Carrier®

33CS
Variable Volume and Temperature (VVT®) Zone Controller

COMMERCIAL UNITARY SYSTEMS

Installation, Service, and Troubleshooting Instructions

CONTENTS

GENERAL

The zone controller operates in a VVT system. The VVT system allows a single-zone heating/cooling unit to operate as a multiple-zone system. The conditioned space is divided into occupied zones. Each occupied zone is monitored by a zone controller. The zone controller regulates the amount of conditioned air entering a zone through the control of a supply-air damper. Airflow to each zone is controlled individually by each zone controller.

Each zone controller communicates with the monitor thermostat. The monitor thermostat assesses information from every zone controller and controls the operation of the heating/cooling unit.

NOTE: The Comfort System VVT zone controller will not be compatible with a VVT Generation II Enhanced or Pre-Enhanced device. The Carrier Comfort System (CCS) VVT system will not support Enhanced or Pre-Enhanced devices.

INSTALLATION

Zone Controller Placement — Begin the zone controller installation by determining where the zone controller will be located. In most cases, this will be pre-determined by the building plans.

The zone controller should be located on an interior wall, about 5 ft from the ground. The zone controller should be located away from direct sunlight, drafts, or interior heat sources which may influence temperature readings.

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The zone controller may also be mounted in a remote location with the use of an optional remote room sensor.

Refer to the mounting instructions provided with the monitor thermostat for more information on wall installation. See Fig. 1 for dimensions of the zone controller.

Wiring Requirements — The wiring requirements for the VVT System are:

ZONE CONTROLLER TO NETWORK — Wire must be 18 gage, 3-conductor, shielded, stranded wire, color coded (RED, BLACK, GREEN), plenum rated if required, and long enough to run from zone controller to zone controller in daisy-chain configuration. One end of the shield must be tied to the chassis ground. The other end must be taped back. Between the ends, the wire shields must be wire-nutted and taped together in a daisy chain. A maximum run of 1000 ft is recommended. With 3 field-supplied repeaters, the maximum run can be extended to 4000 ft.

⚠ CAUTION

Do not ground the wire shield in more than one location. Multiple grounding locations will cause electrical flow through the shield and thermostat communications may be disrupted.

ZONE CONTROLLER TO DAMPER CIRCUIT BOARD — Wire must be 18 gage, 5-conductor, shielded, stranded wire, color coded (RED, WHITE, BLUE, YELLOW, and GREEN), plenum rated if required, and long enough to run from zone controller to damper circuit board.

NOTE: Do not run the zone controller network and the control wire in the same conduit for more than 5 ft. Never run wires near any cable carrying AC voltage. For further wiring information, consult the local Carrier distributor.

Power required to each damper circuit board is 24 vac/ 30 va. Typical wiring is 18 gage thermostat wire (standard or plenum cable). Power to the damper circuit board should come from a transformer of sufficient VA capacity. A short in the field wiring or transformer will cause non-warranty damage to the damper circuit board. Test before attaching to damper actuator.

Call the local Carrier representative if more information is needed about wiring the VVT® System or the zone controller.

Damper Circuit Board Installation — The damper circuit board is located in the damper module. Refer to the damper installation instructions for more information on the damper circuit board.

Wiring Connections

WIRE DAMPER CIRCUIT BOARD TO ZONE CONTROLLER — Wire each zone controller to its respective damper circuit board as shown in Fig. 2. Wiring connections should be made at the wiring connector board of the zone controller and at the damper circuit board.

⚠ WARNING

Electric shock can cause injury or death. Ensure power to the transformer has been disconnected before wiring.

WIRE NETWORK TO ZONE CONTROLLER — Connect the black, red, and green wires from the network cable to the terminals on the zone controller wiring connector board.

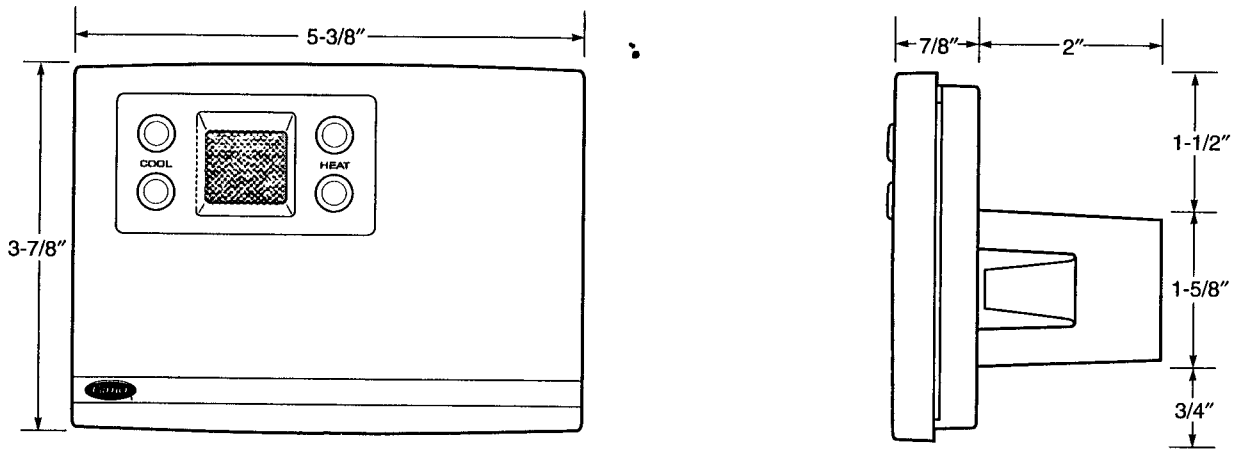
WIRE SENSORS TO DAMPER BOARD — The damper board sensor wiring bundle contains the wires required to connect the sensors. See Fig. 3. Wire nut the filter status sensor to the H wiring bundle. Wire nut the humidity sensor to the H and V wiring bundles. The humidity sensor and filter status sensor cannot be used at the same time, do not wire both sensors to the H wiring bundle. Wire nut the duct temperature sensor to the R wiring bundle. Wire nut the IAQ (indoor-air quality) sensor to the O wiring bundle.

NOTE: For IAQ sensor wiring and installation, see Indoor-Air Quality (IAQ) Sensor Installation section below.

Indoor-Air Quality (IAQ) Sensor Installation — An IAQ sensor is designed for use with the Carrier Comfort system. The sensor has a range of 0 to 5000 ppm of CO_2. The factory setting is 1000 ppm. This set point is adjustable only through software. An isolated power supply of 16 to 24 vac is required and provided with the sensor, with a 300 mA average and a 500 mA peak. The IAQ sensors are available in 3 models: Wall Mount with LED (light-emitting diode), Wall Mount, and Duct Mount.

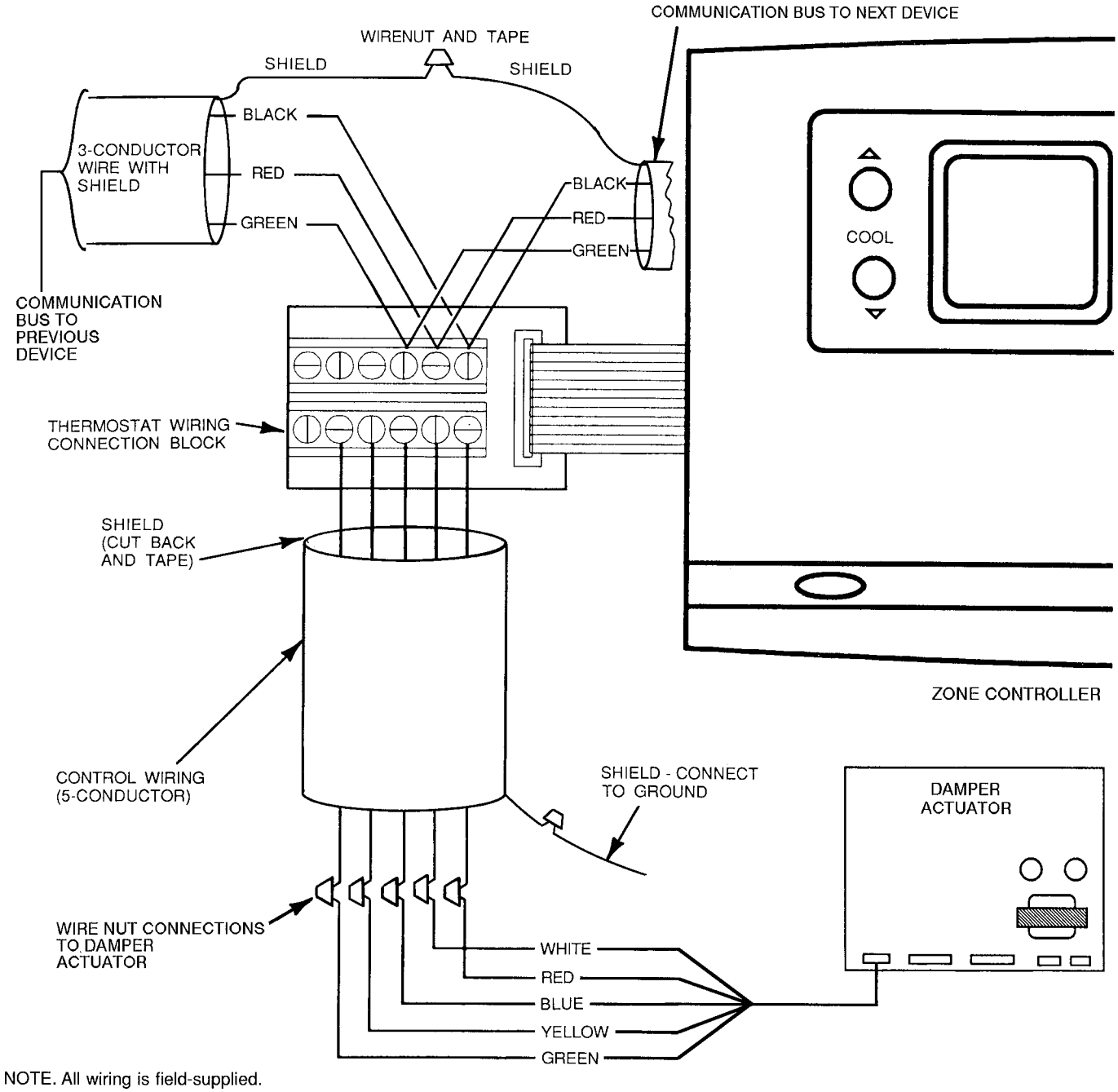
The wall-mounted sensors are mounted within the occupied space. They read the CO_2 levels at their location. The Wall Mount with LED sensor will display the current reading on the LED display screen on the sensor.

When the IAQ sensor is wired to the zone controller, only that zone will respond to the sensor. If the IAQ sensor is wired to a Monitor-Only relay board or to the bypass controller, then any zone can be configured to participate in the IAQ sequence.



FRONT VIEW SIDE VIEW

Fig. 1 — Zone Controller Dimensions



NOTE. All wiring is field-supplied.

Fig. 2 — Zone Controller Wiring

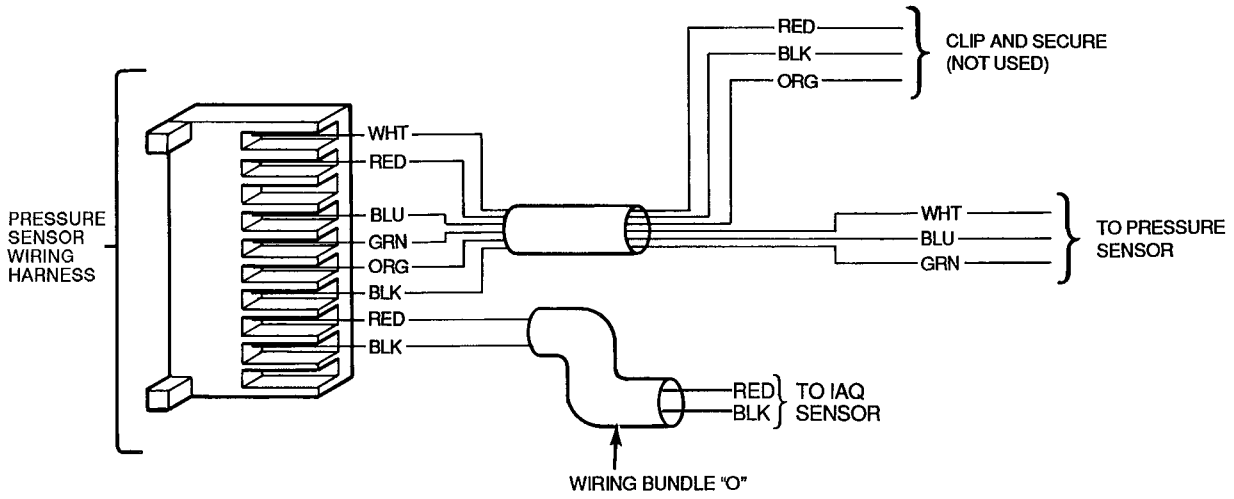


Fig. 3 — Damper Board Sensor Wiring

LOCAL MODE IAQ WIRING — Wire the dry contact relay output from the sensor (connections 3 and 4) to the red and black wires of the "O" section of the field-supplied pressure sensor harness of the zone controller damper. A pressure sensor harness is supplied with a pressure sensor for use with the bypass damper. Recommended gage of wire is 14, stranded.

Wire the 2 wires from the isolated 24 vac power supply to the power input side of the sensor (connections 1 and 5). Recommended gage of wire is 14, stranded. The green/red LED on the sensor shows steady green during normal operation.

Configure the options associated with the sensor. Refer to the Indoor-Air Quality Sensor section on page 11.

Provide Power To Damper Circuit Board — After the wiring has been completed, provide power to the damper circuit board. Once power has been provided to the damper circuit board, the damper circuit board will provide power to the zone controller. The heating or cooling set points will appear on the zone controller display screen. The zone controller is now ready to be programmed. If the display is blank or blinking, recheck the wiring connections between the zone controller and damper circuit board or refer to Troubleshooting section on page 23. There should be a steady 10 vdc between the red and white connections.

CONFIGURATION

Configuration can be done either manually with the set point buttons on the monitor thermostat or by computer with the Carrier network access software through the system network. Refer to each specific section in this manual for detailed instructions on configuring the monitor thermostat options.

A special start-up category of options (category 8) has been designated as the start-up catagory. This category contains options which must be configured correctly before the zone controller will operate. After installation, configure the start-up category first. The start-up category will automatically be displayed after the zone controller is powered up for the first time and programming is accessed. The device address must be configured before operating the system. All other configurations may be left at their default settings for a quick start-up.

Manual Configuration — To manually configure the zone controller thermostat, press both upper or both lower set point buttons simultaneously to enter programming mode. See Fig. 4 and 5. The configuration screen will display the current category in the lower right corner (numbered from 1 to 14). Press the left upper or lower set point buttons to access the different configuration categories. Press the select (right lower set point) button to accept the current category. The escape (right upper set point) button can be used to return to the category screen. The categories will loop around when scrolling from 14 back to 1.

The left upper and lower set point buttons are used to scroll through the options of each category. The word "option" will be displayed. The option number and the current configuration of the option are displayed in the lower right corner of the screen. See Table 1 for categories and options. When the desired option is shown on the screen, press the select button. The configurable data will flash. The left set point

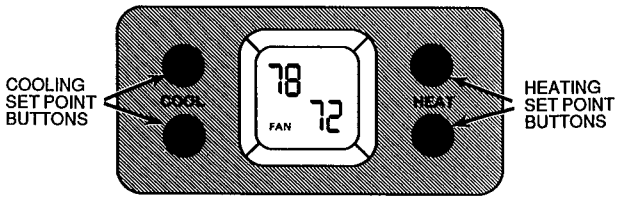


Fig. 4 — Zone Controller Display Screen

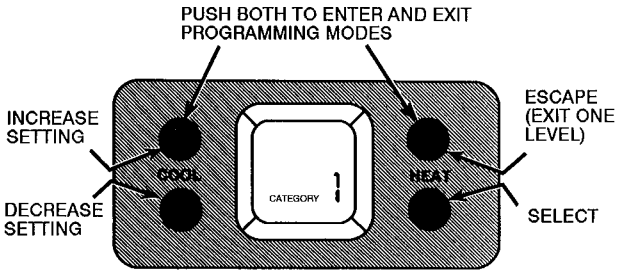


Fig. 5 — Zone Controller Configuration Buttons

buttons are used to change the data values. When the desired setting is shown press the select button to store the change. To exit without saving changes, press both upper or both lower set point buttons or press the escape button. If no buttons are pressed while in programming mode for 3 minutes, the zone controller will reset back to the normal display.

Each option is discussed in detail in this manual. Refer to the correct section for more information.

NOTE: Occupancy schedule programming is slightly different than the above programming procedure. Refer to the Occupancy Schedules section on page 8 for more information.

Computer Configuration — To configure the zone controller with an IBM compatible computer, Carrier network access software must be used.

ZONE CONTROLLER DISPLAY

The zone controller is capable of different display modes. The user can decide which display mode the zone controller will operate in. Information is displayed on the zone controller LCD screen. In normal operating mode, the system status display is shown.

System Status Display — System status display is shown during normal operation. The display cycles between the heating and cooling set points and the room temperature when the Rotating Display option is ON. When the Rotating Display option is OFF, the thermostat will only display the heating and cooling set points.

When the fan relay of the heating/cooling equipment is energized, the word FAN will be displayed on the zone controller screen.

When System Cooling Mode is energized, the word COOL will be displayed on the zone controller screen. When System Heating Mode is energized, the word HEAT will be displayed on the zone controller screen.

When the second stage of heating or cooling is entered, a decimal point is displayed to the right of the cooling set point.

If a set point is forced by control software or data transfer, then an "F" will be displayed on the screen during Alternate Information display.

If a zone controller has energized supplemental heat, then "SUH" will be displayed. The zone controller will display both the system mode and the supplemental heat mode if both are active simultaneously.

If error code display is turned on and a zone is participating in IAQ, then the display will show "IA9" to reflect IAQ mode. It will also display error codes.

More information can be shown by accessing the Alternate Information Display function.

Rotating Display — The Rotating Display option controls what information is shown on the display screen during normal operation. When Rotating Display is ON, the heating and cooling set points and the zone temperature are rotated on the display. When Rotating Display is OFF, only the heating and cooling set points are shown. The Rotating Display option is configured in category 1, option 5.

Alternate Information Display — Allows the zone controller to display additional information. Simultaneously press the cooling or heating set point buttons, and the zone controller will display a sequence of information. The information displayed is determined by the configuration setting of Alternate Information. The display can be frozen by pushing any set point button during the display sequence.

The Alternate Information option can be set to ON or OFF. To configure, set category to 7 and option to 2. Use the left set point buttons to toggle the option ON or OFF.

When Alternate Information is ON and the Information Display mode is activated, the monitor thermostat will display the following information (if available) in this order:

- (1) zone temperature
- (2) time of day
- (3) security access level
- (4) duct temperature
- (5) zone damper position
- (6) outside-air temperature
- (7) indoor air relative humidity
- (8) airflow CFM
- (9) IAQ status (digital input)

The information is shown on the top half of the display screen. The number of the sequence (1-9) is shown in the bottom right corner to help distinguish what is being displayed. The numbering is not shown when the Alternate Information option is turned OFF.

When Alternate Information is OFF and the Information Display mode is activated, the monitor thermostat will display the following information (if available) in this order:

- zone temperature
- time of day
- security access level

Display Freeze — After Information Display is activated, momentarily press any set point button to continuously display the information shown when the set point button was pressed. Press a set point button to resume the information display sequence.

NOTE: Normal operation of the zone controller is not affected by the Display Freeze or Alternate Information Display operations.

Table 1 — VVT Zone Controller Categories and Options

OPTION	DESCRIPTION	DEFAULT	MINIMUM	MAXIMUM
CATEGORY 1.0 SET POINTS				
1.1	Cooling Set Point Low Limit (F)	68	50	99
1.2	Heating Set Point High Limit (F)	75	50	99
1.3	Unoccupied Cooling Set Point (F)	80	50	99
1.4	Unoccupied Heating Set Point (F)	65	40	99
1.5	Rotating Display	ON	OFF	ON
1.6	Fahrenheit Temperature Display	ON	OFF	ON
CATEGORY 2.0 OCCUPANCY SCHEDULE				
2.1-2.8	Occupancy Period 1-8 Days Active Start Time Stop Time	 MTWTF 6:00 AM 6:00 PM	 NONE 12:00 AM 12.00 AM	 MTWTFSSH 11:59 PM 11:59 PM
2.9	Schedule Number	0	0	99
2.10	Override Time Limit (Hours)	1	0	4
CATEGORY 3.0 DAMPER				
3.1	Maximum Damper Position	15	8	15
3.2	Minimum Damper Position	5	0	7
3.3	Ventilation Position	5	0	7
3.4	Pressure Independent	OFF	OFF	ON
3.5	ZD/RD Actuator	ON	OFF	ON
3.6	Counterclockwise Open	ON	OFF	ON
3.7	Minimum Airflow Set Point	0	0	5000
3.8	Maximum Airflow Set Point	0	0	5000
3.9	Damper Size — Area (square in.)	0	0	1000
CATEGORY 4.0 HVAC EQUIPMENT				
No configuration required by zone controller.				
CATEGORY 5.0 SENSORS				
5.1	Room Sensor (1 — Local Room Sensor, 2 — Remote Room Sensor, 3 — Average Local and Remote Room Sensors)	1	1	3
5.2	Zone Temperature Sensor Calibration (F)	Zone Temp.	30	180
5.3	Remote Room Sensor Calibration (F)	Room Temp	30	180
5.4	Duct Temperature Sensor Calibration (F)	Duct Temp	30	180
5.5	Pressure Sensor Range	0 0	0 0	5 0
5.6	Velocity Pressure Probe Gain	1 0	0 5	5.0
5.7	Auto-Zero	OFF	OFF	ON
5.8	Position Damper	0	0	15
5.9	Pressure Sensor Calibration (in. wg)	Airflow	0	20 47
CATEGORY 6.0 SUPPLEMENTAL HEAT				
6.1	Zone Supplemental Heat	OFF	OFF	ON
6.2	Supplemental Heat Damper Position Factor	0	0	10
6.3	Supplemental Heat Time Guard Override	OFF	OFF	ON
6.4	Fan Powered Mixing Box	0	0	2
6.5	Hydronic Heat	OFF	OFF	ON
6.6	Supplemental Heat Lockout Override	OFF	OFF	ON
CATEGORY 7.0 DIAGNOSTICS/METERING				
7.1	Error Code Display	ON	OFF	ON
7.2	Alternate Information	ON	OFF	ON
7.3	Occupied Trend Demand (1/10°F)	0.0	0 0	25 5
7.4	Occupied Trend Time Limit (Minutes)	2	1	255
7.5	HVAC Usage Meter	OFF	OFF	ON
7.6	Override Usage Meter	OFF	OFF	ON
7.7	Supplemental Heat Override Usage Meter	OFF	OFF	ON
7.8	Unit Reset	OFF	OFF	ON
CATEGORY 8.0 START-UP				
8.1	Device Element Address	0	0	239
8.2	Access Security Level	1	1	4
8.3	Device Bus Number	0	0	239
CATEGORY 9.0 BROADCAST / DAYLIGHT SAVINGS TIME				
9.1	Broadcast Acknowledge	OFF	OFF	ON
9.2	Request Network Time	OFF	OFF	ON

Table 1 — VVT Zone Controller Categories and Options (cont)

OPTION	DESCRIPTION	DEFAULT	MINIMUM	MAXIMUM
CATEGORY 10.0 HOLIDAY SCHEDULES				
10.1-10.18	Holiday Schedule 1-18 Holiday Start Month Start Day Duration (Days)	 0 0 0	 0 0 0	 12 31 99
CATEGORY 11.0 ALARM				
11.1	Equipment Priority	7	0	9
11.2	Communication Failure Retry Time (Minutes)	10	1	240
11.3	Re-Alarm Time (Minutes)	30	1	255
CATEGORY 12.0 OPTIMAL START				
No configuration required by zone controller.				
CATEGORY 13.0 LOADSHED				
No configuration required by zone controller.				
CATEGORY 14.0 INDOOR-AIR QUALITY (IAQ)				
14.1	Indoor-Air Quality Participation	OFF	OFF	ON
14.2	Local Indoor-Air Quality Sensor	OFF	OFF	ON
14.3	Indoor-Air Quality Maximum Space Temperature Reset (F)	2	0	10
14.4	Indoor-Air Quality Alarm Delay (Minutes)	0	0	240

START-UP

The start-up category for configuration contains important communication, security, and operation information which the zone controller will need to operate.

NOTE: The start-up category will display first when entering programming mode, on initial power up to the zone controller or when the zone controller has a device address of zero.

Device Address — Communication with the zone controller is accomplished by the network. The zone controller utilizes the network to:

- adjust operation parameters
- to receive additional information necessary to control its zone.

The Device Address option allows the zone controller to establish an identity on the Carrier network for transmitting and receiving information. The device address is set in category 8, option 1. The factory setting is 0. Use the left set point buttons to raise and lower the device address until the correct address is shown on the zone controller. The zone controller will not operate as part of a VVT system without a device address.

Device Bus Number — On the network, there is one primary bus, and any number of secondary busses which reside on the primary bus. The primary bus is always bus number 0. The secondary bus address must be between 1 and 239. When the zone controller resides on a secondary bus, the bus address must be entered into the Device Bus Number configuration. The default is 0. Acceptable values range from 0 to 239. The Device Bus Number is set in category 8, option 3.

The primary bus number is always 0. Secondary buses can be added by using a network bridge module. This secondary bus has a bus number equal to the device address of the bridge module. Any devices (monitor thermostat, zone controller, bypass controller) on this secondary bus must have their device bus number set equal to the device address of the bridge module.

Device Access Security Level — The device access security level is used to limit access to the zone controller functions by unauthorized personnel. The access security level is configured in category 8, option 2. The factory setting is 1. The range of acceptable access security levels is 1 to 4.

Access security level 1 allows full programming of the zone controller. Access security level 2 allows programming of occupied set points and occupancy schedules. Access security level 3 allows programming of occupied set points only. Access security level 4 allows no programming.

⚠ CAUTION

Do not leave the access security level option at 1 after configuration is complete. Untrained or unauthorized users may change safety set points or other important information.

If the access security level is changed from 1, the access security level cannot be changed back in the normal method because programming is not allowed. To reconfigure the access security level of the zone controller, activate the alternate information display (simultaneously press both heating or both cooling buttons). When the information display shows the access security level (display number 3), press any button to freeze the display. Then press both upper or both lower set point buttons to enter the programming mode. Reconfigure category 8, option 2 to the desired access security level.

OCCUPIED MODE OPERATION

Occupied mode is the time period when the zone controller maintains the occupied set point temperatures. Occupied time periods are selected to follow the zone controller occupancy schedule of the zone. See the Unoccupied Mode Operation section on page 8 for more information on selection of time schedules. The zone controller follows its own occupancy schedule or a global schedule which it receives through communication.

During the occupied mode, the occupied set points:

- can be fully adjusted throughout the occupied set point range (depending on security level)
- can be limited to maximum and minimum values within the occupied set point range

Occupied Set Points — The occupied set points establish the range of acceptable temperatures in a zone during a given time period. Heating and cooling temperatures are maintained in the zone controlled by the zone controller during the occupied mode. The range of allowable temperatures is 50 to 99 F for heating and cooling (dependent on the occupied set point limits).

The left set point buttons control the cooling set point. Press the top set point button to raise the set point. Press the bottom set point button to lower the set point. The cooling set point is displayed in the top left corner of the zone controller screen.

The right set point buttons control the heating set point. Press the top set point button to raise the set point. Press the bottom set point button to lower the set point. The heating set point is displayed in the bottom right corner of the zone controller screen.

The zone controller will continuously display the occupied set points unless it is in unoccupied mode or display freeze has been activated, or the Rotating Display option is configured to ON.

Occupied Set Point Limiting — The occupied set point limits establish the maximum allowable heating set point and the minimum allowable cooling set point. The range of allowable temperature limits is 50 to 99 F for heating and cooling.

To configure the Cooling Set Point Low Limit option, configure category 1, option 1. The left set point buttons control the cooling set point low limit. Press the top set point button to raise the set point limit. Press the bottom set point button to lower the set point limit. The cooling set point limit is displayed in the top left corner of the zone controller screen. The range of values is 50 to 99. The default is 68.

To configure the Heating Set Point High Limit option, configure category 1, option 2. The left set point buttons control the heating set point upper limit. Press the top set point button to raise the set point limit. Press the bottom set point button to lower the set point limit. The range of values is 50 to 99. The default is 75.

By limiting the occupied set points to a defined range, the heating and cooling system will operate within desired parameters. The occupied system will help limit the possibility of extended unit cycles to heat or cool a zone.

UNOCCUPIED MODE OPERATION

Unoccupied mode is the time period when the zone controller maintains the unoccupied set point temperatures. Unoccupied time periods follow the schedule of the zone controller zone. Unoccupied time periods allow for lower heating temperature set points and higher cooling temperature set points to conserve equipment usage when the zone is unoccupied. The zone controller follows its own occupancy schedule or a global schedule which it receives through communication.

The zone controller unoccupied time periods may be controlled:

- locally by the zone controller, which will follow its own programmed unoccupied and occupied time periods
- through communication from another device on the communication bus, which will send the zone controller an occupied schedule.

During local control the unoccupied/occupied programs can be locked to prevent unauthorized or unintentional changes. When the zone controller is in a time period designated for unoccupied mode operation, zone occupants can temporarily override unoccupied operation to the occupied mode. During unoccupied override, the zone controller will maintain configured occupied conditions. At the end of the override period, the zone controller will automatically return to unoccupied mode operation. The amount of override time is configured through category 2, option 10. The range is from 0 to 4 hours in 1 hour increments. The override is disabled if the Override Time Limit option is set to 0. The default is 1 hour.

NOTE: Once the zone controller is in unoccupied override mode, it cannot be cancelled by the user from the zone controller. Network access software must be used.

When the zone controller is operating in unoccupied mode, the unoccupied set points will be displayed on the zone controller screen.

Unoccupied Set Points — The unoccupied set points establish the range of acceptable temperatures maintained in the zone controlled by the zone controller during the unoccupied mode. The range of allowable temperatures is 40 to 99 F for heating and 50 to 99 F for cooling.

To configure the unoccupied cooling set points, set category 1, option 3. The left set point buttons control the unoccupied cooling set point. Press the top set point button to raise the set point. Press the bottom set point button to lower the set point. The unoccupied cooling set point is displayed in the top left corner of the zone controller screen. The range is 50 to 99 F. The default value is 80 F.

To configure the unoccupied heating set points, set category 1, option 4. The left set point buttons control the unoccupied heating set point. Press the top set point button to raise the set point. Press the bottom set point button to lower the set point. The unoccupied heating set point is displayed in the top left corner of the zone controller screen. The range is 40 to 99 F. The default value is 65 F.

Occupancy Schedules — The occupancy schedules establishes the time periods when the zone controller operates in the occupied or unoccupied mode.

The occupancy schedules have individual 7-day programming with 8 time periods. Unoccupied/occupied ON/OFF times are entered on the minute. The start of an ON time is the beginning of the occupied mode. The start of an OFF time is the beginning of the unoccupied mode.

NOTE: If an ON time and an OFF time are set for the same hour, zone controller operates in unoccupied mode for that entire day.

The Unoccupied/Occupied program of the zone controller can be configured locally using program mode.

PROGRAMMING SCHEDULES USING SOFTWARE — Each occupancy time schedule consists of 8 periods. From the Carrier network access software each period may be configured. Three configuration options are set from the software: Occupied From, Occupied To, and Days of the Week the schedule is in effect. Eight different days are recognized: Monday through Sunday, and Holiday.

OCCUPANCY SCHEDULE MODE — The unoccupied/occupied program can be directly configured at the zone controller. Press both upper (or lower) set point buttons at the same time to enter into the program mode. The occupancy schedules are in category 2, options 1 through 8. Option 1 is occupied schedule 1. Option 2 is occupied schedule 2. The options continue to option 8 which is occupancy schedule 8.

The procedure is different than programming other options. When category 2 is shown on the display screen, press the select (lower right) button. The display will show option 1. This will show the start time for option 1 only. To modify the start time for option 1, press select. Only the time will be modified. To modify to the stop time for option 1 press the upper left set point button. Instead of displaying option 2, the stop time for option 1 will be shown. Press the select button to modify the stop time. To modify the days of the week that the occupancy schedule will be active, use the upper left set point button to toggle to the next option. Instead of showing option 2, the screen will display the active days for the occupied schedule. Each occupied schedule (options 2.1 through 2.8) will have three different screens associated with it — start time, stop time, and active days.

Start Time — When the select button is pressed from the first option screen, the hours number will flash. The hours are modified through the left set point buttons. The AM/PM modifier will automatically switch when scrolling through the times. To change the minutes, press the select button again. The minutes numbers will flash. Use the left set point buttons to modify the minutes. Press select again to save the current time and return to the options screen, or press escape to exit without saving changes.

Stop Time — When the select button is pressed from the second option screen, the hours number will flash. The hours are modified through the left set point buttons. The AM/PM modifier will automatically switch when scrolling through the times. To change the minutes, press the select button again. The minutes numbers will flash. Use the left set point buttons to modify the minutes. Press select again to save the current time and return to the options screen, or press escape to exit without saving changes.

Active Days — When the select button is pressed from the third option screen, the active days will be shown and the first day, M (Monday) will be blinking. Use the left set point buttons to turn the day ON or OFF. Use the select button to scroll through the possible active days. The programmable days are: M (Monday), T (Tuesday), W (Wednesday), TH (Thursday), F (Friday), SA (Saturday), SU (Sunday), and H (Holiday).

Schedule Number — If Schedule Number option is set to 0, the zone controller will always be in occupied mode. If Schedule Number option is set to 1 through 64, the zone controller will follow the unoccupied/occupied programs stored in memory. If Schedule Number option is set to 65 through 99, the zone controller will follow the unoccupied/occupied programs specified in the global schedule located elsewhere on the network. If a global schedule is configured and there is not a device broadcasting a global schedule, then the zone controller will run in unoccupied mode.

To configure the Schedule Number option, configure category 2, option 9. Use the left set point buttons to toggle the option until the correct number is shown. The range of acceptable values is 0 to 99. The default value is 0.

Unoccupied Override — Unoccupied Override temporarily overrides the unoccupied mode at the zone controller, allowing the zone to maintain occupied set points. To activate unoccupied override, press the lower cooling or upper heating set point button. The unoccupied display will be replaced with the normal display. Once initiated, unoccupied override remains in effect until the end of the Unoccupied Override Time Limit, or the start of the occupied mode.

NOTE: The unoccupied override will not work if the zone controller is following a global schedule, the zone controller must have its own schedule.

To disable unoccupied override, configure the Unoccupied Override Time Limit to 0 hours.

UNOCCUPIED OVERRIDE TIME LIMIT — The Override Time Limit establishes the amount of time the zone controller operates in the occupied mode when unoccupied override is activated. To set the option, configure category 2, option 10. The number of hours will be displayed. Press the upper set point buttons to raise the time limit. Press the lower set point buttons to lower the time limit. The range is 0 to 4 hours in 1 hour increments. To disable unoccupied override, configure the time limit to 0 hours. The default value is 1 hour.

SENSORS

The zone controller utilizes information from the following sensors to operate a zone damper:

- zone temperature sensor
- remote room temperature sensor
- supply air (duct) temperature sensor
- pressure sensor
- (IAQ) indoor-air quality sensor

When necessary, sensor calibration can be performed at the zone controller with the appropriate tools.

Zone Temperature Monitoring — The zone controller uses a sensor installed on its circuit board to monitor the temperature in the zone. Remote room sensors can be field-installed.

The zone controller can do one of the following:

- use the local zone temperature sensor for temperature information
- use its remote room sensor(s) (field installed) for temperature information
- average the temperatures it receives from its local room temperature sensor and one remote room sensor for temperature information.

To configure the room sensor, select category 5, option 1. When the Room Sensor option is set to 1, the zone controller will use the local zone temperature sensor for temperature information. When the Room sensor option is set to 2, the zone controller uses its remote room sensor(s) (up to 4, field-installed) for temperature information. When the Room Sensor option is set to 3, the zone controller averages the temperatures it receives from its local room temperature sensor and one remote room sensor for temperature information.

Zone Temperature Sensor — The zone controller measures zone temperature through a solid-state temperature sensor located on the printed circuit board. See Fig. 6. The sensor measures temperature with a range of 30 to 180 F with 1/10 degree resolution.

ZONE TEMPERATURE SENSOR CALIBRATION — To calibrate the zone temperature sensor, configure category 5, option 2. The temperature reading of the sensor will be displayed. Compare the reading to an accurate thermometer. Use the left upper or lower set point buttons to raise or lower the temperature reading (by tenths of a degree) until the desired calibrated temperature is shown. The range of possible temperatures is 30 to 180 F.

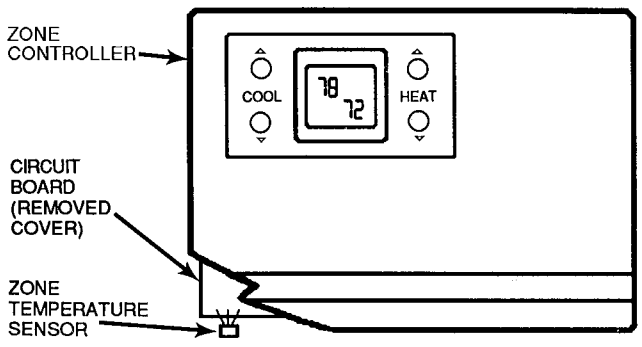


Fig. 6 — Zone Temperature Sensor

Remote Room Temperature Sensor — The zone controller measures zone temperature through a solid-state temperature sensor located at a remote location up to 1000 ft from the zone controller. The sensor measures temperature with a range of 30 to 180 F in 1/10 degree increments. The remote room temperature sensor is connected to the zone controller through the wiring connector board. See Fig. 7. Up to 4 remote room sensors can be used. When more than 1 remote room sensor is used, the temperatures are averaged.

All sensors must be wired in parallel. When adding remote room sensors, a field-supplied 9.2 K ohm resistor must be added to the connector block for each sensor. See Fig. 7.

REMOTE ROOM TEMPERATURE SENSOR CALIBRATION — To calibrate the remote room temperature sensor, configure category 5, option 3. The temperature reading of the sensor will be displayed. Compare the reading to an accurate thermometer placed in the approximate center of the space (or measure temperature at each sensor and manually compute the average). Use the left upper or lower set point buttons to raise or lower the temperature reading (by tenths of a degree) until the desired calibrated temperature is shown. The range of possible temperatures is 30 to 180 F.

Duct (Supply Air) Temperature Sensor — The zone controller measures duct (supply air) temperature through a solid-state temperature sensor located on the printed circuit board of the zone damper actuator. See Fig. 8. The sensor can be located up to 500 ft from the zone controller. The sensor measures temperature with a range of 30 to 180 F with 1/10 degree resolution.

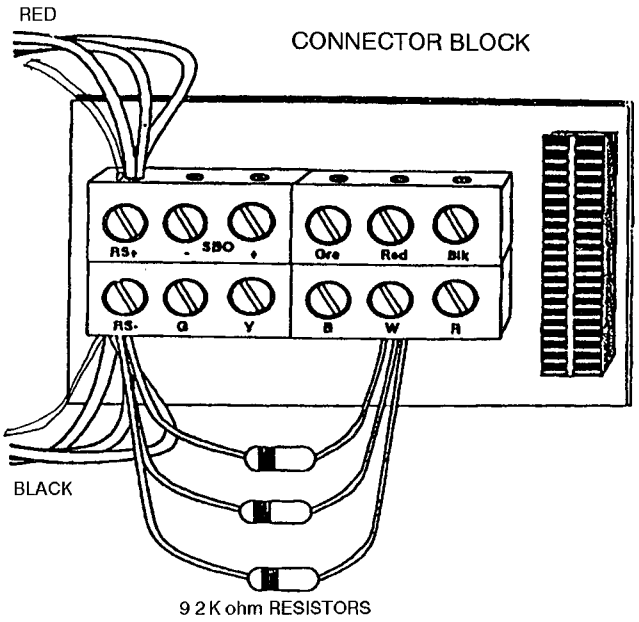
DUCT TEMPERATURE SENSOR CALIBRATION — To calibrate the duct temperature sensor, configure category 5, option 4. The temperature reading of the sensor will be displayed. Compare the reading to an accurate thermometer. Use the left upper or lower set point buttons to raise or lower the temperature reading (by tenths of a degree) until the desired calibrated temperature is shown. The range of possible temperatures is 30 to 180 F.

Pressure Sensor — The zone controller can measure airflow pressure up to 100 ft from the damper actuator through a solid-state sensor in a range of 0.00 to 5.00 in. wg. The range is determined by the pressure sensor used in the application and is configured in the pressure sensor range option (category 5, option 6). The option can be set from 0.00 to 5.00 in. wg. The default is 0.00 in. wg. Use the left set point buttons to adjust the range of the pressure sensor which is determined by the type of sensor being used. A 33CSPS-01 sensor should be configured to 0.5 in. wg. A 33CSPS-02 pressure sensor should be configured to 2.0 in. wg.

NOTE: The 33CSPS-01 pressure sensor uses a velocity probe. The 33CSPS-02 pressure sensor uses a static pickup. A typical pressure sensor installation would use the pressure sensor and a corresponding enclosure; however in applications using a ZD model zone damper, only the pressure sensor circuit board will fit inside the damper actuator.

The pressure sensor is interfaced to the zone controller through the printed circuit board in the zone damper actuator. See Fig. 9. Refer to the pressure sensor installation instructions for more specific pressure sensor wiring.

PRESSURE SENSOR CALIBRATION — The pressure sensor can be calibrated through category 5, option 9. The pressure sensor reading will be shown. Use the left set point buttons to raise or lower the pressure reading to the desired value. The range of values is 0.00 to 20.47 in. wg.



NOTE For each additional sensor (2 or more total) a resistor must be added Resistors are wired in parallel between terminals RS- and W on the thermostat terminal block.

Example shown is for 4 Remote Room Sensors

Fig. 7 — Remote Room Sensor Wiring

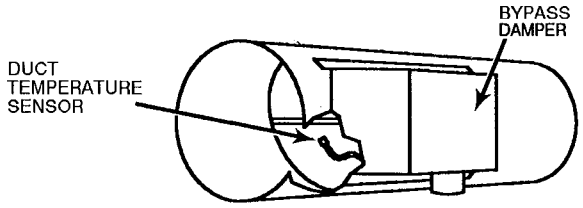


Fig. 8 — Duct (Supply Air) Temperature Sensor Location

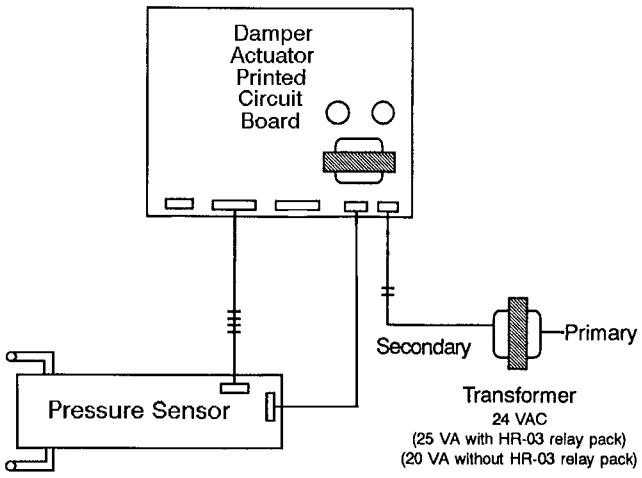


Fig. 9 — Zone Controller and Airflow Sensor Wiring For Pressure Independent Operation (ZD Model Damper Mounted Airflow Sensor)

VELOCITY PRESSURE PROBE GAIN — The pressure pickup which sends the pressure data can distort data due to placement, vibration, or other factors. The Velocity Pressure Probe Gain option allows a multiplier to be added to the value being read by the pressure pickup. The default is 1.0 (multiplying by 1 results in an identical value). The range of values is 0.5 to 5.0. To configure the Velocity Pressure Probe Gain option, set category 5, option 6. Enter the gain for the pickup probe specified per the manufacturer.

PRESSURE SENSOR RE-ZERO — To assure that the zone controller is able to maintain proper static pressure levels during normal operation, the zone controller will automatically re-zero when the Auto-Zero Enable option is selected.

To auto-zero the pressure sensor, select category 5, option 7 (Auto-Zero Enable). Set the option to ON. The zone controller will turn off the system fan and allow time for the pressure to settle. The zone controller will wait until the pressure in the system has dissipated before zeroing the sensor. Once this time period expires, the zone controller will automatically zero the pressure sensor and reset the option to OFF.

POSITION DAMPER — The zone controller damper position can be forced to any position through the Position Damper option when in pressure independent operation. This can be used to help determine the desired velocity pressure when using Pressure Independent Control. To configure this option, select category 5, option 8. The current damper position will be shown. Use the left set point buttons to adjust the value. The range of values is 0 to 15, with 0 fully closed and 15 fully open. The default is 0.

Velocity Pressure Probe Calibration — The velocity pressure probe is used in conjunction with the zone controller for Pressure Independent operation. Refer to the pressure sensor installation instructions for more information on tubing and sensor location.

To calibrate the velocity pressure probe, perform the following procedure:

1. Install a manometer or Magnehelic gage in parallel with the pressure sensor. Tee the Magnehelic gage high port into the high port of the pressure sensor. The high pressure port is indicated with a P1 on the sensor. Tee the Magnehelic gage low port into the low port of the pressure sensor. The low pressure port is indicated with a P2 on the sensor.
2. Configure the zone controller pressure sensor range (category 5, option 5). The value of 0.5 in. wg should be set for use with a 33CSPS—01. Verify that it is set correctly.
3. Configure the zone controller Velocity Pressure Probe Gain option (category 5, option 6). The default value is 1.0.

   The value entered for Velocity Pressure Probe Gain is based on which model PSP (Pressure Static Pickup) is used. A value of 2.3 should be used for all PSP models.
4. Initiate the zone controller Auto-Zero function (category 5, option 7). Set the value to ON. The zone controller will position its damper full closed and zero the sensor reading. Once this is complete, the zone controller will automatically turn the option to OFF.
5. Initiate the zone controller Position Damper function (category 5, option 8). Adjust the damper position until the desired velocity pressure is obtained at the manometer or Magnehelic gage.
6. Calibrate the pressure sensor (category 5, option 9). Adjust the displayed value until it matches the measured value of the manometer or Magnehelic gage.
7. Set the Minimum and Maximum Airflow Set Points (category 3, options 7 and 8). Set the Minimum Airflow Set Point to allow acceptable fresh air requirements. Set the Maximum Airflow Set Point so acceptable noise levels are not exceeded.
8. Set the Damper Size option (category 3, option 9). The value is set in square inches and is the cross sectional area in which the probe is located.
9. Enable Pressure Independent Control (category 3, option 4). Set the value to ON.

Indoor-Air Quality Sensor — The Comfort IAQ feature allows the Carrier Comfort system to interface with the economizer on the HVAC equipment and maintain the quality of indoor air within acceptable limits. An IAQ sensor (CO_2) is used to monitor the IAQ levels in a zone or in the return air duct. On zone controllers, the zone controller is configured to either participate in the IAQ system, ignore IAQ commands, or run IAQ monitoring locally.

When the CO_2 level exceeds the preset level (factory configuration is 1000 ppm), the sensor signals the indoor-fan motor to run. The indoor fan circulates the air throughout the occupied space. At the end of 5 to 30 minutes (on the first IAQ alarm of the day only), if the CO_2 level still exceeds the set point, the indoor fan will stay energized. The zone controller opens the zone damper to the full open position (in local mode) or all the participating zone dmapers open (in system IAQ mode). This forces fresh outside air to enter the zone(s) with deficient IAQ. When the IAQ level drops below the IAQ set point, the zone dampers return to their standard operating mode.

When the system is bringing in additional outside air, the thermostat is reset 0 to 10° F (field-configured) above or below the original set point to allow the outside air to circulate before the heating or cooling mode is initiated. A set of contacts are also available on the relay pack which can be used to start a local exhaust fan when the system is bringing in additional outside air (if not used for supplemental heat). The zone controller will display status when the system is in this mode.

SYSTEM IAQ PARTICIPATION — To configure the System IAQ Participation option, set category 14, option 1. When the option is configured ON, the zone controller will modulate during IAQ fan operation. When the option is configured OFF, the IAQ commands from the system are not used. The default is OFF.

LOCAL IAQ SENSOR — The Local IAQ Sensor function specifies if the zone controller (or controlling monitor thermostat) is using a CO_2 sensor. If the option is set to ON, the zone controller monitors the input of the sensor. If the option is set to OFF, the zone controller does not monitor the input of the sensor.

To configure the Local IAQ Sensor option, set category 14, option 2. Use the left set point buttons to toggle the option ON or OFF. The default is OFF.

IAQ MAXIMUM SPACE TEMPERATURE RESET — When the IAQ mode brings in fresh outdoor air, the space temperature will rise or drop depending on the outside-air temperature. The IAQ Maximum Space Temperature option will keep the HVAC equipment from entering heating or cooling unless the temperature change is greater than the set point. This keeps the heating or cooling equipment from coming on during IAQ mode. The option is configured in category 14, option 3. The set point can be configured from 0 to 10° F. The default value is 2° F.

NOTE: The IAQ Maximum Space Temperature Reset option is always displayed is Fahrenheit, even when the Fahrenheit Temperature Display option (category 1, option 6) is set to OFF.

IAQ ALARM DELAY — The IAQ Alarm Delay option controls how long the zone controller will wait before issuing an IAQ alarm. To configure the IAQ Alarm Delay option, set category 14, option 4. The number of minutes will be shown. The range of acceptable values is 0 to 240 minutes in 1-minute increments. Use the left set point buttons to set the time limit to the desired value. The default value is 0 minutes.

DAMPER CONTROL

The zone controller modulates a zone damper to maintain the zone temperature conditions as determined by the occupied or unoccupied set points.

The zone controller has 5 modes of damper operation available:

- system mode
- local mode
- damper ventilation mode
- IAQ mode
- damper supplemental heat mode

The zone controller selects a damper mode based on zone conditions and communications with the monitor thermostat. The proper damper position is determined by the settings of the Pressure Independent option (Pressure Dependent Operation or Pressure Independent Operation).

During Pressure Independent Damper Modulation, the zone controller damper is modulated to maintain a specific quantity (cfm) of supply air.

Damper Interface — The zone controller is interfaced to the damper actuator through the wiring connector board. The zone controller can be used to control one master damper and up to 3 slave dampers. See Fig. 10. The zone controller directly controls only the master damper. Slave dampers will receive and follow damper position commands sent to the master damper, but do not send information to the zone controller.

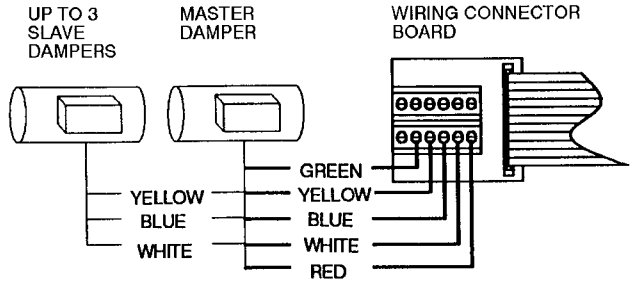


Fig. 10 — Damper Wiring Connections

Damper Modes — The zone controller has 5 modes of damper operation available: local mode, system mode, damper ventilation mode, supplemental heat mode, and IAQ mode.

If the zone controller is a member of a zoning system, it will have an associated system control (monitor thermostat, fan box monitor, etc.) that determines the heating/cooling equipment operation based on zone demand.

When a system control has chosen a system mode, the zone controller selects a damper mode based on the system mode. If the associated system control has not chosen a system mode, the zone controller selects a damper mode based on the local mode.

ASSOCIATED CONTROL SYSTEM MODE — When central system heating is needed, the system mode will be heating mode. When central system cooling is needed, the system mode will be cooling mode.

If the zone controller zone has a heating demand and the system is in heating mode, the zone damper is modulated in the damper heating mode.

If the zone controller zone has a cooling demand and the system is in cooling mode, the zone damper is modulated in the damper cooling mode.

If the zone controller has no zone heating or cooling demand, or if the zone controller zone demand is opposite of the system mode, the zone controller will modulate the zone damper in damper minimum airflow mode.

LOCAL MODE — When the system control has not selected a system mode, the zone controller compares zone temperature to supply-air temperature and determines the local damper mode.

If the zone damper supply-air temperature is warmer than the zone temperature and the zone controller is in heating mode, then the zone damper is modulated in the damper heating mode.

If the zone damper supply air temperature is colder than the zone temperature and the zone controller is in cooling mode, then the zone damper is modulated in the damper cooling mode.

If the zone controller has a zone heating or cooling demand which is directly opposite of the local mode, the zone controller will modulate the zone damper in the damper minimum airflow mode.

If the zone controller has no zone heating or cooling demand, the zone controller can modulate the zone damper in the damper ventilation mode.

DAMPER VENTILATION AIRFLOW POSITION — The Damper Ventilation Airflow Position is the position that the damper will modulate to while in the ventilation mode. To configure the option, set category 3, option 3. Use the set point buttons to raise or lower the setting to the desired value. The range of values is 0 to 7, where 0 is fully closed and 7 is half open. The default is 5. If the Damper Ventilation Position is set to 0, or to a value equal or less than the Minimum Damper Position, then ventilation mode is off. If the Damper Ventilation Position is set to a value higher than the Minimum Damper Position, then ventilation mode is on.

Pressure Dependent Damper Modulation — The zone controller modulates the zone damper depending on zone temperature, supply-air temperature, zone demand, and mode. The zone damper may be modulated to one of 16 mechanical positions. Position 0 is fully closed, position 15 is fully open.

The zone controller modulates the zone damper to the Damper Maximum Open Position when zone demand is greater than 1.5° F or greater and the system mode matches zone demand. The zone damper cannot open to a position greater than the maximum damper position.

When zone demand is less than 1.5° F, the zone controller modulates the zone damper to maintain a percentage proportional to zone demand. The damper cannot close to a position less than the Minimum Damper Position. See Fig. 11 for an example of damper modulation.

To configure the zone controller for damper modulation (Pressure Dependent Operation), set the Zone Pressure Independent Operation option (category 3, option 4) to OFF.

When the zone controller is chosen as the reference zone by the associated system control (monitor thermostat, system controller, etc.), it modulates the zone damper to the Damper Maximum Open Position. The zone controller operates at the maximum position until it is no longer the reference zone.

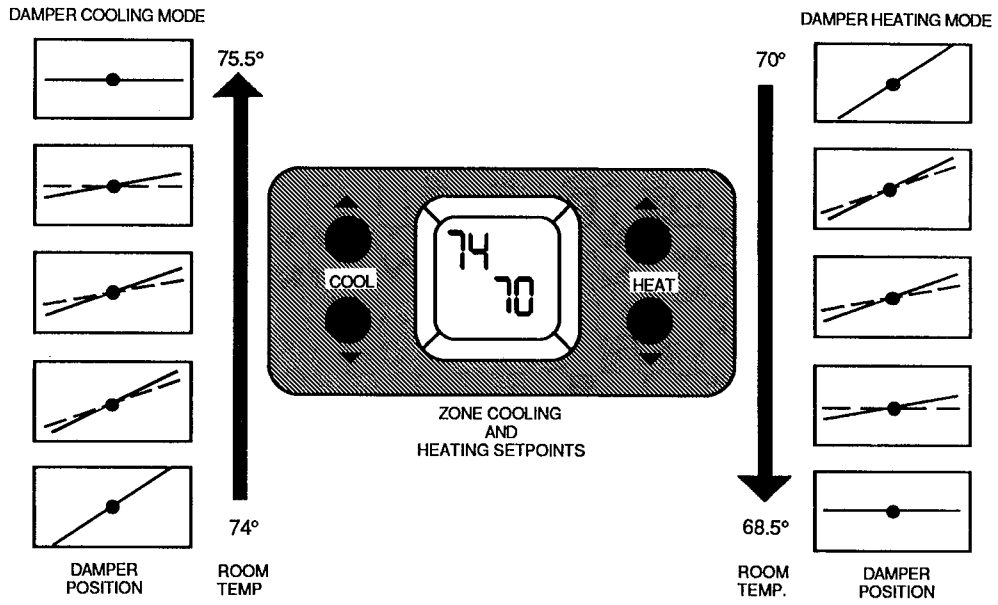


Fig. 11 — Damper Modulation

NOTE: Regardless of zone demand or Ventilation position setting, the zone controller will not close the zone damper beyond the Minimum Damper Position.

If the zone damper supply-air temperature is within the temperature range of 65 to 80 F, and the Ventilation Position is set higher than the Minimum Damper Position, the zone controller modulates its zone damper to the Ventilation Position.

If the zone damper supply-air temperature is not within the temperature range of 65 to 80 F, the zone controller modulates its zone damper to the Minimum Damper Position.

When the zone controller is in the damper minimum airflow mode, it modulates the zone damper to the Minimum Damper Position.

Pressure Independent Damper Modulation — During pressure independent damper modulation, the zone controller will modulate its zone damper to maintain the airflow (cfm) set point. Airflow to the zone is maintained between the Minimum Airflow Set Point and the Maximum Airflow Set Point.

When zone demand is 1.5° F or greater, the zone controller modulates the zone damper open, until airflow through the damper equals the Airflow Set Point or until the Damper Maximum Open Position is reached. When zone demand is less than 1.5° F, the zone controller modulates the zone damper to maintain a percentage of the Airflow Set Point proportional to zone demand.

To configure the zone controller for pressure independent damper modulation, set the Zone Pressure Independent Operation option to ON. The Minimum and Maximum Airflow Set Points, Velocity Pressure Probe Gain, Pressure Sensor Range, and the Damper Size must all be configured correctly for independent pressure modulation.

When the zone controller is chosen as the reference zone by the associated system control (monitor thermostat, system controller, etc.), it modulates the zone damper open until airflow through the damper equals the Airflow Set Point or the Damper Maximum Open Position is reached. The zone controller operates at the maximum airflow condition until it is no longer the reference zone.

NOTE: When the Ventilation Position is set to 0 (ventilation mode is off) and the zone controller is in occupied mode, regardless of zone demand, the zone controller will not close the zone damper beyond the Damper Minimum Airflow Position.

PRESSURE INDEPENDENT DAMPER MODULATION DURING DAMPER VENTILATION MODE — If the zone damper supply-air temperature is within the temperature range of 65 to 80 F, the zone controller modulates its zone damper to maintain a percentage of the Airflow Set Point proportional to the damper ventilation position.

If the zone damper supply-air temperature is not within the temperature range of 65 to 80 F, the zone controller modulates its zone damper to the minimum airflow set point.

When the zone controller is in the damper minimum airflow mode, the zone controller modulates the zone damper to maintain a percentage of the Airflow Set Point proportional to the damper minimum airflow position.

NOTE: During the ventilation mode, the zone controller will not close the zone damper past the setting of the Damper Minimum Airflow Position option.

PRESSURE INDEPENDENT OPERATION — If the Pressure Independent Operation option is set to ON, the zone controller modulates its zone damper using pressure independent damper modulation. If the Pressure Independent Operation option is set to OFF, the zone controller modulates its zone damper using pressure dependent damper modulation.

To configure the Pressure Independent Operation option, set category 3, option 4. Use the left set point buttons to toggle the display ON or OFF. The default is OFF.

MAXIMUM DAMPER POSITION — The damper maximum airflow position determines the maximum amount that the damper will open or close during modulation. To configure the Maximum Damper Position option, set category 3, option 1. Use the left set point buttons to raise or lower the Maximum Damper Position setting. The range of values is 15 to 08, where 15 is fully open and 08 is half open. The default is 15.

MINIMUM DAMPER POSITION — The damper minimum airflow position determines the minimum amount that the damper will open or close during modulation. To configure the Minimum Damper Position option, set category 3, option 2. Use the left set point buttons to raise or lower the Minimum Damper Position setting. The range of values is 0 to 7, where 0 is fully closed and 07 is half open. The default is 5.

MINIMUM AIRFLOW SET POINT — The Minimum Airflow Set Point establishes the minimum supply airflow that can be delivered to the zone controller zone during pressure independent damper modulation. The airflow set point is shown in cubic feet per minute.

To configure the Minimum Airflow Set Point option, set category 3, option 7. The Minimum Airflow Set Point will be shown. The range of values is 0 to 5000 cfm. Use the left set point buttons to increase or decrease the Minimum Airflow Set Point. The default is 5.

NOTE: When the zone controller is measuring supply airflow in cfm, if both heating or cooling set point buttons are pressed, the Airflow Set Point display will be replaced by the current supply air airflow (cfm) for the zone controller zone.

MAXIMUM AIRFLOW SET POINT — The Maximum Airflow Set Point establishes the maximum supply airflow that can be delivered to the zone controller zone during pressure independent damper modulation. The airflow set point is shown in cubic feet per minute.

To configure the Maximum Airflow Set Point option, set category 3, option 8. The Maximum Airflow Set Point will be shown. The range of values is 0 to 5000 cfm. Use the left set point buttons to increase or decrease the Maximum Airflow Set Point. The default is 5.

NOTE: When the zone controller is measuring supply airflow in cfm, if both heating or cooling set point buttons are pressed, the Airflow Set Point display will be replaced by the current supply air airflow (cfm) for the zone controller zone.

DAMPER SIZE — The Damper Size option allows the zone controller to be configured for the correct cross sectional area (square inches) of the duct at the pressure sensor pickup (PSP) location.

To configure the Damper Size option, set category 3, option 9. Use the left set point buttons to toggle the display until the correct damper size is shown. See Table 2 for a description of damper sizes. The range of values is 0 to 1000 sq in. The default is 0.

Table 2 — Damper Sizes

ZONE DAMPER MODEL NUMBER	CROSS SECTIONAL AREA (sq. in.)
ZD06 Carrier Round Zone Damper	28
ZD08 Carrier Round Zone Damper	50
ZD10 Carrier Round Zone Damper	78
ZD12 Carrier Round Zone Damper	112
ZD14 Carrier Round Zone Damper	153
ZD16 Carrier Round Zone Damper	200
RD8x10 Carrier Rectangular Damper	78
RD8x14 Carrier Rectangular Damper	110
RD8x18 Carrier Rectangular Damper	142
RD8x24 Carrier Rectangular Damper	190

NOTE Cross sectional areas are calculated using inside diameters assuming 0 03 in sheet metal thickness and rounded off to the nearest whole square inch.

ZD/RD ACTUATOR — If the ZD/RD Actuator option is set to ON, the zone controller is configured to operate a model ZD/RD actuator. If the ZD/RD Actuator option is set to OFF, the zone controller is configured to operate a high torque actuator.

NOTE: The HTA-02 rotates through 60 degrees of travel. The HTA-03 rotates through 90 degrees of travel. The HTA-02 and 03 are available as separate damper actuators and are not factory-assembled to a damper.

To configure the ZD/RD Actuator option, set category 3, option 5. Use the left set point buttons to toggle the setting to ON or OFF. The default is ON.

COUNTERCLOCKWISE OPEN DAMPER MODULATION — If the Counterclockwise Open Damper Modulation option is set to ON, the zone controller will modulate the damper counterclockwise to move it into the open position. If the Counterclockwise Open Damper Modulation option is set to OFF, the zone controller will modulate the damper clockwise to move it into the open position.

To configure the Counterclockwise Open Damper Modulation option, set category 3, option 6. Use the left set point buttons to toggle the setting to ON or OFF. The default is ON.

The following VAV (variable air volume) zone dampers require counterclockwise rotation to modulate the damper to an open position:

- Model ZD Zone Damper
- Model RD Rectangular Damper
- Model MA08 Actuator

SUPPLEMENTAL HEAT

The operation of supplemental heat for each zone is controlled by the zone controller. The zone controller works in conjunction with the associated monitor thermostat to:

- lockout supplemental heat based on outside-air temperature
- utilize central heat and supplemental heat to satisfy zone heating demands

When airflow into the zone is necessary during supplemental heat operation the monitor thermostat can be configured to energize the supply air fan. The zone controller can be configured to open the zone damper and allow the required amount of supply air into the zone.

The zone controller can be configured to control a variety of supplemental heat sources:

- Fan Powered Mixing Box
- Perimeter Baseboard Heat
- Radiant Heating Panel
- Duct Mounted Heat

The zone controller can be configured to energize the primary air fan in series fan powered mixing boxes continuously during occupied mode and to satisfy a zone heating or cooling demand during unoccupied mode. If the zone controller is an IAQ participant and has an exhaust fan, the zone controller cannot control supplemental heat.

Supplemental Heat Interface — The zone supplemental heat source is interfaced to the zone controller through a Heating Relay Pack. With the relay pack the zone controller can control a fan and two stages of supplemental heat. See Fig. 12.

For side pocket fan powered mixing boxes (parallel fan box), the zone controller can control three stages of heat. At 1.5° F demand, the zone controller energizes the fan relay. At 2.0° F demand the zone controller energizes the H1 heat relay. At 2.5° F demand the zone controller energizes the H2 heat relay.

For series fan powered mixing boxes, the zone controller can control the primary air fan and two stages of heat. The fan relay (FAN) controls the mixing box primary air fan. The first stage heat relay (H1) controls the mixing box first stage electric or hot water heat. The second stage heat relay (H2) controls the mixing box second stage electric or hot water heat.

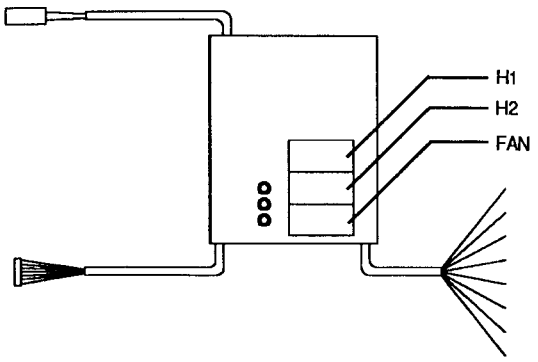


Fig. 12 — Supplemental Heat Interface

Supplemental Heat Operation — The zone controller can use supplemental heat to satisfy the zone heating demand when the Zone Supplemental Heat function is set to ON.

The zone controller uses the Heating Relay Pack to:

- energize first stage supplemental heat (H1) when zone heating demand is 1.5° F
- energize second stage supplemental heat (H2) when zone heating demand is 2.0° F.

Once a stage of supplemental heat is energized, it remains on until zone heating demand is 0.5° F or less.

NOTE: Supplemental Heat Operation can be disabled by the monitor thermostat.

ZONE SUPPLEMENTAL HEAT — When the Zone Supplemental Heat option is set to ON, the zone controller can use supplemental heat operation to satisfy zone heating demand. When the Zone Supplemental Heat option is set to OFF, the zone controller will not energize supplemental heat.

To configure the Zone Supplemental Heat option, set category 6, option 1. Use the left set point buttons to toggle the setting to ON or OFF. The default is OFF.

SUPPLEMENTAL HEAT TIME GUARD — The zone controller has a system time limit (time guard) which prevents supplemental heat from being energized directly after supplemental heat has been deenergized, the zone controller receives power, or the zone controller resets.

The power-up or reset time guard determines how long the zone controller will wait before starting the supplemental heat when the zone controller is powered up or reset. The length of the time guard is 30 seconds plus 0 to 189 seconds (determined by the first 6 bits of the address of the zone controller). This keeps the supplemental heating equipment from starting simultaneously with other equipment which keeps peak energy usage down. The system fan controlled by the zone controller has a power-up or reset time guard of 30 seconds.

After the supplemental heat has been deenergized, the zone controller will wait 30 seconds before allowing the system fan to be energized, and 2 minutes before allowing the heat relay to be energized.

SUPPLEMENTAL HEAT TIME GUARD OVERRIDE — When the Supplemental Heat Time Guard Override option is set to ON, the zone controller supplemental heat time guards are reset to 30 seconds.

NOTE: When Supplemental Heat Time Guard Override is set to ON, the zone controller resets it to OFF when supplemental heat is energized.

When the Supplemental Heat Time Guard Override option is set to OFF, the Supplemental Heat Time Guard determines time guard length based on normal operation.

To configure the Supplemental Heat Time Guard Override option, set category 6, option 3. Use the left set point buttons toggle the setting to ON or OFF. The default is OFF.

Supplemental Heating Damper Modulation — Prior to energizing supplemental heat the zone controller will modulate the Zone Damper to the Supplemental Heat Damper Position.

When the zone controller monitor thermostat has selected a system heating mode:

- if supplemental heat is energized, the zone controller modulates the damper to the Damper Maximum Open Position (or to the Airflow Set Point if the Zone Pressure Independent Operation option is ON)
- if supplemental heat is deenergized, the zone controller modulates the damper using Damper Modulation (pressure dependent operation) or Pressure Independent Damper modulation functions.

SUPPLEMENTAL HEAT DAMPER FACTOR — The Supplemental Heat Damper Factor option specifies the damper position during supplemental heat damper modulation.

If the Pressure Independent Operation option is set to OFF, the Supplemental Heat Damper Factor is a percentage of the 15 damper positions.

If the Pressure Independent Operation option is set to ON, the Supplemental Heat Damper Factor is specified as a percentage of the Airflow Set Point.

To configure the Supplemental Heat Damper Factor setting, set category 6, option 2. The zone controller supplemental heat damper position will be displayed.

The position is shown in the top left corner. Use the left set point buttons to raise or lower the position setting. The range of values is 10 to 00, where 10 is the maximum damper factor and 00 is the minimum damper factor. The default is 00.

As an example, if the Maximum Damper Position is set to 13 and the Minimum Damper Position is set to 5. Subtract 5 from 13 to get 8. Divide 8 by 10 to get 0.8. Supplemental Heat Damper Factor 00 is 5 (Minimum Damper Position). Use this formula is determine the Supplemental Heat Damper Factors: Minimum Position + (((Maximum Position – Minimum Position)/10) * supplement heat position). Factor 01 is 5 + (0.8 * 1) = 5 (all values are truncated). Factor 02 is 5 + (0.8 * 2) = 6. Factor 10 will be 13 (the Maximum Damper Position).

NOTE: If the Minimum or Maximum Damper Position options are changed, the Supplemental Heat Damper Factor will be automatically recalculated.

FAN POWERED MIXING BOX — The zone controller will operate a fan powered mixing box.

To configure the Fan Powered Mixing Box option, set category 6, option 4. Use the left set point buttons to toggle the display from 0 to 2. When the option is set to 0, the zone controller will not use a fan powered mixing box. When the option is set to 1, the zone controller will function with a series fan powered mixing box. When the option is set to 2, the zone controller will function with a parallel fan powered mixing box. The default is 0.

If the Fan Powered Mixing Box option is set to 0, the zone controller will not operate as a Fan Powered Mixing Box.

When the Fan Powered Mixing Box option is set to 1 (Series Fan Box), the zone controller will energize the fan relay continuously during Occupied Mode. The Heat1 relay energizes at 1.5° F demand. The Heat2 relay energizes at 2.0° F demand.

When the Fan Powered Mixing Box option is set to 2 (Parallel Fan Box), the zone controller will energize the fan relay as first stage heating when there is 1.5° F heating demand. The Heat1 relay will energize for second stage heat when there is a 2.0° F demand. The Heat2 relay will energize as third stage when there is a 2.5° F demand.

NOTE: The zone controller will not deenergize the fan relay until zone demand is less than 0.5° F.

HYDRONIC HEAT — The zone controller does not need a Time Guard for Supplemental Heat stages when hot water is used for heat.

When the Hydronic Heat option is set to ON, the zone controller will energize the supplemental heat stages without time guards.

When the Hydronic Heat option is set to OFF, the zone controller will energize the supplemental heat stages only after the time guards have expired.

To configure the Hydronic Heat option, set category 6, option 5. Use the left set point buttons to toggle the setting to ON or OFF. The default is OFF.

SUPPLEMENTAL HEAT LOCKOUT OVERRIDE — The zone controller can be configured to ignore a Supplemental Heat Lockout command sent by the associated monitor thermostat.

When the Supplemental Heat Lockout Override option is set to ON the zone controller will ignore the Supplemental Heat Lockout command sent by the associated System Controller.

When the Supplemental Heat Lockout Override option is set to OFF, the zone controller will accept the Supplemental Heat Lockout command sent by the System Controller.

To configure the Supplemental Heat Lockout option, set category 6, option 6. Use the left set point buttons to toggle the setting to ON or OFF. The default is OFF.

METERING

The zone controller has zone metering capabilities. The zone controller can meter zone usage in three ways:

- usage of the zone in addition to the normal occupied schedule (amount of time the zone is in Unoccupied Override).
- usage of the heating/cooling equipment to maintain zone temperature conditions (amount of time the zone demand matches the System Mode).
- usage of the supplemental heating equipment to maintain zone temperature conditions during unoccupied override.

HVAC Usage Meter — The zone controller has a usage meter that can accumulate up to 32,767 minutes (22.75 days) of zone usage. Through communication, the amount of time accumulated in the meter can be accessed, recorded, and reset to zero. Once the maximum amount of time has been accumulated, the zone controller stops metering and an HVAC Usage Meter Full Error is generated.

To disable the zone controller HVAC Usage Meter, set the HVAC Usage Meter option to OFF. No metering occurs. To Enable the HVAC Usage Meter, set the option to ON. To configure the HVAC usage meter option, set category 7, option 5. Use the left set point buttons to toggle the option ON or OFF. The default is OFF.

Override Usage Meter — The zone controller has an override usage meter that can accumulate up to 32,767 minutes (22.75 days) of override usage. When the Override Usage Meter option is set to ON, zone metering will occur when the zone controller is in Unoccupied Override. When the Override Usage Meter option is set to OFF, zone metering for override usage will not occur. Once the maximum amount of time has been accumulated, the zone controller stops metering and an Override Usage Meter Full Error is generated.

To configure the Override Usage Meter option, set category 7, option 6. Use the left set point buttons to toggle the setting to ON or OFF. The default is OFF.

Supplemental Heat Override Usage Meter — The zone controller has a supplemental heat override usage meter that can accumulate up to 32,767 minutes (22.75 days) of supplemental heat override usage. When the Supplemental Heat Override Usage Meter option is set to ON, zone metering occurs when the zone controller uses supplemental heat during unoccupied override. When the Supplemental Heat Override Usage Meter option is set to OFF, zone metering will not occur for supplemental heat usage in unoccupied override. Once the maximum amount of time has been accumulated, the zone controller stops metering and a Supplemental Heat Override Usage Meter Full Error is generated.

To configure the Supplemental Heat Override Usage Meter option, set category 7, option 7. Use the left set point buttons to toggle the setting to ON or OFF. The default is OFF.

DIAGNOSTICS

The zone controller has diagnostic capabilities for components, information, zone comfort, and usage.

Diagnostic problems, called errors or alarms, are divided into 3 categories: Hardware Failure (HF) errors, Storage Failure (SF) errors, and System Errors (SE). The zone controller tracks the operating conditions in the zone.

Error Code Display — An error code representing the SE, SF, and HF diagnostic functions can be displayed to indicate which error has been declared. The 2 letters located in the left of the display represent the type of error. The 3 numbers located in the right of the display identify the specific error.

When the Error Code Display option is ON, an error code will be displayed when the associated error occurs. Any previous error codes that occurred when the Error Code Display was configured OFF will be displayed.

NOTE: When an error is cleared, any errors remaining in the zone controller will be displayed sequentially until all errors are cleared.

When the Error Code Display option is set to OFF, no error codes will be displayed by the zone controller.

To configure the Error Code Display option, set category 7, option 1. Use the left set point buttons to toggle the setting to ON or OFF. The default is ON.

System Errors (SE) — System Errors occur when the zone controller detects a zone operating problem or system operating problem. See Table 3 for System Errors.

COMFORT TREND ERROR (Space Temperature Alarm) (SE01) — A Comfort Trend error is a system error that provides information on the ability of the system to maintain temperature conditions in its reference zone.

When the reference zone demand exceeds the Comfort Trend Demand Set Point, the zone controller begins tracking the Temperature Trend of the zone.

The zone controller declares a Comfort Trend Error for the zone when the Temperature Trend is continuously zero (zone temperature conditions are not improving) or positive (zone temperature conditions are becoming worse) for the entire Comfort Trend Time Limit.

To clear a Comfort Trend Error, use the Unit Reset function. The Unit Reset function is in category 7, option 8. The default is OFF. Use the left set point buttons to set the option to ON. The zone controller will reset all errors and return to the OFF configuration.

By indicating when zone heating or cooling set points cannot be satisfied, a Comfort Trend Error helps identify zone heating or cooling problems.

When the system is commissioned, this information can be used by the installing contractor to recognize zone airflow or supply-air temperature problems in the system.

During system operation, Comfort Trend Errors can be continuously monitored by the servicing contractor through a local network access device to determine when system or equipment problems are affecting zone comfort.

To troubleshoot a Comfort Trend Error:

1. Check the quantity of airflow into the zone controller's zone.
   a. Check the configuration of the zone controller Damper Maximum Open Position setting (category 3, option 1) and the position of any balancing dampers used by the zone. Dampers may need to be adjusted further open to allow additional airflow into the zone. The allowable range for the Damper Maximum Open Position setting is 15 to 8, with 15 being full open and 8 being approximately 50% open.
   b. Check the ductwork running to the zone controller's zone. Loose connections, obstructions, or poorly insulated duct can result in reduced air volume or temperatures causing the zone not to satisfy within the Comfort Trend Time Limit.
   c. Check the bypass controller configuration. If the bypass controller is not configured correctly, it can keep the system static pressure too low to meet the zone design load airflow requirements.
   d. After the previous steps have been completed, the performance of the supply air fan should be checked. During full load situations, the fan must produce an adequate quantity of supply air at the necessary static pressure to meet the zone design requirements. Reset the zone controller error register.
2. Check the temperature of supply air into the zone. If the temperature is above the zone design conditions during system cooling mode, or below design conditions during system heating mode, the operation of the equipment should be checked. Reset the zone controller error register.

Comfort Trend Demand Set Point — The Comfort Trend Demand Set Point establishes the minimum zone demand level that must exist in the zone, if it is the reference zone, before it can declare a Comfort Trend Error.

The Comfort Trend Demand set point is configured in category 7, option 3. Use the left set point buttons to raise or lower the set point. The range of values is 0 to 25.5° F in 1/10° F increments. The default is 0° F. The function is disabled if it is set to 0° F.

NOTE: The Comfort Trend Demand set point is always displayed in Fahrenheit, even if the Fahrenheit Display option is set to OFF.

Comfort Trend Time Limit — The Comfort Trend Time Limit establishes the continuous amount of time that must elapse before the zone controller can declare a Comfort Trend Error.

The Comfort Trend Time Limit set point is configured from category 7, option 4. The range of values is 2 to 255 minutes in 1-minute increments. The default is 2.

METER FULL ERROR (SE02,03,04) — System Errors SE02, SE03, and SE04 indicate when a zone meter is full.

NOTE: During a meter full error, the full usage meter stops recording and retains its maximum value until cleared.

To clear an SE02, SE03, or SE04 error, reset the full meter to zero by using network access software. Use the Unit Reset function to clear the error. The Unit Reset function is in category 7, option 8. The default is OFF. Use the left set point buttons to set the option to ON. The zone controller will reset all errors.

IAQ EXCEEDED LIMIT ERROR (SE10) — When the CO_2 level exceeds the preset level, the sensor signals the zone controller. The zone controller will wait until the IAQ Alarm Delay time (category 14, option 4) has expired, then it will issue an SE10. The system (if configured) will bring in fresh outdoor air to meet IAQ requirements. If the IAQ Alarm Delay is not set to give the system enough time to correct IAQ problems, the SE10 will be issued every time the IAQ mode is entered.

To clear a system error, use the Unit Reset function. The Unit Reset function is in category 7, option 8. The default is OFF. Use the left set point buttons to set the option to ON. The zone controller will reset all errors.

Table 3 – System Errors

ERROR CODE	SYSTEM ERROR DESCRIPTION	ALARM PRIORITY LEVEL
SE01	Comfort Trend (Space Temperature Alarm)	2
SE02	HVAC Usage Meter Full	4
SE03	Override Usage Meter Full	4
SE04	Supplemental Heat Override Usage Meter Full	4
SE10	IAQ Exceeded Limit	2

Storage Failure (SF) Errors — A Storage Failure error is an indication that the zone controller has invalid information. The zone controller stores its information in NOVRAM (non-volatile memory). If the zone controller determines that a piece of stored information is incorrect, it generates a storage failure error.

When an SF Error occurs, the zone controller replaces the invalid data in memory with factory selected default values and the invalid information is not used by the associated system control.

To clear an SF Error, enter correct data at the zone controller. See Table 4 for a description of Storage Failure Errors.

EXAMPLE OF CLEARING AN SF ERROR — The zone controller displays a SF19 error. Look up SF19 in Table 4. The affected configuration is Maximum Damper Position. The default value is 15. The desired setting is 12.

To clear the SF19 error manually, reconfigure the Maximum Damper Position option to 12. The SF19 error should be cleared.

NOTE: If the SF error cannot be cleared, replace the zone controller and configure the new thermostat to match desired settings.

Hardware Failure (HF) Errors — A Hardware Failure (HF) error is an error that corresponds to a hardware failure at the zone controller, associated sensors, or zone damper.

To clear a HF Error, the component responsible for initiating the HF Error must be adjusted, repaired, or replaced. See Table 5 for a description of HF errors.

CANNOT DETECT CLOSED DAMPER — An HF01 error is issued when the thermostat attempts to position the damper closed, but the position sensor indicates the damper is not at the fully closed position.

To clear the error, correct the damper problem and use the Unit Reset function. The Unit Reset function is in category 7, option 8. The default is OFF. Use the left set point buttons to set the option to ON. The zone controller will reset all errors.

To correct the damper problem:

1. Check the damper for mechanical binding. An obstruction in the damper or a bent damper blade can prohibit the damper from modulating closed. Remove the source of binding.
2. Check the actuator-to-damper alignment. If the damper shaft is out of alignment with the actuator crank arm position, the damper may reach the fully closed position before the actuator.

   Align the damper and the actuator so both fully closed positions coincide. Prior to alignment, the Minimum Damper Position (category 3, option 2) setting should be configured to zero. This will ensure the actuator will be in the fully closed position when the zone controller demand is zero.
3. Check the damper actuator position to see if the traveler arm has moved past the position sensor. If the traveler arm is stuck at full open or full closed position, use the following steps to correct the problem:
   a. Disconnect the zone controller from the wiring connector board.
   b. At the damper, using a flat head screw driver, turn the traveler screw (located on the stepper motor) until the traveler arm is midway between the fully closed and fully open positions.
   c. Reconnect the zone controller.

Table 4 — Storage Failure (SF) Errors

ERROR	INFORMATION AFFECTED	DEFAULT VALUE(S)
SF01	Occupied Cooling Set Point	72
SF02	Occupied Heating Set Point	68
SF03	Cooling Set Point Low Limit	68
SF04	Heating Set Point High Limit	75
SF05	Unoccupied Cooling Set Point	80
SF06	Unoccupied Heating Set Point	65
SF07	Rotating Display	ON
SF08	Fahrenheit Temperature Display	ON
SF09	Occupancy Period 1	MTWTHF 6:00AM-6:00PM
SF10	Occupancy Period 2	–
SF11	Occupancy Period 3	–
SF12	Occupancy Period 4	–
SF13	Occupancy Period 5	–
SF14	Occupancy Period 6	–
SF15	Occupancy Period 7	–
SF16	Occupancy Period 8	–
SF17	Schedule Number	0
SF18	Override Time Limit	1
SF19	Maximum Damper Position	15
SF20	Minimum Damper Position	5
SF21	Pressure Independent Operation	OFF
SF22	Ventilation Position	5
SF23	ZD/RD Actuator	ON
SF24	Counterclockwise Open	ON
SF25	Maximum Airflow Set Point	0
SF26	Minimum Airflow Set Point	0
SF27	Damper Size	0
SF46	Zone Temperature Sensor Calibration	Factory Calibrated
SF47	Remote Room Sensor Calibration	Factory Calibrated
SF48	Duct Temperature Sensor Calibration	Factory Calibrated
SF49	Pressure Sensor Calibration	Factory Calibrated
SF51	Room Sensor	1
SF59	Zone Supplemental Heat	OFF
SF60	Supplemental Heat Damper Position	0
SF61	Alarm System Name	Network Configured
SF62	Fan Powered Mixing Box	0
SF63	Hydronic Heat	OFF
SF64	Supplemental Heat Lockout Override	OFF
SF65	Error Code Display	ON
SF67	Alternate Information	ON
SF68	Comfort Trend Demand	0
SF69	Comfort Trend Time Limit	0
SF70	HVAC Usage Meter Data	OFF
SF71	Override Usage Meter Data	OFF
SF72	Supplemental Heat Override Usage Meter Data	OFF
SF75	Device Element Address	0
SF76	Security Level	1
SF77	Device Bus Number	0
SF82	Broadcast Acknowledge	OFF
SF83	Global Schedule Broadcast	OFF
SF85	Holiday Schedules	0
SF86	Equipment Priority	7
SF87	Communication Failure Retry Time	10
SF88	Re-Alarm Time	30
SF89	IAQ System	ON
SF93	Local IAQ Sensor	OFF
SF95	IAQ Maximum Space Temperature Reset	OFF
SF98	Alarm Routing Control	Network Configured (11000000)
SF100	HVAC Meter Enable	ON
SF101	Override Meter Enable	ON
SF103	Supplemental Heat Override Meter Enable	ON

Table 5 — Hardware Failure (HF) Errors

ERROR	HARDWARE PROBLEMS	PRIORITY LEVEL
HF01	Cannot Detect Closed Damper	2
HF02	Cannot Detect Open Damper	2
HF03	Zone Temperature Sensor Out of Range	2
HF04	Remote Room Sensor Out of Range	2
HF05	Duct Temperature Sensor Out of Range	2
HF06	Hardware NOVRAM Failure	2
HF07	Hardware Analog/Digital Failure	2
HF08	Pressure Sensor Out of Range	2

4. Check for excessive inlet static pressure beyond the rated ability of the damper actuator.
   - ZD and RD zone dampers are rated for 18 in.-lb.
   - The MA-08 actuator is rated for 18 in.-lb.
   - The HTA-02 actuator is rated for 80 in.-lb.
   - The HTA-03 actuator is rated for 45 in.-lb.
5. Check the configuration of the zone controller Counterclockwise Open option (category 3, option 6). For Carrier dampers, which the damper blade modulates counterclockwise to open, the option should be configured correctly.
6. Check the wiring between the damper actuator and zone controller. If the green wire between the damper actuator and the zone controller has lost continuity, the zone controller will constantly receive the indication that the damper is fully closed.

   To check the wiring, disconnect the zone controller and wiring connector board. Connect the zone controller and wiring connector board directly at the damper board. If the error disappears, the field wiring or the connections should be checked.

   If the error is still present, the zone controller circuit board, the wiring connector board, or the damper actuator circuit board is bad. To isolate the defective component, replace components, one at a time, until the error disappears.

CANNOT DETECT OPEN DAMPER — An HF02 error is issued when the zone controller attempts to open the damper, but the position sensor indicates the damper is fully closed.

To clear the error, correct the damper problem and use the Unit Reset function. The Unit Reset function is in category 7, option 8. The default is OFF. Use the left set point buttons to set the option to ON. The zone controller will reset all errors.

To correct the damper problem:

1. Check the damper for mechanical binding. An obstruction in the damper or a bent damper blade can prohibit the damper from modulating open. Remove the source of binding.
2. Check the damper actuator position to see if the traveler arm has moved past the position sensor. If the traveler arm is stuck at full open or full closed position, use the following steps to correct the problem:
   a. Disconnect the zone controller from the wiring connector board.
   b. At the damper, using a flat head screw driver, turn the traveler screw (located on the stepper motor) until the traveler arm is midway between the full closed and full open positions.
   c. Reconnect the zone controller.
3. Check for excessive inlet static pressure beyond the rated ability of the damper actuator.
   - ZD and RD zone dampers are rated for 18 in.-lb.
   - The MA-08 actuator is rated for 18 in.-lb.
   - The HTA-02 actuator is rated for 80 in.-lb.
   - The HTA-03 actuator is rated for 45 in.-lb.
4. Check the wiring between the damper actuator and zone controller. If the green wire between the damper actuator and the zone controller has lost continuity, the zone controller will constantly receive the indication that the damper is fully closed.

   To check the wiring, disconnect the zone controller and wiring connector board. Connect the zone controller and wiring connector board directly at the damper board. If the error disappears, the field wiring or the connections should be checked.

   If the error is still present, the zone controller circuit board, the wiring connector board, or the damper actuator circuit board is bad. To isolate the defective component, replace components, one at a time, until the error disappears.

ZONE TEMPERATURE SENSOR OUT OF RANGE — An HF03 error is issued when the zone temperature sensor is reading below 30 F or greater than 180 F. The zone temperature sensor can be recalibrated. The HF03 error will automatically clear when the sensor reading is back within the allowable range.

To check the zone temperature sensor:

1. Check that the zone temperature sensor is physically intact on the zone controller printed circuit board. Ensure the sensor is not shorted against the zone controller printed circuit board.
2. a. Ensure the Room Sensor option (category 5, option 1) has been configured correctly.
   b. Check for other wiring running parallel to and less than 12 in. from the remote room sensor wiring. Avoid running AC, control, or communication bus near the remote room sensor wiring. Maintain a minimum separation of 12 in. or more between other wiring and remote room sensor wiring.
3. Check the zone temperature sensor calibration. Calibrate the sensor by manual calibration at the zone controller using the Zone Temperature Sensor Calibration function (category 5, option 2) and an accurate thermometer. Measure the temperature at the zone controller zone temperature sensor location using the accurate thermometer. Wait for the reading to stabilize. Using the set point buttons, increase or decrease the temperature display to match the reading of the thermometer. If the zone temperature sensor cannot be recalibrated, replace the zone controller.

REMOTE ROOM SENSOR OUT OF RANGE — An HF04 error is issued when the remote room temperature sensor is reading below 30 F or greater than 180 F. The remote room temperature sensor can be recalibrated. The HF04 error will automatically clear when the sensor reading is back within the allowable range.

To check the remote room sensor:

1. Check that the remote room sensor wiring and connections to the circuit board are physically intact. Ensure the 5-conductor control wiring running between the damper actuator and the zone controller is not run near AC, control, or communication bus wiring. Maintain a minimum separation of 12 in. or more between other wiring and remote room sensor wiring. A resistor must be added in parallel if using more than one remote room sensor.

2. Check for proper wiring connections (red to +, black to -). A 9.2 k ohm resistor must be added in parallel if using more than one remote room sensor.
3. Verify that option 5.1, Room Sensor, is set correctly.
4. Check the remote room sensor calibration. Calibrate the sensor by manual calibration at the zone controller using the Remote Room Sensor Calibration function (category 5, option 3) and an accurate thermometer. Measure the temperature at the remote room temperature sensor location using the accurate thermometer. Wait for the reading to stabilize. Using the set point buttons, increase or decrease the temperature display to match the reading of the thermometer.

DUCT TEMPERATURE SENSOR OUT OF RANGE — An HF05 error is issued when the duct temperature sensor is reading below 30 F or greater than 180 F. The duct temperature sensor can be recalibrated. The HF05 error will automatically clear when the sensor reading is back within the allowable range.

To check the duct temperature sensor:

1. Check that the duct temperature sensor wiring and connections to the damper actuator circuit board are physically intact. Ensure the five conductor control wiring running between the damper actuator and the zone controller is not run near AC, control, or communication bus wiring. Maintain a minimum separation of 12 in. or more between other wiring.
2. Check the duct temperature sensor calibration. Calibrate the sensor by manual calibration at the zone controller using the Duct Temperature Sensor Calibration function (category 5, option 4) and an accurate thermometer. Measure the temperature at the duct temperature sensor location using the accurate thermometer. Wait for the reading to stabilize. Using the set point buttons, increase or decrease the temperature display to match the reading of the thermometer. If the duct temperature cannot be recalibrated, replace the damper board or duct sensor.
3. Check the wiring between the damper actuator and the zone controller. If the green wire between the damper actuator and the zone controller has lost continuity,the zone controller will not function properly.

HARDWARE NOVRAM FAILURE — An HF06 error is issued when the zone controller detects a problem in its nonvolatile memory. If the zone controller is able to correct the problem, the error will clear in approximately 10 minutes. If the condition persists, the zone controller must be replaced.

HARDWARE A/D FAILURE — An HF07 error is issued when the zone controller detects a problem with its analog/digital converter circuitry. If the zone controller is able to correct the problem, the error will clear in approximately 10 minutes. If the condition persists, the zone controller must be replaced.

PRESSURE SENSOR OUT OF RANGE — An HF08 error is issued when the pressure sensor is reading below 0.00 in. wg or greater than 5.0 in. wg. The pressure sensor can be recalibrated. The HF08 error will automatically clear when the sensor reading is back within the allowable range.

To clear the HF08 error:

1. Check for excessive static pressure or excessive differential pressure at the pressure sensor pressure pickup. The 33CSPS-01 is rated for a maximum of 0.5 in. wg. The 33CSPS-02 is rated for a maximum of 2.0 in. wg. When the pressure sensor is operating at or above the rated pressure, the sensor readings will be unstable, causing an HF08 error.
2. Check the connection of hoses running from the PSP pressure pickup and the pressure sensor. Incorrect or faulty connections with the PSP pressure pickup can result in an HF08 error.
3. Check to ensure the pressure sensor wiring connection to the damper actuator is complete and well connected. Ensure the connections labeled "O" on the pressure sensor wiring harness are not used or shorted to ground. For the zone controller, the two wires marked "O" on the pressure sensor wiring harness are not used and can be clipped to prevent possible connection to ground.
4. Check the wiring from the pressure sensor to the damper actuator printed circuit board. If improperly wired the zone controller will be unable to communicate with the pressure sensor. This will result in an HF08 error. To check the wiring:
   a. Remove the pressure sensor from location and wire it directly to the factory supplied six-wire harness. The harness should be connected to the damper actuator printed circuit board.
   b. If the HF08 error disappears, then the field-wiring or connections should be checked.
   c. If the HF08 error still appears, the damper circuit board or the pressure sensor may have failed.
   d. To determine the defective component, replace the components one at a time until the problem is isolated.

Zone Controller Reset — The zone controller constantly verifies operation and the information it utilizes. When it finds a fault in a specified area, the zone controller resets using the zone controller initialization display.

The zone controller will reset when it finds fault in the following areas:

- The ability of the microprocessor to properly operate the programs used by the zone controller is verified to prevent improper response to zone and system conditions.
- The level of power used by the zone damper (24 vac) and by the zone controller (10 vdc) is checked to prevent improper operation by micro-electronic components during low power conditions.
- The ability of the zone controller to communicate with the zone damper to prevent incorrect operation of the zone damper.

Each piece of information received by the zone controller is verified to eliminate the use of incorrect data. Each portion of information stored by the zone controller is verified to eliminate the use of incorrect data. When possible, system communication and data storage faults are corrected by the zone controller. When corrections cannot be made the information is regarded as invalid and not utilized.

BROADCAST

The zone controller is part of a Carrier Comfort system. As a part of the system, on the network, the zone controller can send or receive broadcasts.

Broadcast Acknowledge — When the Broadcast Acknowledge option is set to ON, the zone controller will acknowledge any CCN broadcast. Every primary and secondary bus must have only one broadcast acknowledger.

When the Broadcast Acknowledge option is set to OFF, the zone controller will not acknowledge a CCN broadcast.

To set the option, configure category 9, option 1. Use the left set point buttons to toggle the option ON or OFF. The default is OFF.

Network Time Request — When the Network Time Request option is set to ON, the zone controller will request CCN time and date from the network. On every network, there must be only one device requesting time.

When the Network Time Broadcast option is set to OFF, the zone controller will not request time and date.

To set the option, configure category 9, option 2. Use the left set point buttons to toggle the option ON or OFF. The default is OFF.

NOTE: This should only be required in stand-alone applications. In a typical system, the zone controller will receive time from its associated monitor thermostat.

HOLIDAY SCHEDULES

The zone controller supports holiday scheduling. Eighteen different holidays can be user-defined. Each holiday has a start date (month and day) and a duration. When a user-defined holiday occurs, the zone controller follows the holiday schedule defined in the occupancy periods.

To define a holiday, advance to category 10. Each option (holiday schedule) has 2 screens. The first option screen shows the month and day. The second option screen shows the duration. The default values are 0 for each schedule. Press the enter button on the first screen to modify the month and day. The month will flash. Use the left set point buttons to scroll through the months. January is 1. February is 2, and so on. The range of acceptable values is 0 to 12. Set the month to 0 to disable the holiday schedule.

Once the month has been selected, press the enter button. The day will flash. Use the left set point buttons to scroll through the days. The range of acceptable values is 0 to 31. Set the day to 0 to disable the holiday schedule. Press enter again to return to the option selection screen. Toggle to the second screen of option 10.1 by pressing the upper left set point button. Press the enter button. The duration will flash. The duration is the number of days the holiday schedule will be active. The range of acceptable values is 0 to 99. Set the value to 0 to disable the holiday schedule.

Options 10.1 through 10.18 are configured in the same manner.

NOTE: Holidays are not broadcast or received as part of a global broadcast.

ALARM OPTIONS

The alarms options of the zone controller are responsible for transmitting alarms on the CCN (Carrier Comfort Network). A specified device (such as the Building Supervisor) on the CCN records the alarm messages from all other devices and uses this data to produce alarm messages. The zone controller detects successful transmission of the alarm and will retry if there is a communication failure. If the alarm is successfully transmitted, the zone controller will reset the alarm. The zone controller will also re-transmit an alarm if the alarm persists.

Equipment Priority — The Equipment Priority function tells the error recording device the priority of the device that is sending the alarm. The priority determines which alarms are shown first and which alarms are deleted when the alarm memory is full. To set the option, configure category 11, option 1. The range is 0 to 7, where 7 is the highest priority. The default value is 7 (zone controller priority).

⚠ CAUTION

It is recommended that this value not be changed. Equipment damage can occur if low priority values are given to high priority alarms.

Communication Failure Retry Time — The Communication Failure Retry Time option configures how long the zone controller will wait before re-sending an alarm that was not received by a device. The option is configured in category 11, option 2. The range of acceptable values is 0 to 240 minutes. The default is 10 minutes. A value of 0 disables this function.

Re-Alarm Time — The Re-Alarm Time option configures how long the zone controller will wait before re-sending an alarm after the alarm message has been received by a device. When the condition returns to normal, the alarm will no longer be sent. The option is configured in category 11, option 3. The range of acceptable values is 1 to 255 minutes. The default is 30 minutes. A value of 255 disables re-alarming.

Alarm Routing Control — The Alarm Routing Control option determines which devices on the CCN will receive and process the alarm information. This option cannot be configured from the monitor thermostat. The default value is 11000000. A value of 10000000 sends alarms to the Building Supervisor. A value of 01000000 sends alarms to the Auto-Dial gateway. A value of 00010000 sends alarms to the printer interface. This value sends/marks alarms for building supervisors autodial gateways. A value of 00000000 disables all alarms going out on the CCN. The option is configured through Carrier network access software.

Alarm System Name — The Alarm System Name option identifies the alarm system on the CCN. This option cannot be configured from the zone controller. The default name is 33CSZC. The option is configured through Carrier network access software.

ALARM DESCRIPTION

This section describes the major alarm types that are available within the system. The alarm types are: space temperature alarm (comfort trend) and IAQ status alarm.

The section describes each alarm in detail: what controllers it works with; the sensors required for the alarm to be activated; and how the alarm is configured, disabled, and normalized. The description provides information on how the alarm is applied and the necessary hardware required for proper operation.

Space Temperature Alarm (Comfort Trend) — See Table 6 for Space Temperature Alarm Specifications.

Table 6 — Space Temperature Alarm

FUNCTION	DESCRIPTION
Controllers	Monitor Thermostat/Zone Controller
Sensor Required	None (Space Temperature Sensor is in zone controller)
Sensor Wiring	None, Sensor Integral to Zone Controller
Input	Comfort Trend Demand Comfort Trend Time Limit
Output	SE01 Comfort Trend Error (Space Temperature Alarm)
Category/Option	7.3 (Comfort Trend Demand) 7 4 (Comfort Trend Time Limit)
Configuration Values	7.3 — Range 0 F to 25.5 F 7.4 — Range 2 to 255 minutes
Configuration Increments	7 3 — 0 1° F 7 4 — 1 minute
Associated Functions	None

OPERATION — A space temperature (Comfort Trend) alarm indicates when the system is unable to maintain space temperature comfort conditions. Space temperature alarms are an indication that the HVAC system operation has difficulty maintaining zone space temperature. The temperature demand of the space or zone is the difference between the set point (either heating or cooling) and actual space temperature of the zone.

When the demand of the zone exceeds the Comfort Trend Demand value (category 7, option 3), the zone controller begins to calculate the temperature trend of the zone. The temperature trend is simply the "real time" ability of the space to lower or reduce the temperature demand of the space. The time is measured during the period when the temperature trend does not show improvement, or indicates conditions between set point and space temperature are getting worse. When the length of time measured reaches the Comfort Trend Time Limit value, a Space Temperature alarm is initiated.

CONFIGURATION TO ACTIVATE ALARM — To activate a space temperature alarm, configure the Comfort Trend Demand set point to any value except 0. Configure the Comfort Trend Time Limit set point.

CONFIGURATION TO NORMALIZE ALARM — The space temperature alarm will automatically clear when the system can properly condition the space. To remove any alarms, follow the procedure to clear the alarm from the zone controller and network using manual reset.

CONFIGURATION EXAMPLE

Occupied Space Cooling Set Point:	72 F
Occupied Space Heating Set Point:	68 F
Comfort Trend Demand:	4.5 F
Comfort Trend Time Limit:	7 minutes

The system is operating normally without alarm during the cooling mode. The trend of the space temperature indicates that the system is unable to keep the space within set points, and space temperature rises to 76.5 F. The trend of the space temperature is not improving, and temperature conditions are getting worse for at least 7 minutes. At that time, a space temperature (Comfort Trend) alarm (SE01) is initiated. The alarm will automatically clear when the system can properly maintain space temperature conditions within the space.

The alarm is removed using the manual reset. The system will not return to normal without being reset.

CLEARING THE ALARM FROM THE ZONE CONTROLLER — Space temperature alarms can be cleared or "erased" from the system in three ways:

- Cycle power to the zone controller OFF, then ON.
- Reset the zone controller. Initiate a reset by switching the Unit Reset option to the ON configuration (Category 7, Option 8).
- Switch the configuration value for Comfort Trend Demand or the Comfort Trend Time Limit to zero, then back to an acceptable range (category 7, options 3 or 4).

Indoor-Air Quality Status Alarm — Refer to Table 7 for IAQ (indoor-air quality) alarm specifications.

OPERATION — When the CO_2 level exceeds the preset level, the sensor signals the zone controller. The zone controller will wait until the IAQ Alarm Delay option (category 14, option 4) has expired, then it will issue an SE10. The system (if configured) will bring in fresh outdoor air to meet IAQ requirements.

Table 7 — IAQ Status Alarm

FUNCTION	DESCRIPTION
Controllers	Monitor Thermostat, Zone Controller, Bypass Controller
Sensor Required	IAQ (CO_2) Sensor
Sensor Wiring	Pins 6 and 7 of Relay Board or Wire to Damper Board
Input	Closed contact when level exceeded.
Output	SE-10
Category/Option	14.1 (System IAQ Participation) 14 2 (Local IAQ Sensor)
Configuration Values	14.1 — ON 14.2 — ON
Configuration Increments	Not Applicable
Associated Functions	None

When the CO_2 level exceeds the preset level (factory configuration is 1000 ppm and cannot be changed without optional software), the sensor signals the monitor thermostat. The monitor thermostat energizes the indoor-fan motor (if not already running). If the Auxiliary Relay has been configured for IAQ operation, the monitor thermostat energizes the relay after the time delay on the first IAQ alarm of the day, or immediately on any other IAQ alarms. This is intended for use with an economizer, but can be wired to an exhaust fan or HRV (heat recovery ventilator). If used with an economizer, the economizer moves to the minimum position and the indoor fan circulates the air throughout the occupied space.

The monitor thermostat has 3 lockout features which will prevent system IAQ mode: if the outdoor humidity is too high or the outdoor temperature is too high or too low.

When the monitor thermostat receives an IAQ alarm from a bypass controller (or itself in monitor-only mode), it sends all the zone controllers the system IAQ alarm.

When the IAQ starts, the economizer damper opens (if configured) and the zone damper moves to the full open position. This forces fresh outside air to enter the zone with deficient IAQ. When the IAQ level drops below the IAQ set point, the economizer and zone dampers return to their standard operating mode.

When the system is bringing in additional outside air, the thermostat is reset 0 to 10° F (field-configured) above and below the original set point to allow the outside air to circulate before the heating or cooling mode is initiated. The zone controller will display status when the system is in this mode.

CLEARING THE ALARM — To clear a system error, use the Unit Reset function. The Unit Reset function is in category 7, option 8. The default is OFF. Use the left set point buttons to set the option to ON. The zone controller will reset all errors.

NETWORK ACCESSIBLE VARIABLES

When using network access software, the set point and operation tables can be accessed. The variables in the tables can be read, written, or forced to a certain value. The zone controller point display table is shown in Table 8. Other network software access tables are shown in Table 9.

Table 8 — Zone Controller Point Display Table

VARIABLE DESCRIPTION	POINT NAME	READ/WRITE CAPABILITY
Zone Temperature	ZT	Yes
Duct Temperature	DT	Yes
Outside-Air Temperature	OAT	Yes
Zone Demand	ZDMD	Read Only
Demand Type	DMDTYPE	Read Only
Occupied	OCC	Yes
Damper Position	DPOS	Yes
Series Fan/Paral. Stage 1	FN	Yes
SH Stage 1/Paral. Stage 2	H1	Yes
SH Stage/Paral. Stage 3	H2	Yes
Exhaust Fan Relay	AUX	Yes
HVAC Usage Meter (Mtr)	UMHVAC	Yes
Override (Ovrd) Usage Mtr	UMUO	Yes
HVAC Ovrd Usage Mtr	UMUOSM	Yes
Airflow CFM	CFM	Read Only
IAQ Status	IAQLOG	Yes

Table 9 — Zone Controller Network Access Tables

TABLE NAME	TABLE DESCRIPTION
33CSZC	Controller ID
CONFIG1	Configuration Table 1
CONFIG2	Configuration Table 2
SERVICE1	Service Table 1
ZONESTAT	Points Display Table
ALARMLOG	Maintenance Table 1
SERVICE2	Service Table 2
SETPOINT	Set Point Table
OCCPC01S	Occupancy Supervisory Table
OCCPC01E	Maintenance Table 2
HOLIDEF	Holiday Definition Table
ALARMDEF	Alarm POC Table
OCCDEFM	Occupancy Definition Table
ALARMS01	Alarm Text Table
HOLDY01S	Holiday Schedule 01
HOLDY02S	Holiday Schedule 02
HOLDY03S	Holiday Schedule 03
HOLDY04S	Holiday Schedule 04
HOLDY05S	Holiday Schedule 05
HOLDY06S	Holiday Schedule 06
HOLDY07S	Holiday Schedule 07
HOLDY08S	Holiday Schedule 08
HOLDY09S	Holiday Schedule 09
HOLDY10S	Holiday Schedule 10
HOLDY11S	Holiday Schedule 11
HOLDY12S	Holiday Schedule 12
HOLDY13S	Holiday Schedule 13
HOLDY14S	Holiday Schedule 14
HOLDY15S	Holiday Schedule 15
HOLDY16S	Holiday Schedule 16
HOLDY17S	Holiday Schedule 17
HOLDY18S	Holiday Schedule 18
BRODEFS	Broadcast POC Table
BROCASTS	Broadcast Table
TIME	Time/Date Table

POC — Product Outboard Control

TROUBLESHOOTING

This section contains information to assist in troubleshooting operating problems and errors associated with the zone controller. The most common operating problems and types of errors associated with the zone controller are:

- Operating Problems. No display or flashing displays occur when the zone controller is not receiving rated power or has miswired connections.
- Zone Controller Communication Problems. Not displaying correct time of day or does not follow associated System Controller program schedule. Device Address not displayed during a communication check from a monitor thermostat.
- Supplemental Heat Problems. The zone controller is not energizing supplemental or auxiliary heating equipment.
- Hardware Failure (HF) Errors. These errors occur when the zone controller detects a problem with one of its own components.
- Storage Failure (SF) Errors. These errors occur when the zone controller detects and replaces faulty data contained within memory with factory selected default values.
- System Errors (SE). These errors occur when the zone controller detects a zone operating problem or has a full usage meter.

Operating problems other than those listed above may be related to the Carrier network.

NOTE: For complete details on the configuration of all affected options, refer to the proper sections in this manual.

General Operating Problems

NO DISPLAY — If the zone controller display remains blank after 24 vac power has been applied to the damper actuator, it is an indication that power is not reaching the zone controller.

At the damper actuator, check that 24 vac is being supplied from the power transformer. Acceptable voltage range is 22 to 30 vac.

The va requirements are:

- 20 va for dampers only. (No relay packs or pressure sensors.)
- 25 va for dampers interfaced with a relay pack or a pressure sensor.
- 30 va for dampers interfaced to both a relay pack and a pressure sensor.

Check the wiring between the 24 vac transformer and the damper actuator or replace the transformer as necessary.

At the zone controller wiring connector board, with the zone controller connected, check for approximately 10 vdc (steady) across the red and white wires from the damper actuator.

Check the continuity of the 5-conductor wire running between the zone controller wiring connector board and the damper actuator.

Check that the zone controller ribbon cable is properly seated in the wiring connector board. Disconnect, then reconnect the ribbon cable from the connector board. If the zone controller display remains blank after the ribbon cable is reconnected, use the ribbon cable wiring diagram on page 27 to check the zone controller wiring connector block and ribbon cable.

Try connecting different zone controllers. If a different zone controller works, the other zone controller is faulty. Try connecting the zone controller at the damper actuator board. If it works, the wiring from the damper actuator to the zone controller is faulty.

At the damper actuator, with the zone controller connected, check for approximately 10 VDC (steady) across the white and red wires to the zone controller. If faulty, replace the damper actuator.

BLINKING DISPLAY — If the zone controller display shows four zeros that either blink on and off, or that are constantly displayed, it is an indication the zone controller is continuously going through the power-up sequence and cannot enter normal operating mode.

Check for any of the following conditions that would cause the display to blink or constantly display four zeros:

- Low voltage from the 24 vac transformer. Acceptable voltage range is 22 to 30 vac.

- Unsteady 10 vdc across the red and white wires from the damper actuator.
- The yellow or blue wire from the damper actuator to the zone controller wiring connector board is broken or disconnected.
- The zone controller ribbon cable is improperly installed or defective.
- The zone controller wiring connector board is defective. See diagram on page 27 for ribbon cable and wiring connector block troubleshooting information.
- The zone controller or damper actuator is defective.

Zone Controller Communication Problems — Most communication problems are associated with improper configuration of the system devices, faulty wiring, or failure of a single device wired to the communication bus.

COMMON COMMUNICATION RELATED PROBLEMS — The following are indications of communication related problems:

- A zone controller does not correctly indicate equipment fan operation, the current system mode, or time of day.
- During the communication check, the system controller associated with the zone controller fails to verify communications with the zone controller.
- The zone controller operates continuously in unoccupied or occupied modes, even though unoccupied program or local unoccupied control functions are properly configured.

COMMON CAUSES OF SYSTEM COMMUNICATION PROBLEMS — The configuration of the network is such that one item can cause multiple problems, or one error can cover up several problems. If a problem is found, correct it and check the network for other communications problems that may appear.

1. Check the device address of the zone controller. A zone controller must have an address below the associated monitor thermostat and within the controller scanning range. See Table 10.

Table 10 — Controlling Device Scanning Range

CONTROLLING DEVICE	MAXIMUM SCANNING RANGE
33CSVM(T)-04	4 Device Addresses below its own
33CSVM(T)-16	16 Device Addresses below its own
33CSVM(T)-32	31 Device Addresses below its own

   For additional information about addressing devices on the network, refer to the Carrier Network Installation Instructions.
2. Check the configuration of the communication related options of the system controller and each device in the problem system. Every device has one or more communication related options that could be configured incorrectly.
3. Check the zone controller mounting and cover plates for protruding screw heads or bent interior standoffs.

   Protruding screw heads on the rear mounting plate can cause a short between the rear pins of the set point buttons. The zone controller can not communicate with the system controller when the set point buttons are depressed.

   Bent interior standoffs could constantly press the set point buttons and block the device from communicating.
4. Check the zone controller wiring connector board for the correct network wire connections.

   The red, green, and black wires must be in their proper locations. The wiring connector block is labeled to indicate the correct wiring connections. Use the ribbon cable wiring diagram on page 27 to check for a faulty ribbon cable, wiring connector board, or failed TVA (transient voltage arrestor).

If the communication related problem still exists, a device on the network could be defective or the communication bus wiring may be faulty.

Supplemental Heat Problems — When the zone controller is interfaced to supplemental/auxiliary heating equipment, use the following section to troubleshoot problems related to the supplemental heat operation.

SUPPLEMENTAL HEAT (SUH) ANNUNCIATOR NOT DISPLAYED — The zone controller does not activate supplemental heat upon 1.5° F demand (no SUH annunciator displayed).

If the zone controller zone has a heating demand of 1.5° F or more and the optional supplemental/auxiliary heat is not energized, the problem could be one or a combination of the following items:

1. Ensure the zone controller zone heating demand is equal to or greater than 1.5° F.
2. Ensure the zone controller Zone Supplemental Heat option (category 6, option 1) is configured ON.
3. Ensure the zone controller Supplemental Heat Time Guard has expired. Upon power up, reset, or after the supplemental heat has been deenergized, the length of Time Guard is 2 minutes.

   The Supplemental Heat Time Guard Override option (category 6, option 3) may be used to override the time guard to 30 seconds for one cycle. Activate the override by setting the option to ON.
4. Ensure the zone controller is free of possible HF or SF Errors that can lockout its ability to energize supplemental heat. HF and SF Errors will be displayed by the zone controller if the Error Code Display function (category 7, option 1) is configured ON.
5. Check the configuration of the monitor thermostat associated with the zone controller. The monitor thermostat has one or more options that have the ability to lockout the zone controller supplemental/auxiliary heat.

   The monitor thermostat Heating Lockout Temperature set point should be set correctly. For additional information refer to the monitor thermostat installation and operating instructions.

SUPPLEMENTAL HEAT (SUH) ANNUNCIATOR DISPLAYED — The zone controller SUH annunciator is ON, but the supplemental heat source is not energized.

Check the zone controller's associated system controller's system mode. If the system controller has selected a heating mode, the zone controller HEAT annunciator will be on, yet the supplemental heat may be OFF.

Check the LEDs on the zone controller relay pack. Perform the correct procedure.

LED NOT LIT — The zone controller SUH annunciator is ON but the LED on the relay pack is not lit. See Fig. 13 and 14.

1. At the damper actuator, unplug the relay pack and check the voltages between the damper output PIN 1 (common) and PIN 5 (H1). There should be approximately 7.5 to 9.5 vdc (steady). If the zone controller zone demand is equal or greater than 2.0° F, the voltage between PIN 1 (common) and both PIN 5 (H1) and PIN 6 (H2) should be the same. If not, replace the damper actuator circuit board.
2. At the damper actuator, with the relay pack plugged in, check the voltages across the relay pack input connector plug. Voltages should read approximately 4 to 6 vdc (steady) between the black wire and the appropriate relay pack input wire. If not, replace relay pack.

LED IS LIT — The zone controller SUH annunciator is ON, the LED on the relay pack is lit, but the corresponding equipment stage is not energized. See Fig. 13 and 14.

1. Check the AC voltage across the relay board common (red) and any deenergized relay (H2 or H3/FAN in Fig. 14). The voltage should read 24 vac. If not, check for wiring error.
2. Check the AC voltage across the relay board common (red) and any suspect relay board output (H1 in Fig. 14). The voltage should read near zero (<1 vac). If not, check for bad relay board.
3. Check the AC voltage across a suspected contactor coil. The voltage should read 24 vac. If not, check the contactor coil wiring.
4. Other possibilities are: bad contactor, defective equipment, or no unit power.

Zone Controller Wiring — Refer to Fig. 15 for a wiring diagram of the zone controller ribbon strip.

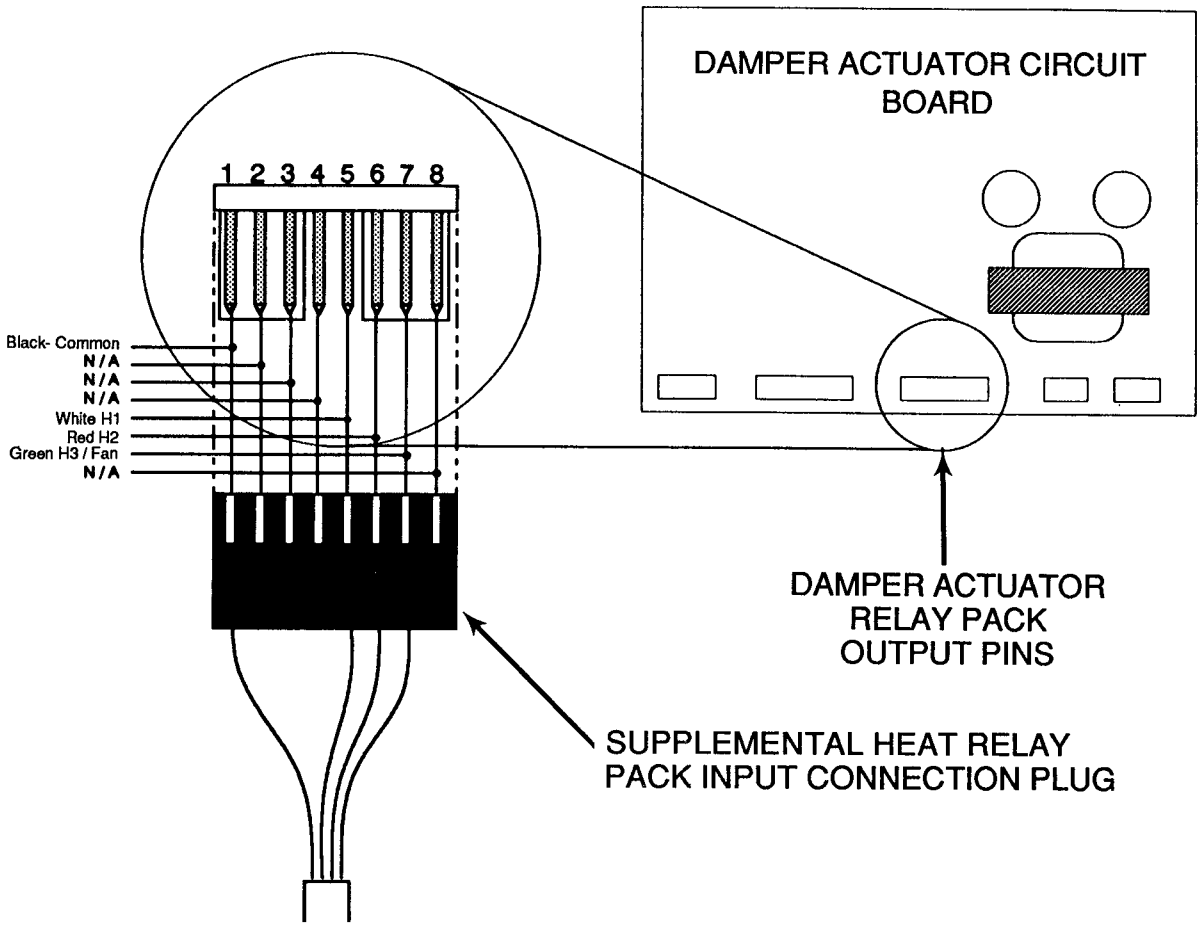


Fig. 13 — Damper Actuator Relay

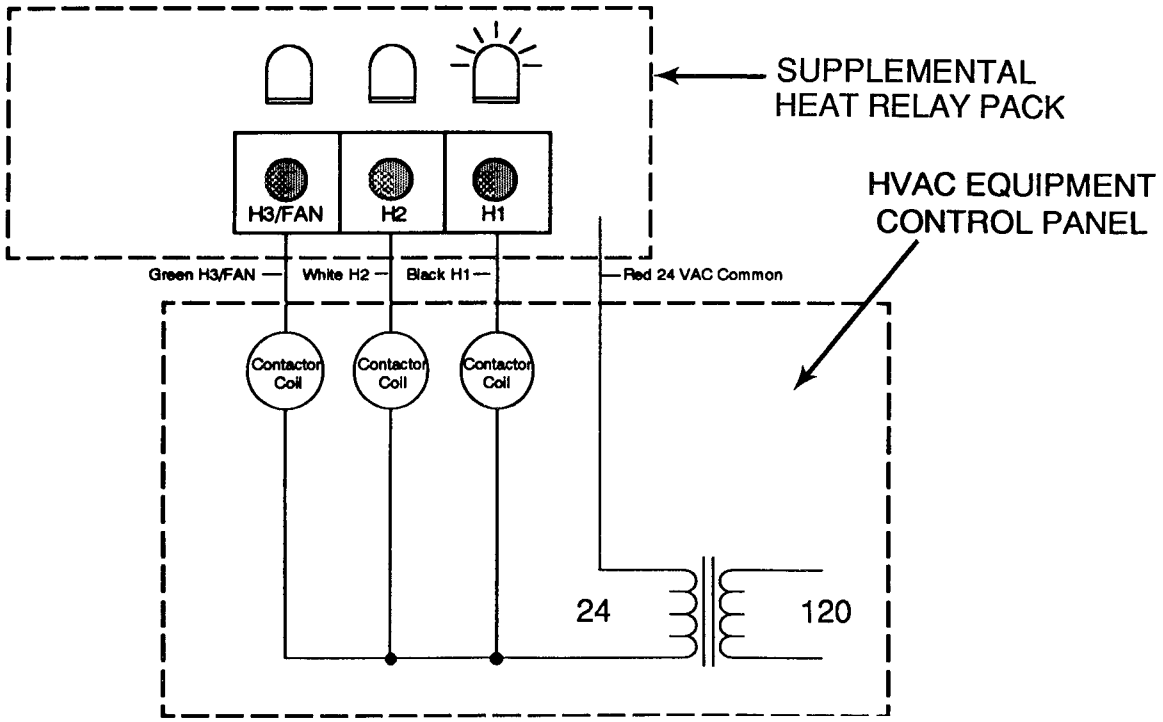
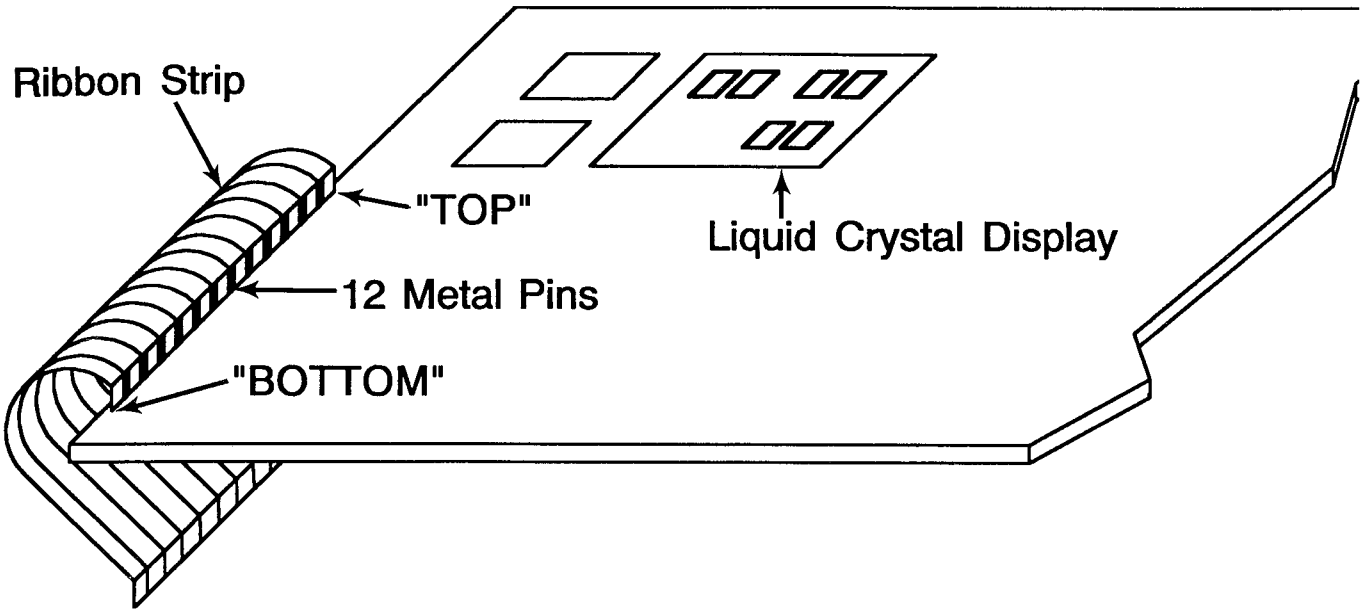


Fig. 14 — Relay Pack Wiring



Ribbon Strip Metal Pins	Corresponding wire connected to Terminal Block	
"TOP" 1st Pin	SBO +	
2nd Pin	Red	3-Wire Cable Communication Bus
3rd Pin	Black	
4th Pin	Green	
5th Pin	SBO-	
6th Pin	White	5-Wire Cable to Damper or Single Zone Relay Pack
7th Pin	Red	
8th Pin	Blue	
9th Pin	Yellow	
10th Pin	Green	
11th Pin	Red (RS+)	
"BOTTOM" 12th Pin	Black (RS–)	

LEGEND

SBO — Setback Override
TVA — Transient Voltage Arrestor

NOTES
1 By checking continuity on ribbon strip pins, continuous or intermittent problems with the "connector block" (i e , bad or cracked solder joints or tracings) can be found.
2. Check continuity between the communication bus wiring connector block terminals (red and black) and the ribbon strip SBO– termination. If there is continuity, the TVA has failed.

Fig. 15 — Ribbon Cable and Connector Block Wiring

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