumper is installed at terminals R-CC (reverse rotation, factory supplied).
3. Emergency stop jumper is installed from terminals S4-CC (factory supplied).
4. A 4 to 20 mA signal is applied across terminals IV-P24 (PSIO1, Channel 15).
5. DIP switch SW1 (located on the VFD's printed circuit control panel) must be set to "I" (indicating usage of a 4 to 20 mA input signal at terminals "IV").
6. Speed Control (located on the VFD's keypad/display) set for "Remote" (press the "Speed Ctrl" button until LED "Remote" is illuminated).
7. Programmed according to Carrier defaults.
8. Building Pressure set point established by user, or use factory default (6 VDC indicating 0.0 in. wg) (see Table 89).

POWER EXHAUST VFD OPERATIONAL STATUS — The power exhaust VFDs contain extensive self-diagnostic functions which are accessed through the power exhaust VFD display panel (located on the front of the power exhaust VFD or at a remote location when the accessory remote display package has been installed).

⚠ CAUTION

If using the VFD display panel, **disconnect all power to the unit and the VFD before entering unit,** or use the accessory remote display module. Disable supply fan and motor operation before accessing VFD-mounted display module.

When power is first supplied to the power exhaust VFD, the display automatically starts with the frequency monitor function of its standard monitor mode. In the frequency monitor function, the output frequency is displayed. Push the **S/P/M (Setup/Program/Monitor)** key to switch to the Mode Selection menu. Push the **S/P/M** key again to toggle the display back to the standard monitor mode.

From the Mode Selection menu, the service person can view all of the monitored status variables, including up to four user-selected variables and any trip history in the memory.

Refer to the separate VFD Operation Manual for detailed instructions on accessing diagnostic information, initiating troubleshooting, and clearing any trip history.

RESTORING FACTORY POWER EXHAUST VFD DEFAULTS — The original factory configuration values are saved in the memory of the power exhaust VFD band can be restored by the service person if required. There are two types of saved file data: Carrier-factory settings (factory programmed settings made to the power exhaust VFD which apply specifically to the unit it is installed on) and standard defaults for general Carrier unit use.

The Carrier-factory settings are maintained as user settings. These can be restored by entering the Setup mode (in the **S/P/M** menu) and setting parameter tYP = 6 on the keypad/display. This will recall the specific factory defaults for this unit.

Occasionally it may be necessary to restore the power exhaust VFD defaults to the general Carrier use values. These are stored in an OPTION ROM (read-only memory chip). However, some variables may need to be manually changed to match the specific unit's factory default settings. To recall the general Carrier defaults, enter the Setup mode and set parameter tYP = 3. Refer to Tables 90-92 for items requiring manual adjustment.

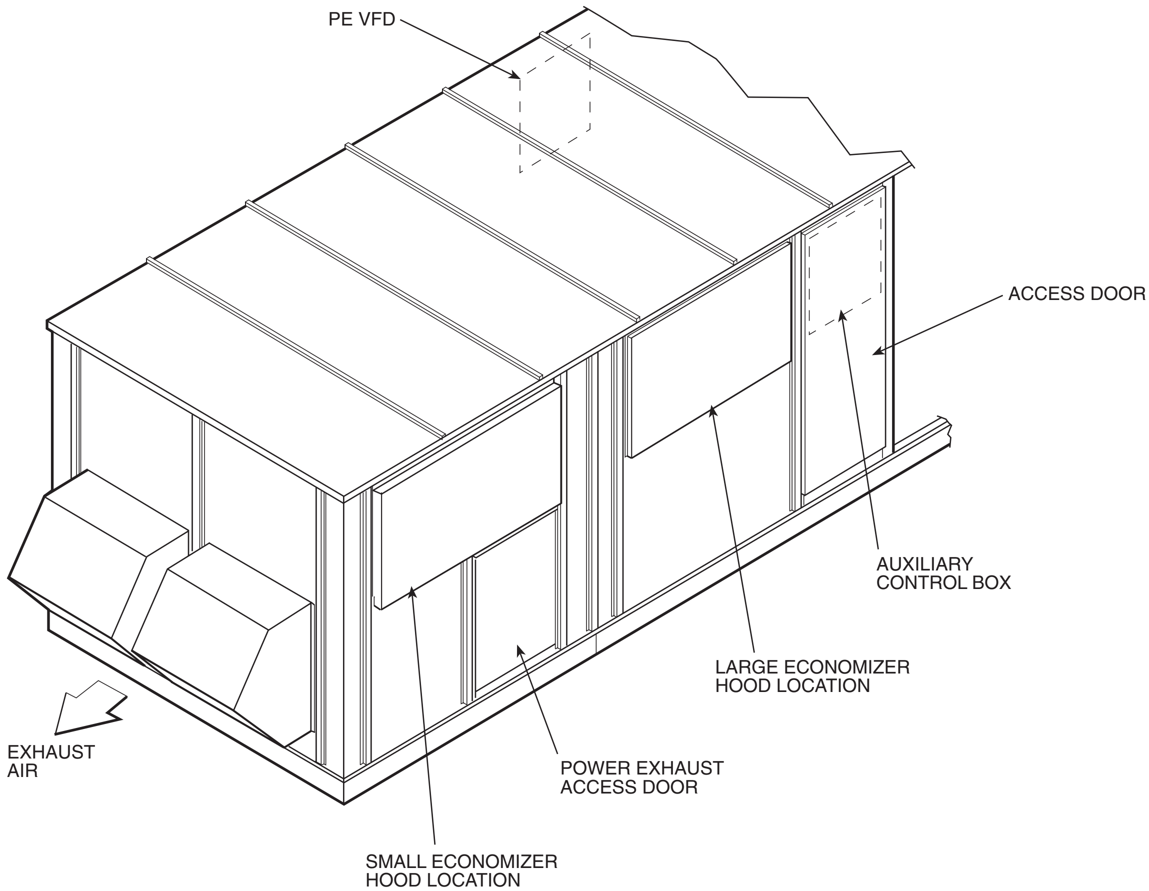


Fig. 57 — High Capacity Power Exhaust Details — 48ZW and 50ZW,ZZ Units

Table 90 — Power Exhaust VFD Required User Adjusted Defaults

UNIT	ITEM
48ZW and 50ZW,ZZ	Motor Overload Settings (See Tables 91 and 92)
	Gr.St/Ot1 = 4
	Gr.St/Ot2 = 2
	Gr.St/Ot2d = 5
	Gr.St/Ot2H = 100
	Gr.St/LF = 15
	SEtP/UL = 60.0
	SEtP/P4 = 100
	SetP/LL = 10.0
	SetP/tYP = 5
	Gr. Fb/FbP1 = 1
	Gr. Pn/Fr = 0
	Gr. Pr/UuC = 1
	Gr. Ut/Cnod = 1
	Gr. Ut/Fnod = 2
	Gr. Ut/bLPn = 1

Table 91 — Power Exhaust Fan Motor Overload Setting (tHr1) — Sizes 030-070

MOTOR (hp)	HIGH EFFICIENCY				PREMIUM EFFICIENCY		
	PE Letter*	230V	460V	575V	PE Letter*	230V	460V
6	G†	98.4	75.08	84.04	Q†	98.4	75.08
10	H	96.6	97.3	90.9	R	96.6	97.3
15	J	78.3	100.0	100.0	S	78.3	100.0
20	K	87.3	100.0	95.1	T	87.3	100.0

*Outdoor Air Power Exhaust Option of the unit model number in the 16th Position.
†030-050 units only.

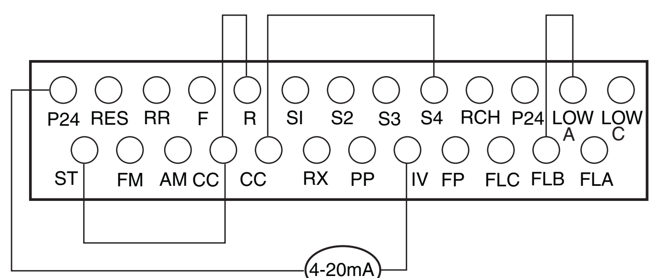


Fig. 58 — Power Exhaust Variable Frequency Drive Terminal Block

Table 92 — Power Exhaust Fan Motor Overload Setting (tHr1) — Sizes 075 to 105

MOTOR (hp)	HIGH EFFICIENCY			PREMIUM EFFICIENCY	
	PE Letter*	460V	575V	PE Letter*	460V
10	F	97.3	90.9	M	97.3
15	G	100.0	100.0	N	100.0
20	H	100.0	95.1	P	100.0
High-Capacity Power Exhaust (Size 75 to 105 ton)					
20	—	100.0	95.1	E	100.0
30	A	92.3	100.0	F	92.3
40	B	84.6	90.1	G	84.6
50	C	92.2	—	H	92.2
60	D	86.0	—	J	86.0
High-Capacity Power Exhaust with Plenum (Size 75 to 105 ton)					
20	Q	100.0	95.1	V	100.0
25	R	93.5	100.0	W	93.5
30	S	92.3	100.0	Z	92.3
40	T	84.6	90.1	Y	84.6

*Outdoor Air Power Exhaust Option of the unit model number in the 16th Position.

Return/Exhaust Fan Variable Frequency Drive (48ZL and 50ZL,ZM)

⚠ WARNING

Factory-installed optional VFD is located near the return/exhaust fan and motor. During any service work or programming at the VFD, operation of the fan and motor is not desirable. Either disable the return/exhaust fan or install an accessory VFD remote display. Physical injury could result.

NOTE: The RE VFD (part no. TOSVERT130-E3) is specially modified for use on Carrier equipment. Some specifications and control configuration defaults for Carrier applications will differ from the VFD manufacturer manual included in the packet. See Appendix G for listing of Carrier-specific default values.

TRANSDUCER CONTROL — The VFD monitors and controls the mixing box pressure at the filter section via a differential pressure transducer. The pressure transducer is located in the auxiliary control box. The pressure transducer's high-pressure reference port is connected to the outside of the unit cabinet. The pressure transducer's low-pressure reference port is connected to the pick-up sensor at the filter section. Both ports are factory-installed.

The mixing box pressure transducer (MBPT) monitors the static pressure in the mixing box and provides a 4 to 20 mA signal directly to the return/exhaust VFD. The internal logic of the RE VFD compares this signal representing actual mixing box pressure to the pressure set point. The RE VFD automatically adjusts its output to the power exhaust fan motor to maintain the desired set point.

The MBPT has a range of –0.5 to +0.5 in. wg. The output is a 4 to 20 mA signal, scaled to this range. The RE VFD translates the 4 to 20 mA signal to represent a frequency value over the control range of 0 to 60 Hz. See Table 93. The set point for the mixing box pressure control is established at the RE VFD keypad in terms of Hz. The factory default set point is 21 Hz, representing a mixing box pressure of –0.15 in. wg.

DETERMINE RE VFD SET POINT — The mixing box pressure set point will control the amount of outside air volume at a given minimum economizer damper position. By increasing the set point, there will be less outside air coming in from the economizer. Decreasing the set point will bring in more outside air. The factory default set point should meet most of the application needs, but it can be changed through the VFD keypad. To convert the desired MBP into the RE VFD set point, refer to Table 93. Locate the pressure value in the table closest to the desired MBP for the application and use the corresponding set point (Hz) value. If necessary, interpolation between duct static pressure values is permissible. The set point should always be lower than 30 Hz (0.0 in. wg).

ADJUST RE VFD SET POINT — To adjust the RE VFD set point, the RE VFD must be powered. Since it is located in the indoor section of the unit, use caution to ensure that the service access door is blocked open and will not close suddenly.

RETURN/EXHAUST FAN MOTOR OVERLOAD PROTECTION — The VFD provides operating overload protection for the supply fan motor. The factory has programmed the RE VFD overload function to match the factory-installed motor (motor size and efficiency). If the power exhaust fan motor is changed from the original factory selection, the overload value may need to be changed by the service person. Contact your local Carrier representative for assistance in determining the proper overload setting.

NOTE: Variable frequency drive size is matched to factory-installed motor size. Do not increase motor size without also changing to equivalent VFD size.

Table 93 — PE VFD Set Point (Frequency Command) for Building Pressure

PRESSURE (in. wg)	VFD SET POINT (Hz)	CONTROL SIGNAL (mA)	PRESSURE (in. wg)	VFD SET POINT (Hz)	CONTROL SIGNAL (mA)
0.50	0.0	4.00	**0.00**	30.0	12.00
0.45	3.0	4.80	**–0.05**	33.0	12.80
0.40	6.0	5.60	**–0.10**	36.0	13.60
0.35	9.0	6.40	**–0.15**	39.0	14.40
0.30	12.0	7.20	**–0.20**	42.0	15.20
0.25	15.0	8.00	**–0.25**	45.0	16.00
0.20	18.0	8.80	**–0.30**	48.0	16.80
0.15	21.0	9.60	**–0.35**	51.0	17.60
0.10	24.0	10.40	**–0.40**	54.0	18.40
0.05	27.0	11.20	**–0.45**	57.0	19.20
			–0.50	60.0	20.00

RETURN/EXHAUST VFD OPERATION — When troubleshooting the power exhaust VFD, check first that all required conditions for RE VFD operation are satisfied.

For the RE VFD to run, the following conditions must be met at the power exhaust VFD (see Fig. 59):

1. Drive enable jumper is installed from terminals ST-CC (factory supplied).
2. Proper rotation jumper is installed at terminals F-CC (forward rotation, factory installed).
3. Emergency stop jumper is installed from terminals S4-CC (factory installed).
4. A 4 to 20 mA signal is applied across terminals IV-P24 (from pressure transducer, factory supplied).
5. DIP switch SW1 (located on the VFD's printed circuit control panel) must be set to "I" (indicating usage of a 4 to 20 mA input signal at terminals "IV").
6. Speed Control (located on the VFD's keypad/display" set to "Remote" (press the "Speed Ctrl" button until LED "Remote" is illuminated).
7. Programmed according to Carrier defaults.
8. Mixing Box Pressure set point established by user, or use factory default (21 Hz indicating –0.15 in. wg).

RETURN/EXHAUST VFD OPERATIONAL STATUS — The RE VFDs contain extensive self-diagnostic functions which are accessed through the RE VFD display panel (located on the front of the RE VFD or at a remote location when the accessory remote display package has been installed).

⚠ CAUTION

If using the VFD display panel**, disconnect all power to the unit and the VFD before entering unit**, or use the accessory remote display module. Disable supply fan and motor operation before accessing VFD-mounted display module.

When power is first supplied to the return/exhaust fan VFD, the display automatically starts with the frequency monitor function of its standard monitor mode. In the frequency monitor function, the output frequency is displayed. Push the S/P/M **(Setup/Program/Monitor)** key to switch to the Mode Selection menu. Push the S/P/M key again to toggle the display back to the standard monitor mode.

From the Mode Selection menu, the service person can view all of the monitored status variables, including up to four user-selected variables and any trip history in the memory.

Refer to the separate VFD Operation Manual for detailed instructions on accessing diagnostic information, initiating troubleshooting and clearing any trip history.

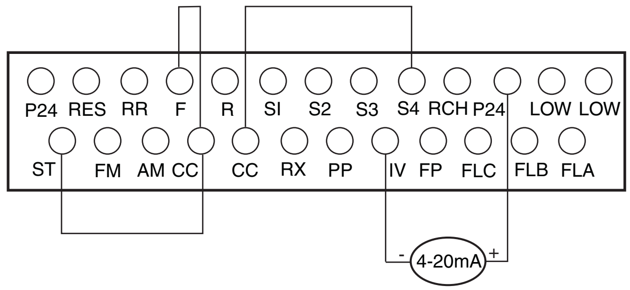


Fig. 59 — Return Fan Variable Frequency Drive Terminal Block

RESTORING FACTORY RE VFD DEFAULTS — The original factory configuration values are saved in the memory of the RE VFD and can be restored by the service person if required. There are two types of saved file data: Carrier-factory settings (factory programmed settings made to the RE VFD which apply specifically to the unit it is installed on) and standard defaults for general Carrier unit use.

The Carrier-factory settings are maintained as user settings. These can be restored by entering the Setup mode (in the S/P/M menu) and setting parameter tYP=6 on the keypad/display. This will recall the specific factory defaults for this unit.

Occasionally it may be necessary to restore the RE VFD defaults to the general Carrier use values. These are stored in an OPTION ROM (read-only memory chip). However, some variables may need to be manually changed to match the specific unit's factory default settings. To recall the general Carrier defaults, enter the Setup mode and set parameter tYP=3. Refer to Tables 94 and 95 for items requiring manual adjustment.

Table 94 — Return/Exhaust Fan VFD Required User Adjusted Defaults

UNIT	ITEM
48/50ZL,ZM075-105 Units	Motor Overload Settings (see Table 95)
	1. Check jumper CC-F 2. Gr. UT/bLSF = 1 3. SetP/tYP = 5 (Save User Settings) 4. SetP/ACC1 = 120.0 5. SetP/DEC1 = 120.0 6. SetP/LL = 10.0 7. Gr. F/FH = 60 8. Gr. Fb/FbP1 = 1 9. Gr. Fb/P1LL = 5 10. Gr. Pr/UuC = 1 11. Gr. Ut/Cnod = 1 12. Gr. Ut/Fnod = 2 13. Gr. Ut/bLPn = 1

Table 95 — Return/Exhaust Fan Motor Overload Settings

UNIT 48/50	UNIT VOLTAGE DESIGNATION Model No. Position 12		MOTOR HP DESIGNATION Model No. Position 16	tHr1 SETTING
ZL,ZM	6	and	Q,V	98.0
	6	and	R,W	87.0
	6	and	S,X	82.0
	6	and	T,Y	85.0

RETURN/EXHAUST FAN PLENUM PRESSURE SAFETY SWITCH (48ZL AND 50ZL,ZM) — The return/exhaust fan Plenum Pressure Safety Switch (PPSS) is used to control the plenum pressure where the return/exhaust fan is at. The PPSS is located at the return end of the unit in auxiliary control box and can be accessed by opening the access door. The high-pressure reference port of the PPSS is connected to a static pressure pick-up tube located in the return/exhaust fan plenum. The low-pressure port of the PPSS is connected to the outside of the unit cabinet. Both ports tubing are factory-installed.

The PPSS has a factory-set point of 5 in. wg. The PPSS monitors the static pressure in the plenum section and compares it to the set point. If the plenum pressure goes higher than the set point, the pressure switch will trip off and disconnect the power supply to the power exhaust contactor (PEC) and the return exhaust fan will be shut off. After the pressure drops below the set point, the PPSS can be reset by pressing the reset button on the back of the switch. See Fig. 60.

During normal operation, the return/exhaust fan plenum pressure will never go higher than the set point. If the economizer is open and the building pressure stays low, the power exhaust damper will not open and the plenum pressure could go higher than the set point, which would trigger the PPSS to trip off. Always check if the power exhaust damper and the building pressure switch work properly before reset the switch.

⚠ WARNING

The economizer is located near the return/exhaust fan and motor. During any service work, operation of the fan and motor is not desirable. Always disable the supply fan and the return/exhaust fan before starting the service work.

If the PPSS trips off very often due to the above reason, the economizer linkage setup can be changed. The economizer linkage can be accessed from the filter section doors on both sides of the unit. As shown in Fig. 61, make sure the economizer damper is 100% open (outside air damper is fully open and return air damper is fully closed). Loosen the linkage adjusting screws on both damper assemblies and open up the return air damper about 15 degrees, and re-tighten the adjusting screws. In this way, the return damper on the economizer will never go fully closed, so the plenum pressure will stay under the PPSS set point. If the trip-off problem persists, continue to open up the linkage. The linkage adjustment should not exceed 30 degrees.

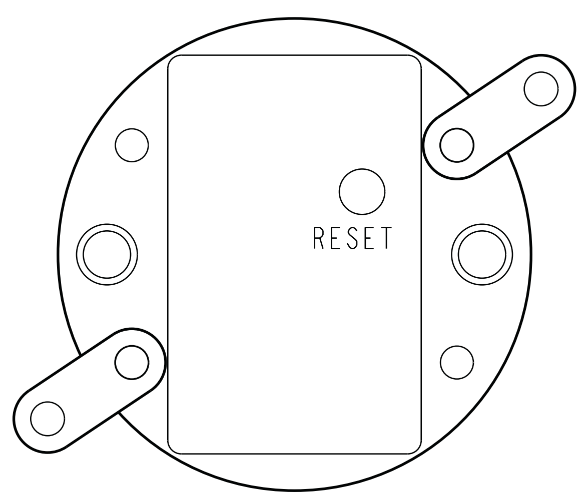


Fig. 60 — Return/Exhaust Fan Plenum Pressure Safety Switch

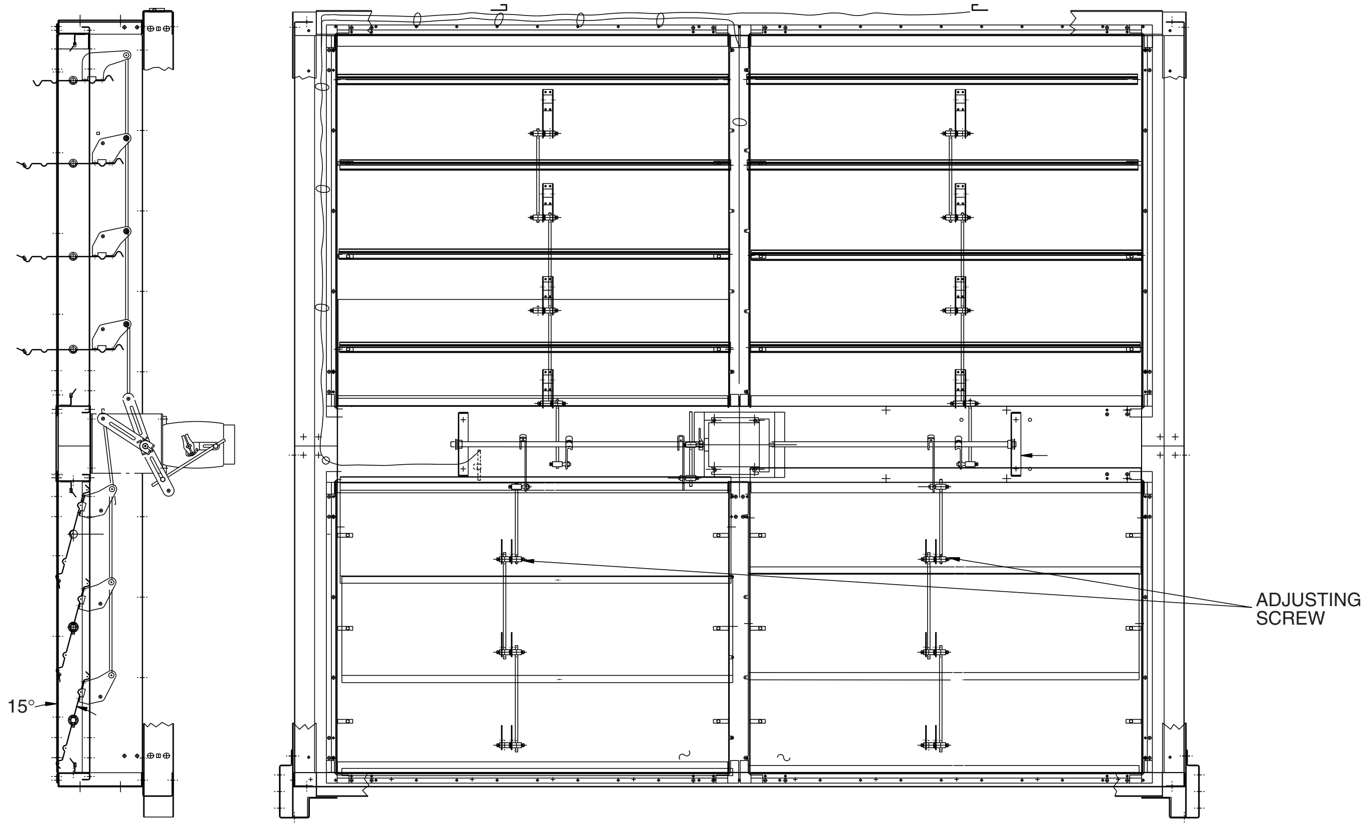


Fig. 61 — Economizer Linkage Adjustment

Quick Test — The test function provides a check on control inputs and outputs, and can only be conducted when the unit is in the Standby mode. To put the unit into the Standby mode, press [1] [1] [STAT], then [▼], then [1] [ENTER]. Display will read STBY YES.

The test function and associated subfunctions should be run to check all unit inputs and outputs prior to unit start-up. Refer to the Test Function section on page 112 for additional details on the test function and performing quick tests.

> IMPORTANT: Be sure unit is in the Standby mode ([1] [1] [STAT]) PRIOR to initiating the test function. The standby/run mode under [1] [1] [STAT] MUST read STBY YES. Test mode will not operate unless unit is in standby. If the unit is equipped with Remote Start, place LOCAL/REMOTE switch in the LOCAL (off) position. The accessory HSIO is required to place unit control in STBY YES mode and to initiate Quick Test function.

To operate a test:

1. Enter the desired test subfunction.
2. Press [▼] to scroll to the desired test.
3. Press [ENTER] to start the test.

Pressing [▼] after a test has started advances the system to the next test whether the current test has timed out or not. If the keypad is not used for 10 minutes, the display will return to the rotating default display. You must press [6] [TEST ALRM] and [ENTER] to exit quick test. To restart the test procedure, press [TEST ALRM]. To terminate the quick test press [6] [TEST ALRM] ; EXIT TST will be displayed. Press [ENTER] and TST CMPL will be displayed, ending the quick test.

> IMPORTANT: The user MUST press [6] [TEST ALRM] [ENTER] to restore the unit software to automatic control. To return unit to run mode (STBY NO), press [1] [1] [STAT] [·] [ENTER] . If the unit is equipped with Remote Start, place LOCAL/REMOTE switch in the REMOTE (on) position.

While the unit is in the test function, other functions can be accessed by pressing the appropriate keys. If a component is operating under a test function, it will remain operating when another function (such as temperatures or pressures under the status function) is accessed. The test function must be reentered to shut down that component.

[1] [TEST ALRM] (Inputs) — The factory/field test of inputs function displays the current sensor input value (analog type) or status (discrete type). During the inputs portion of the quick test, the compressors and fan motors will not operate.

[2] [TEST ALRM] (Analog outputs) — The factory/field test of analog outputs causes the analog outputs to be cycled to specific output values. Each output is disabled by selecting the next output (press the [▼] or [▲] key).

To test inlet guide vanes or variable frequency drives:

1. Press [2] [TEST ALRM]. The display will be ANLGOUT.
2. Press [▼] once to scroll down. The display will read IGV (inlet guide vanes test) (sizes 030-075) or INV (inverter test) (sizes 090 and 105).
3. Press [ENTER] to start the test. The supply fan will start and VFD will go from 0% speed (default position when unit starts) to 50% speed or IGVs will go from 0% open to 50% open.

4. Press [ENTER] again to drive the VFD from 50% to 100% speed or IGVs from 50% to 100% open.
5. Press [ENTER] again to change the VFD from 100% speed to 0% speed or IGVs from 100% open to 0% open.

NOTE: The VFD is configured such that at 0% speed command from the unit PIC control the supply fan VFD will run at about 26 Hz. This will narrow the operating range and improve the control stability.

6. Press [▼] once to scroll down. The display will read ECON (economizer test).

NOTE: The economizer, heating coil valve, and analog humidifier tests operate in the same manner as the IGV test. The PED (modulating power exhaust test) operates in a similar manner except that the sequence of operation when pressing the [ENTER] key is zero to 75% speed (press [ENTER] once), 75% to 100% speed (press [ENTER] again), 100% to 20% speed (press [ENTER] again), and 20% to 0 speed (press [ENTER] again).

[3] [TEST ALRM] (Discrete outputs) — The factory/field test of discrete outputs enables the discrete outputs. Each output is disabled when the next output is selected by pressing the [▼] or [▲] keys.

[4] [TEST ALRM] (Compressors) — The factory/field test of compressors enables the supply-air fan and sets the inlet guide vanes or variable frequency drives to 30% (if so equipped) when any compressor is selected. During the compressor test, the compressors will operate for ten seconds after the fan has been enabled.

NOTE: The service valves must be open, and the crankcase heaters should be energized for at least 24 hours before performing the compressor tests.

Once a compressor is operated using the test function, it is not allowed to operate again for 30 seconds. The supply-air fan and inlet guide vanes or variable frequency drives (if so equipped) are not disabled until the compressor test is exited.

[5] [TEST ALRM] (Heat) — During the factory/field test of heat, the supply-air fan is enabled. As the fan starts, the inlet guide vanes variable frequency drives are set to 30% open (if so equipped). The heat interlock relay contacts are switched when any stage of heat is selected. The test delays approximately 11 seconds after the fan is enabled and prior to energizing the first selected heat stage.

NOTE: Any selected heat stage causes that stage to be selected and all other stages will be disabled. The supply-air fan, variable frequency drives (if so equipped), and heat interlock relay are *NOT* disabled until the heat test is exited.

[6] [TEST ALRM] (Exit Test) — In order to exit the factory/field test mode, press [ENTER]. TST CMPL is displayed, and the expansion of TST CMPL (press [ENTER]) indicates that the quick test has been terminated.

Forcing Values — The control unit allows service person to input (or force) values into set points for troubleshooting. By forcing values in submaster reference loops or input channels, the service person can force the unit control to respond to different situations which may not occur normally at that time. In this way, operation of the unit and control can be tested. The input channels where forced values are permitted are identified in the directory tables.

To override an input channel or submaster reference, use the HSIO to display the current value. Type in the override value and press the [ENTER] key. If the override value is within the allowable range, the value will be accepted. No action will occur if the value is outside the acceptable range for that variable.

The override is removed by pressing the [CLEAR] key. The normal system value will be restored.

SERVICE

History Function — The history function allows the user to look at unit operational information. See Table 96.

[1] [HIST] (Alarm history) — This subfunction allows the user to view the last 9 alarm codes and their descriptions. The latest (newest) alarm is listed first, followed in succession by next older alarms. When a new alarm is generated, it is listed at the top, displacing all earlier alarms down one position, and the last (oldest) alarm is deleted from the display. Alarms are retained during a loss of power.

[2] [HIST] (Maintenance history) — The maintenance history subfunction displays the latest service date. A service technician can enter a new service date through the HSIO keypad. The entry of a service date shall be password protected. See Service Function section below for more details. The last 2 service dates are displayed at the building supervisor.

Service Function — The service function allows the user to view and modify the unit configuration files. Factory, field, and service configuration data may be viewed, changed, and/or entered through the keypad and display module. See Table 97.

[1] [SRVC] (Log on/Log off) — The service function is password protected by a non-changeable password. To log on, press [1] [SRVC] and the display will read LOG ON. Press [1] [1] [1] [1] [ENTER] and the display will change to LOGGEDON. At this time, configurations may be viewed or modified. To log out, press [1] [SRVC] [▼] [ENTER] and the display will read LOGD OFF.

[2] [SRVC] (Software version) — This subfunction allows the user to view information about the software, such as the version number and language options.

[3] [SRVC] (Factory configuration) — This subfunction allows for factory configuration of the unit size, type, and options. Under this subfunction, there are a minimum of 7 configuration fields that are configured at the factory.

NOTE: If a processor is replaced in the field, these configuration fields must be configured using the keypad at this subfunction.

To change a configuration:

1. Display present configuration field.
2. Enter the new configuration data.
3. Press [ENTER] (see Table 98 for more details).
4. Enable the Data Reset function.

[4] [SRVC] (Element bus address) — The element bus address subfunction is used to identify the unit address assignment when the unit is used on a CCN network. The unit address consists of two parts — a bus address and an element address. When more than one unit is connected to the CCN, the element addresses must be changed (no two element addresses on the same bus may be the same). Bus and element addresses must be changed at the HSIO. Range for bus address to 0 to 239; range for element address is 1 to 239.

Table 96 — History Directory

HISTORY			
Subfunction	**Keypad Entry**	**Display**	**Comment**
1 ALARM HISTORY	[1] [HIST]	ALRMHIST	Alarm history
	▼	ALARM X	Latest alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
	▼	ALARM X	Previous alarm expansion
2 MAINTENANCE HISTORY	[2] [HIST]	MTN/HIS	Maintenance history
	▼	mm.dd.yy	Latest service date

[5] [SRVC] (Units of measure) — Measurements can be displayed in either English or SI Metric units. The default is English. To change units, press [5] [SRVC]. The display will be UNIT 0 (English units). Press [1] [ENTER] and the display will change to UNIT 1 (SI Metric units).

[6] [SRVC] (User configuration) — After logging on, this subfunction allows the user to read or change the factory configuration of user options. Table 98 shows the particular factory and user configurations that are factory set.

The majority of user configuration items are self-explanatory. However, the ventilation control requires the following information:

0 = economizer minimum position is controlled by minimum position entered.

1 = economizer minimum position is controlled by IAQ set point.

2 = economizer minimum position is controlled to maintain a constant outdoor-air cfm set point.

3 = economizer will use the largest of the minimum set points as stated in 0, 1, and 2 settings above.

[7] [SRVC] (Heating coil) — This subfunction allows the user to view and modify the factory configuration of the heating coil.

The fan off value is the supply-air temperature that the hydronic heating coil valve will modulate open or closed to maintain during periods when the evaporator fan is off. This is designed to prevent coil freeze-up during off periods.

[8] [SRVC] (Cooling coil) — This subfunction is used to read or change the configuration of the cooling coil parameters. The high humidity limit is the set point used when the cooling control will be overridden by the humidity control.

[9] [SRVC] (Duct pressure) — This subfunction is used to read or change the configuration of duct pressure control.

[1] [0] [SRVC] (Economizer) — The economizer subfunction is used to read or change the configuration of the economizer.

NOTE: The economizer dampers modulate to maintain a supply-air temperature equal to the damper set point (VAV only).

[1] [1] [SRVC] (Heat) — This subfunction is used to read or change the configuration of staged heat.

[1] [2] [SRVC] (Unoccupied free cooling) — This subfunction is used to read or change the configuration of the unoccupied free cooling option.

[1] [3] [SRVC] (Adaptive optimal start/stop) — This subfunction is used to read or change the configuration of the adaptive optimal start/stop option. Refer to Carrier Comfort Network product literature for more information on configurations.

[1] [4] [SRVC] (Space temperature reset) — This subfunction is used to read or change the configuration of the space temperature reset. Refer to the Supply-Air Set Point Reset section on page 40 and Space Temperature Averaging section on page 50 for more information.

[1] [5] [SRVC] (Loadshed) — This subfunction is used to read or change the configuration of loadshed. Loadshed is used to define the CCN groups for redline and loadshed functions. Groups 1 through 16 are acceptable values.

[1] [6] [SRVC] (Indoor-air quality) — This subfunction is used to read or change the configuration of the indoor-air quality option. Refer to the Indoor-Air Quality section on page 34 for more details.

[1] [7] [SRVC] (Humidity) — This subfunction is used to read or change the configuration of the humidity option.

[1] [8] [SRVC] (Building pressure) — This subfunction is used to read or change the configuration of the building pressure option.

[1] [9] [SRVC] (Alert limits) — This is used to read or change the configuration of the alert limits.

[2] [0] [SRVC] (Service history) — This subfunction is used to read the unit service history.

[2] [1] [SRVC] (Service/Maintenance alert) — This is used to read or change the configuration of the service maintenance alert option.

NOTE: When the number of hours the supply-air fan has been energized reaches the alert limit, alert no. 173 is generated and SMEH 0.0 is displayed, resetting the supply-air fan's run time to 0 hours. The supply-air fan cumulative time energized can also be reset by pressing [2] [HIST] and entering a new service date. This function can be used to monitor standard service practices, such as lubrication of bearings and changing or cleaning filters.

[2] [2] [SRVC] (Override history) — This subfunction is used to read the status of the timed override history. This value is cumulative for the current 24-hour period (beginning at midnight).

NOTE: This subfunction is a "read only" option.

Table 97 — Service Directory

SERVICE			
Subfunction	**Keypad Entry**	**Display**	**Description**
1 LOG ON/OFF	[1] [SRVC]	LOG ON	Enter password followed by [ENTER]
	[1] [1] [1] [1] [ENTER]	LOGGEDON	Logged on okay
	[▼]	LOG OFF	Press [ENTER] to log off
	[ENTER]	LOGD OFF	Logged off okay
2 SOFTWARE VERSION	[2] [SRVC]	VERSION	Software version number
	[▼]	500054XX 131139XX	PIC Version CESR500054-XX (Sizes 030-075) PIC Version CESR131139-XX (Sizes 090 and 105)
3 FACTORY CONFIGURATION	[3] [SRVC]	FACT CFG	Factory configuration
	[▼]	TYPE X	Unit type (0 = CV, 1 = VAV)
	[▼]	SIZE X	Unit size (030-105)
	[▼]	ULOP X	Number of unloaders 2/3/4 (Sizes 030-075 Only)
	[▼]	HPSP X	Head pressure set point (F)
	[▼]	HEAT X	Heat type (0 = None, 1 = Water/Steam [hydronic], 2 = Elec, 3 = Gas)
	[▼]	HTSG X	Number of heat stages (0 to 5) (Sizes 030-075 Only)
	[▼]	TRNS X	Building Transducer options (0 = No, 1 = Yes)
	[▼]	SF2S X	Two-speed supply-air fan (0 = No, 1 = Yes) (Sizes 030-075 Only)
	[▼]	ECON X	Economizer (0 = None, 1, 2 = Air, 3 = Two-Pos)
	[▼]	FANT X (030-075) PWRXX (090,105)	Fan Type (0 = None, 1 = Exh, 2 = Mod Exh, 3 = Mod Rtn)
	[▼]	HUEN X	Humidifier control (0 = None, 1 = Analog, 2 = Discrete)
	[▼]	DTRS X	Data reset (0 = No, 1 = Yes) (Required to save edits)
	[▼]	DPA CALB	Calibrate discharge A pressure sensor
	[▼]	DPB CALB	Calibrate discharge B pressure sensor
	[▼]	SPA CALB	Calibrate suction A pressure sensor
	[▼]	SPB CALB	Calibrate suction B pressure sensor
4 ELEMENT BUS ADDRESS	[4] [SRVC]	BUS ADDR	Element bus address
	[▼]	BUS X	Bus number (factory default = 0)
	[▼]	ADR X	Element address (factory default = 1)
5 UNITS	[5] [SRVC]	UNITS X	English/metric system (0 = English, 1 = Metric)

LEGEND

AOSS — Adaptive Optimal Start/Stop
Cont — Continuous
CV — Constant Volume
DTCC — Discrete Time Clock Control
Exh — Exhaust
IAQ — Indoor-Air Quality
MDP — Minimum Damper Position
Mod — Modulating
NTFC — Nighttime Free Cooling
OAC — Outdoor-Air Cfm Control
OAT — Outdoor-Air Temperature
PIC — Product Integrated Controls
Rtn — Return
Temp — Temperature
VAV — Variable Air Volume

*An "X [ENTER]" in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing [ENTER]. The valid force ranges are listed in the Expansion column.

NOTE: If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

Table 97 — Service Directory (cont)

SERVICE (cont)			
Subfunction	**Keypad Entry**	**Display**	**Description**
6 USER CONFIGURATION	6 SRVC	USER CFG	User configuration
	▼	HUSN X	Humidity sensors (0 = None, 1 = Differential [2 Sensors], 2 = Space Override [1 Sensor])
	▼	SUSN X	Suction sensors (0 = No, 1 = Yes)
	▼	VENT X	Ventilation control (0 = MDP, 1 = IAQ, 2 = CFM, 3 = All)
	▼	MMAS X	Motormaster (0 = No, 1 = Yes)
	▼	PURG X	Indoor-air quality (0 = Disable, 1 = Enable)
	▼	NTEN X	Nighttime free cool (0 = Disable, 1 = Enable)
	▼	OSEN X	Adaptive optimal start/stop (0 = Disable, 1 = Enable)
	▼	DLEN X	Demand limit (0 = Disable, 1 = Enable)
	▼	OHEN X	Occupied heating (0 = Disable, 1 = Enable)
	▼	RSEN X	Space temperature reset (0 = Disable, 1 = Enable)
	▼	DPEN X	Duct pressure control (0 = Disable, 1 = Enable)
	▼	FANM X	Fan mode auto/cont (0 = Auto, 1 = Cont)
	▼	TSCH X	Timed override schedules (1 = Unit, 2 = DTCC, 3 = Both)
	▼	TOVR X	Timed override value (0 to 4 hours)
	▼	LLAG X	Lead/Lag option (0 = Disable, 1 = Enable)
7 HEATING COIL	7 SRVC	HEATCOIL	Configure heating coil
	▼	MLG X	Master loop gain value
	▼	SMG X	Submaster gain value
	▼	SCV X	Submaster center value
	▼	FOV X	Fan off value (F)
	▼	SMR X	Submaster reference value
	X ENTER *	SMR X	Submaster reference value forced (35 to 140 F)
8 COOLING	8 SRVC	COOLING	Configure cooling parameters
	▼	MLG X	Master loop gain value
	▼	HHL X	High humidity limit (0 to 99%)
9 DUCT PRESSURE	9 SRVC	DUCTPRES	Configure duct pressure control
	▼	MLG X	Master loop gain value
	▼	SMG X	Submaster gain value
	▼	SCV X	Submaster center value
	▼	SMR X	Submaster reference value
	X ENTER *	SMR X	Submaster reference value forced (0.0 to 5.0 in. wg)
10 ECONOMIZER	1 0 SRVC	ECONMIZR	Configure economizer
	▼	MLG X	Master loop gain value
	▼	SMG X	Submaster gain value
	▼	SCV X	Submaster center value
	▼	MDP X	Minimum damper position (percent open)

Table 97 — Service Directory (cont)

Subfunction	Keypad Entry	Display	Description
SERVICE (cont)			
10 ECONOMIZER (cont)	▼	PES1 X (030-075) PES X (090,105)	Power exhaust set point 1
	▼	PES2 X	Power exhaust set point 2 (Sizes 030-075 Only)
	▼	SMR X	Submaster reference value
	X ENTER *	SMR X	Submaster reference value forced (40 to 120)
	▼	DPSP X	Damper set point (F)
	X ENTER *	DPSP X	Damper set point forced (45 to 80 F)
	▼	OAE X	Outdoor air enthalpy value
	▼	RAE X	Return air enthalpy value
11 HEAT	1 1 SRVC	HEAT	Configure staged heat
	▼	MLG X	Master loop gain value
	▼	SMG X	Submaster gain value
	▼	SMR X	Submaster reference value
	X ENTER *	SMR X	Submaster reference value forced (35 to 140)
12 NTFC	1 2 SRVC	NTFC	Configure nighttime free cool (NTFC)
	▼	NTLO X	NTFC lockout temp (min. OAT to operate NTFC F)
13 AOSS	1 3 SRVC	AOSS	Configure adaptive optimal start/stop
	▼	BLDF X	Building factor value (1 to 100; default = 10)
	▼	UOCF X	24-hour unoccupied factor (0 to 99; default = 15)
	▼	SETB X	Set point bias (0 to 10; default = 2)
	▼	OSMT X	Maximum allowable stop time (10 to 120; default = 60)
14 SPACE TEMPERATURE RESET	1 4 SRVC	SPCRESET	Configure space temperature reset
	▼	RTIO X	Reset ratio (0 to 10; default = 3)
	▼	LIMT X	Reset limit (0 to 20; default = 10)
15 LOADSHED	1 5 SRVC	LOADSHED	Configure loadshed
	▼	LSGP X	Loadshed group number (1 to 16; default = 1)
16 IAQ/CFM	1 6 SRVC	IAQ	Configure indoor-air quality
	▼	LEVEL X	IAQ priority level (1 = high, 2 = medium, 3 = low; default = 2)
	▼	IAQS X	IAQ Set point (0 to 5000 ppm; default = 650)
	▼	IAQG X	IAQ gain (–2 to 2)
	▼	OCS X	Outdoor air cfm set point
	▼	OACG X	Outdoor air cfm gain (.1 to 2.0)

LEGEND

AOSS — Adaptive Optimal Start/Stop
CFM — Outdoor-Air CFM Control
Cont — Continuous
CV — Constant Volume
DTCC — Discrete Time Clock Control
Exh — Exhaust
IAQ — Indoor-Air Quality
MDP — Minimum Damper Position
NTFC — Nighttime Free Cooling
OAC — Outdoor-Air Cfm Control
OAT — Outdoor-Air Temperature
Rtn — Return
Temp — Temperature
VAV — Variable Air Volume

*An "X ENTER" in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing ENTER. The valid force ranges are listed in the Expansion column.

NOTE: If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

Table 97 — Service Directory (cont)

SERVICE (cont)			
Subfunction	**Keypad Entry**	**Display**	**Description**
16 IAQ/CFM (cont)	▼	IVL X	IAQ voltage low point
	▼	IRL X	IAQ reference low point
	▼	IVH X	IAQ voltage high point
	▼	IRH X	IAQ reference high point
	▼	IQMX X	IAQ maximum damper position (0 to 100%; default = 50%)
	▼	OCMX X	OAC maximum damper position (0 to 100%; default = 50%)
17 HUMIDITY	1 7 SRVC	HUMIDITY	Configure humidity
	▼	MLG X	Master loop gain value
	▼	SMG X	Submaster gain value
	▼	SCV X	Submaster center value
	▼	SMR X	Submaster reference value
	X ENTER *	SMR X	Submaster reference value forced (0 to 90)
18 BUILDING PRESSURE	1 8 SRVC	BLD PRES	Configure building pressure
	▼	MLG X	Master loop gain value
	▼	SMG X	Submaster gain value
	▼	SCV X	Submaster center value
	▼	SMR X	Submaster reference value
	X ENTER *	SMR X	Submaster reference value forced (0.0 to 0.5)
	▼	BPS X	Building pressure set point (0 to 0.50; default = 0.05)
	▼	BPSO X	Building pressure set point offset (0.05 to 0.50; default = 0.05)
19 ALERT LIMITS	1 9 SRVC	ALRTLIMT	Configure alert limits
	▼	SPLO X	Space temp low alert limit/occupied X
	▼	SPHO X	Space temp high alert limit/occupied X
	▼	SPLU X	Space temp low alert limit/unoccupied X
	▼	SPHU X	Space temp high alert limit/unoccupied X
	▼	SALO X	Supply air temp low alert limit/occupied X
	▼	SAHO X	Supply air temp high alert limit/occupied X
	▼	SALU X	Supply air temp low alert limit/unoccupied X
	▼	SAHU X	Supply air temp high alert limit/unoccupied X
	▼	RALO X	Return air temp low alert limit/occupied X
	▼	RAHO X	Return air temp high alert limit/occupied X
	▼	RALU X	Return air temp low alert limit/unoccupied X
	▼	RAHU X	Return air temp high alert limit/unoccupied X
	▼	OATL X	Outdoor air temp low alert limit X
	▼	OATH X	Outdoor air temp high alert limit X
	▼	RHL X	Relative humidity low alert limit X
	▼	RHH X	Relative humidity high alert limit X
	▼	ORHL X	Outdoor air relative humidity low alert limit X

Table 97 — Service Directory (cont)

SERVICE (cont)			
Subfunction	**Keypad Entry**	**Display**	**Description**
19 ALERT LIMITS (cont)	▼	ORHH X	Outdoor air relative humidity high alert limit X
	▼	SPL X	Static pressure low alert limit X
	▼	SPH X	Static pressure high alert limit X
	▼	BPL X	Building pressure low alert limit X
	▼	BPH X	Building pressure high alert limit X
	▼	OACL X (030-075) OCL X (090,105)	Outdoor air cfm low alert limit X
	▼	OACH X (030-075) OCH X (090,105)	Outdoor air cfm high alert limit X
	▼	IAQL X	Indoor-air quality low alert limit X
	▼	IAQH X	Indoor-air quality high alert limit X
20 SERVICE HISTORY	2 0 SRVC	SERVHIST	Service history
	▼	CAT X	Circuit A run time
	▼	CBT X	Circuit B run time
	▼	SFT X	Supply-air fan run time
	▼	CYC X	Cycles stage 0 to stage 1
21 SERVICE MAINTENANCE	2 1 SRVC	SRV/MTN	Service maintenance alert
	▼	SMAL X	Service/maintenance alert limit (X hrs x 1000)
	▼	SMEH X	Service maintenance elapsed hours (X.X x 1000)
22 TIMED OVERRIDE HISTORY	2 2 SRVC	OVRDHIST	History of timed overrides
	▼	OHR X	Hours of timed overrides

LEGEND

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IAQ — Indoor-Air Quality
MDP — Minimum Damper Position
NTFC — Nighttime Free Cooling
OAC — Outdoor-Air Cfm Control
OAT — Outdoor-Air Temperature
Rtn — Return
Temp — Temperature
VAV — Variable Air Volume

*An “X ENTER ” in the Keypad Entry column indicates that the reading can be forced by entering a value and then pressing ENTER. The valid force ranges are listed in the Expansion column.

NOTE: If unit is not configured for a certain subfunction, that subfunction will not show up when scrolling through values.

Table 98 — Factory/Field Configuration Procedure

KEYPAD ENTRY	DISPLAY	COMMENTS
1 SRVC 1 1 1 1 ENTER	LOG ON LOGGEDON	Must enter password
3 SRVC	FACT CFG	Factory configuration
▼	TYPE VAV	Unit type — Enter correct value
ENTER	TYPE X	CV = 0, VAV = 1
▼	SIZE 34	Unit size — Enter correct value:
ENTER	SIZE X	030,035,040,050,060,070,075,090,105*
▼	ULOP 2	Number of Unloaders (030-075 Only) — Enter value:
ENTER	ULOP X	2, 3, or 4 (030-075 Only)
▼	HPSP 113	Head pressure set point; Default = 113 F
▼	HEAT 0	Heat type — Enter correct value:
ENTER	HEAT X	0=None, 1 = Hot Water/Steam, 2 = Elec, 3 = Gas
▼	HTSG 2	Number of Heat Stages (030-075 Only); Default: 2 stages (0-5 avail)
▼	TRNS 0	Transducers option — Enter value:
ENTER	TRNS X	0 = No; 1 = Yes
▼*	SF2S 0	Two-Speed Supply-Air Fan (030-075 Only); Default = No (0 = No, 1 = Yes)
▼	ECON YES	Economizer Option — Enter value:
ENTER	ECON X	0 = None, 1 = Air
▼	FANT 0 (030-075) PWRX 0 (090,105)	Fan type — Enter correct value:
ENTER	FANT X (030-075) PWRX X (090,105)	0 = none, 1 = Exhaust, 2 = Mod Exhaust, 3 = Mod Return
▼	HUEN 0	Humidifier control
ENTER	HUEN X	0 = none, 1 = Analog, 2 = Discrete
▼	DTRS	Data reset (0 = No, 1 = Yes)
ENTER	See Note 2 below	Edits being inputted; takes approximately 40 seconds.
▼	DPA CALB	
ENTER	DPA CALB	Calibrate discharge pressure sensor A
▼	DPB CALB	
ENTER	DPB CALB	Calibrate discharge pressure sensor B
▼	SPA CALB	
ENTER	SPA CALB	Calibrate suction pressure sensor A
▼	SPB CALB	
ENTER	SPB CALB	Calibrate suction pressure sensor B

LEGEND

AOSS — Adaptive Optimal Start/Stop
CV — Constant Volume
DTCC — Discrete Time Clock Control
Elec — Electric
IAQ — Indoor-Air Quality
Mod — Modulating
NTFC — Nighttime Free Cool
SPT — Space Temperature
VAV — Variable Air Volume

*Alarm 86, illegal configuration, will result if value is not inputted correctly.

NOTES:
1. Calibration of the pressure transducers is not required unless problems with the transducers occur or the standard PSIO is replaced. To calibrate pressure transducers:
   a. Disconnect from system.
   b. Hang in the atmosphere.
   c. Read pressure. Pressures before calibration must be in the range of ±3 psig (atmosphere).
   d. Press ENTER .
   e. Reattach to system.
2. Upon completion of the factory/field configuration step, move to the DTRS (Data Reset) subfunction. Press 1 ENTER , and all revised inputs will be loaded. This procedure takes approximately 40 seconds. The display returns to the default rotating display.

IMPORTANT: The Data Reset function should be performed any time one or more of the values is configured. See Note 2 above for more details.

Table 98 — Factory/Field Configuration Procedure (cont)

KEYPAD ENTRY	DISPLAY	COMMENTS
6 SRVC	USER CFG	User configuration
▼	HUSN 0	Humidity sensors; Default = No (0 = No,1 = Differential [2 sensors], 2 = Space Override [1 sensor])
▼	SUSN NO	Suction sensors (Enter value)
ENTER	SUSN X	0 = No, 1 = Yes
▼	VENT 0	Ventilation control (Enter value)
ENTER	VENT X	0 = SPT, 1 = IAQ, 2 = CFM, 3 = All
▼	MMAS YES	Head pressure control function (Enter value)
ENTER	MMAS X	0 = No, 1 = Yes
▼	PURG DIS	IAQ purge enable; Default = Disable (0 = Disable, 1 = Enable)
▼	NTEN DIS	NTFC enable; Default = Disable (0 = Disable, 1 = Enable)
▼	OSEN DIS	AOSS enable; Default = Disable (0 = Disable, 1 = Enable)
▼	DLEN DIS	Demand limit enable; Default = Disable (0 = Disable, 1 = Enable)
▼	OHEN DIS	Occupied heating enable; Default = Disable (0 = Disable, 1 = Enable)
▼*	RSEN DIS	Space temperature reset enable; Default = Disable (0 = Disable,1 = Enable)
▼	DPEN 0	Duct pressure control (Enter value)
ENTER*	DPEN X	0 = Disable, 1 = Enable
▼	FANM 0	Fan Mode (Enter value)
ENTER*	FANM X	0 = Automatic, 1 = Continuous
▼	TSCH 1	Timed Override Schedules (Enter value)
ENTER	TSCH X	1 = Unit, 2 = DTCC, 3 = Both
▼	TOVR 0	Timed Override Hours (Enter value)
ENTER	TOVR X	0, 1, 2, 3, or 4
▼	LLAG	Lead/Lag Option; Enter 0 = No or 1 = Yes

LEGEND

AOSS — Adaptive Optimal Start/Stop
CFM — Outdoor-Air CFM Control
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Elec — Electric
IAQ — Indoor-Air Quality
Mod — Modulating
NTFC — Nighttime Free Cool
SPT — Space Temperature
VAV — Variable Air Volume

*Alarm 86, illegal configuration, will result if value is not inputted correctly.

NOTES:
1. Calibration of the pressure transducers is not required unless problems with the transducers occur or the standard PSIO is replaced. To calibrate pressure transducers:
   a. Disconnect from system.
   b. Hang in the atmosphere.
   c. Read pressure. Pressures before calibration must be in the range of ±3 psig (atmosphere).
   d. Press ENTER
   e. Reattach to system.
2. Upon completion of the factory/field configuration step, move to the DTRS (Data Reset) subfunction. Press 1 ENTER , and all revised inputs will be loaded. This procedure takes approximately 40 seconds. The display returns to the default rotating display.

IMPORTANT: The Data Reset function should be performed any time one or more of the values is configured. See Note 2 above for more details.

Test Function — The test function operates the "quick test" diagnostic program. See Quick Test section on page 103 and Table 99 for full details.

Table 99 — Test Directory

TEST			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press EXPN/EDIT key)**
1 INPUTS	1 TEST/ALRM	INPUTS	FACTORY/FIELD TEST OF INPUTS
	▼	CSA1 X	COMPRESSOR A1 STATUS X
	▼	CSB1 X	COMPRESSOR B1 STATUS X
	▼	CFA1 X	COMPRESSOR A1 SAFETY X
	▼	CFB1 X	COMPRESSOR B1 SAFETY X
	▼	CFA2 X	COMPRESSOR A2 SAFETY X
	▼	CFB2 X	COMPRESSOR B2 SAFETY X
	▼	IAQ X	INDOOR AIR QUALITY X
	▼	OAC X	OUTSIDE AIR CFM X
	▼	SFS X	SUPPLY FAN STATUS X
	▼	ENT X	ENTHALPY SWITCH X
	▼	RH X	RELATIVE HUMIDITY X
	▼	FRZ X	FREEZE STAT X
	▼	OARH X	OUTSIDE AIR RELATIVE HUMIDITY X
	▼	FLTS X	FILTER STATUS X
	▼	EVAC X	EVACUATION X
	▼	PRES X	PRESSURIZATION X
	▼	PURG X	SMOKE PURGE X
	▼	FSD X	FIRE SHUTDOWN X
	▼	SCTA X	CIRCUIT A SATURATED CONDENSING TEMP X
	▼	STA X	CIRCUIT A SUCTION TEMP X
	▼	SSTA X	CIRCUIT A SATURATED SUCTION TEMP X
	▼	SHA X	CIRCUIT A SUCTION SUPERHEAT
	▼	SCTB X	CIRCUIT B SATURATED CONDENSING TEMP X
	▼	STB X	CIRCUIT B SUCTION TEMP X
	▼	SSTB X	CIRCUIT B SATURATED SUCTION TEMP X
	▼	SHB X	CIRCUIT B SUCTION SUPERHEAT
	▼	SAT X	SUPPLY AIR TEMP X
	▼	RAT X	RETURN AIR TEMP X
	▼	SPT X	SPACE TEMP X
	▼	STO X	SPACE TEMPERATURE OFFSET X
	▼	OAT X	OUTSIDE AIR TEMP X
	▼	CEWT X	CONDENSER ENT WATER TEMP X
	▼	DPA X	CIRCUIT A DISCHARGE PRESSURE SENSOR X
	▼	SPA X	CIRCUIT A SUCTION PRESSURE SENSOR X
	▼	LPA X	CIRCUIT A LOW PRESSURE SWITCH X
	▼	DPB X	CIRCUIT B DISCHARGE PRESSURE SENSOR X
	▼	SPB X	CIRCUIT B SUCTION PRESSURE SENSOR X
	▼	LPB X	CIRCUIT B LOW PRESSURE SWITCH X
	▼	BP X	BUILDING PRESSURE X
	▼	SP X	STATIC PRESSURE X

*See Quick Test section page 103 for details on correct operation of these tests.
†The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions.
**Compressors are energized for 10 seconds.

Table 99 — Test Directory (cont)

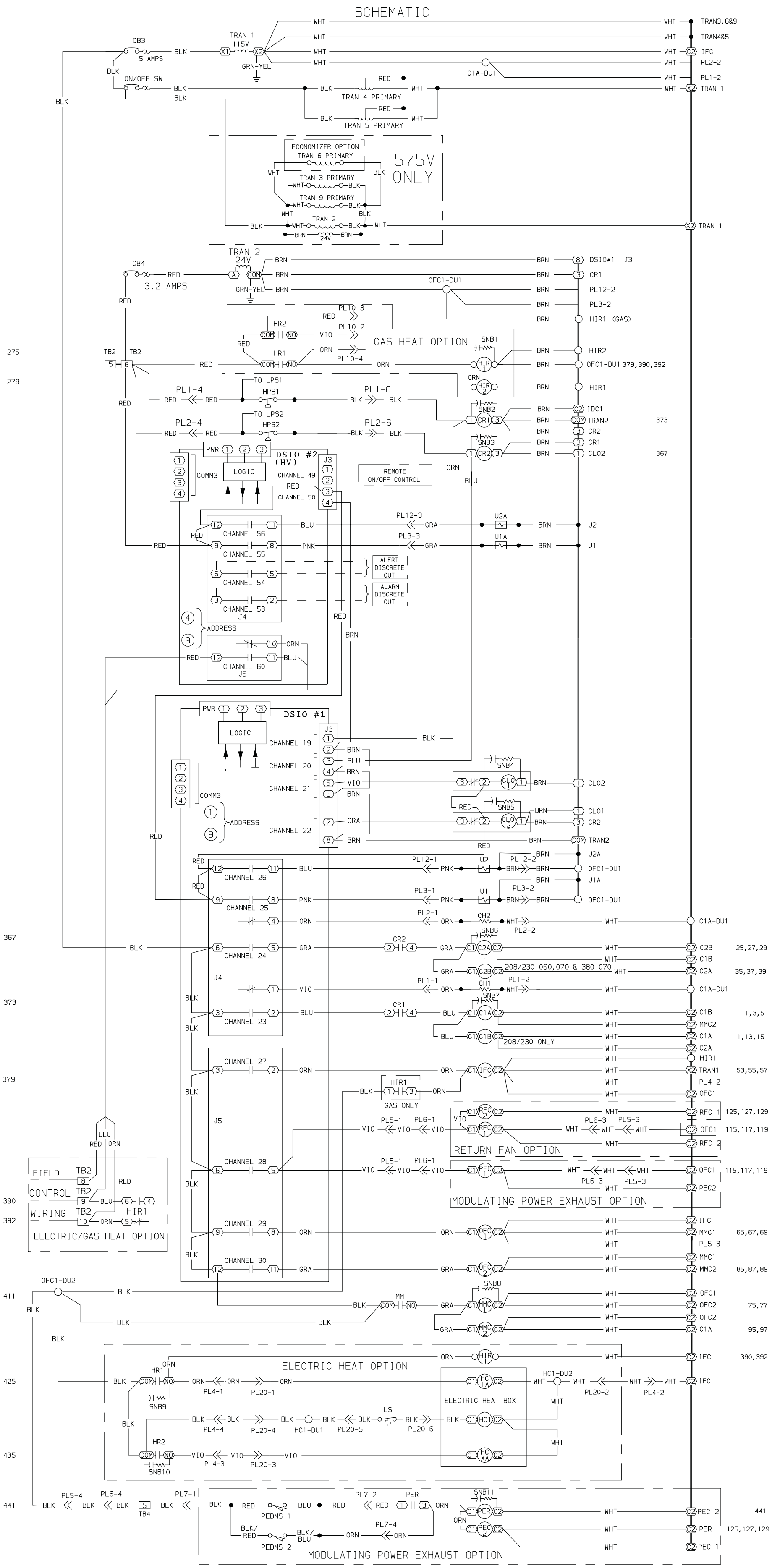
TEST (cont)			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press EXPN/EDIT key)**
2 ANALOG OUTPUTS	2 TEST/ALRM *	ANLGOUT	FACTORY/FIELD TEST OF ANALOG OUTPUTS
	▼	IGV (030-075) INV (090,105)	INLET GUIDE VANES TEST
	ENTER	IGV TEST (030-075) INV TEST (090,105)	TESTING INLET GUIDE VANES
	▼	ECON	ECONOMIZER TEST
	ENTER	ECON TST	TESTING ECONOMIZER
	▼	HCV	HEATING COIL VALVE TEST
	ENTER	HCV TST	TESTING HEATING COIL VALVE
	▼	PERD (030-075) PED (090,105)	POWER EXHAUST/RETURN DAMPER TEST
	ENTER	PERD TST (030-075) PED TST (090,105)	TESTING EXHAUST/RETURN DAMPER
	▼	HUM	HUMIDIFIER 4-20 TEST
	ENTER	HUM TST	TESTING HUMIDIFIER 4-20
3 DISCRETE OUTPUTS	3 TEST/ALRM	DISCOUT	FACTORY/FIELD TEST OF DISCRETE OUTPUTS
	▼	SF	SUPPLY FAN
	ENTER	SF TEST	TESTING SUPPLY FAN
	▼	EC2P	ECONOMIZER 2 POSITION TEST
	ENTER	EC2P TEST	TESTING ECONOMIZER 2 POSITION
	▼	MM (030-075) MMA (090,105)	MOTOR MASTER TESTS (030-075) CIRCUIT A MOTOR MASTER TESTS (090,105)
	ENTER	MM TEST (030-075) MMA TEST (090,105)	TESTING MOTOR MASTER (030-075) TESTING MOTOR MASTER CIRCUIT A (090,105)
	▼	FR2 (030-075) OFA (090,105)	OUTDOOR FAN 2 TEST (030-075) CIRCUIT A OUTDOOR FAN TEST (090,105)
	ENTER	FR2 TEST (030-075) OFA TEST (090,105)	TESTING OUTDOOR FAN 2 (030-075) TESTING OUTDOOR FAN CIRCUIT A (090,105)
	▼	MMB	CIRCUIT B MOTOR MASTER TESTS (090,105)
	ENTER	MMB TEST	TESTING MOTOR MASTER CIRCUIT B (090,105)
	▼	FR3 (030-075) OFB (090,105)	OUTDOOR FAN 3 TEST (030-075) CIRCUIT B OUTDOOR FAN TEST (090,105)
	ENTER	FR3 TEST (030-075) OFB TEST (090,105)	TESTING OUTDOOR FAN 3 (030-075) TESTING OUTDOOR FAN CIRCUIT B (090,105)
	▼	SF2S	2 SPEED SUPPLY FAN TEST
	ENTER	SF2S TST	TESTING 2 SPEED SUPPLY FAN
	▼	EFRF	EXHAUST/RETURN FAN TEST
	ENTER	EFRF TST	TESTING EXHAUST/RETURN FAN
	▼	ULA1	UNLOADER A1 TEST
	ENTER	ULA1 TST	TESTING UNLOADER A1
	▼	ULB1	UNLOADER B1 TEST
	ENTER	ULB1 TST	TESTING UNLOADER B1
	▼	ULA2	UNLOADER A2 TEST
	ENTER	ULA2 TST	TESTING UNLOADER A2
	▼	ULB2	UNLOADER B2 TEST
	ENTER	ULB2 TST	TESTING UNLOADER B2
	▼	HUM1	HUMIDIFIER 1ST STAGE TEST
	ENTER	HUM1 TST	TESTING HUMIDIFIER 1ST STAGE
	▼	DTCC	DISCRETE TIME CLOCK CONTROL TEST
	▼	DTCC TST	TESTING DISCRETE TIME CLOCK CONTROL

Table 99 — Test Directory (cont)

TEST (cont)			
Subfunction	**Keypad Entry**	**Display**	**Expansion (Press EXPN/EDIT key)**
3 DISCRETE OUTPUTS (cont)	▼	PERD	POWER EXHAUST/RETURN DAMPER TEST (030-075)
	ENTER	PERD TST	TESTING EXHAUST/RETURN DAMPER (030-075)
4 COMPRESSOR TESTS	4 TEST/ALRM	COMPRSR	FACTORY/FIELD TEST OF COMPRESSOR
	▼	CPA1†	COMPRESSOR A1 TEST
	ENTER	CPA1 TST	TESTING COMPRESSOR A1**
	▼	CPB1	COMPRESSOR B1
	ENTER	CPB1 TST	TESTING COMPRESSOR B1**
	▼	CPA2	COMPRESSOR A2 TEST (105 Only)
	ENTER	CPA2 TST	TESTING COMPRESSOR A2 (105 Only)
	▼	CPB2	COMPRESSOR B2 TEST (105 Only)
	ENTER	CPB2 TST	TESTING COMPRESSOR B2 (105 Only)
5 HEAT STAGES	5 TEST/ALRM	HEAT	FACTORY/FIELD TEST OF HEAT
	▼	HS1†	STAGE 1 TEST
	ENTER	STG1 TST	TESTING HEAT STAGE 1
	▼	HS2	STAGE 2 TEST
	ENTER	STG2 TST	TESTING HEAT STAGE 2
	▼	HS3	STAGE 3 TEST (030-075 Only)
	ENTER	STG3 TST	TESTING HEAT STAGE 3
	▼	HS4	STAGE 4 TEST (030-075 Only)
	ENTER	STG4 TST	TESTING HEAT STAGE 4
	▼	HS5	STAGE 5 TEST (030-075 Only)
	ENTER	STG5 TST	TESTING HEAT STAGE 5
6 EXIT TEST	6 TEST/ALRM	EXIT TST	EXIT FACTORY/FIELD TEST
	ENTER	TST CMPL	TEST COMPLETE

*See Quick Test section page 103 for details on correct operation of these tests.
†The supply-air fan is energized at this point and remains on for the duration of the compressor/heat test functions.
**Compressors are energized for 10 seconds.

Unit Control Wiring — Refer to Fig. 62 and 63 for typical unit wiring.



LEGEND

BP	— Building Pressure Switch
C	— Compressor Contactor
CB	— Circuit Breaker
CCN	— Carrier Comfort Network
CF	— Check Filter Switch
CFM	— Outdoor Air CFM
CH	— Crankcase Heater
CLO	— Compressor Lockout
COM	— Common
COMM	— Communication
CR	— Control Relay
DP	— Duct Pressure Switch
DPT	— Duct Pressure Transducer
DSIO	— Module Relay
DU	— Dummy Terminal
ECON	— Economizer
FS	— Fan Status Switch
HC	— Heater Contactor
HIR	— Heat Interlock Relay
HPS	— High-Pressure Switch
HR	— Heater Relay
HSIO	— Keyboard and Display Module
IDC	— Induced-Draft Contactor
IFC	— Indoor Fan Contactor
IGV	— Inlet Guide Vane
IGVM	— Inlet Guide Vane Motor
LPS	— Low-Pressure Switch
LS	— Limit Switch
MM	— Motormaster Relay
MMC	— Motormaster Contactor
OFC	— Outdoor Fan Contactor
PEC	— Power Exhaust Contactor
PEDMS	— Power Exhaust Damper Motor Switch
PER	— Power Exhaust Relay
PL	— Plug Assembly
PS	— Power Supply
PSIO	— Processor Module
PWR	— Power
RFC	— Return Fan Contactor
RFDM	— Return Fan Damper Motor
RES	— Resistor
SNB	— Snubber
SPT	— Suction Pressure Transducer
SW	— Switch
TB	— Terminal Block
TRAN	— Transformer
U	— Compressor Unloader Solenoid
VFD	— Variable Frequency Drive

Marked Wire

Terminal (Marked)

Terminal (Unmarked)

Terminal Block

Splice

Splice (Marked)

Factory Wiring

Field Control Wiring

Field Power Wiring

Accessory or Optional Wiring

To Indicate Common Potential Only, Not To Represent Wiring

Fig. 62 — Typical Wiring Schematic (Sizes 055-075 Shown)

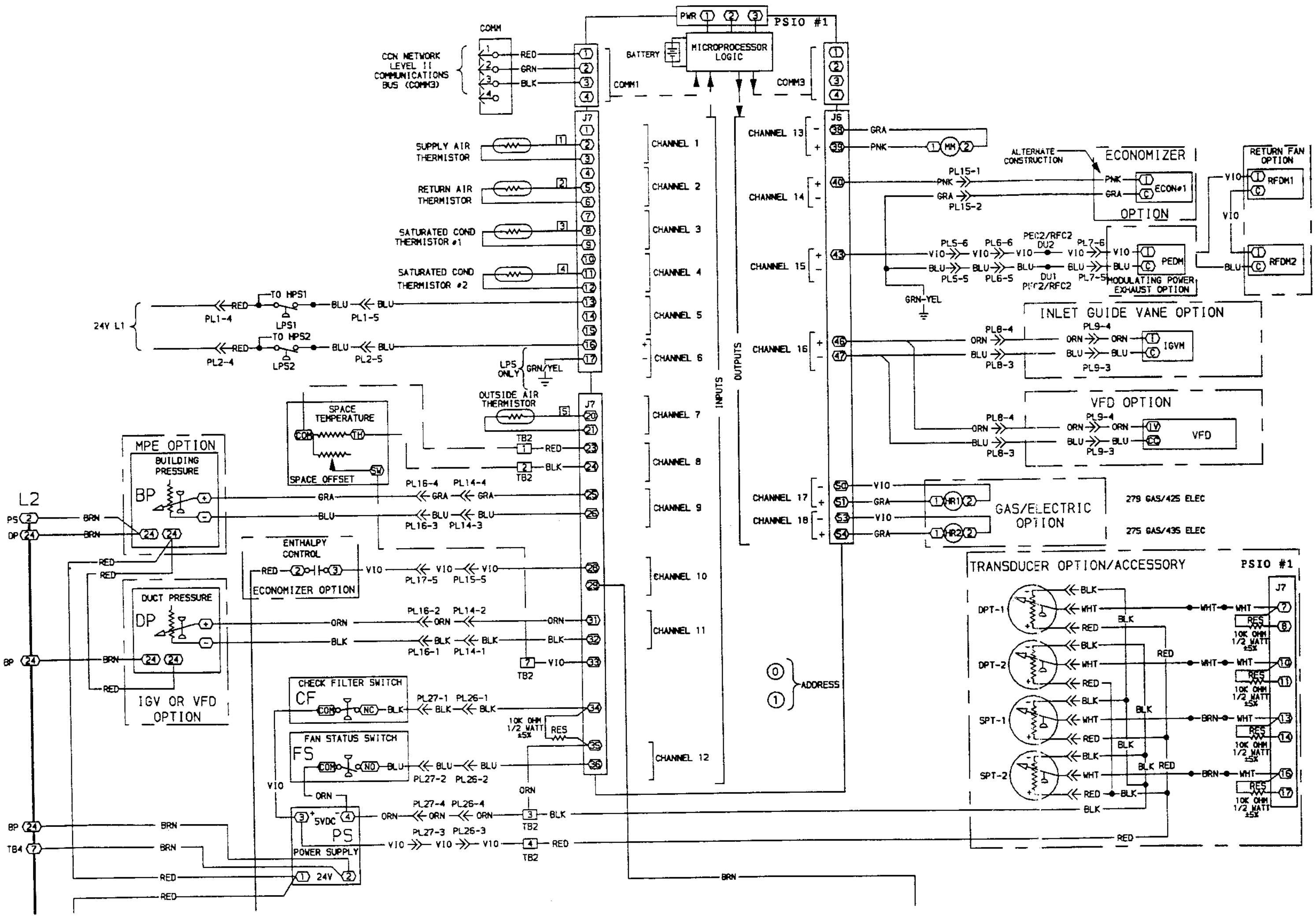


Fig. 63 — Typical Control Wiring (Sizes 055-075 Shown)

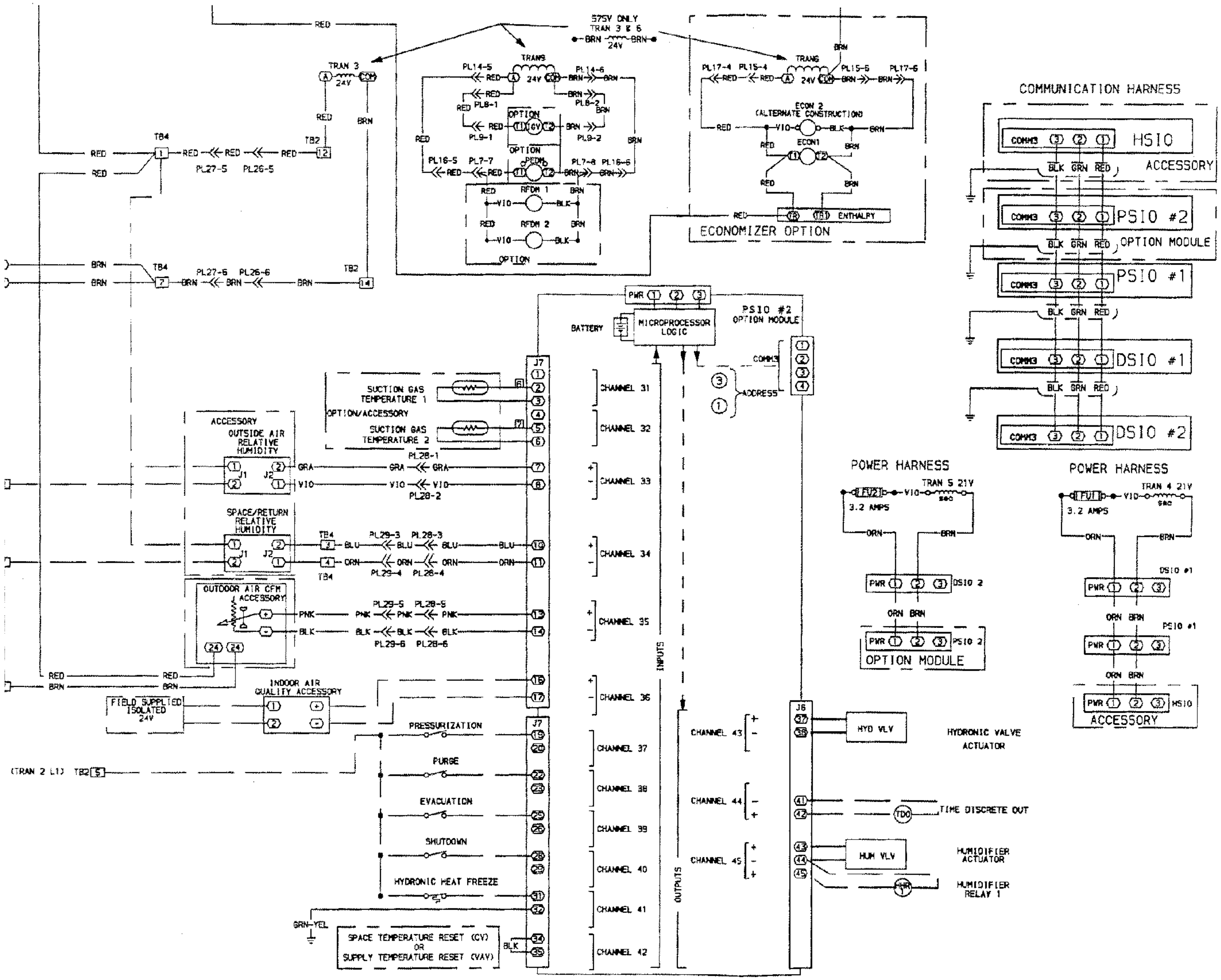


Fig. 63 — Typical Control Wiring (Sizes 055-075 Shown) (cont)

APPENDIX A

INPUT/OUTPUT TABLES, CHANNELS 1-18 (PSIO-1) — SIZES 030-075

PSIO-1	TERMINAL ID		SIGNAL		TYPE	POINT NAME — ASSIGNMENT
Channel No.	+	–	Type	Level		
Inputs						
1	J7-2	J7-3	Analog	Varies*	Thermistor, 5K	SAT — Supply Air Temp
2	J7-5	J7-6	Analog	Varies*	Thermistor, 5K	RAT — Return Air Temp
3	J7-8†	J7-9	Analog	Varies*	Thermistor, 5K	STHA — Saturated Condensing Temp, Ckt 1
	J7-8†	J7-7	Analog	1-5 vdc	Transducer, Pressure	DPAV — Discharge Pressure Transducer, Ckt 1
4	J7-11†	J7-12	Analog	Varies*	Thermistor, 5K	STHB — Saturated Condensing Temp, Ckt 2
	J7-11†	J7-10	Analog	1-5 vdc	Transducer, Pressure	DPBV — Discharge Pressure Transducer, Ckt 2
5	J7-13†	J7-14	Discrete	24 vac	Contact set	LPA — Low Pressure Switch, Ckt 1
	J7-13†	J7-14	Analog	1-5 vdc	Transducer, Pressure	SPAV — Suction Pressure Transducer, Ckt 1
6	J7-16†	J7-17	Discrete	24 vac	Contact set	LPB — Low Pressure Switch, Ckt 2
	J7-16†	J7-17	Analog	1-5 vdc	Transducer, Pressure	SPBV — Suction Pressure Transducer, Ckt 2
7	J7-20	J7-21	Analog	Varies*	Thermistor, 5K	OAT — Outdoor Air Temp
8	J7-23	J7-24	Analog	Varies*	Thermistor, 10K	SPT — Space Temp
9	J7-25	J7-26	Analog	2-10 vdc	Transducer, Pressure	BP — Building Pressure
10	J7-28	J7-29	Discrete	24 vac	Contact set	ENTH — Enthalpy Switch
11	J7-31	J7-32	Analog	2-10 vdc	Transducer, Pressure	SP — Duct Static Pressure (VAV)
	J7-33	J7-32	Analog	2-10 vdc	Thermistor, 10K	STO — Space Temp Offset/T-56
12	J7-35	J7-36	Discrete	5 vdc	Contact set	FLTS — Filter Status
	Pin 36	J7-36	Discrete	10 vdc	Contact set	SFS — Supply Fan Status
Outputs						
13	J6-39	J6-38	Discrete	24 vac	Contact, NO	MM — Motormaster®/OD Fan Stage 1
14	J6-40	—	Analog	10 vdc	Proportional, 4-20 mA	ECON — Economizer Damper Position
15	J6-43	—	Analog	10 vdc	Proportional, 4-20 mA	PED — Power Exhaust Damper Position or PE VFD Speed
16	J6-46	J6-47	Analog	10 vdc	Proportional, 4-20 mA	IGV — IGV/Inverter/(VAV)
	J6-48	J6-47	Discrete	24 vac	Contact, NO	SF2S — Supply Fan Low Speed (CV)
17	J6-51	J6-50	Discrete	24 vac	Contacts (NO)	HS1 — Heat Stage 1
18	J6-54	J6-53	Discrete	24 vac	Contacts (NO)	HS2 — Heat Stage 2

INPUT/OUTPUT TABLES, CHANNELS 19-30 (DSIO-1) — SIZES 030-075

DSIO-1	TERMINAL ID		SIGNAL		TYPE	POINT NAME — ASSIGNMENT
Channel No.	+	–	Type	Level		
Inputs						
19	J3-1	J3-2	Discrete	24 vac	Contact set	CPFA1 — Compressor 1 Safety
10	J3-3	J3-4	Discrete	24 vac	Contact set	CPFB1 — Compressor 2 Safety
21	J3-5	J3-6	Discrete	24 vac	Contact set	CPSA1 — Compressor 1 Status
22	J3-7	J3-8	Discrete	24 vac	Contact set	CPSB1 — Compressor 2 Status
Outputs						
23	J4-3	J4-2	Discrete	115 vac	Contact set (NO)	CMPA1 — Compressor 1
	J4-3	J4-1	Discrete	115 vac	Contact set (NC)	CH1 — Crankcase Heater 1
24	J4-6	J4-5	Discrete	115 vac	Contact set (NO)	CMPB1 — Compressor 2
	J4-6	J4-4	Discrete	115 vac	Contact set (NC)	CH2 — Crankcase Heater 2
25	J4-9	J4-8	Discrete	24 vac	Contact set (NO)	ULDA1 — Unloader U1
26	J4-12	J4-11	Discrete	24 vac	Contact set (NO)	ULDB1 — Unloader U2
27	J5-3	J5-2	Discrete	115 vac	Contact set (NO)	SF — Supply Fan Contactor
28	J5-6	J5-5	Discrete	115 vac	Contact set (NO)	EF — Exhaust Fan Contactor
29	J5-9	J5-8	Discrete	115 vac	Contact set (NO)	FR2 — Outdoor Fan Contactor, Ckt 1
30	J5-12	J5-11	Discrete	115 vac	Contact set (NO)	FR3 — Outdoor Fan Contactor, Ckt 2

LEGEND

CV — Constant Volume
HIR — Heat Interlock Relay
IGV — Inlet Guide Vanes
NC — Normally Closed
NO — Normally Open
PE VFD — Power Exhaust Variable Frequency Drive
Temp — Temperature
VAV — Variable Air Volume

*Thermistor voltage signals varies according to temperature at thermistor; see Thermistor Characteristic Tables 80 and 81 for correlation of temperature and volts at these channels.

†When accessory transducer/sensor package has been installed (requires changes in “Factory Configuration” inputs).
**Field-connection from building/energy management system.
††Use relay HK35AB-001 (SPDT — Pilot Duty) for external control.
***Field-connection to room terminal heating interlock.

UNIT SIZE	030-050	055-075
HIR Contact	TB3	TB2
N.O.	4 + 5	8 + 9
N.C.	4 + 2	8 + 10

APPENDIX A (cont)

INPUT/OUTPUT TABLES, CHANNELS 31-48 (PSIO-2) — SIZES 030-075

PSIO-2	TERMINAL ID		SIGNAL		TYPE	POINT NAME — ASSIGNMENT
Channel No.	+	–	Type	Level		
Inputs						
31	J7-2	J7-3	Analog	Varies*	Thermistor, 5K	STA — Suction Gas Temperature, Ckt 1
32	J7-5	J7-6	Analog	Varies*	Thermistor, 5K	STB — Suction Gas Temperature, Ckt 2
33	J7-7	J7-8	Analog	2-10 vdc	Analog	OARH — Outdoor Relative Humidity
34	J7-10	J7-11	Analog	2-10 vdc	Analog	RH — Space/Return Relative Humidity
35	J7-13	J7-14	Analog	2-10 vdc	Analog	OAC — Outdoor Air CFM
36	J7-16	J7-17	Analog	2-10 vdc	Analog	IAQ — Indoor Air Quality
37	J7-19	J7-32	Discrete	24 vac	Contact, NO	PRES — Pressurization
38	J7-22	J7-32	Discrete	24 vac	Contact, NO	PURG — Smoke Purge
39	J7-25	J7-32	Discrete	24 vac	Contact, NO	EVAC — Evacuation
40	J7-28	J7-32	Discrete	24 vac	Contact, NO	FSD — Fire Shutdown
41	J7-31	J7-32	Discrete	24 vac	Contact, NO	FRZ — Freeze Stat
42	J7-34	J7-35	Analog	2-10 vdc**	Analog	SATRV — Supply Air Reset
Outputs						
43	J6-37	J6-38	Analog	10 vdc	Proportional, 4-20 mA	HCV — Heating Coil Valve
44	J6-42	J6-41	Discrete	20 vdc††	Contact, NO	DTCC — Discrete Timeclock Control
45	J6-43	J6-44	Analog	10 vdc	Proportional, 4-20 mA	HUM — Analog Humidifier
	J6-45	J6-44	Discrete	20 vdc††	Contact, NO	HUM — Discrete Stage Humidifier
46	—	—	—	—	—	(Not used)
47	—	—	—	—	—	(Not used)
48	—	—	—	—	—	(Not used)

INPUT/OUTPUT TABLES, CHANNELS 49-60 (DSIO-2) — SIZES 030-075

DSIO-2	TERMINAL ID		SIGNAL		TYPE	POINT NAME — ASSIGNMENT
Channel No.	+	–	Type	Level		
Inputs						
49	J3-1	J3-2	Discrete	24 vdc**	Discrete	EXTCLK — Remote Occupied/ Unoccupied
50	J3-3	J3-4	—	—	—	(Not used)
51	J3-5	J3-6	—	—	—	(Not used)
52	J3-7	J3-8	—	—	—	(Not used)
Outputs						
53	J4-3	J4-2	Discrete	115 vac	Contact, NO	ALARMLT — Alarm Light, Discrete
54	J4-6	J4-5	Discrete	115 vac	Contact, NO	ALERTLT — Alert Light, Discrete
55	J4-9	J4-8	Discrete	24 vac	Contact, NO	ULDA2 — Unloader U1A
56	J4-12	J4-11	Discrete	24 vac	Contact, NO	ULDB2 — Unloader U2A
57	—	—	—	—	—	(Not used)
58	—	—	—	—	—	(Not used)
59	—	—	—	—	—	(Not used)
60	J5-12	J5-11	Discrete	115 vac***	Contact, NO	HIR — Heat Interlock Relay***
	J5-12	J5-10	Discrete	115 vac***	Contact, NC	

LEGEND

CV — Constant Volume
HIR — Heat Interlock Relay
NC — Normally Closed
NO — Normally Open
Temp — Temperature
VAV — Variable Air Volume

*Thermistor voltage signals varies according to temperature at thermistor; see Thermistor Characteristic Tables 80 and 81 for correlation of temperature and volts at these channels.

†When accessory transducer/sensor package has been installed (requires changes in “Factory Configuration” inputs).
**Field-connection from building/energy management system.
††Use relay HK35AB-001 (SPDT — pilot duty) for external control.
***Field-connection to room terminal heating interlock.

UNIT SIZE	030-050	055-075
HIR Contact	TB3	TB2
N.O.	4 + 5	8 + 9
N.C.	4 + 2	8 + 10

APPENDIX B

INPUT/OUTPUT TABLES — CHANNELS 1-18 (PSIO-1) — SIZES 090 AND 105

PSIO-1 Channel No.	TERMINAL ID +	TERMINAL ID –	SIGNAL Type	SIGNAL Level	TYPE	ASSIGNMENT
Inputs						
1	J7-2	J7-3	Analog	Varies*	Thermistor, 5K	SAT — Supply-Air Temperature
2	J7-5	J7-6	Analog	Varies*	Thermistor, 5K	RAT — Return-Air Temperature
3	J7-8	J7-9	Analog	Varies*	Thermistor, 5K	STHA — Saturated Condensing Temperature, Circuit A
	J7-8†	J7-7	Analog	1-5 vdc	Transducer, Pressure	DPAV — Discharge Pressure Transducer, Circuit A
4	J7-11	J7-12	Analog	Varies*	Thermistor, 5K	STHB — Saturated Condensing Temperature, Circuit B
	J7-11†	J7-10	Analog	1-5 vdc	Transducer, Pressure	DPBV — Discharge Pressure Transducer, Circuit B
5	J7-13	J7-14	Discrete	24 vac	Contact Set	LPA — Low-Pressure Switch, Circuit A
	J7-13†		Analog	1-5 vdc	Transducer, Pressure	SPAV — Suction Pressure Transducer, Circuit B
6	J7-16	J7-17	Discrete	24 vac	Contact Set	LPB — Low-Pressure Switch, Circuit B
	J7-16†	J7-17	Analog	1-5 vdc	Transducer, Pressure	SPBV — Suction Press Transducer, Circuit B
7	J7-20	J7-21	Analog	Varies*	Thermistor, 5K	OAT — Outdoor-Air Temperature
8	J7-23	J7-24	Analog	Varies*	Thermistor, 10K	SPTSNSR —Space Temperature
9	J7-25	J7-26	Analog	2-10 vdc	Transducer, Pressure	BP — Building Pressure
10	J7-28	J7-29	Discrete	24 vac	Contact Set	ENTH — Enthalpy Switch
11	J7-31	J7-32	Analog	2-10 vdc	Transducer, Pressure	SP — Duct Static Pressure (VAV)
	J7-33		Analog	2-10 vdc	Thermistor, 10K	STOTHERM — Space Temperature Offset/T-56
12	J7-35	J7-36	Discrete	5 vdc	Contact Set	FLTS — Filter Status
	Pin 36		Discrete	10 vdc	Contact Set	SFS — Supply Fan Status
Outputs						
13	J6-37	—	—	—	—	Not Used
14	J6-40	—	Analog	10 vdc	Proportional, 4-20 mA	ECON — Economizer Damper Position
15	J6-43	—	Analog	10 vdc	Proportional, 4-20 mA	PED — Power Exhaust Damper Position
16	J6-46	J6-47	Analog	10 vdc	Proportional, 4-20 mA	INV — Inverter/IGV (VAV)
17	J6-51	J6-50	Discrete	24 vac	Contacts (NO)	HS1 — Heat Stage 1
18	J6-54	J6-53	Discrete	24 vac	Contacts (NO)	HS2 — Heat Stage 2

INPUT/OUTPUT TABLES — CHANNELS 19-30 (DSIO-1) — SIZES 090 AND 105

DSIO-1 Channel No.	TERMINAL ID +	TERMINAL ID –	SIGNAL Type	SIGNAL Level	TYPE	ASSIGNMENT
Inputs						
19	J3-1	J3-2	Discrete	24 vac	Contact Set	CPFA1 — Compressor A1 Safety
20	J3-3	J3-4	Discrete	24 vac	Contact Set	CPFB1 — Compressor B1 Safety
21	J3-5	J3-6	Discrete	24 vac	Contact Set	CPSA1 — Compressor A1 Status
22	J3-7	J3-8	Discrete	24 vac	Contact Set	CPSA1 — Compressor A1 Status
Outputs						
23	J4-3	J4-2	Discrete	115 vac	Contact Set (NO)	CMPA1 — Compressor A1
	J4-3	J4-1	Discrete	115 vac	Contact Set (NC)	CCHA1 — Crankcase Heater A1
24	J4-6	J4-5	Discrete	115 vac	Contact Set (NO)	CMPB1 — Compressor B1
	J4-6	J4-4	Discrete	115 vac	Contact Set (NC)	CCHB1 — Crankcase Heater B1
25	J4-9	J4-8	Discrete	24 vac	Contact Set (NO)	ULDA1 — Unloader A1
26	J4-12	J4-11	Discrete	24 vac	Contact Set (NO)	UNLB1 — Unloader B1
27	J5-3	J5-2	Discrete	115 vac	Contact Set (NO)	SPF — Supply Fan Contactor
28	J5-6	J5-5	Discrete	115 vac	Contact Set (NO)	EF — Exhaust Fan Contactor
29	J5-9	J5-8	Discrete	115 vac	Contact Set (NO)	OFA — Outdoor Fan Contactor, Circuit A
30	J5-12	J5-11	Discrete	115 vac	Contact Set (NO)	OFB — Outdoor Fan Contactor, Circuit B

LEGEND

HIR — Heat Interlock Relay
IGV — Inlet Guide Vanes
NC — Normally Closed
NO — Normally Open
VAV — Variable Air Volume

*Thermistor voltage signals varies according to temperature at thermistor; see Thermistor Characteristic Tables 80 and 81 for correlation of temperature and volts at these channels.

†When accessory transducer/sensor package has been installed (requires changes in "Factory Configuration" inputs).
**Use relay HK35AB-001 (SPDT — pilot duty) for external control.
††Field-connection from building/energy management system.
***Field-connection to room terminal heating interlock.

UNIT SIZE	090,105
HIR Contact	TB2
N.O.	8 + 9
N.C.	8 + 10

APPENDIX B (cont)

INPUT/OUTPUT TABLES — CHANNELS 31-48 (PSIO-2) — SIZES 090 AND 105

PSIO-2 Channel No.	TERMINAL ID +	TERMINAL ID –	SIGNAL Type	SIGNAL Level	TYPE	ASSIGNMENT
Inputs						
31	J7-2	J7-3	Analog	Varies*	Thermistor, 5K	STATHERM — Suction Gas Thermistor, Circuit A
32	J7-5	J7-6	Analog	Varies*	Thermistor, 5K	STBTHERM — Suction Gas Thermistor, Circuit B
33	J7-7	J7-8	Analog	2-10 vdc	Analog	OARHV — Outdoor Relative Humidity
34	J7-10	J7-11	Analog	2-10 vdc	Analog	RHV — Space/Return Relative Humidity
35	J7-13	J7-14	Analog	2-10 vdc	Analog	OACV — Outdoor Air Cfm
36	J7-16	J7-17	Analog	2-10 vdc	Analog	IAQV — Indoor Air Quality
37	J7-19	J7-32	Discrete	24 vac	Contact, NO	PRES — Pressurization
38	J7-22	J7-32	Discrete	24 vac	Contact, NO	PURG — Smoke Purge
39	J7-25	J7-32	Discrete	24 vac	Contact, NO	EVAC — Evacuation
40	J7-28	J7-32	Discrete	24 vac	Contact, NO	FSD — Fire Shutdown
41	J7-31	J7-32	Discrete	24 vac	Contact, NO	FRZ — Freezestat
42	J7-34	J7-35	Analog	2-10 vdc††	Analog	SATRV — Supply Air Reset
Outputs						
43	J6-37	J6-38	Analog	10 vdc	Proportional, 4-20 mA	HCVOUT — Heating Coil Valve
44	J6-42	J6-41	Discrete	20 vdc	Contact, NO**	DTCC — Discrete Time Clock Control
45	J6-43	J6-44	Analog	10 vdc	Proportional, 4-20 mA	HUMOUT — Analog Humidifier
	J6-45	J6-44	Discrete	20 vdc	Contact, NO**	HUMOUT — Discrete Stage Humidifier
46	J6-48	J6-47	Discrete	24 vac	Contact, NO	MMB — Motormaster® Control/Outdoor Fan Stage 1, Circuit B
47	J6-51	J6-50	Discrete	24 vac	Contact, NO	MMA — Motormaster Control/Outdoor Fan Stage 1, Circuit A
48	J6-54	J6-53	Discrete	24 vac	Contact, NO	ALERTLT — Alert Light

INPUT/OUTPUT TABLES — CHANNELS 49-60 (DSIO-2) — SIZES 090 AND 105

DSIO-2 Channel No.	TERMINAL ID +	TERMINAL ID –	SIGNAL Type	SIGNAL Level	TYPE	ASSIGNMENT
Inputs						
49	J3-1	J3-2	Discrete	24 vac**	Discrete	EXTCLK — Remote Occupied/Unoccupied
50	J3-3	J3-4				(Not Used)
51	J3-5	J3-6	Discrete	24 vac	Contact Set	CPFA2 — Compressor A2 Safety
52	J3-7	J3-8	Discrete	24 vac	Contact Set	CPFB1 — Compressor B2 Safety
Outputs						
53	J4-3	J4-2	Discrete	115 vac	Contact, NO	CMPA2 — Compressor A2
	J4-3	J4-1	Discrete	115 vac	Contact, NC	CCHA2 — Compressor A2
54	J4-6	J4-5	Discrete	115 vac	Contact, NO	CMPB2 — Compressor B2
	J4-6	J4-4	Discrete	115 vac	Contact, NC	CCHB2 — Compressor B2
55	J4-9	J4-8	Discrete	24 vac	Contact, NO	ULDA2 — Unloader A2
56	J4-12	J4-11	Discrete	24 vac	Contact, NO	UNLB2 — Unloader B2
57	J5-3	J5-2	—	—	—	Not Used
58	J5-6	J5-5	—	—	—	Not Used
59	J5-9	J5-8	Discrete	115 vac††	Contact, NO	Alarm, Discrete (Field Connection)
	J5-9	J5-7	Discrete	115 vac††	Contact, NC	
60	J5-12	J5-11	Discrete	115 vac***	Contact, NO	HIR — Heat Interlock Relay (Field Connection)
	J5-12	J5-10	Discrete	115 vac***	Contact, NC	

LEGEND

HIR — Heat Interlock Relay
IGV — Inlet Guide Vanes
NC — Normally Closed
NO — Normally Open
VAV — Variable Air Volume

*Thermistor voltage signals varies according to temperature at thermistor; see Thermistor Characteristic Tables 80 and 81 for correlation of temperature and volts at these channels.

†When accessory transducer/sensor package has been installed (requires changes in "Factory Configuration" inputs).
**Use relay HK35AB-001 (SPDT — pilot duty) for external control.
††Field-connection from building/energy management system.
***Field-connection to room terminal heating interlock

UNIT SIZE	090,105
HIR Contact	TB2
N.O.	8 + 9
N.C.	8 + 10

APPENDIX C — CCN Points List

CCN TABLE NAME	CCN POINT NAME	EXPANDED NAME	READ/WRITE PROPERTIES	DISPLAY FORMAT/ ENGINEERING UNITS
STATUS01	SPT	Space Temperature	RW	–10 to +245 F
	SAT	Supply Air Temperature	RW	–10 to +245 F
	RAT	Return Air Temperature	RW	–10 to +245 F
	CLSP	Control Set Point	RO	F
	CCAP	Cooling Percentage Total Capacity	RO	0 to 100%
	HCAP	Heating Percentage Total Capacity	RO	0 to 100%
	ECOS	Economizer Active	RO	no/yes
	SFS	Supply Fan Status	RO	on/off
	SF	Supply Fan Relay	RW	on/off
	SF2S	2-Speed Fan Relay*	RO	on/off
	SP	Duct Static Pressure	RW	0.0 to 5.0 in. wg
	IGV	Inlet Guide Vanes/Inverter*	RW	0 to 100%
	INV	Inlet Guide Vanes/Inverter†	RW	0 to 100%
	OAT	Outside Air Temperature	RW	–40 to +245 F
	ECON	Economizer Damper	RW	0 to 100%
	IQMP	IAQ Minimum Damper Position†	RW	0 to 100%
	BP	Building Pressure	RW	–0.5 to +0.5 in. wg
	EFRF	Exhaust/Return Fan	RW	on/off
	PED	Power Exhaust Damper	RW	0 to 100%
	FLTS	Filter Status	RW	dirty/clean
	EXTCLK	External Clock Input	RO	on/off
STATUS02	MM	Motormaster/Fan Stage 1*	RO	on/off
	FR2	Condenser Fan Stage 2*	RO	on/off
	FR3	Condenser Fan Stage 3*	RO	on/off
	STO	Space Temperature Reset	RO	F
	HS1	Heat Stage 1	RO	on/off
	HS2	Heat Stage 2	RO	on/off
	HIR	Heat Interlock Relay	RO	on/off
	SATRESET	Supply Air Set Point Reset	RO	F
STATUS03	RH	Return/Space Humidity	RW	0 to 100%
	OARH	Outside Air Humidity	RW	0 to 100%
	HUM	Humidifier — Proportional	RW	0 to 100%
	HUM	Humidifier — Discrete	RW	on/off
	ENTH	Enthalpy Status	RW	hi/low
	OAC	Outside Air CFM	RW	0 to 50,000 CFM
	IAQ	IAQ (CO_2)	RW	0 to 5000 PPM
	EVAC	Evacuation	RW	alarm/norm
	PRES	Pressurization	RW	alarm/norm
	PURG	Smoke Purge	RW	alarm/norm
	FSD	Fire Shutdown	RW	alarm/norm
	DTCC	Discrete Time Clock Control	RW	on/off
	HCV	Heating Valve	RW	0 to 100%
	FRZ	Freezestat Status	RW	alarm/norm
	SMZ	Load-Unload Compressor Factor	RO	0 to 100%
STATUS04	STRST	Space Temperature Reset	RO	no/yes
	DEMLT	Demand Limit	RO	no/yes
	UNCHT	Unoccupied Heating	RO	no/yes
	UNCCL	Unoccupied Cooling	RO	no/yes
	STDBY	Unit in Standby	RO	no/yes
	OPTST	Optimal Start	RO	no/yes
	UNOCC	Unoccupied	RO	no/yes
	IAQPG	IAQ Purge	RO	no/yes
	OPTSP	Optimal Stop	RO	no/yes
	OCCHT	Occupied Heating	RO	no/yes
	OCCCL	Occupied Cooling	RO	no/yes
	OCCFO	Occupied Fan Only	RO	no/yes
	NTFCL	Night Time Free Cooling	RO	no/yes
	PRESS	Pressurization	RO	no/yes
	EVACN	Evacuation	RO	no/yes
	SMKPG	Smoke Purge	RO	no/yes
	FIRES	Fire Shutdown	RO	no/yes
	TIMOV	Timed Override	RO	no/yes
	DAVCL	DAV Control	RO	no/yes
	FFTST	Factory/Field Test	RO	no/yes

CCN TABLE NAME	CCN POINT NAME	EXPANDED NAME	READ/WRITE PROPERTIES	DISPLAY FORMAT/ ENGINEERING UNITS
STATUS04 (cont)	HHOVR	High Humidity Override	RO	no/yes
	IAQCL	IAQ/Outdoor Air CFM Ctrl†	RO	no/yes
STATUS05	CPSA1	Compressor A1 Status	RO	on/off
	CPFA1	Compressor A1 Safety	RO	alarm/norm
	CMPA1	Compressor A1	RO	on/off
	CPFA2	Compressor A2 Safety†	RO	alarm/norm
	CMPA2	Compressor A2†	RO	on/off
	ULDA1	Unloader A1	RO	on/off
	ULDA2	Unloader A2†	RO	on/off
	SDRA	Cir A Solenoid*	RO	on/off
	LPA	Cir A Low Pressure	RO	alarm/norm
	SPA	Cir A Suction Pressure	RO	psi
	DPA	Cir A Discharge Pressure	RO	psi
	SCTA	Cir A Saturated Condensing Temperature	RO	F
	SSTA	Cir A Saturated Suction Temperature	RO	F
	SHA	Cir A Suction Superheat	RO	F
	STA	Cir A Suction Temperature	RO	F
	MMA	Cir A Motormaster/Fan 1	RO	on/off
	OFA	Cir A Outdoor Fan 2	RO	on/off
STATUS06	CPSB1	Compressor B1 Status	RO	on/off
	CPFB1	Compressor B1 Safety	RO	alarm/norm
	CMPB1	Compressor B1	RO	on/off
	CPFB2	Compressor B2 Safety†	RO	alarm/norm
	CMPB2	Compressor B2†	RO	on/off
	ULDB1	Unloader B1	RO	on/off
	ULDB2	Unloader B2†	RO	on/off
	SDRB	Cir B Solenoid*	RO	on/off
	LPB	Cir B Low Pressure	RO	alarm/norm
	SPB	Cir B Suction Pressure	RO	psi
	DPB	Cir B Discharge Pressure	RO	psi
	SCTB	Cir B Saturated Condensing Temperature	RO	F
	SSTB	Cir B Saturated Suction Temperature	RO	F
	SHB	Cir B Suction Superheat	RO	F
	STB	Cir B Suction Temperature	RO	F
	MMB	Cir B Motormaster/Fan 1	RO	on/off
	OFB	Cir B Outdoor Fan 2	RO	on/off
SETPOINT	OHSP	Occupied Heat Set Point	RW	55 to 80 F
	OCSP	Occupied Cool Set Point	RW	55 to 80 F
	UHSP	Unoccupied Heat Set Point	RW	40 to 80 F
	UCSP	Unoccupied Cool Set Point	RW	75 to 95 F
	HUSP	Humidity Set Point	RW	0 to 100%
	SPSP	Static Pressure Set Point	RW	0.0 to 5.0 in. wg
	BPSP	Building Pressure Set Point	RW	–0.5 to +0.5 in. wg
	SASP	Supply Air Temperature Set Point	RW	40 to 70 F
	NTLO	NTFC Lockout Temperature	RW	40 to 70 F
	RTIO	Reset Ratio	RW	0 to 10 F
	LIMT	Reset Limit	RW	0 to 20 F
	LSP	Demand Limit Set Point	RW	0 to 100%
	MDP	Economizer Minimum Damper Position	RW	0 to 100%
	OACS	Outside Air CFM Set Point	RW	0 to 50,000 CFM
	IAQS	IAQ Set Point	RW	0 to 5000 PPM
	HHOR	High Humidity Override	RW	0 to 100%
	ECSO	Economizer Set Point Offset	RW	0 to 10 F
	USDB	Unoccupied Set Point Deadband*	RW	0 to 10 F
	UHDB	Unoccupied Heating Deadband†	RW	0 to 10 F
	UCDB	Unoccupied Cooling Deadband†	RW	0 to 10 F
	LTMP	Low Temperature Minimum Position	RW	0 to 100%
	HTMP	High Temperature Minimum Position	RW	0 to 100%
OCCDEFCS	OCCPCO1S	Occupancy Schedule	TS	

LEGEND

DAV — Digital Air Volume
IAQ — Indoor-Air Quality
NTFC — Nighttime Free Cooling
RO — Read Only
RW — Read/Write
TS — Time Schedule object with read/write properties

*Sizes 090 and 105 only.
†Sizes 030-075 only.

APPENDIX D — BACnet Points List

CCN TABLE NAME	CCN POINT NAME	BACnet OBJECT NAME	EXPANDED NAME	BACnet OBJECT TYPE	BACnet OBJECT PROPERTIES	BAClink DEFAULT TEMPLATE	DISPLAY FORMAT/ ENGINEERING UNITS
STATUS01	SPT	SPT	Space Temperature	AI	RW	Y	–10 to +245 F
	SAT	SAT	Supply Air Temperature	AI	RW	Y	–10 to +245 F
	RAT	RAT	Return Air Temperature	AI	RW	Y	–10 to +245 F
	SFS	SFS	Supply Fan Status	BI	RO	Y	on/off
	SF	SF	Supply Fan Relay	BO	RW	Y	on/off
	SP	SP	Duct Static Pressure	AI	RW	Y	0.0 to 5.0 in. wg
	IGV	IGV	Inlet Guide Vanes	AI	RW	Y	0 to 100%
	OAT	OAT	Outside Air Temperature	AI	RW		–40 to +245 F
	ECON	ECON	Economizer Damper	AO	RW	Y	0 to 100%
	BP	BP	Building Pressure	AI	RW		–0.5 to +0.5 in. wg
	EFRF	EFRF	Exhaust/Return Fan	BO	RW		on/off
	FLTS	FLTS	Filter Status	BI	RW		dirty/clean
	EXTCLK	EXTCLK	External Clock Input	BV	RO	Y	on/off
	PED	PED	Power Exhaust Damper	AO	RW		0 to 100%
STATUS02	MM	MM	Motormaster/Fan Stage 1	BO	RO		on/off
	FR2	FR2	Condenser Fan Stage 2	BO	RO		on/off
	FR3	FR3	Condenser Fan Stage 3	BO	RO		on/off
	HS1	HS1	Heat Stage 1	BO	RO	Y	on/off
	HS2	HS2	Heat Stage 2	BO	RO	Y	on/off
STATUS03	RH	RH	Return/Space Humidity	AI	RW		0 to 100%
	OARH	OARH	Outside Air Humidity	AI	RW		0 to 100%
	ENTH	ENTH	Enthalpy Status	BI	RW		hi/low
	OAC	OAC	Outside Air CFM	AI	RW		0 to 50,000 CFM
	IAQ	IAQ	IAQ (CO_2)	AI	RW		0 to 5000 PPM
	EVAC	EVAC	Evacuation	BV	RW		alarm/norm
	PRES	PRES	Pressurization	BV	RW		alarm/norm
	PURG	PURG	Smoke Purge	BV	RW		alarm/norm
	FSD	FSD	Fire Shutdown	BV	RW		alarm/norm
	FRZ	FRZ	Freezestat Status	BI	RW		alarm/norm
	HCV	HCV	Heating Valve	AO	RW		0 to 100%
STATUS04	STRST	STRST	Space Temperature Reset	AI	RO		no/yes
	UNCHT	UNCHT	Unoccupied Heating	BV	RO		no/yes
	UNCCL	UNCCL	Unoccupied Cooling	BV	RO		no/yes
	STDBY	STDBY	Unit in Standby	BV	RO		no/yes
	OPTST	OPTST	Optimal Start	BV	RO		no/yes
	UNOCC	UNOCC	Unoccupied	BV	RO		no/yes
	IAQPG	IAQPG	IAQ Purge	BV	RO		no/yes
	OPTSP	OPTSP	Optimal Stop	BV	RO		no/yes
	OCCHT	OCCHT	Occupied Heating	BV	RO		no/yes
	OCCCL	OCCCL	Occupied Cooling	BV	RO		no/yes
	OCCFO	OCCFO	Occupied Fan Only	BV	RO		no/yes
	NTFCL	NTFCL	Night Time Free Cooling	BV	RO		no/yes
	PRESS	PRESS	Pressurization	BV	RO		no/yes
	EVACN	EVACN	Evacuation	BV	RO		no/yes
	SMKPG	SMKPG	Smoke Purge	BV	RO		no/yes
	FIRES	FIRES	Fire Shutdown	BV	RO		no/yes
	TIMOV	TIMOV	Timed Override	BV	RO		no/yes
	HHOVR	HHOVR	High Humidity Override	BV	RO		no/yes
	IAQCL	IAQCL	IAQ/Outdoor Air CFM Ctrl*	BV	RO		no/yes
STATUS05	CMPA1	CMPA1	Compressor A1	BO	RO	Y	on/off
	CPSA1	CPSA1	Compressor A1 Status	BI	RO		on/off
	ULDA1	ULDA1	Unloader A1	BO	RO		on/off
	CMPA2	CMPA2	Compressor A2*	BO	RO		on/off
	ULDA2	ULDA2	Unloader A2*	BO	RO		on/off
	CPFA1	CPFA1	Compressor A1 Safety	BI	RO		alarm/norm
STATUS06	CMPB1	CMPB1	Compressor B1	BO	RO	Y	on/off
	CMPB2	CMPB2	Compressor B2*	BO	RO		on/off
	CPSB1	CPSB1	Compressor B1 Status	BI	RO		on/off
	ULDB1	ULDB1	Unloader B1	BO	RO		on/off
	ULDB2	ULDB2	Unloader B2*	BO	RO		on/off
	CPFB1	CPFB1	Compressor B1 Safety	BI	RO		alarm/norm
	CPFB2	CPFB2	Compressor B2 Safety*	BI	RO		alarm/norm

APPENDIX D — BACnet Points List (cont)

CCN TABLE NAME	CCN POINT NAME	BACnet OBJECT NAME	EXPANDED NAME	BACnet OBJECT TYPE	BACnet OBJECT PROPERTIES	BAClink DEFAULT TEMPLATE	DISPLAY FORMAT/ ENGINEERING UNITS
SETPOINT	OHSP	OHSP	Occupied Heat Set Point	AV	RW	Y	55 to 80 F
	OCSP	OCSP	Occupied Cool Set Point	AV	RW	Y	55 to 80 F
	UHSP	UHSP	Unoccupied Heat Set Point	AV	RW	Y	40 to 80 F
	UCSP	UCSP	Unoccupied Cool Set Point	AV	RW	Y	75 to 95 F
	HUSP	HUSP	Humidity Set Point	AV	RW		0 to 100%
	SPSP	SPSP	Static Pressure Set Point	AV	RW	Y	0.0 to 5.0 in. wg
	BPSP	BPSP	Building Pressure Set Point	AV	RW		–0.5 to +0.5 in. wg
	SASP	SASP	Supply Air Temperature Set Point	AV	RW	Y	40 to 70 F
	MDP	MDP	Economizer Minimum Damper Position	AV	RW	Y	0 to 100%
	OACS	OACS	Outside Air CFM Set Point	AV	RW		0 to 50,000 CFM
	IAQS	IAQS	IAQ Set Point	AV	RW		0 to 5000 PPM
	HHOR	HHOR	High Humidity Override	AV	RW		0 to 100%
OCCDEFCS	OCCPCO1S	OCCPC01S	Occupancy Schedule	TS	RW	Y	

LEGEND

AI — Analog Input object type defined by BACnet to have only read only properties.
AO — Analog Output object type defined by BACnet to have read and write properties.
AV — Analog Value object type defined by BACnet to have read and/or write properties.
BI — Binary Input object type defined by BACnet to have read only properties.
BO — Binary Output object type defined by BACnet to have read only properties.
BV — Binary Value object type defined by BACnet to have read and/or write properties.
RO — Read Only
RW — Read/Write
TS — Time Schedule object with read/write properties
Y — Yes, this object comes configured in the BAClink template.

*Sizes 090 and 105 only.

APPENDIX E — Supply Fan VFD — Carrier Default Program Parameter Values

PARAMETER GROUP	PARAMETER	DEFAULT VALUE
SEtP (Setup)	ACC1	60.0 Sec
	DEC1	60.0 Sec
	UL	60.0 Hz
	LL	10.0 Hz*
	Luln	1
	P3	20%
	F-P3	0.0 Hz
	P4	100%
	F-P4	60 Hz
	tHr1	See Tables 87 and 88
	StC1	0
	StL1	110%
	OLN	1
	tYP	5*
Gr.F (Fundamental)	FH	60 Hz
	Pt	2
Gr.Fb (Feedback)	FbP1	1*
	Fbln	2
	GP	.30
	GI	2 sec
	GA	0
	GFS	80
	P1LL	10
	PuL	1
	PuUl	10
	PuLL	10
Gr.SF (Frequency Settings)	Fsor	60 Hz
	Sr.n	1* (055-105 only)
	SrN1	0* (055-105 only)
Gr.Pn (Panel Control)	Fr	0*
Gr.St (Terminal Selection)	1t	1
	1t0	0
	1t1	56
	1t2	13
	1t3	3
	1t4	10
Gr.Pr (Protection)	UuC	1*
	UuCt	2
	ArSt	3
Gr.Ut (Utility)	Cnod	1*
	bLSF	1* (055-105 only)
	Fnod	2*
	bLPn	1*

*These settings differ from the VFD manufacturer defaults and are required for Carrier applications.

NOTE: To restore original factory settings, change tYP to 6 in Setup mode (SEtP). This restores the VFD original factory settings.

APPENDIX F — High-Capacity Power Exhaust VFD — Carrier Default Program Parameter Values

PARAMETER GROUP	PARAMETER	DEFAULT VALUE
SEtP (Setup)	ACC1	60.0 Sec
	DEC1	60.0 Sec
	UL	60.0 Hz*
	LL	10.0 Hz*
	Luln	1
	P3	20%
	F-P3	0.0 Hz
	P4	100%*
	F-P4	60 Hz
	tHr1	See Tables 91 and 92
	StC1	0
	StL1	110%
	OLN	1
	tYP	5*
Gr.F (Fundamental)	FH	60 Hz
	Pt	12
Gr.Fb (Feedback)	FbP1	1*
	Fbin	2
	GP	.30
	GI	2 sec
	GA	0
	GFS	80
	P1LL	10
	PuL	1
	PuUl	10
	PuLL	10
Gr.SF (Frequency Settings)	Fsor	60 Hz
Gr.Pn (Panel Control)	Fr	0*
Gr.St (Terminal Selection)	1t	1
	1t0	0
	1t1	56
	1t2	13
	1t3	3
	1t4	10
	Ot1	4*
	Ot2	2*
	Ot2d	5*
	Ot2H	100*
	LF	15*
Gr.Pr (Protection)	UuC	1*
	UuCt	2
	ArSt	3
Gr.Ut (Utility)	Cnod	1*
	Fnod	2*
	bLPn	1*

*These settings differ from the Toshiba defaults and are required for Carrier applications.

NOTE: To restore original factory settings, change tYP to 6 in SEtup mode (SEtP).
This restores the VFD original factory settings.

APPENDIX G — Return/Exhaust Fan VFD — Carrier Default Program Parameter Values

PARAMETER GROUP	PARAMETER	DEFAULT VALUE
SEtP (Setup)	ACC1	120.0 Sec*
	DEC1	120.0 Sec*
	UL	60.0 Hz
	LL	10.0 Hz*
	Luln	1
	P3	20%
	F-P3	0.0 Hz
	P4	100%
	F-P4	60 Hz
	tHr1	See Tables 94 and 95
	StC1	0
	StL1	110%
	OLN	1
	tYP	5*
Gr.F (Fundamental)	FH	60 Hz*
	Pt	2
Gr.Fb (Feedback)	FbP1	1*
	Fbln	2
	GP	.30
	GI	2 sec
	GA	0
	GFS	80
	P1LL	5*
	PuL	1
	PuUl	10
	PuLL	10
Gr.St (Terminal Selection)	1t	1
	1t0	0
	1t1	56
	1t2	13
	1t3	3
	1t4	10
Gr.Pr (Protection)	UuC	1*
	UuCt	2
	ArSt	3
Gr.Ut (Utility)	Cnod	1*
	bLSF	1*
	Fnod	2*
	bLPn	1*

*These settings differ from the Toshiba defaults and are required for Carrier applications.

NOTE: To restore original factory settings, change tYP to 6 in Setup mode (SEtP). This restores the VFD original factory settings.

APPENDIX H — Carrier Comfort Network Tables for Staged Gas Controller

CONFIGURATION

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Setpoint Select	0=SetpointAdjust 1=Single Setpoint 2=Dual 7 Day 3=Dual CCN	0	None	SETPTSEL
Heat Stage Type	0=2 stages 1=5 stages 2=7 stages 3=9 stages 4=11 stages	0	None	HTSTGTYP
Max Cap Change per Cycle	5-30	45	%	CAPMXSTG
PID Algorithm Rate	60-300	90	sec	HEATPIDR
Proportional Gain	0.5-1.5	1		P_GAIN
Derivative Gain	0.5-1.5	1		D_GAIN
Abs. Min Rate for Deadbnd	0-5	0.5	%	MINRT_DB
Upper Temp. Deadbnd Limit	0-5	2	dF	UPPER_DB
Lower Temp. Deadbnd Limit	–5-0	–2	dF	LOWER_DB
Limit Switch Monitoring	YES/NO	YES	None	LIMTMON1
Limit Switch High Temp	110-180	170	dF	LIMTHIHT
Limit Switch Low Temp	100-170	160	dF	LIMTLOHT
SAT Limit Config	0-20	10	dF	LIMT_SAT
Heat Rise dF/sec clamp	0.05-0.2	0.06	dF/sec	HEATRISE

DISPLAY (NAVIGATOR SETUP)

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Display Password	Nnnn	1111		PASSWORD
Password Enable	enable/disable	enable		PASS_EBL
Metric Display	Off/On	Off		DISPUNIT
Language	0=ENGLISH 1=FRANCAIS 2=ESPANOL 3=PORTUGUES	0		LANGUAGE

SCHEDOVR (TIMED OVERRIDE SETUP)

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Schedule Number	0-99	0		SCHEDNUM
Override Time Limit	0-4	0	hours	OTL
Timed Override Hours	0-4	0	hours	OVR_EXT
Time Override	YES/NO	NO		TIMEOVER

7 DAY_OCC (7 Day Occupancy)

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Monday Occupied	0-24:00	0		MON_OCC
Monday Unoccupied	0-24:00	0		MON_UNC
Tuesday Occupied	0-24:00	0		TUE_OCC
Tuesday Unoccupied	0-24:00	0		TUE_UNC
Wednesday Occupied	0-24:00	0		WED_OCC
Wednesday Unoccupied	0-24:00	0		WED_UNC
Thursday Occupied	0-24:00	0		THU_OCC
Thursday Unoccupied	0-24:00	0		THU_UNC
Friday Occupied	0-24:00	0		FRI_OCC
Friday Unoccupied	0-24:00	0		FRI_UNC
Saturday Occupied	0-24:00	0		SAT_OCC
Saturday Unoccupied	0-24:00	0		SAT_UNC
Sunday Occupied	0-24:00	0		SUN_OCC
Sunday Unoccupied	0-24:00	0		SUN_UNC

NOTE: The time is set and displayed in military time.

HOLIDAY (30 Holidays….01S-30S)

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Holiday Start Month	0-12	0		HOL-MON
Start Day	0-31	0		HOL-DAY
Duration (days)	0-99	0		HOL-LEN

ALARMDEF (Alarm Definition Table)

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Alarm Routing Control	00000000	000000000		ALRM_CNT
Equipment Priority	0 to 7	5		EQP_TYPE
Comm Failure Retry Time	1 to 240	30	min	RETRY_TM
Re-alarm Time	1 to 225	30	min	RE-ALARM
Alarm System Name	XXXXXXXX	STAGEGAS		ALRM_NAM

BRODEFS (Broadcast POC Definition Table)

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
CCN Time/Date Broadcast	Yes/No	No		CCNBC
CCN OAT Broadcast	Yes/No	No		OATBC
Global Schedule Broadcast	Yes/No	No		GSBC
CCN Broadcast Acknowledger	Yes/No	No		CCNBCACK
Daylight Savings Start				
Month	1 to 12	4		STARTM
Week	1 to 5	1		SATARTW
Day	1 to 7	7		STARTD
Minutes to add	0 to 99	60	min	MINADD
Daylight Savings Stop				
Month	1 to 12	10		STOPM
Week	1 to 5	5		STOPW
Day	1 to 7	7		STOPD
Minutes to subtract	0 to 99	60	min	MINSUB

SETPOINT

DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
Cooling Setpoint 1	35-70	45.0	dF	COOLSP1
Cooling Setpoint 2	35-70	47.0	dF	COOLSP2
Heating Setpoint 1	80-125	102.5	dF	HEATSP1
Heating Setpoint 2	80-125	100.5	dF	HEATSP2

VERSIONS

DESCRIPTION	VERSION NUMBER	STATUS
MBB	CESR131274-	XX-YY*
MARQUEE	CESR131171-	XX-YY
NAVIGATOR	CESR130227-	XX-YY

*XX=major revision field; YY=minor revision field.

STAGEMON

DESCRIPTION	STATUS	UNITS	POINT
Internal Calculated Cap	0-100	%	CAP_CALC
Current Running Capacity	0-100	%	CAPACITY
Proportional Cap. Change	0-CAPMXSTG	%	P
Derivative Cap. Change	0-CAPMXSTG	%	D
PID Timer in Seconds	0-300	sec	RATETIMR
Current Heat Stage	0-HTMAXSTG		HT_STAGE
Control Setpoint	~30-~125	dF	SETP
Supply Air Temperature	–40-240	dF	SAT
Limit Switch Temperature	–40-240	dF	LIMTTEMP
Hi Limit Switch Tmp Mode	On/Off		LIMTMODE
SAT Cutoff Mode	On/Off		SATCMODE
Capacity Clamp Mode	On/Off		CAPMODE

ALARMS

DESCRIPTION	STATUS	UNITS	POINT
Active Alarm #1	Axxx*		ALARM01C
Active Alarm #2	Axxx		ALARM02C
Active Alarm #3	Axxx		ALARM03C
Active Alarm #4	Axxx		ALARM04C
Active Alarm #5	Axxx		ALARM05C
Active Alarm #6	Axxx		ALARM06C
Active Alarm #7	Axxx		ALARM07C
Active Alarm #8	Axxx		ALARM08C
Active Alarm #9	Axxx		ALARM09C
Active Alarm #10	Axxx		ALARM10C
Active Alarm #11	Axxx		ALARM11C
Active Alarm #12	Axxx		ALARM12C
Active Alarm #13	Axxx		ALARM13C
Active Alarm #14	Axxx		ALARM14C
Active Alarm #15	Axxx		ALARM15C
Active Alarm #16	Axxx		ALARM16C
Active Alarm #17	Axxx		ALARM17C
Active Alarm #18	Axxx		ALARM18C
Active Alarm #19	Axxx		ALARM19C
Active Alarm #20	Axxx		ALARM20C
Active Alarm #21	Axxx		ALARM21C
Active Alarm #22	Axxx		ALARM22C
Active Alarm #23	Axxx		ALARM23C
Active Alarm #24	Axxx		ALARM24C
Active Alarm #25	Axxx		ALARM25C

*Alarms preceded with A, Alerts preceded with T.

NOTE: This table is for display only.

OCCDEFM

DESCRIPTION	STATUS	UNITS	POINT
Current Mode (1=Occup.)	N	none	MODE
Current Occup. Period #	Nn	none	PER-NO
Timed Override in Effect	YES/NO	none	OVERLAST
Timed Override Duration	Nn	none	OVR_HRS
Current Occupied Time	HH:MM	none	STRTIME
Current Unoccupied Time	HH:MM	none	ENDTIME
Next Occupied Day	DOW	none	NXTOCDAY
Next Occupied Time	HH:MM	none	NXTOCTIM
Next Unoccupied Day	DOW	none	NXTUNDAY
Next Unoccupied Time	HH:MM	none	NXTUNTIM
Previous Unoccupied Day	DOW	none	PRVUNDAY
Previous Unoccupied Time	HH:MM	none	PRVUNTIM

TESTMODE

DESCRIPTION	STATUS	POINT	FORCIBLE
Service test	Yes/No	SERVTEST	Y
Heat Output #1	On/Off	HEATTST1	Y
Heat Output #2	On/Off	HEATTST2	Y
Heat Output #3	On/Off	HEATTST3	Y
Heat Output #4	On/Off	HEATTST4	Y
Heat Output #5	On/Off	HEATTST5	Y
Heat Output #6	On/Off	HEATTST6	Y

HEATOUTS

DESCRIPTION	STATUS	POINT	FORCIBLE
Heat Output 1	On/Off	HEATOUT1	N
Heat Output 2	On/Off	HEATOUT2	N
Heat Output 3	On/Off	HEATOUT3	N
Heat Output 4	On/Off	HEATOUT4	N
Heat Output 5	On/Off	HEATOUT5	N
Heat Output 6	On/Off	HEATOUT6	N

INPUTS

DESCRIPTION	STATUS	POINT	FORCIBLE
Cool Input #1	On/Off	COOL_IN1	N
Cool Input #2	On/Off	COOL_IN2	N
Supply Fan Status	On/Off	SFANSTAT	N
Heat Input #1	On/Off	HEAT_IN1	N
Heat Input #2	On/Off	HEAT_IN2	N
Dehumidify Input	On/Off	DEHUMID	N

SATTEMPS

DESCRIPTION	STATUS	POINT	FORCIBLE
Supply Air Temperature	–40-240dF	SAT	N
Supply Air Temperature 1	–40-240dF	SAT1	N
Supply Air Temperature 2	–40-240dF	SAT2	N
Supply Air Temperature 3	–40-240dF	SAT3	N

GAS_DISP

DESCRIPTION	STATUS	POINT	FORCIBLE
Control Mode	No Mode Heat Mode #1 Heat Mode #2 Cool Mode Test Mode	MODE	N
Control Setpoint	~35-125dF	SETP	N
Supply Air Temperature	–40-240dF	SAT	N
Current Running Capacity	0-100%	CAPACITY	N
Current Heat Stage	0-max allowed	HT_STAGE	N
Maximum Heat Stages	2-max allowed	HTMAXSTG	N
Cooling Setpoint	~35-70dF	COOLSETP	N
Heating Setpoint	~80-125dF	HEATSETP	N
Limit Switch Temperature	~40-240dF	LIMTTEMP	N
Hi Limit Switch Tmp Mode	On/Off	LIMTMODE	N
SAT Cutoff Mode	On/Off	SATCMODE	N
Capacity Clamp Mode	On/Off	CAPMODE	N
Occupied	On/Off	OCC	Y
Emergency Stop	Enable/Emstop	EMSTOP	Y

TIME SCHEDULE CONFIG.

PERIOD	DAY FLAGS	OCCUPIED TIME	UNOCCUPIED TIME
	MTWTFSSH	00:00-23:59	00:00-23:59
Period 1:	00000000	0000	0000
Period 2:	00000000	0000	0000
Period 3:	00000000	0000	0000
Period 4:	00000000	0000	0000
Period 5:	00000000	0000	0000
Period 6:	00000000	0000	0000
Period 7:	00000000	0000	0000
Period 8:	00000000	0000	0000

NOTE: Time is set and displayed in military time.

SERVICE TRAINING

Packaged Service Training programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs are available, using popular video-based formats and materials. All include video and/or slides, plus companion book.

Classroom Service Training which includes ‘‘hands-on’’ experience with the products in our labs can mean increased confidence that really pays dividends in faster troubleshooting and fewer callbacks. Course descriptions and schedules are in our catalog.

CALL FOR FREE CATALOG 1-800-962-9212

[ ] Packaged Service Training [ ] Classroom Service Training

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START-UP CHECKLIST

MODEL NO.: ____________________ SERIAL NO.: ____________________
DATE: ____________________ TECHNICIAN: ____________________

I. PRE-START-UP:

- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ LOOSEN ALL SHIPPING HOLDDOWN BOLTS AND REMOVE SHIPPING BRACKETS PER INSTRUCTIONS
- ☐ VERIFY THAT COMPRESSOR SUSPENSION SPRINGS HAVE BEEN LOOSENED PER INSTRUCTIONS
- ☐ VERIFY OPENING OF ECONOMIZER HOOD
- ☐ VERIFY INSTALLATION OF EXHAUST HOOD
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT POWER SUPPLY MATCHES UNIT DATA PLATE
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ CHECK GAS PIPING FOR LEAKS (48 SERIES ONLY)
- ☐ CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SET SCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ OPEN SUCTION, DISCHARGE, AND LIQUID LINE SERVICE VALVES
- ☐ CHECK COMPRESSOR OIL LEVEL SIGHT GLASS AND VERIFY PROPER LEVEL
- ☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR 24 HOURS
- ☐ CHECK VOLTAGE IMBALANCE
  LINE-TO-LINE VOLTS: AB______V AC______V BC______V

  (AB + AC + BC)/3 = AVERAGE VOLTAGE = _______V

  MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _______V

  VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _______ %

  IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!
  CALL LOCAL POWER COMPANY FOR ASSISTANCE

II. PRELIMINARY CHECKLIST ITEMS (DETERMINE BEFORE CONFIGURING CONTROLS):

CONTROL SETTINGS FOR NON-NETWORKED, FREESTANDING UNIT

- ☐ UNIT TO BE OPERATED ON VARIABLE AIR VOLUME (VAV) RATHER THAN CONSTANT VOLUME (CV)
- ☐ CONFIRM THAT SPACE TEMPERATURE SENSOR (T-55) HAS BEEN WIRED CORRECTLY PER SPACE TEMPERATURE SENSOR (T-55) SECTION ON PAGE 43
- ☐ CONFIRM THAT TUBING FOR SPACE AND SUPPLY DUCT PRESSURES HAS BEEN INSTALLED
- ☐ SET ENTHALPY CONTROL SET POINT ON ECONOMIZER
- ☐ SET SUPPLY FAN AND "CHECK FILTER" STATUS SWITCHES FOR JOB REQUIREMENTS

UNIT OPTION CHECKLIST

PRESENT?

- ☐ VARIABLE VOLUME POWER EXHAUST
- ☐ VARIABLE FREQUENCY DRIVE ON SUPPLY FAN (VAV ONLY)
- ☐ HOT GAS BYPASS
- ☐ VAV WITH OCCUPIED HEAT

II. PRELIMINARY CHECKLIST ITEMS (cont)

CHANGES TO DEFAULT VALUES

RECORD ALL CHANGES MADE TO FACTORY DEFAULT VALUES

____

____

____

____

____

____

III. START-UP

CHECK EVAPORATOR FAN SPEED AND RECORD. __________

CHECK CONDENSER FAN SPEED AND RECORD. __________

AFTER AT LEAST 10 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

	COMP A1	COMP A2	COMP B1	COMP B2
OIL PRESSURE				
SUCTION PRESSURE				
SUCTION LINE TEMP				
DISCHARGE PRESSURE				
DISCHARGE LINE TEMP				
ENTERING CONDENSER AIR TEMP				
LEAVING CONDENSER AIR TEMP				
EVAP ENTERING AIR DB TEMP				
EVAP ENTERING AIR WB TEMP				
EVAP LEAVING AIR DB TEMP				
EVAP LEAVING AIR WB TEMP				
COMPRESSOR AMPS (L1)				
COMPRESSOR AMPS (L2)				
COMPRESSOR AMPS (L3)				

ELECTRICAL

SUPPLY FAN AMPS __________ EXHAUST FAN AMPS __________

ELECTRIC HEAT 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

PRESSURES

GAS INLET PRESSURE ________ IN. WG (48 Series Units Only)

GAS MANIFOLD PRESSURE STAGE NO. 1 _________ IN. WG STAGE NO. 2 ___________ IN. WG (48 Series Units Only)

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

REFRIGERANT DISCHARGE CIRCUIT NO. 1 ________ PSIG CIRCUIT NO. 2 __________ PSIG

VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS IN INSTALLATION INSTRUCTIONS

GENERAL

ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS

CHECK THE COMPRESSOR OIL LEVEL SIGHT GLASSES; ARE THE SIGHT GLASSES SHOWING OIL LEVEL PER INSTALLATION INSTRUCTIONS. (Y/N) ________

PERFORM CONTROL CONFIGURATION PROCEDURE ON PAGES CL-3 AND CL-4.

CONTROL CONFIGURATION

KEYBOARD ENTRY	DISPLAY	DESCRIPTION VALUES IN [ ] INDICATE FACTORY DEFAULTS
1 SRVC	LOG ON	Enter password followed by ENTER
1 1 1 1 ENTER	LOGGEDON	Logged on okay
3 SRVC	FACT CFG	Factory configuration
▼	TYPE X	Unit type (0 = CV, 1 = VAV) [Default is 1]
x ENTER	TYPE X	Verify unit type and change if necessary. If CV unit, see CV control configuration.
▼ 1 ENTER	DTRS	Data Reset Enable Data Reset
6 SRVC	FACT CFG	User Configuration
▼	OHEN X	Occupied Heating
1 ENTER		Enable Occupied Heating (or Disable, 1 = Enable)
▼	LLAG X	Use ▼ to access lead/lag option — disable with HGBP
0 ENTER	DISABLE	Disable lead/lag (0 = DIS, 1 = ENB) [1]
1 8 SRVC	BLD PRES	Configure building pressure control (modulating power exhaust)
▼	BPS .05	Use ▼ for building pressure set point (range 0 to .5) [.05]
x ENTER	BPS X	Set building pressure set point per job requirements
1 SRVC	LOGGEDON	Access log on/off function
▼	LOG OFF	Use ▼ to access log off
ENTER	LOGD OFF	Logged off okay
1 TEST ALRM **through** 6 TEST ALRM	INPUTS	Run quick test to verify operation of unit functions (see Quick Test section on page 103.)
1 SET	SETPOINT	Set system set points per job requirements
▼	OHSP X	Set occupied heat set point (Range 55-80 F) [68] CV only
▼	OCSP X	Set occupied cool set point (Range 55-80 F) [78] CV only
▼	UHSP X	Set unoccupied heat set point (Range 40-80 F) [55]
▼	UCSP X	Set unoccupied cool set point (Range 75-95 F) [90]
▼	SPSP X	Set supply duct pressure set point (Range 0-5.0 in. wg) [1.5]
▼	SASP X	Set supply air set point temperature (Range 45-70 F) [55]
3 SET	TIME	Current time/date
▼	dow.hh.mm	Set day of week and time
▼	mm.dd.yy	Set month, day, and year
4 SET	DAYLIGHT	Set daylight savings time begin/end dates. Required if job conditions require adjustment of clock for daylight savings time (see Adjusting Set Points section on page 56.)
5 SET	HOLIDAY	Set holiday dates. Required if job conditions require a different schedule on holidays than other days (see Adjusting Set Points section on page 56.)
2 SCHD **through** 1 8 SCHD	PERIOD X	Set occupied/unoccupied schedules. Required if job conditions require unit to enter unoccupied cycle at programmed times of day or days of week (see Adjusting Set Points section on page 56.)

NOTE: Data in brackets [ ] is default value.

CONSTANT VOLUME CONTROL CONFIGURATION		
KEYBOARD ENTRY	DISPLAY	DESCRIPTION
6 SRVC	FACT CONFIG	
▼	FANM	Fan Mode
x ENTER	FANMx	Select Fan Mode (Auto. = 0, Cont. = 1)
1 0 SRVC	ECONOMIZER	Configure Economizer
▼	SMG x.x	Submaster Gain
8 . 0 ENTER	SMG 8.0	Set SMG to 8.0 [–7.5]

NOTES:

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE