

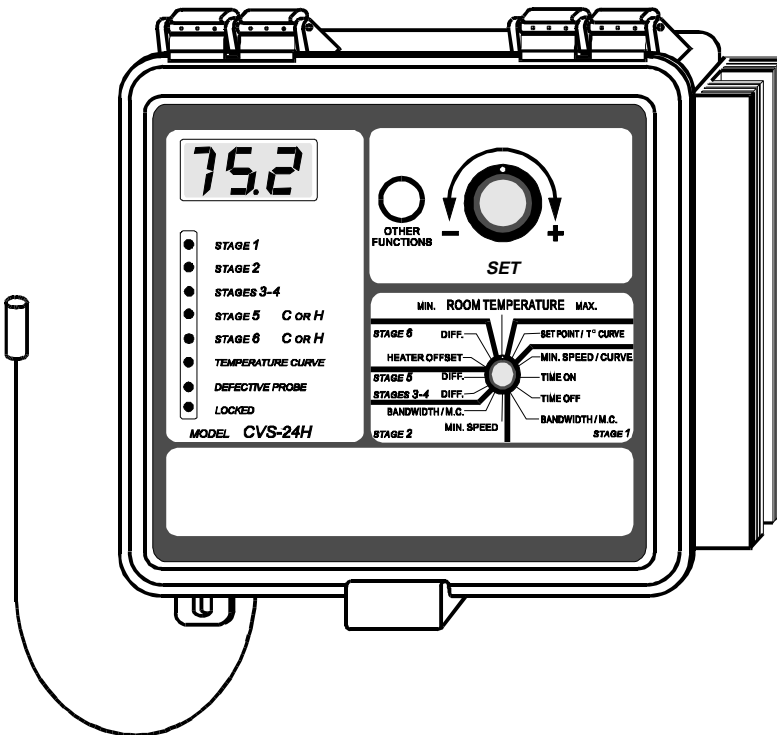
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# Temperature Controller

# CVS-24H

## User's Guide

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Read this guide carefully before using the controller.

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## FOR CUSTOMER USE

This controller has a serial number located on the side of the enclosure. Please record this number and retain it for your records.

Model number        CVS-24H      
Serial number

## FEATURES

The CVS-24H controls two stages of variable speed cooling fans and two stages of constant speed fans, as well as two stages of constant speed fans or heating units. In addition, the last constant speed fan stage can be configured as a mist cooling stage.

The main features of the controller are as follows:

- A **THREE DIGIT DISPLAY** allows you to specify temperatures to within one tenth of a degree (Celsius or Fahrenheit).
- **PILOT LIGHTS** indicate the state of outputs, allowing you to monitor the operation of the system without having to enter the room.
- Up to **FOUR INDEPENDENT TEMPERATURE PROBES** can be connected to the controller in order to obtain a more accurate reading of the average room temperature and a faster reaction time.
- A **TEMPERATURE CURVE** comprised of six different points provides an automatic adjustment of the target room temperature over a given period of time.
- A **MINIMUM VENTILATION CYCLE** allows you to operate the fans continuously or intermittently when ventilation is not required for a cooling purpose. This reduces the level of humidity and supplies oxygen to the room. It also prevents the fans from freezing in the winter.
- You can choose from among **TEN DIFFERENT MOTOR CURVES** to ensure that the controller supplies the correct voltage to the fan motors. This feature provides a high degree of compatibility between controller and fan motor.
- The controller supplies **MAXIMUM VOLTAGE DURING 2 SECONDS** at every variable speed fan start-up, in order to overcome the inertia of the ventilation system components and de-ice the fan blades in cold weather conditions.

- A **DE-ICING CYCLE** is provided for de-icing stage 2 variable-speed fans in cold weather conditions.
- Fuses located at the input and outputs of the controller provide **OVERLOAD AND OVERVOLTAGE PROTECTION**.
- When used with a computer communication module, the controller **COMMUNICATES WITH A COMPUTER**. This makes possible the centralization of information management and a more diversified control strategy.
- When used in combination with a WR-F-1A controller, the CVS-24H **COORDINATES THE MOVEMENT OF THE AIR INLETS WITH THE OPERATION OF THE FANS**. This allows the air inlets to be adjusted correctly, free of the influence of noncontrollable factors such as wind or air from adjoining rooms.

## **PRECAUTIONS**

**In case of a system failure, we strongly recommend that you install an alarm system as well as a natural ventilation system in the room. We also recommend that you install a back-up thermostat on at least one cooling stage (to connect the thermostat, refer to the wiring diagram enclosed with this user's guide).**

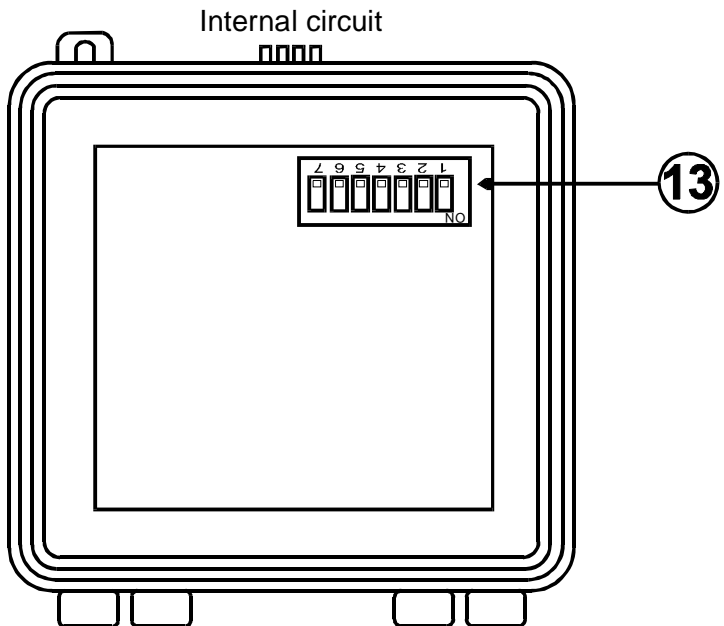
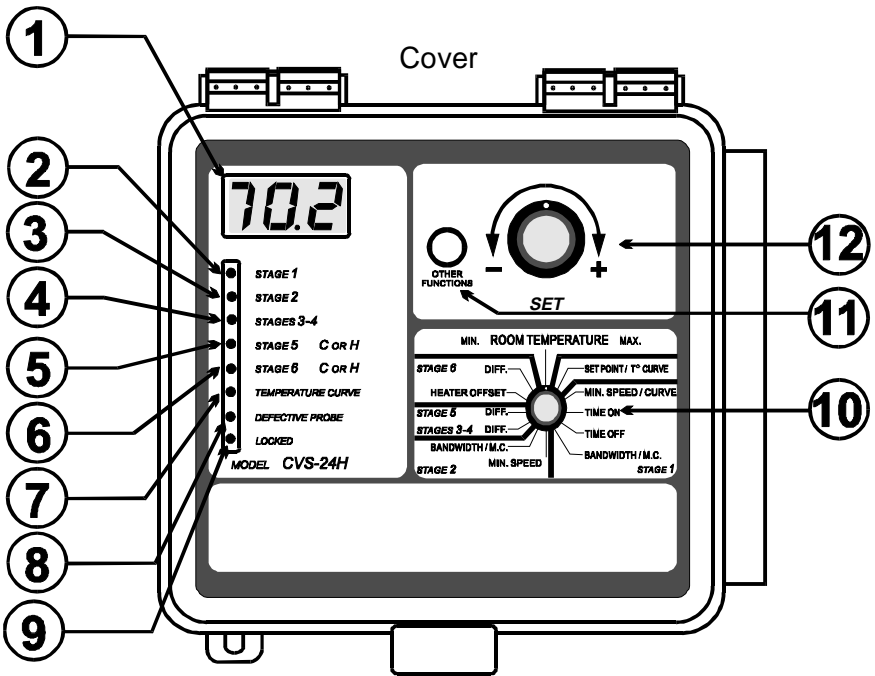
**Fuses on the input and outputs of the controller provide overload and overvoltage protection. To further prolong the life of the controller, we recommend that you install an additional protection device on the supply circuit as well as an external relay on all ON/OFF stages.**

**The room temperature where the controller is installed MUST ALWAYS REMAIN BETWEEN 32° ET 104°F (0° ET 40°C).**

**To avoid exposing the controller to harmful gases or excessive humidity, it is preferable to install it in a corridor.**

**DO NOT SPRAY WATER ON THE CONTROLLER**

# LOCATION OF THE CONTROLS



- 1** **THREE DIGIT DISPLAY**  
Displays temperatures and other parameters shown around the parameter selection knob.
- 2** **STAGE 1 PILOT LIGHT**  
Turns on when the stage 1 fans are on.
- 3** **STAGE 2 PILOT LIGHT**  
Turns on when the stage 2 fans are on.
- 4** **STAGE 3 AND 4 PILOT LIGHT**  
Flashes when the stage 3 fans are on and turns on when the stage 4 fans are on.
- 5** **STAGE 5 PILOT LIGHT**  
Turns on when the stage 5 fans or heating units are on.
- 6** **STAGE 6 PILOT LIGHT**  
Turns on when the stage 6 fans or heating units are on.
- 7** **TEMPERATURE AND MINIMUM SPEED CURVE PILOT LIGHT**  
Turns on when the temperature curve is activated. Flashes when the temperature curve is activated and the minimum speed curve is in operation.
- 8** **DEFECTIVE PROBE PILOT LIGHT**  
Turns on when a defective probe is detected.
- 9** **LOCKED PARAMETER PILOT LIGHT**  
Turns on when the parameters are locked.
- 10** **PARAMETER SELECTION KNOB**  
Use this selection knob to select a parameter.
- 11** **TEMPERATURE CURVE PUSH-BUTTON**  
Use this push-button to view or set the points of the temperature curve.
- 12** **ADJUSTMENT KNOB**  
Use this adjustment knob to adjust the value of the selected parameter.

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## SWITCHES

Use these switches to set the operating modes as described in the table below.

DESCRIPTION	SWITCH		OPERATING MODE
	#	POSITION	
LOCKING THE PARAMETERS	1	ON OFF	Locked parameters Unlocked parameters
TEMPERATURE UNITS	2	ON OFF	Degrees Celsius Degrees Fahrenheit
PROBE # 2	3	ON OFF	Activated probe Deactivated probe
PROBE # 3	4	ON OFF	Activated probe Deactivated probe
PROBE # 4	5	ON OFF	Activated probe Deactivated probe
COOLING OR HEATING	6 and 7	6 : OFF ; 7 : ON or OFF 6 : ON ; 7 : ON 6 : ON ; 7 : OFF	Stage 5 : cooling    Stage 6 : cooling Stage 5 : heating    Stage 6 : heating Stage 5 : cooling    Stage 6 : heating



# INSTALLATION

## Step 1 : MOUNTING THE CONTROLLER

Open the latch and lift the cover. Remove the black caps located on each of the four mounting holes. Mount the enclosure to the wall using four screws. Insert the screws into the mounting holes and tighten. **Fasten the black caps onto the mounting holes.**

## Step 2 : CONNECTING THE EQUIPMENT

To connect the fans and heating units to the controller, refer to the wiring diagram enclosed with this user's guide.

- Set the voltage switch located inside the enclosure to the appropriate line voltage.
- Use the electrical knockouts provided at the bottom of the enclosure. Do not make additional holes in the enclosure, particularly on the side of the enclosure when using a computer communication module.
- If metallic cable holders are used to secure cables entering the enclosure, use the ground plate provided with the controller. Connect the ground wire to the ground stud on the plate.
- When connecting heating units to the controller, it may be necessary to install a transformer in order to adapt the voltage to the heating units.



ALL WIRING MUST BE DONE BY AN AUTHORIZED ELECTRICIAN AND MUST COMPLY WITH APPLICABLE CODES , LAWS AND REGULATIONS. BE SURE POWER IS OFF BEFORE DOING ANY WIRING TO AVOID ELECTRICAL SHOCK AND EQUIPMENT DAMAGE.

## Step 3 : CONNECTING THE PROBES

### To extend the probes:

Each probe can be extended up to 500 ft (150 m). To extend a probe:

- Use a shielded cable with an outside diameter between 0.245 and 0.260 in (6.22 and 6.60 mm) (the cable dimension must not be under 18 AWG) to ensure the cable entry is liquid-tight. **Do not ground the shielding.**
- It is preferable to weld the cable joint to ensure a proper contact between the two cables.

**CAUTION:** Do not run probe cables next to other power cables. When crossing over other cables, cross at 90°.

### To connect the probes:

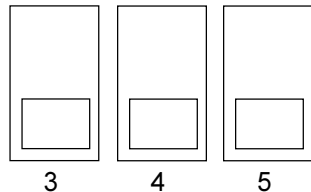
The controller is supplied with one probe connected to terminal #1. Up to three additional probes can be connected to the controller.

- Use terminals # 2, 3 and 4 to connect the additional probes as shown on the wiring diagram enclosed with this user's guide.

**CAUTION:** The probes operate under low voltage and are isolated from the supply. Be sure the probe cables remain isolated from all high voltage sources. In particular, do not route the probe cables through the same electrical knockout as other power cables.

- Activate each additional probe by <sup>ON</sup> setting the appropriate switch to ON:

- Switch # 3 activates terminal # 2.
- Switch # 4 activates terminal # 3.
- Switch # 5 activates terminal # 4.



**FACTORY SETTING:** When the controller is shipped from the factory, switches # 3, 4 and 5 are set to OFF (the probes are deactivated).

## Defective probes:

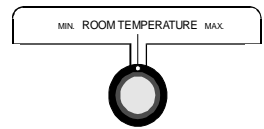
If a defective probe is detected, the defective probe pilot light turns on. The room temperature shown on the display will then be the average value of all temperatures measured by the probes remaining in proper condition and the controller will operate according to this temperature.

To determine which probe is defective:

- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.



- Press the push-button. If the probe connected to terminal #1 (supplied with the controller) is not defective, the word "PR1" and the temperature measured by the probe will alternately appear on the display. If the probe connected to terminal #1 (supplied with the controller) is defective, the word "PR1" and the letter "P" will alternately appear on the display.



For each additional probe connected to the controller:

- Press the push-button once again. If the probe is not defective, the word "PR#" (# is the number of the terminal to which the probe is connected) and the temperature measured by the probe will alternately appear on the display. If the probe is defective, the word "PR#" and the letter "P" will alternately appear on the display.

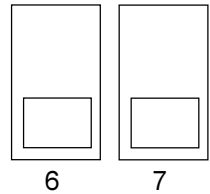
## Step 4 : SELECTING THE OPERATING MODE FOR STAGES 5 AND 6

Stages 5 and 6 can both be used for cooling or heating. If one stage is used for cooling and the other for heating, the fans must be connected to stage 5 and the heating units to stage 6.

### To select the operating mode:

■ Set switches # 6 and # 7 to the required position: ON

- Stages 5 and 6 used for heating:  
set switch # 6 to ON and switch # 7 to ON.
- Stages 5 and 6 used for cooling:  
set switch # 6 to OFF and switch # 7 to ON or OFF.
- Stage 5 used for cooling and stage 6 used for heating:  
set switch # 6 to ON and switch # 7 to OFF.



**FACTORY SETTING:** When the controller is shipped from the factory, switch #6 is set to OFF and switch #7 is set to OFF (stage 5 and 6 used for cooling).

## **Step 5 : SELECTING MOTOR CURVES FOR THE VARIABLE SPEED STAGES**

The relationship between the voltage supplied to a variable speed motor and the speed it develops is described by a motor curve. This curve varies with the make and capacity of the motor. The variable speed motors available in the industry have been grouped into ten categories and the controller is programmed with a different motor curve for each of these categories. Selecting an appropriate curve for each of the variable speed stages will ensure that the controller supplies the correct voltage to the fan motors.

### **To select a motor curve for stage 1:**

- In the list of motors enclosed with this user's guide, locate the make and capacity of the motors you are using and note the corresponding curve number.
- Set the parameter selection knob to BANDWIDTH-STAGE 1. The stage 1 bandwidth appears flashing on the display.
- Press the temperature curve push-button. The currently selected curve number appears flashing on the display.
- Turn the adjustment knob to adjust the curve number to the desired value.
- Return to the stage 1 band width display either by pressing the temperature curve push-button or by waiting 10 seconds without changing the position of the adjustment knob.

### **To select a motor curve for stage 2:**

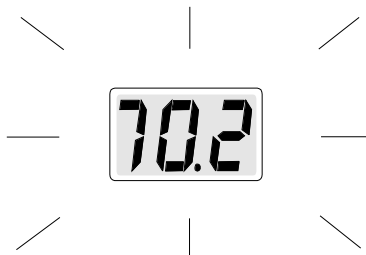
- Repeat the steps described for stage 1, this time setting the parameter selection knob to BANDWIDTH - STAGE 2.

**FACTORY SETTING:** When the controller is shipped from the factory, curve number 4 is selected for both stage 1 and stage 2.

# USING THE CONTROLLER

## 1 VALUES FLASHING ON THE DISPLAY

The display flashes certain values and does not flash others. The flashing indicates that the value on the display can be adjusted. Values that are not flashing can not be adjusted.

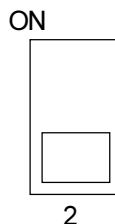


## 2 HOW TO SELECT A TEMPERATURE UNIT

Temperatures can be displayed either in degrees Celsius or degrees Fahrenheit.

■ Set switch # 2 to the desired position:

- ON : degrees Celsius.
- OFF : degrees Fahrenheit.

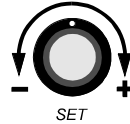


**FACTORY SETTING:** When the controller is shipped from the factory, switch #2 is set to OFF (temperatures are displayed in degrees Fahrenheit).

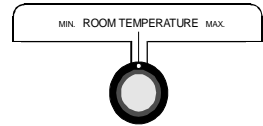
### 3 HOW TO VIEW AND RESET TEMPERATURES

To view the room temperature and the temperature measured by each probe:

- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.



The room temperature shown on the display is the average value of all temperatures measured by probes that are activated and in proper operating condition.



- Press the push-button. The word "PR1" and the temperature measured by the probe connected to terminal # 1 (supplied with the controller) alternately appear on the display.

For each additional probe connected to the controller:

- Press the push-button once again. The word "PR#" (# is the number of the terminal to which the probe is connected) and the temperature measured by the probe alternately appear on the display.

To view the minimum and maximum temperatures:

- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.
- Turn the adjustment knob clockwise by one notch. The minimum temperature appears flashing on the display.
- Turn the adjustment knob clockwise one notch further. The maximum temperature appears flashing on the display.
- Turn the adjustment knob clockwise a third notch. The room temperature again appears on the display.

- If the adjustment knob is turned counterclockwise rather than clockwise, the display sequence will be reversed (room-maximum-minimum-room).

The minimum and maximum temperatures are the lowest and highest values of all room temperatures measured since the last reset.

### To reset the minimum and maximum temperatures:

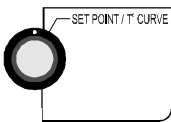
- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.
- Turn the adjustment knob clockwise (or counterclockwise) by one notch and leave it in this position. The minimum (or maximum) temperature first appears flashing on the display. After 10 seconds, the display stops flashing and the room temperature again appears on the display, indicating that the reset is completed.

When the minimum and maximum temperatures are reset, their current values are erased from memory and the controller begins to store in memory new values measured from that moment on.

**NOTE :** To avoid resetting the minimum and maximum temperatures while viewing them, be sure to return to the room temperature display within the 10 second delay.

## 4 PARAMETER DESCRIPTIONS

### ▶ SET POINT / TEMPERATURE CURVE



The controller maintains a specified target room temperature by controlling the operation of the fans and heating units. The target room temperature can be specified in two ways:

#### 1 - With a temperature set point

When a temperature set point is specified, the controller considers this temperature set point as the target room temperature as long as the temperature curve is not activated.

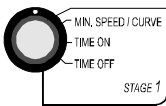


## 2 - With a temperature curve

When a temperature curve is specified and activated, the controller automatically adjusts the target room temperature over a given period of time. The temperature curve is comprised of six points. A day number as well as a temperature set point for this day number must be specified for each of the six points. When the temperature curve is activated, the controller adjusts the target room temperature every hour in a linear fashion between two consecutive points. When the last point of the curve is reached, the temperature curve becomes deactivated. The controller maintains the last temperature set point of the curve until the curve is reactivated or until a new temperature set point is specified.

### ► STAGE 1 PARAMETERS

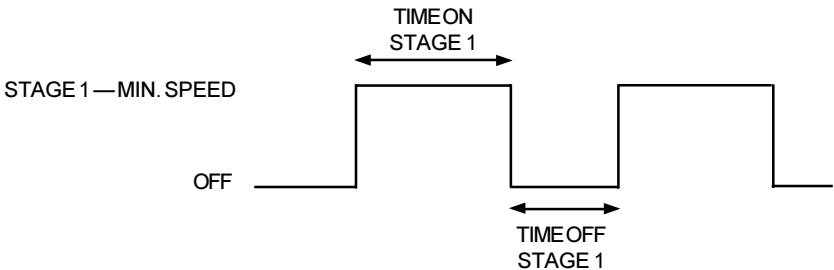
#### Minimum ventilation cycle parameters:



When ventilation is not required for a cooling purpose, the stage 1 fans operate according to the minimum ventilation cycle.

Time on [seconds] - The stage 1 time on is the running time of the stage 1 fans when they are operating according to the minimum ventilation cycle.

Time off [seconds] - The stage 1 time off is the off time of the stage 1 fans when they are operating according to the minimum ventilation cycle.



The fans can be set to operate in three different ways:

1 - To run the fans continuously: set time off to zero and time on to any value other than zero.

2 - To run the fans intermittently: set time on to the desired running time and time off to the desired off time.

3 - To stop the fans: set time on to zero and time off to any value (equal to or other than zero).

Minimum speed / curve [% of the full speed of the fans] - When the stage 1 fans operate according to the minimum ventilation cycle, they run at minimum speed. This speed can be specified in two ways:

1 - With a single minimum speed

When a single minimum speed is specified and the minimum speed curve is deactivated or the minimum speed curve is activated but not effectively in operation, the stage 1 fans run at this speed.

2 - With a minimum speed curve

When a minimum speed curve is specified and activated, the controller automatically adjusts the stage 1 minimum speed over a given period of time. The minimum speed curve is comprised of six points. A day number as well as a minimum speed for this day number must be specified for each of the six points. When the minimum speed curve is activated, the controller adjusts the stage 1 minimum speed every hour in a linear fashion between two consecutive points.

However, if the room temperature falls below the following values:

(1) Stage 6 is used for cooling: **"set point - 5°F (2.8°C)"**

(2) Stage 6 is used for heating:

**"set point - 5°F (2.8°C) - heat offset - differential 6"**

or

**"set point"** if the preceding value is greater than the set point

the fans will begin to run at the minimum speed specified for the first point of the curve and will continue to do so as long as the room temperature remains below the set point. When the room temperature rises above the set point, the fans will return to the current minimum speed.

When the last point of the curve is reached, the curve becomes deactivated. The controller maintains the last minimum speed of the curve until the curve is reactivated or until a new single minimum speed is specified.

The minimum speed curve and the temperature curve are related in the following ways:

- The minimum speed curve can be activated only if the temperature curve is already activated.
- All points of the minimum speed curve, other than the first one, are automatically given day numbers identical to those specified for the temperature curve. Only the first point of the minimum speed curve has an adjustable day number. This day number must be higher or equal to the day number specified for the first point of the temperature curve and lower than the day number specified for the second point of the temperature curve.

For example:

	TEMPERATURE CURVE	MINIMUM SPEED CURVE
POINT 1	d5	d5 to d9 (adjustable)
POINT 2	d10	d10 (not adjustable)

- When the minimum speed curve is activated, it will effectively be in operation (i.e. the controller will begin to adjust the minimum speed according to the specified points of the curve) only when the current day number of the temperature curve reaches the first day number of the minimum speed curve.

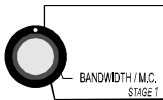
For example:

	TEMPERATURE CURVE		MINIMUM SPEED CURVE	
	Day number	Temperature	Day number	Speed
POINT 1	d5	90.0 °F	d7	10 %
POINT 2	d10	85.0 °F	d10	20 %

⇒ If you activated the temperature curve yesterday, the current day number of the temperature curve is d6. Therefore, if you activate the minimum speed curve today, it will effectively be in operation only tomorrow, when the current day number of the temperature curve reaches d7. In the meantime, the fans will run at the specified single minimum speed.

⇒ If you activated the temperature curve three days ago, the current day number of the temperature curve is d8. Therefore, if you activate the minimum speed curve today, it will effectively be in operation the moment you activate it. In this case, the current minimum speed will be a value between 10% and 20%.

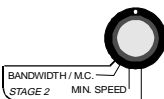
### Variable speed ventilation:



When ventilation is not required for cooling, the stage 1 fans stop operating according to the minimum ventilation cycle. The fans start to operate continuously and their speed varies according to the room temperature.

**Bandwidth** [°F or °C] - The stage 1 bandwidth is the variation in the room temperature between the moment the stage 1 fans run at minimum speed and the moment they reach full speed.

### ► STAGE 2 PARAMETERS



**Minimum speed** [% of the full speed of the fans]  
- The stage 2 minimum speed is the speed at which the stage 2 fans start to run and return to a stop.

**Bandwidth** [°F or °C] - The stage 2 bandwidth is the variation in the room temperature between the moment the stage 2 fans run at minimum speed and the moment they reach full speed.

### **DE-ICING OF STAGE 2 FANS**

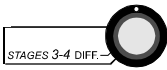
A de-icing cycle is provided to allow de-icing of stage 2 fans in cold weather conditions. A cycle is defined to start stage 2 fans periodically. When the cycle time has elapsed, the stage 1 fans are stopped. The stage 2 fans are

started at full speed and then operated at the stage 2 minimum speed during a user-defined time. Then, stage 2 fans are turned off and operation of stage 1 fans is resumed at the appropriate speed.

De-icing Cycle Time [in minutes] - The stage 2 de-icing cycle time is the time lapse between de-icing operations.

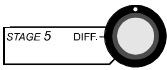
De-icing Time On [in seconds] - The stage 2 de-icing time on is the time stage 2 fans are turned on during de-icing operations.

## ► STAGE 3 AND 4 PARAMETERS



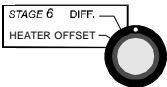
Differential [°F or °C] - The stage 3 and 4 differential is the variation in the room temperature between the moment the stage 3 fans and the stage 4 fans turn on and the moment they turn off.

## ► STAGE 5 PARAMETERS



Differential [°F or °C] - The stage 5 differential is the variation in the room temperature between the moment the stage 5 fans or heating units turn on and the moment they turn off.

## ► STAGE 6 PARAMETERS



Differential [°F or °C] - The stage 6 differential is the variation in the room temperature between the moment the stage 6 fans or heating units turn on and the moment they turn off.

Heater offset [°F or °C] - The stage 6 heater offset is the number of degrees below the temperature set point at which the stage 6 heating units turn off. When the heater offset is activated, it can be adjusted to a positive or negative value. When the heater offset is deactivated, it can be adjusted only to a positive value.

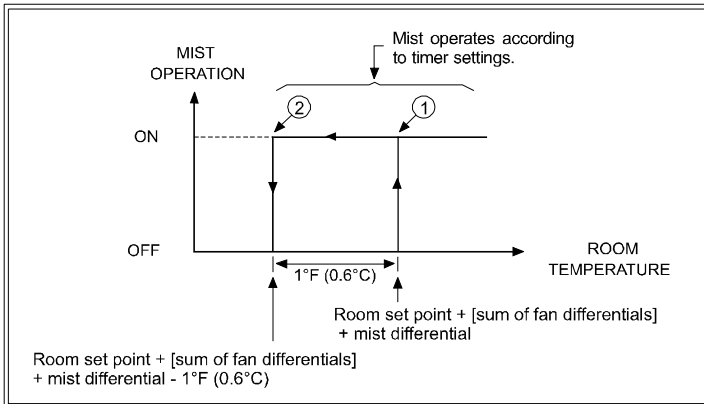
## ► MIST PARAMETERS

The last cooling stage can be configured as a mist stage. The number of heating stages determines which stage this is.

<u>NUMBER OF HEATING STAGES</u>	<u>MIST STAGE</u>
0	6
1	5
2	4

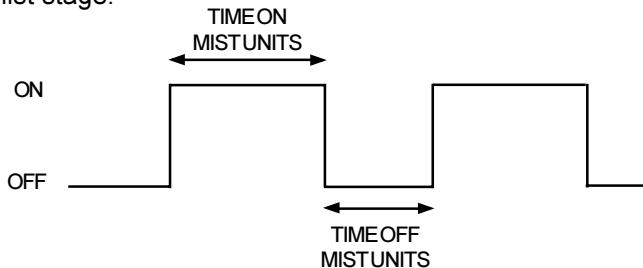
To access the parameters, position the selector switch at the differential of the mist stage.

Differential [ $^{\circ}\text{F}$  or  $^{\circ}\text{C}$ ] - The mist differential is the variation in room temperature at which the mist units turn on (point 1 in the diagram below). The value of the differential minus  $1^{\circ}\text{F}$  is the temperature at which the mist units turn off (point 2).



Time on [minutes] - The mist units operate according to a timer cycle. The time on is the running time of the mist units.

Time off [minutes] - The time off is the off time of the mist units. Note that time off must be non-zero in order for the controller to recognize the stage as a mist stage.



## 5

**PARAMETER FACTORY SETTINGS**

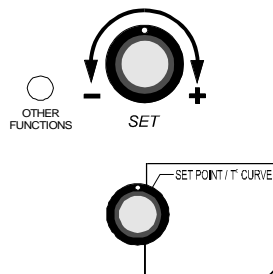
The controller is programmed at the factory with the settings shown below. Keep the settings that are convenient for you and make changes where necessary. These factory settings will not be retained in memory once they have been changed.

<b>PARAMETER</b>		<b>FACTORY SETTING</b>
Temperature set point		75.0°F (23.9 °C)
Temperature curve		deactivated
STAGE 1	Minimum speed	40 %
	Time on	15 seconds
	Time off	0 seconds
	Bandwidth	3.0°F (1.7°C)
STAGE 2	Minimum speed	40 %
	Bandwidth	2.0°F (1.1°C)
	De-icing Cycle Time	1 minute
	De-icing Time On	0 seconds
STAGES 3-4	Differential	2.0°F (1.1°C)
STAGE 5	Differential	2.0°F (1.1°C)
STAGE 6	Heater Offset	0.5°F (0.3°C)
	Differential	2.0°F (1.1°C)
MIST	Time on	1 minute
	Time off	0 minutes
	Differential	2.0°F (1.1°C)

**NOTE:** If the power supply is cut off, the parameter settings will be kept in memory until the power is restored.

## ► SET POINT / TEMPERATURE CURVE

The set point and the points of the temperature curve can be adjusted only if the temperature curve is deactivated. If the temperature curve pilot light is on, the temperature curve is presently activated.



Deactivate the temperature curve as follows:

- Set the parameter selection knob to SET POINT / T° CURVE. The current temperature set point appears flashing on the display.
- Press the temperature curve push-button repeatedly until the word ON appears flashing on the display.
- Turn the adjustment knob counterclockwise one notch and leave it in this position. The word OFF appears flashing on the display and after 10 seconds, the temperature curve pilot light turns off indicating that the temperature curve is now deactivated.

### To adjust the temperature set point:

- Set the parameter selection knob to SET POINT / T° CURVE. The current temperature set point appears flashing on the display.
- Turn the adjustment knob to adjust the temperature set point to the desired value.

### To adjust the points of the temperature curve:

- Set the parameter selection knob to SET POINT / T° CURVE. The current temperature set point appears flashing on the display.



- Press the temperature curve push-button. The word OFF appears on the display, indicating the temperature curve is deactivated.

Repeat the following steps for each of the six points:

- Press the temperature curve push-button once again. A day number, preceded by the letter "d", appears flashing on the display.
- Turn the adjustment knob to adjust the day number to the desired value.
- Press the temperature curve push-button once again. The current temperature set point for this day number appears flashing on the display.
- Turn the adjustment knob to adjust the temperature set point to the desired value.

**NOTES:** (1) All six points of the curve must be specified. If you do not need six different points, repeat your last temperature set point for each unnecessary point of the curve.

(2) To reduce the risk of errors:

- it is not permitted to specify decreasing day numbers;
- it is not permitted to specify increasing temperature set points;
- the highest day number is 99;
- the temperature variation can not exceed 3°F (1.6°C) per day.

When the six points of the temperature curve have been specified, the temperature curve must be activated for the controller to begin to automatically adjust the target room temperature.

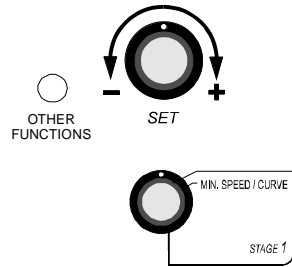
Activate the temperature curve as follows:

- Press the temperature curve push-button once again. The word OFF appears flashing on the display.
- Turn the adjustment knob clockwise by one notch and leave it in this position. The word ON appears flashing on the display and after 10 seconds, the temperature curve pilot light turns on indicating that the temperature curve is now activated.

**NOTE:** When the temperature curve is activated, the current target room temperature can be viewed at any time by setting the parameter selection knob to SET PT / T° CURVE. The current day number can then be viewed by pressing the temperature curve push-button.

## 6.2 STAGE 1 MINIMUM SPEED / CURVE

The points of the minimum speed curve can be adjusted only if the minimum speed curve is deactivated. If the minimum speed curve is activated, deactivate the curve as described below.



The single minimum speed can be adjusted even if the minimum speed curve is activated as long as it is not effectively in operation. If the curve is in operation, deactivate the curve as described below.

Deactivate the minimum speed curve as follows:

- Set the parameter selection knob to MIN.SPEED / CURVE. The current minimum speed appears flashing on the display.
- Press the push-button repeatedly until the word ON appears flashing on the display.
- Turn the adjustment knob counterclockwise one notch. The word OFF appears flashing on the display, indicating that the minimum speed curve is now deactivated.

**To adjust the single minimum speed:**

- Set the parameter selection knob to MIN.SPEED / CURVE. The current minimum speed appears flashing on the display.
- Turn the adjustment knob to adjust the minimum speed to the desired value.

## To adjust the points of the minimum speed curve:

- Set the parameter selection knob to MIN.SPEED / CURVE. The current minimum speed appears flashing on the display.
- Press the push-button. The word OFF appears on the display, indicating the minimum speed curve is inactivated.

### Repeat the following steps for each of the six points:

- Press the push-button once again. A day number, preceded by the letter "d", appears flashing on the display.
- For the first point of the curve, turn the adjustment knob to adjust the day number to the desired value. For all other points of the curve, the day number can not be adjusted.
- Press the push-button once again. The current minimum speed for this day number appears flashing on the display.
- Turn the adjustment knob to adjust the minimum speed to the desired value.

**NOTES:** (1) All six points of the curve must be specified. If you do not need six different points, repeat your last minimum speed for each unnecessary point of the curve.

(2) To reduce the risk of errors:

- it is not permitted to specify decreasing minimum speeds;
- the minimum speed variation can not exceed 10% per day.

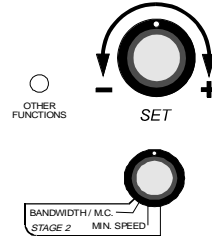
When the six points of the minimum speed curve have been specified, activate the minimum speed curve as described below (the minimum speed curve can be activated only if the temperature curve is activated).

### Activate the minimum speed curve as follows:

- Press the push-button once again. The word OFF appears flashing on the display.
- Turn the adjustment knob clockwise by one notch. The word ON appears flashing on the display, indicating that the minimum speed curve is now activated.

**NOTE:** When the minimum speed curve is in operation, the current minimum speed can be viewed at any time by setting the parameter selection knob to MIN.SPEED / CURVE. The current day number can then be viewed by pressing the push-button.

### 6.3 STAGE 2 DE-ICING

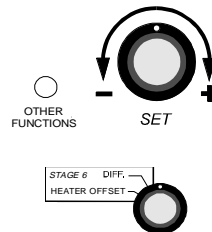


To adjust de-icing parameters:

- Set the parameter selection knob to STAGE 2 — MIN. SPEED and press the push-button. The current de-icing cycle time is displayed, alternating with the letters "CyC".
- Turn the adjustment knob to adjust the de-icing cycle time to the desired value.
- Press the push-button. De-icing Time On is displayed, alternating with the letters "On".
- Turn the adjustment knob to adjust the de-icing time on to the desired value. To turn off de-icing, set Time On to zero.

### 6.4 STAGE 6 HEATER OFFSET

When the heater offset is activated, it can be adjusted to a positive or negative value.  
When the heater offset is deactivated, it can be adjusted only to a positive value.



Activate or deactivate the heater offset as follows:

- Set the parameter selection knob to HEATER OFFSET. The current heater offset appears flashing on the display.

- Press the push-button. The word ON or OFF appears flashing on the display. Turn the adjustment knob clockwise one notch to activate the heater offset (the word ON appears flashing on the display) or counterclockwise to deactivate to heater offset (the word OFF appears flashing on the display).

**To adjust the stage 6 heater offset:**

- Set the parameter selection knob to HEATER OFFSET. The current heater offset appears flashing on the display.
- Turn the adjustment knob to adjust the heater offset to the desired value.

**6.5 MIST PARAMETERS**

The number of the mist stage depends on the number of heating stages:

<u>NUMBER OF HEATING STAGES</u>	<u>MIST STAGE</u>
0	6
1	5
2	4

The mist parameters are accessed by placing the selector knob at the differential for that stage.

**To adjust the mist differential:**

- Set the parameter selection knob to the differential setting of the mist stage. The current differential appears flashing on the display.
- Using the adjustment knob, set the differential to the desired value.
- The on-off differential is fixed at 1°F (0.6°C).

**To adjust the mist timer settings:**

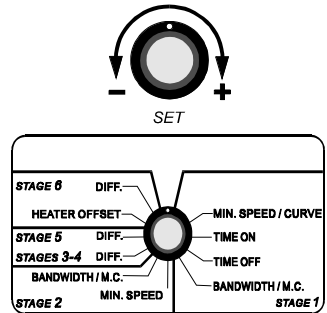
- Set the parameter selection knob to the differential setting of the mist stage. The current differential appears flashing on the display.

- Push the push-button. The word ON flashes on the display, alternating with the current time on value.
- Turn the adjustment knob to adjust the time on to the desired value (in minutes).
- Press the push-button once again. The word OFF flashes on the display, alternating with the current time off value.
- Turn the adjustment knob to adjust the time off to the desired value (in minutes). Note that time off must be greater than zero in order for the controller to operate the stage as a mist stage.

## 6.6 OTHER PARAMETERS

To adjust the stage parameters:

- Set the parameter selection knob to the desired position.
- Turn the adjustment knob to adjust the parameter to the desired value.



# 7

## PARAMETER ADJUSTMENT RANGES

PARAMETER		ADJUSTMENT RANGE
Temperature set point		-40.0 and 99.9°F (-40 and 37.7°C)
STAGE 1	Minimum speed	10 to 100 % of the full speed of the fans
	Time on	0 to 900 seconds, by increments of 15 seconds
	Time off	0 to 900 seconds, by increments of 15 seconds
	Bandwidth	0.5 and 20.0°F (0.3 and 11.1°C)
STAGE 2	Minimum speed	10 to 100 % of the full speed of the fans
	Bandwidth	0.5 and 20.0°F (0.3 and 11.1°C)
	De-icing Cycle Time	1 to 720 minutes
	De-icing Time on	0 to 900 seconds
STAGES 3-4	Differential	0.5 and 20.0°F (0.3 and 11.1°C)
STAGE 5	Differential	0.5 and 20.0°F (0.3 and 11.1°C)
STAGE 6	Heater offset - activated - deactivated	-9.9 and 20.0 °F (-5.5 and 11.1 °C) 0 and 20.0°F (0 and 11.1°C)
	Differential	0.5 and 20.0°F (0.3 and 11.1°C)
MIST	Time on	1 to 60 minutes, by increments of 1 minute
	Time off	0 to 60 minutes, by increments of 1 minute
	Differential	0.5 and 20.0°F (0.3 and 11.1°C)

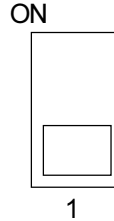
Locking the parameters ensures their settings are not changed by accident. When the parameters are locked, the only settings that can be changed are the temperature set point and the points of the temperature curve (if the temperature curve is deactivated), as well as the stage 1 minimum speed (as long as the minimum speed curve is deactivated). All other parameter settings can not be changed.

**To lock the parameters:**

- Set switch # 1 to ON.

**To unlock the parameters:**

- Set switch # 1 to OFF.

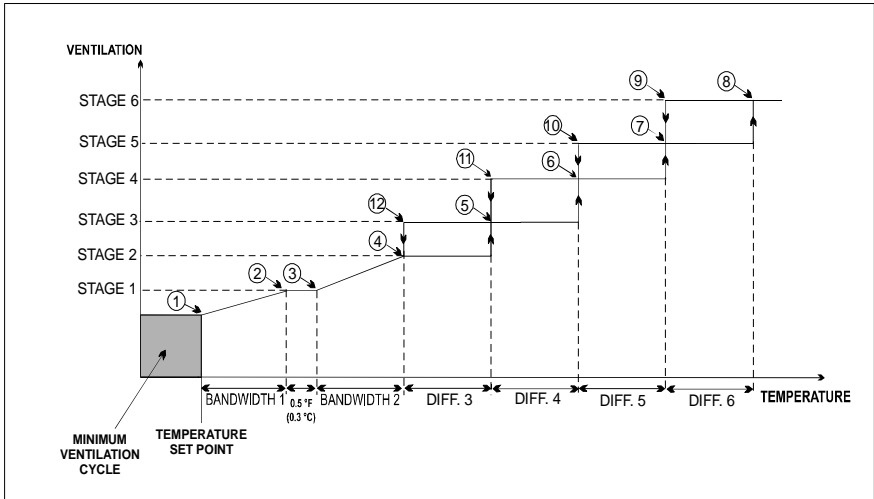


**FACTORY SETTING :** When the controller is shipped from the factory, switch # 1 is set to OFF (the parameters are unlocked).



# HOW THE CONTROLLER OPERATES

## 1 IF STAGES 5 AND 6 ARE USED FOR COOLING



### If the room temperature rises:

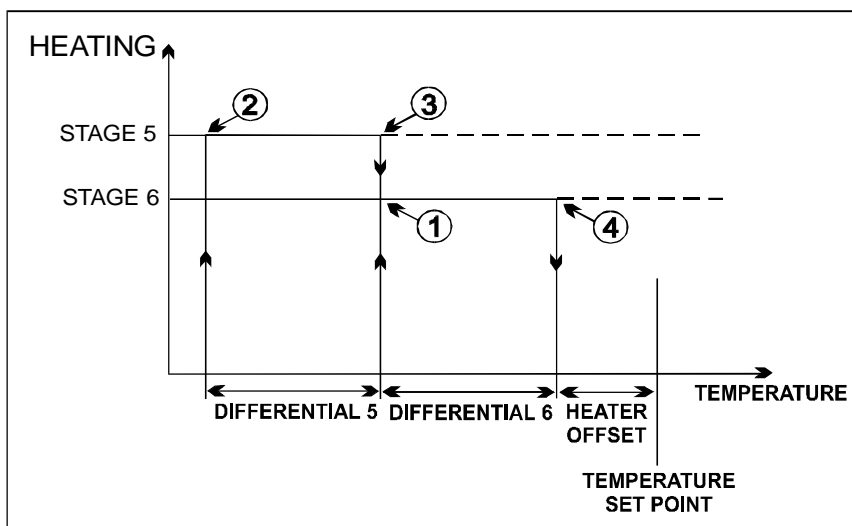
- When **room temperature** < **set point**, the stage 1 fans run at stage 1 minimum speed according to the minimum ventilation cycle.
- **AT POINT 1:** the stage 1 fans stop operating according to the minimum ventilation cycle and increase in speed as the room temperature rises.
- **AT POINT 2:** the stage 1 fans reach full speed.
- **AT POINT 3:** the stage 2 fans start to run at stage 2 minimum speed and increase in speed as the room temperature rises.
- **AT POINT 4:** the stage 2 fans reach full speed.
- **AT POINT 5:** the stage 3 fans start to run.

- **AT POINT 6:** the stage 4 fans start to run.
- **AT POINT 7:** the stage 5 fans start to run.
- **AT POINT 8:** the stage 6 fans start to run.

**If the room temperature falls:**

- **AT POINT 9:** the stage 6 fans return to a stop.
- **AT POINT 10:** the stage 5 fans return to a stop.
- **AT POINT 11:** the stage 4 fans return to a stop.
- **AT POINT 12:** the stage 3 fans return to a stop and the stage 2 fans begin to decrease in speed.
- **AT POINT 3:** the stage 2 fans reach stage 2 minimum speed and return to a stop.
- **AT POINT 2:** the stage 1 fans begin to decrease in speed.
- **AT POINT 1:** the stage 1 fans reach stage 1 minimum speed.
- When **room temperature < set point**, the stage 1 fans operate according to the minimum ventilation cycle at stage 1 minimum speed.

## 2 IF STAGES 5 AND 6 ARE USED FOR HEATING



When stages 5 and 6 are used for heating, stages 1, 2, 3 and 4 operate as described for cooling. However stages 5 and 6 operate at room temperatures below the set point, as described hereafter.

### If the room temperature falls:

- **AT POINT 1:** the stage 6 heating units turn on.
- **AT POINT 2:** the stage 5 heating units turn on.

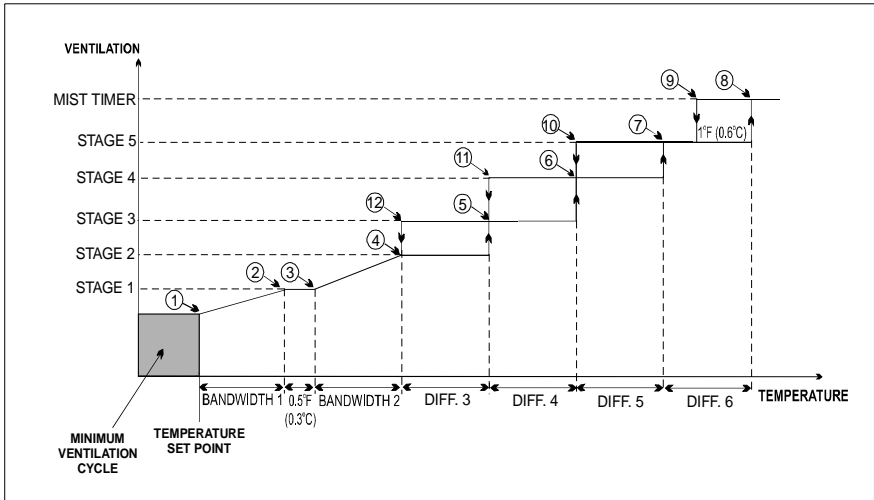
### If the room temperature rises:

- **AT POINT 3:** the stage 5 heating units turn off.
- **AT POINT 4:** the stage 6 heating units turn off.

### 3

## IF THE LAST COOLING STAGE IS A MIST STAGE

The diagram on page 32 where stage 6 is a cooling stage is as follows:



### If the room temperature rises:

- **AT POINT 8:** the stage 6 mist units start operating according to the mist timer settings.

### If the room temperature falls:

- **AT POINT 9:** the stage 6 mist units stop operating (on-off differential is fixed at 1°F).

## TROUBLESHOOTING

PROBLEM	CHECK POINTS
<p>There is no display.</p>	<ul style="list-style-type: none"> <li>▶ The circuit breaker at the service panel is off or tripped. — Reset the circuit breaker.</li> <li>▶ The wiring is incorrect. — Correct the wiring.</li> <li>▶ The input fuse is open. — Replace the fuse.</li> <li>▶ The voltage selector switch is in the wrong position. — Set the switch to the correct position.</li> <li>▶ The display board inter-connect cable is not plugged into the power supply board properly. — Be sure the cable is firmly plugged in.</li> </ul>
<p>The display shows the letter "p".</p>	<ul style="list-style-type: none"> <li>▶ Probe # 1 is connected improperly. — Correct the probe's connection.</li> </ul>
<p>The defective probe pilot light is on.</p>	<ul style="list-style-type: none"> <li>▶ The controller has detected a defective probe. — Follow the procedure described in DEFECTIVE PROBES (page 11) to identify the defective probe. Replace the defective probe.</li> </ul>
<p>The display shows sudden variations in the room temperature.</p>	<ul style="list-style-type: none"> <li>▶ A variation in resistance is induced on the probe circuit. — Be sure the probes are dry. Also, move them away from drafts and from any source of radiant heating.</li> <li>▶ There is electrical noise near the cable of an extended probe. — Do not run probe cables next to other power cables. When crossing over other power cables, cross at 90°.</li> </ul>

PROBLEM	CHECK POINTS
<p>The stage 1 or 2 fans are not running.</p>	<ul style="list-style-type: none"> <li>▶ The wiring is incorrect. <ul style="list-style-type: none"> <li>— Correct the wiring. In particular, be sure two different lines are connected to each fan motor: line L1 modulated by the controller should be combined with another line (N for 115V or L2 for 230V) to activate the fan motor. Also be sure the stage 1 and 2 COMMON is supplied by line L1.</li> </ul> </li>   <li>▶ The stage's fuse is open. <ul style="list-style-type: none"> <li>— Replace the fuse.</li> </ul> </li>   <li>▶ The display board inter-connect cable is not plugged into the power supply board properly. <ul style="list-style-type: none"> <li>— Be sure the cable is firmly plugged in.</li> </ul> </li>   <li>▶ The minimum speed is too low. <ul style="list-style-type: none"> <li>— Adjust the minimum speed to a higher value.</li> </ul> </li>   <li>▶ The fan motor is defective. <ul style="list-style-type: none"> <li>— Connect the fan motor to an alternate power supply. Replace the motor if it still is not operating.</li> </ul> </li> </ul>
<p>The stage 1 or 2 fans run continuously at full speed.</p>	<ul style="list-style-type: none"> <li>▶ The wiring is incorrect. <ul style="list-style-type: none"> <li>— Correct the wiring.</li> </ul> </li>   <li>▶ The room temperature is above the set point. <ul style="list-style-type: none"> <li>— Adjust the set point to the desired value.</li> </ul> </li> </ul>
<p>The stage 1 or 2 fans run erratically.</p>	<ul style="list-style-type: none"> <li>▶ The selected motor curve is inappropriate for the type of fan motors you are using. <ul style="list-style-type: none"> <li>— Select an appropriate motor curve.</li> </ul> </li>   <li>▶ The bandwidth is too low. <ul style="list-style-type: none"> <li>— Adjust the bandwidth to a higher value.</li> </ul> </li>   <li>▶ The stage 1 time on or time off is too short. <ul style="list-style-type: none"> <li>— Adjust the time on or time off to a higher value.</li> </ul> </li> </ul>

PROBLEM	CHECK POINTS
<p>The stage 1 fans do not stop running when operating according to the minimum ventilation cycle.</p>	<ul style="list-style-type: none"> <li>▶ The wiring is incorrect. <ul style="list-style-type: none"> <li>— Correct the wiring. In particular, be sure two different lines are connected to each fan motor: line L1 modulated by the controller should be combined with another line (N for 115V or L2 for 230V) to activate the fan motor. Also be sure the stage 1 and 2 COMMON is supplied by line L1.</li> </ul> </li>   <li>▶ The time on is adjusted to a value other than zero. <ul style="list-style-type: none"> <li>— Adjust the time on to zero.</li> </ul> </li> </ul>
<p>Stage 3, 4, 5 or 6 is not operating.</p>	<ul style="list-style-type: none"> <li>▶ The stage's fuse is open. <ul style="list-style-type: none"> <li>— Replace the fuse.</li> </ul> </li>   <li>▶ The display board inter-connect cable is not plugged into the power supply board properly. <ul style="list-style-type: none"> <li>— Be sure the cable is firmly plugged in.</li> </ul> </li>   <li>▶ The wiring is incorrect. <ul style="list-style-type: none"> <li>— Correct the wiring. In particular, be sure two different lines are connected to each fan motor or heating unit: line L1 at the controller's output should be combined with another line (N for 115V or L2 for 230V) to activate the fan motor or heating unit. Also be sure the stage's COMMON is supplied by line L1.</li> </ul> </li>   <li>▶ The fan motor or heating unit is defective. <ul style="list-style-type: none"> <li>— Connect the fan motor or heating unit to an alternate power supply. Replace the fan motor or heating unit if it still is not operating.</li> </ul> </li>   <li>▶ The controller is defective. <ul style="list-style-type: none"> <li>— Listen to see if there is a clicking sound when the stage's pilot light turns on. If there is no clicking sound, contact your distributor to get the controller repaired.</li> </ul> </li> </ul>

# TECHNICAL SPECIFICATIONS

## MASTER BOX

**Supply:** - 115/230 VAC, (-18%, +8%), 60 Hz, L1 same phases as stages 1 and 2, overload and overvoltage protection fuse F5-1A fast blow.

- 12 VDC for AC back-up supply; can activate Stage 3, Stage 4, Stage 5 and Stage 6 if supplied with DC back-up voltage.

**Stage 1:** Variable output, 60 Hz, 10A FAN (3/4 HP/115VAC) / (1.5 HP/230VAC), same phases as supply, fuse F1-15A slow blow.

**Stage 2:** Variable output, 60 Hz, 10A FAN (3/4 HP/115VAC) / (1.5 HP/230VAC), same phases as supply, fuse F2-15A slow blow.

## AUXILIARY BOX

**Supply:** - 115/230 VAC, (-18%, +8%), 60 Hz, overload and overvoltage protection fuse F6-1A fast blow.

- 12 VDC for AC back-up supply; can activate Stage 3, Stage 4, Stage 5 and Stage 6 if supplied with DC back-up supply.

**Stage 3:** ON-OFF output, 115/230 VAC, 60 Hz, 30 VDC, 6A FAN, 10A RES, fuse F1-10A slow blow.

**Stage 4:** ON-OFF output, 115/230 VAC, 60 Hz, 30 VDC, 6A FAN, 10A RES, fuse F2-10A slow blow.

**Stage 5:** ON-OFF output, 115/230 VAC, 60 Hz, 30 VDC, 6A FAN, 10A RES, heating or ventilation, fuse F3-10A slow blow.

**Stage 6:** ON-OFF output, 115/230 VAC, 60 Hz, 30 VDC, 6A FAN, 10A RES, heating or ventilation, fuse F4-10A slow blow.

**Probes:** Low voltage (< 5V), isolated from the supply. Operating range: -40.0° to 120.0°F (-40.0° to 49°C). Accuracy: 1.8°F (1°C) between 41° and 95°F (5° and 35°C).

**Enclosure:** ABS, moisture and dust-tight.

**The temperature where the controller is installed MUST AT ALL TIMES REMAIN BETWEEN 32 AND 104 °F (0 and 40 °C).**



# NOTES