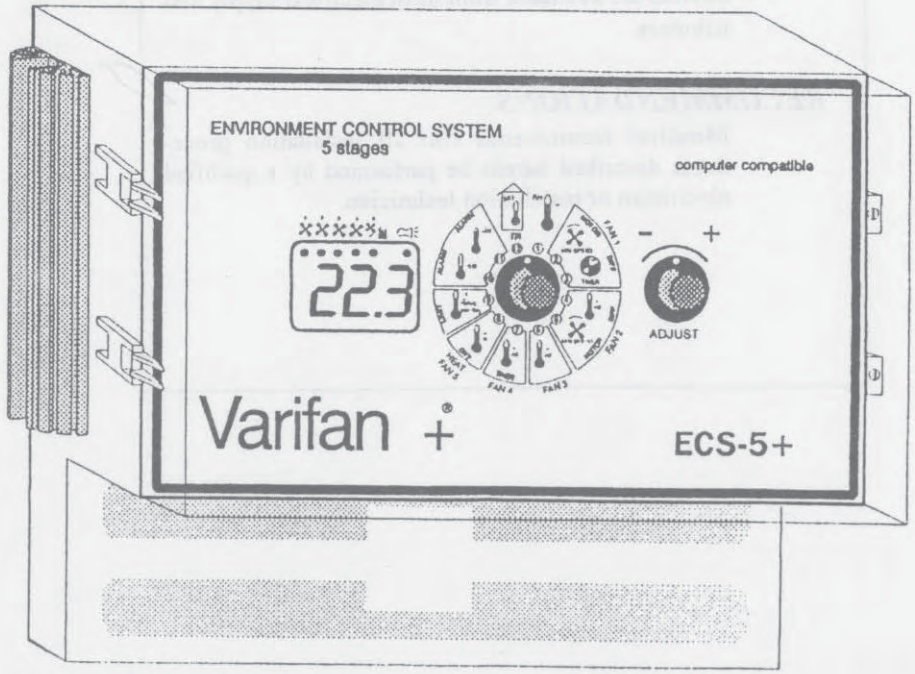
ECS 5+



MAV ECS-5 Ver:01
October 93

DISCLAIMER

Although **Monitrol** Inc. has made every effort to ensure the accuracy of the information contained herein, this document is subject to change without notice due to ongoing product development.

WARNING and PRECAUTIONS

Equipment failure, blown fuses and/or tripped breakers may prove harmful to the contents of the building. It is therefore strongly recommended to install backup devices and alarm or warning devices. Spare equipment should also be available at the owner's site. Equipment manufactured by **Monitrol** is protected against normal line voltage surges. High surges caused by thunder storms or power supply equipment may damage this equipment. For added security against line voltage surges it is recommended that surge and noise suppression devices be installed at the electrical distribution panel. These devices are available from most electrical supply distributors.

RECOMMENDATIONS

Monitrol recommends that all installation procedures described herein be performed by a qualified electrician or installation technician.

All assembled equipment and individual components are submitted for rigorous inspection to assure optimum quality of product and reliability. However the possibility of equipment failure and/or malfunction may still exist.

For service, contact your local retail outlet or distributor. The warranty period shall be two years from the date of manufacture. Proof of payment is required for warranty validation.

Fuse verification and replacement, as well as the proper setting of control values shall be the responsibility of the owner of this equipment.

In all cases, the warranty shall apply only to defects in workmanship and specifically exclude any damage caused by overvoltage, short circuit, misuse, acts of vandalism, fortuitous events, acts of God, flood, fire, hail or natural disaster. This warranty becomes invalid should the installation have been made contrary to the instructions in this manual.

Monitrol assumes only those obligations set forth herein, excluding all other warranties or obligations. This warranty stipulates that, in all cases, **Monitrol** shall be liable only for the supply of replacement parts or goods and shall not be liable for any personal injury, damages, loss of profits, halted operations, fine contravention of the law or damages to the production of the PURCHASER, and the PURCHASER shall take up the defence and hold **Monitrol** faultless regarding any legal or extralegal proceedings, notice, or claim by the customer or by a third party, and regarding any legal and extra legal expenses and fees brought on by such damages.

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RECORD FORM

OPTION	DEFAULT SETTING		USER SETTING
MAIN SET POINT TEMPERATURE	77°F	25°C	
FAN 1 MINIMUM SPEED	24%	24%	
FAN 1 DUTY CYCLE TIMER	ON	ON	
FAN 2 RELATIVE SET POINT	4°F	2°C	
FAN 2 MINIMUM SPEED	24%	24%	
FAN 3 RELATIVE SET POINT	8°F	4°C	
FAN 4/DRIP COOL RELATIVE SET POINT	10°F	5°C	
HEATER/FAN 5 RELATIVE SET POINT	-3°F	-1.5°C	
RAMPING	OFF	OFF	
LOW TEMPERATURE ALARM	-9°F	-5°C	
HIGH TEMPERATURE ALARM	20°F	12°C	
RELATIVE HUMIDITY	65%	65%	
FAN 1 MOTOR COMPATIBILITY	1	1	
FAN 1 DIFFERENTIAL	4°F	2°C	
FAN 2 DIFFERENTIAL	4°F	2°C	
FAN 2 MOTOR COMPATIBILITY	1	1	
DRIP COOL DUTY CYCLE TIMER	ON	ON	
HEATER/FAN 5 HYSTERESIS	2°F	1°C	
MINIMUM RAMPING LIMIT	65°F	18°C	
LOW TEMPERATURE ALARM	-9°F	-5°C	
HIGH TEMPERATURE ALARM	20°F	12°C	

CHAPTER 1

INTRODUCTION

SPECIFICATIONS

DESCRIPTION	VALUE
INPUT POWER	- 12 AMP inductive - 115/230 VAC - 50/60 Hz
STAGE 1 (variable speed)	- 6 AMP; 115V/230V
STAGE 2 (variable speed)	- 6 AMP; 115V/230V
STAGE 3 (dry relay contact)	- 6 AMP conductive; 115V/230V - 10 AMP resistive; 115V/230V
STAGE 4 (dry relay contact)	- 6 AMP conductive; 115V/230V - 10 AMP resistive; 115V/230V
STAGE 5 (dry relay contact)	- 6 AMP conductive; 115V/230V - 10 AMP resistive ; 115V/230V
ALARM (dry relay contact)	- 2 AMP; 30V AC/DC
OUTPUT FUSE PROTECTION	- 10 AMP slow blow

TROUBLE SHOOTING

SYMPTOM	CAUSE and REMEDY
Lo is continually displayed	- Temperature is below minimum (42°F or 5.5°C) - Probe is disconnected or defective
Hi is continually displayed	- Temperature is above maximum (111°F or 44°C) - Probe is short circuited
Fan(s), heater, or Drip Cool unit not operating	- Verify whether the appropriate stage LED is on. If LED is on yet fan, heater, or Drip Cool unit is not operating, verify wiring, device and fuse. Refer to Figure 7 for fuse location. If fuse is blown, replace with fuse of same type.
Stage 5 Fan or Heater is operating erratically	- Verify that the software setting switch (position 3) located at the rear of the faceplate is properly set.
Display is blank	- Verify that the line voltage selector switch is properly set. - Verify that the 10 pin flat cable between the main board and the faceplate board is connected.

1. GENERAL

This document provides a description of the ECS 5+ control panel. This document is organized as follows:

- Introduction
- Installation
- User's Guide
- Appendix

1.1 DESCRIPTION

Congratulations on the purchase of your ECS 5+ environmental control system. The ECS 5+ provides you with full control over temperature, humidity, air flow, and heat resulting in a comfortable environment for your livestock.

The ECS + product line offers a number of added features over existing ECS controls such as:

- Hi/Lo temperature indication
- Automatic temperature reduction (ramping)
- Adaptable variable speed outputs for a wide selection of fan model types.
- Humidity probe
- Full torque fan start preventing motor damage
- Drip cool control

Kits are available to upgrade existing control units.

The ECS 5+ provides microprocessor control over a five stage output.

The first stage controls a variable speed fan which can operate at a continuous low speed to ensure good quality of air at all times. In addition, the first stage may be programmed to cycle on and off. When the room temperature rises above the main set point, the fan accelerates to increase the air flow.

The second stage provides control over a second variable speed fan. This second stage is also fully programmable for settings such as minimum speed, relative set point, etc.

The third stage controls a third single speed fan to aid the second fan for increased air flow.

The fourth stage controls either a fourth single speed fan or a drip cool unit with programmable duty cycle and adjustable timer setting.

The fifth stage controls either a heater for colder climates, or a fifth single speed fan where even further cooling is required.

The ECS 5+ provides you with full control over all five stages via the use of an easy to follow display panel. All programmable features can be customized to meet your requirements. The ECS 5+ keeps you constantly informed by displaying the status of all of its outputs as well as the ambient temperature. With an optional humidity probe, the ECS 5+ displays current humidity levels.

Safety of livestock is ensured by the continuous control of climate and timely alarm notification should environmental conditions exceed alarm set points. Further security may be obtained by connecting all ECS series controls in a network configuration to an optional RCM 40 remote monitoring unit. This provides remote control monitoring of each room. All control panel outputs are fused, and all programmable settings are maintained indefinitely whether or not the ECS 5+ is powered.

The ECS 5+ provides an automatic constant temperature reduction (ramping) feature for your maturing livestock. A built in low temperature safety factor prevents temperatures reaching dangerous limits.

With ECS 5+ in control of your climate, you are assured of optimal living conditions for your livestock.

MOTOR COMPATIBILITY

MAIN SET POINT

The desired room temperature. Other temperature settings on the *ECS 5+* are relative to the main set point temperature.

RELATIVE TEMPERATURE

A value added to or subtracted from the main set point which results in a new temperature at which a desired action starts or stops.

AMBIENT TEMPERATURE

The actual temperature of the room.

AMBIENT HUMIDITY

The actual humidity level of the room.

MINIMUM FAN SPEED

The desired minimum speed for variable speed fans.

RAMPING

An automatic daily reduction in the main set point and all temperature settings relative to this.

DRIP COOL

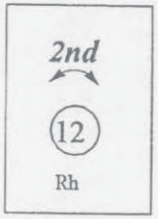
A device used to cool down livestock by dripping water over them.

APPENDIX

CHAPTER 2

INSTALLATION

RELATIVE HUMIDITY DISPLAY



This function displays the relative humidity of the room.

Relative humidity is displayed in 1% increments from a minimum display of 30% to a maximum display of 90%. If a humidity level lower than 10% is sensed, Lo is displayed. Conversely, if a humidity level higher than 90% is sensed, Hi is displayed.

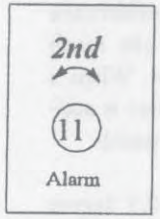
Displaying the humidity level:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode.

The humidity level is displayed on the front panel.

NOTE: If a humidity probe is not installed the unit displays F2.

HIGH TEMPERATURE ALARM



This function establishes the temperature **difference** above the main set point that the room can reach before a high temperature alarm is signalled. When a high temperature alarm occurs an alarm contact is activated and the alarm LED lights on the front panel.

The high temperature alarm is adjusted in 0.5 degree increments from a minimum setting of 0°F (0°C) to a maximum setting of 32.0°F (18.0°C)

Adjusting the high temperature alarm:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (11),
- rotate the Adjustor dial counterclockwise to decrease the setting, clockwise to increase it.

The high temperature alarm setting is displayed on the front panel.

Monitrol recommends that the installation instructions which follow be adhered to as closely as possible, and all work be performed by a certified electrician. Failure to do so may void the warranty!

2.1 UNPACKING

Unpack the ECS 5+ from its box and inspect contents for damage. Should the contents appear to be damaged, contact your local distributor for return material procedures.

The package should contain the following standard items:

- 1 ECS 5+ control panel identified by ECS 5+ printed on the faceplate of the unit.
- 1 installed temperature probe (model number 2004-1K)
- 5 cable fasteners

The following optional items may be included:

- 3 additional temperature probes for temperature averaging,
- 1 humidity probe. The ECS 5+ requires the RHT-1 humidity probe for maximum accuracy in monitoring and control of humidity levels.

2.2 MOUNTING

To limit the unit's exposure to noxious gases install the unit in a hallway.

Make certain that the unit is mounted right side up with the cable entry holes facing down.

The ECS 5+ will operate in a temperature range of 32°F - 120 °F (0 °C - 50 °C).

Use a Phillips screwdriver to remove the lower terminal strip cover exposing two mounting holes located at the bottom left and right corners of the control panel box as shown in figure 1.

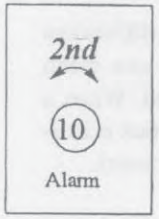
A third mounting hole is located on the rear side of the control panel box. Refer to figure 1.

Mounting hardware is not shipped with the unit.

Install mounting screw on wall and hang the unit in place by sliding the rear mounting hole of the control panel over the screw.

Use two more screws to secure the control panel in place using the bottom mounting holes shown in figure 1.

LOW TEMPERATURE ALARM



This function establishes the temperature **difference** below the main set point that the room can reach before a low temperature alarm is signalled. When a low temperature alarm occurs an alarm contact is activated and the alarm LED lights on the front panel.

The low temperature alarm is adjusted in 0.5 degree increments from a minimum setting of -32.0°F (-18.0°C) to a maximum setting of 0.0°F (0.0°C)

Adjusting the low temperature alarm setting:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (10),
- rotate the Adjustor dial counterclockwise to decrease the setting, clockwise to increase it.

The low temperature alarm setting is displayed on the front panel.

MINIMUM RAMPING

2nd
(9)
Limit

Minimum ramping is the lowest that the ramping function can adjust the main set point to. This is a security feature.

The minimum ramping setting is adjusted in 0.5 degree increments from a minimum setting of 42.0°F (5.5°C) to a maximum setting of 111.0°F (44.0°C).

Adjusting the minimum ramping setting:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (9),
- rotate the Adjustor dial counterclockwise to decrease the minimum ramping setting, clockwise to increase it.

The minimum ramping setting is displayed on the front panel.

NOTE: When the main set point temperature reaches the minimum ramping limit, the ramping setting (primary function 9) automatically shuts off.

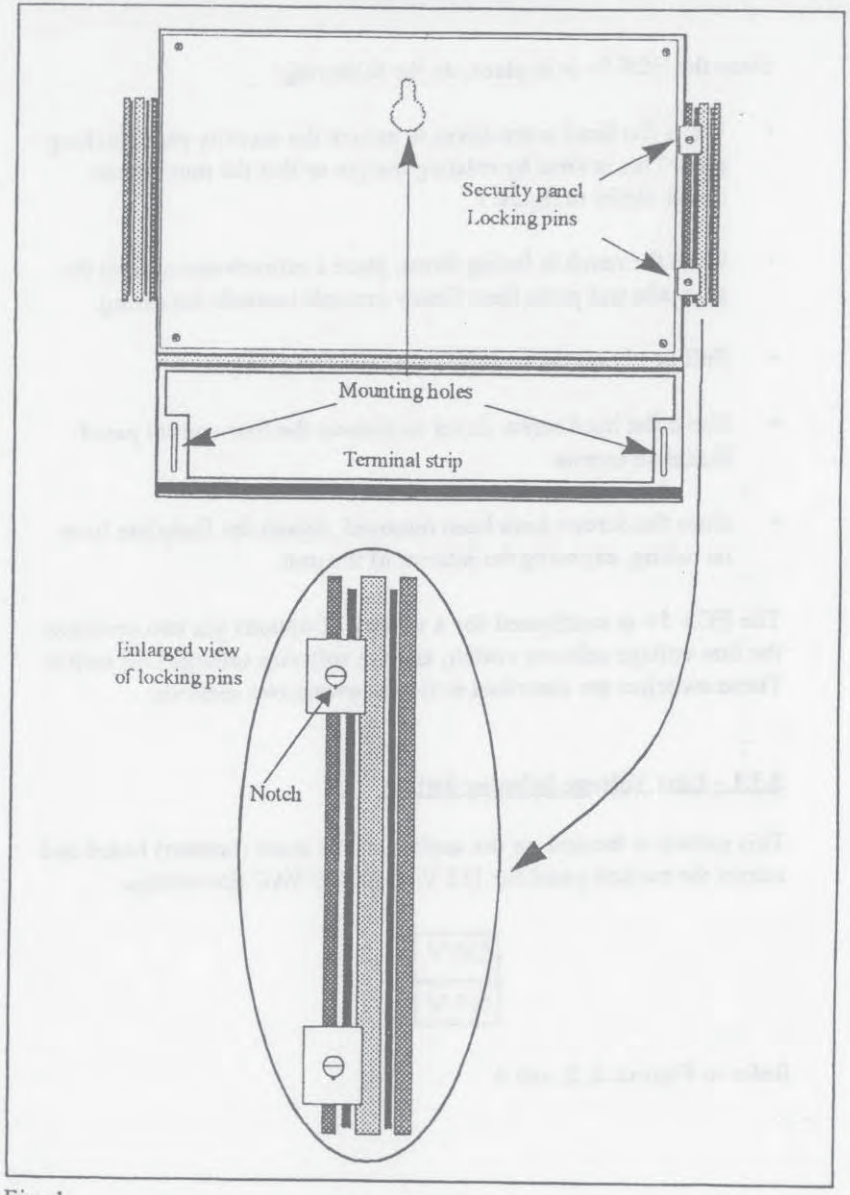


Fig. 1
Mounting holes and locking pins locations

2.3 SWITCH SETTINGS

Once the ECS 5+ is in place, do the following:

- Use a flat head screwdriver to unlock the security panel locking pins. This is done by rotating the pin so that the notch faces down. Refer to figure 1.
- Once the notch is facing down, place a screwdriver against the side tabs and press them firmly inwards towards the casing.
- Pull gently on the security panel swinging it open.
- Use a flat head screw driver to remove the four control panel faceplate screws.
- Once the screws have been removed, detach the faceplate from its casing, exposing the interior of the unit.

The ECS 5+ is configured for a variety of options via two switches: the line voltage selector switch, and the software settings DIP switch. These switches are described in the following two sections.

2.3.1 - Line Voltage Selector Switch

This switch is located on the surface of the main (bottom) board and adapts the control panel for 115 VAC or 230 VAC line voltage.

230 V
115 V

Refer to Figures 2, 3, and 4.

HEATER/FAN 5 HYSTERESIS



In order to minimize erratic behavior of Heater/Fan 5 when ambient room temperature is exactly at the relative set point, the hysteresis setting separates this ON/OFF threshold into two: one ON threshold and one OFF. This feature greatly reduces equipment wear.

The temperature difference between the two thresholds is the hysteresis.

The hysteresis is adjusted in 0.5 degree increments from a minimum setting of 1°F (0.5°C) to a maximum setting of 6°F (3°C) degrees.

Adjusting the hysteresis setting:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (8),
- rotate the Adjustor dial counterclockwise to decrease the hysteresis setting, clockwise to increase it.

The hysteresis setting is displayed on the front panel.

Example: The Heater/Fan *5* relative temperature set by primary function (8) is adjusted to 75°F, and the hysteresis is set to 2°F. When stage *5* is configured for a fifth fan, the temperature of the room must reach 73°F before the fan shuts off, and rise to 75°F before the fan begins to operate.

DRIP COOL DUTY CYCLE

2nd
(7)
Timer

As long as the actual temperature is below the main set point, the Drip Cool unit will not operate. When the ambient temperature rises above the stage 4 relative set point configured by primary function (7), the drip cool unit begins to operate in a duty cycle mode. The duty cycle sets the percentage of time the Drip Cool unit is ON versus the percentage of time the unit is OFF. The ON time is entered as a percentage of the total time which is known as the period.

The Drip Cool duty cycle is adjusted in 5% increments from a minimum setting of OFF, 5%, 10% etc., up to a maximum setting of ON corresponding to continuous operation.

Adjusting the duty cycle of the Drip Cool unit:

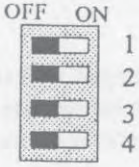
- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (7),
- rotate the Adjustor dial counterclockwise to decrease the duty cycle, clockwise to increase it.

The duty cycle is displayed on the front panel.

Example:
The period of the Drip Cool unit is set to 12 minutes by the software settings DIP switch, while the duty cycle is set to 50%. When the ambient room temperature rises above the relative temperature the Drip Cool unit operates for 6 minutes, and turns OFF for 6 minutes.

2.3.2 - Software Settings DIP Switch

This switch is located at the rear of the control panel faceplate and adjusts the following options.



	OFF	ON
1	Fahrenheit	Celsius
2	Settings locked	Settings unlocked
3	Stage 5 = Heat	Stage 5 = Fan
4	Stages 1=3 min Duty cycle period	Stages 1=5 min Duty cycle period
	Stages 4=12 min Duty cycle period	Stages 4=20 min Duty cycle period

Switch 1 — Selects between a Fahrenheit or Celsius display on the front panel.

Switch 2 — Locks/unlocks user settings. All settings except for main set point, record low, and record high are locked while this switch is off.

Switch 3 — Selects between a Heater or Fan control on Stage five of the control panel.

Switch 4 — Selects between a 3 or 5 minute duty cycle period for variable stage 1.

Selects between a 12 or 20 minute duty cycle period for variable stage 4 when controlling a drip cool unit.

2.4 CONNECTION PROCEDURE

For the connection procedures which follow refer to Figures 2 through 7.

2.4.1 - Input power
To facilitate the installation work, the unit is shipped with two cable knock-outs removed. Should two cable paths not suffice, use a screwdriver to remove up to three more cable knock-outs for the installation of cabling to the control panel.

Do not apply power to the control panel until all connections have been completed!

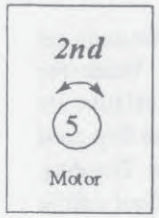
2.4.1.1 - 115 VAC (terminals 11 and 12)
Make certain that the line voltage selector switch is set to 115 VAC. Connect the power cable to terminals 11 and 12 on the main (bottom) board, connect the ground wire to the ground connector in the housing.

2.4.1.2 - 230 VAC (terminals 11 and 12)
Make certain that the line voltage selector switch is set to 230 VAC. Connect the power cable to terminals 11 and 12 on the main (bottom) board, connect the ground wire to the ground connector in the housing.

2.4.2 - Fan 1 (terminals 9 and 10)
Stage 1 controls the operation of the primary fan. Connect the two leads from Fan 1 to terminals 9 and 10 on the main (bottom) board.

2.4.3 - Fan 2 (terminals 7 and 8)
Stage 2 controls the operation of the secondary fan. Connect the two leads from Fan 2 to terminals 7 and 8 on the main (bottom) board.

FAN 2 MOTOR

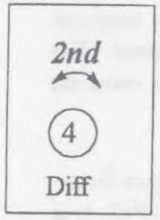


The Fan 2 motor compatibility setting adjusts the control panel outputs to the electrical characteristics of the fan motor. Six choices are available. Choice 1 is suited for most fans. This setting is used when your model of fan motor is not listed in the compatibility table in the Appendix. Settings 2 - 6 are the optimized settings for fan models listed in the compatibility table. Using the compatibility table, find the model number of your fan and take note of the fan motor compatibility number. Contact your local distributor if your model of fan is not listed.

Setting the Fan 2 motor compatibility:
- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (5),
- rotate the Adjustor dial to select a motor setting.

The Fan 2 motor compatibility setting is displayed on the front panel.

FAN 2 DIFFERENTIAL



The Fan 2 differential setting is the temperature at which Fan 2 reaches maximum speed. The value entered is the temperature **difference** above the Fan 2 relative set point temperature setting.

The Fan 2 differential is adjusted in 0.5 degree increments from a minimum setting of 2.0°F (1.0°C) to a maximum setting of 18.0°F (10.0°C).

Adjusting the Fan 2 differential:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (4),
- rotate the Adjustor dial counterclockwise to decrease the differential, clockwise to increase it.

The Fan 2 differential setting is displayed on the front panel.

Example: The main set point temperature of the room is 70°F. A Fan 2 relative set point of 5°F along with a Fan 2 differential setting of 5°F is set. When the temperature of the room reaches 80°F Fan 2 operates at its maximum speed.

2.4.4 - Fan 3

Stage 3 provides a dry contact closure which controls the operation of a third fan. The current rating of the dry contact is 6 Amps (conductive) for a fan. Make connections as follows:

- connect one lead of the fan to terminal 5.
- connect the other lead to L1.
- For a 115v fan, connect a wire between terminal 6 and N (neutral).
- For a 230v fan, connect a wire between terminal 6 and L2.

2.4.5 - Fan 4/Drip Cool

Stage 4 provides a dry contact closure which controls the operation of a fourth single speed fan or a drip cool unit. This contact closure is voltage rated to 230 VAC. The current rating of the dry contact is 6 Amps (conductive) for a fan. Make connections as follows:

- connect one lead of the fan or drip cool unit to terminal 3.
- connect the other lead to L1.
- For a 115v fan or drip cool unit, connect a wire between terminal 4 and N (neutral).
- For a 230v fan or drip cool unit, connect a wire between terminal 4 and L2.

2.4.6 - Fan 5/Heater

Stage 5 provides a dry contact closure which controls the operation of a fifth single speed fan or a heater. This contact closure is voltage rated to 230 VAC. The current rating of the dry contact is 10 Amps (resistive) for a heater and 6 Amps (conductive) for a fan. Set the software settings DIP switch at the rear of the control panel faceplate to ON for a fan or OFF for a heater. Make connections as follows:

- connect one lead of the fan or heater to terminal 1.
- connect the other lead to L1.
- For a 115v fan or heater, connect a wire between terminal 2 and N (neutral).
- For a 230v fan or heater, connect a wire between terminal 2 and L2.

2.5 TEMPERATURE/HUMIDITY PROBES

Temperature and humidity probes use a "Class 2" low voltage circuit. These cables can extend up to a distance of 500 feet (150 meters).

Single probe temperature and humidity connections are illustrated in Figure 5 while temperature probe averaging connections are illustrated in Figure 6.

Use shielded cabling for probes when their cable paths run parallel to high voltage wires. Connect the shields to the ground wire inside the casing. Failure to do so may result in inaccurate readings!

2.5.1 Single Temperature Probe

Install a single temperature probe in an area that best reflects the overall temperature of the room.

Connect the two leads of the temperature probe to the control panel terminals labelled IN1 and GND as indicated in Figure 5.

2.5.2 Averaging (optional)

Four temperature probes are required if temperature averaging is desired in larger rooms. Place the probes in appropriate locations to best average the ambient temperature. Refer to Figure 6.

2.5.3 Humidity Probe (optional)

Install one humidity probe in an area that best reflects the overall humidity of the room.

Connect the humidity probe to the control panel terminals labeled IN1, PWR, and GND as indicated in Figure 5.

FAN 1 DIFFERENTIAL

2nd
(3)
Diff

The Fan 1 differential setting establishes the temperature at which Fan 1 reaches maximum speed. The value is a temperature **difference** from the main set point.

The Fan 1 differential is adjusted in 0.5 degree increments from a minimum setting of 2.0°F (1.0°C) to a maximum setting of 18.0°F (10.0°C).

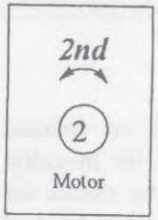
Adjusting the Fan 1 differential:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (3),
- rotate the Adjustor dial counterclockwise to decrease the differential, clockwise to increase it.

The Fan 1 differential setting is displayed on the front panel.

Example: A main set point temperature of 70°F along with a Fan 1 differential setting of 5°F is set. When the temperature of the room reaches 75°F, Fan 1 operates at its maximum speed.

FAN 1 MOTOR



The Fan 1 motor compatibility setting adjusts the control panel outputs to the electrical characteristics of the fan motor. Six choices are available. Choice 1 is suited for most fans. This setting is used when your model of fan is not listed in the compatibility table in the Appendix. Settings 2 - 6 are the optimized settings for fan models listed in the compatibility table. Using the compatibility table, find the model number of your fan motor and take note of the fan motor compatibility number. Contact your local distributor if your model of fan is not listed.

Setting the Fan 1 motor compatibility:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (2),
- rotate the Adjustor dial to select a motor setting.

The Fan 1 motor compatibility setting is displayed on the front panel.

2.6 ALARM

The ECS 5+ provides a normally open and normally closed dry contact for alarming low or high temperature conditions. In addition, this same contact can be used to signal a power failure. This contact may be connected to an alarm system, or directly to a siren and/or auto-dialler.

Make connections as indicated in Figure 5

Momentary power interruptions may trigger false alarms! To avoid false alarming when the ECS 5+ is connected to an alarm system, install a time delay relay between the ECS 5+ and the alarm system.

2.7 POWERING UP

Before powering up the ECS 5+, attach the faceplate and the terminal strip cover to the casing of the control panel, using the six screws previously removed.

Set Selector knob to position (12).

Upon power up, the unit will test its display by briefly lighting all the segments of its LED. Make certain that all segments light.

Following the LED display test, the unit displays the ambient temperature of the room.

If the temperature is not displayed, refer to the Trouble Shooting section in the appendix of this document.

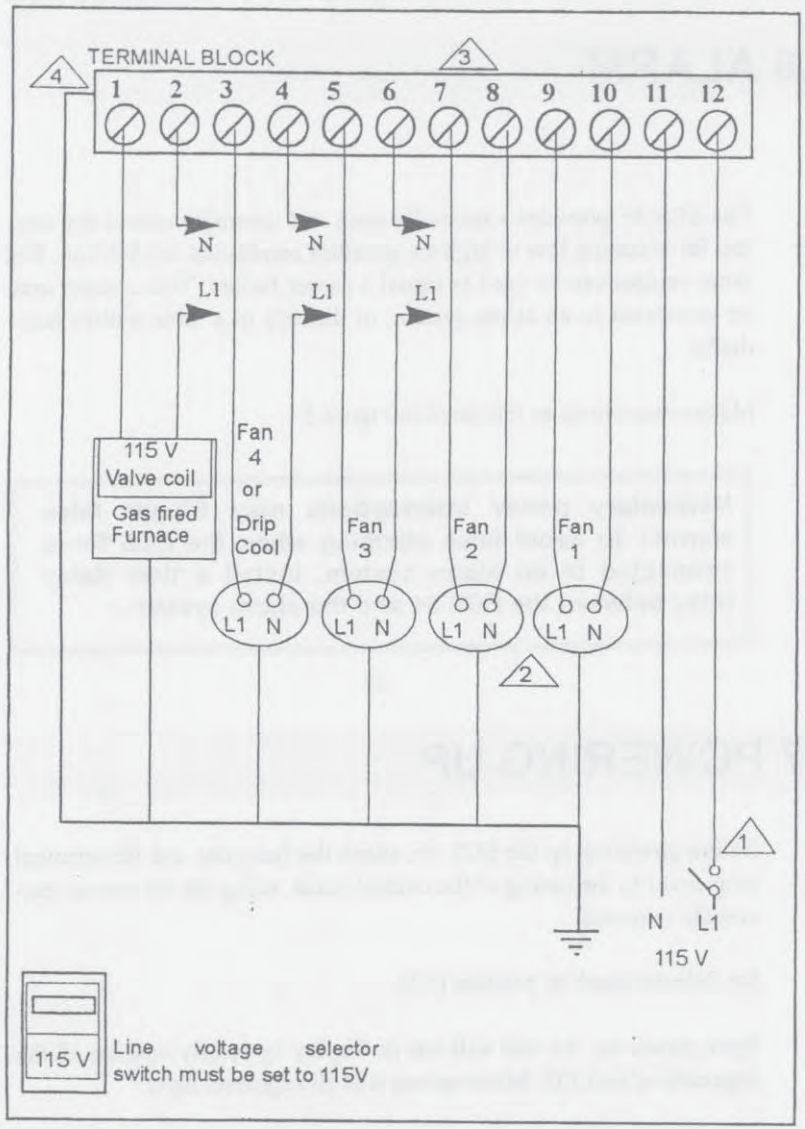
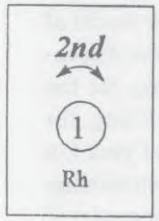


Fig. 2
Four Fans (115V) and One Heating Unit (115V)

SECONDARY FUNCTIONS

RELATIVE HUMIDITY SET POINT



If the control panel is equipped with an optional humidity sensor, this setting regulates the humidity level of the room. The humidity setting affeots the operation of Fan 1 only. When the humidity level of the room exceeds the relative humidity setting, Fan 1 runs at a new minimum speed. The speed that Fan 1 operates at, is governed by the ambient humidity of the room. This in turn may cause the fan to increase to a speed 30% higher than the Fan 1 minimum speed set by primary function (2). The fan operates at this increased speed for as long as the ambient room temperature is below the main set point. When the temperature of the room is greater than the main set point temperature the fan speed increases until the maximum speed for the fan has been reached. The humidity level is adjusted in 1% increments from a minimum setting of 10% to a maximum setting of 90%.

Adjusting the relative humidity level:

- rotate the Selector dial to position (12),
- rapidly rotate the Adjustor dial back and forth to enter secondary function mode,
- rotate the Selector dial to position (1),
- rotate the Adjustor dial counterclockwise to decrease the humidity setting, clockwise to increase it.

The humidity setting is displayed on the front panel.

AMBIENT ROOM TEMPERATURE DISPLAY



This function displays the ambient room temperature. The Selector dial should normally be left in this position.

The ambient temperature is displayed to the nearest 0.5 degree from a minimum display of 42.0°F (5.5°C) to a maximum display of 111°F (44.0°C). If the temperature is lower than 42.0°F, Lo is displayed. If the temperature is higher than 111°F, Hi is displayed.

Viewing the ambient temperature:

- rotate the Selector dial to position (12)

The ambient temperature is displayed on the front panel.

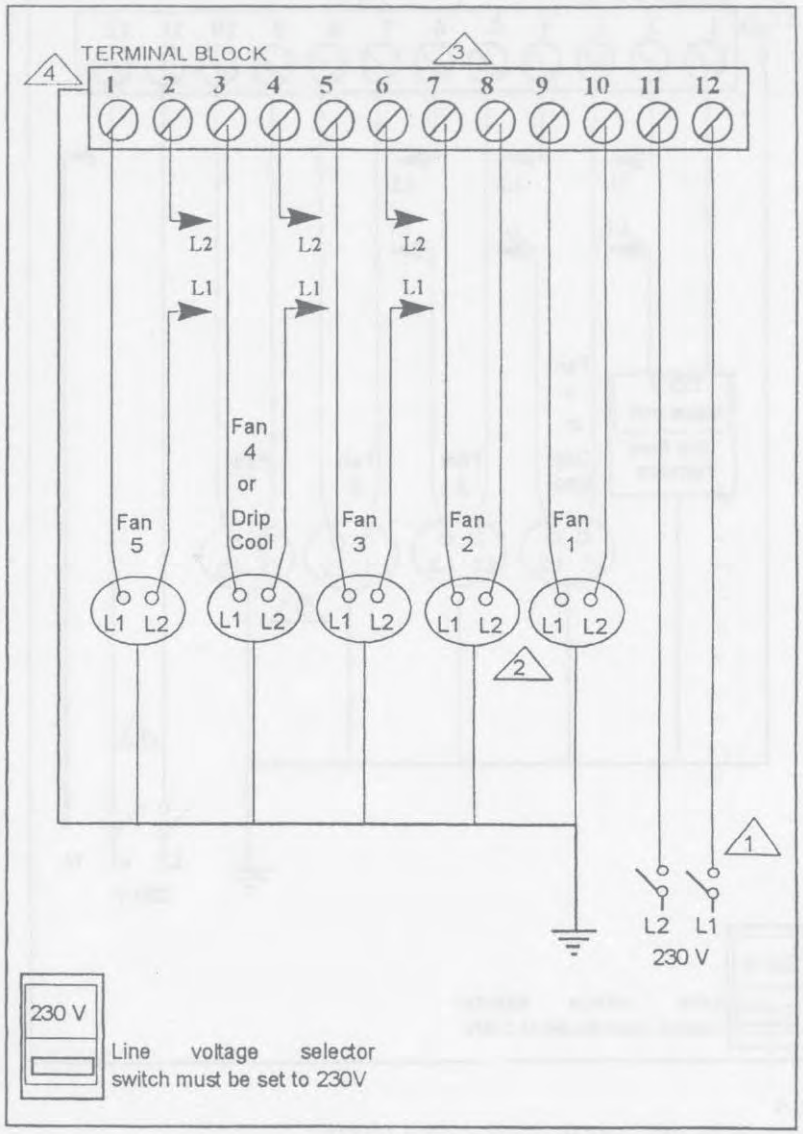


Fig. 3
Five Fans (230V)

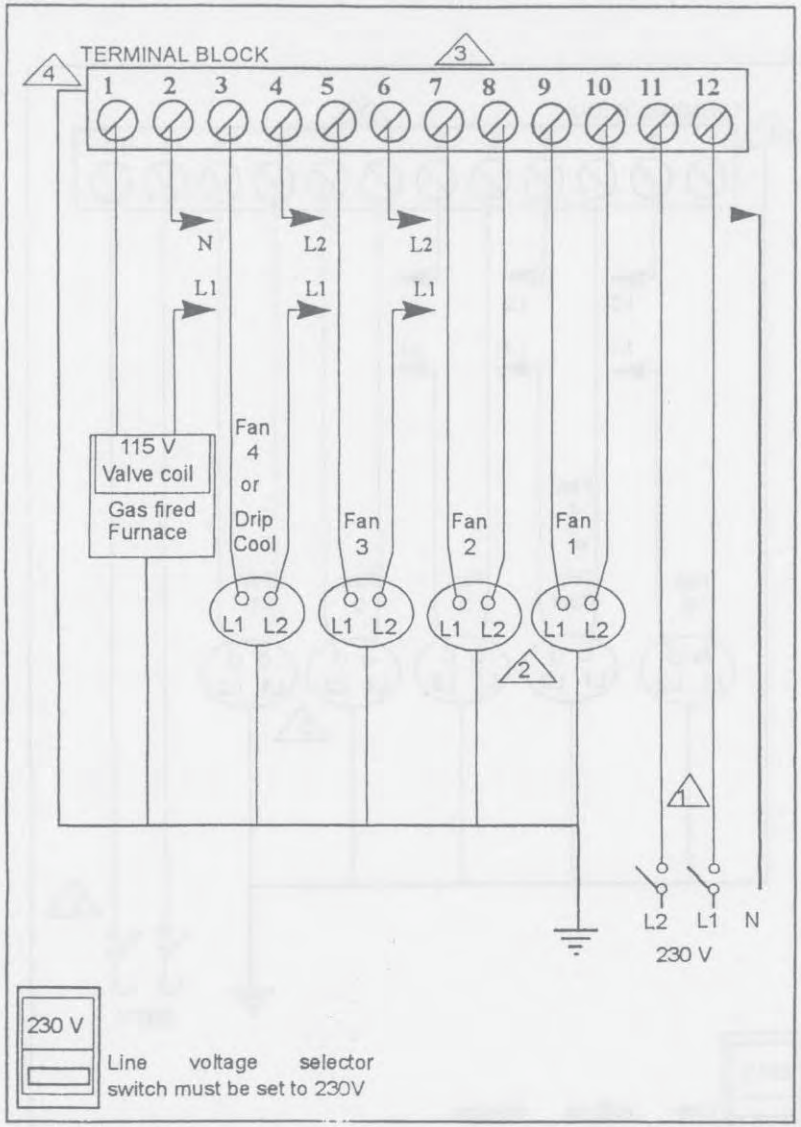


Fig. 4
Four Fans (230V) and One Heating Unit (115V)

RECORD HIGH TEMPERATURE



This function displays the highest recorded temperature since the last clear.

The record high temperature is rounded to the nearest 0.5 degree from a minimum display of 42.0°F (5.5°C) to a maximum display of 111°F (44.0°C). If a temperature higher than 111°F is recorded, Hi is displayed.

Displaying the highest temperature recorded:

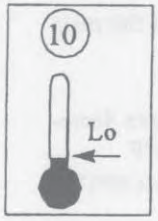
- rotate the Selector dial to position (11)

Clearing the high temperature value

- quickly rotate the Adjustor dial counterclockwise, then clockwise.

CLr will be briefly displayed on the front panel.

RECORD LOW TEMPERATURE



This function displays the lowest recorded temperature since the last clear.

The record low temperature is rounded to the nearest 0.5 degree from a minimum display of 42.0°F (5.5°C) to a maximum display of 111°F (44.0°C). If a temperature lower than 42.0°F is recorded, Lo is displayed.

Viewing the lowest temperature recorded:

- rotate the Selector dial to position (10)

Clearing the low temperature value

- quickly rotate the Adjustor dial counterclockwise, then clockwise.

CLr will be briefly displayed on the front panel.

Notes for Figures 2, 3, and 4

1. Power cut and protection devices in case of overload.
2. Only use fans that have thermal protection devices.
3. Terminals 8, 10, and 11 are connected in common within the control panel.
4. Connect the grounding wire to the ground terminal wire (shown in Figure 7) inside the housing.

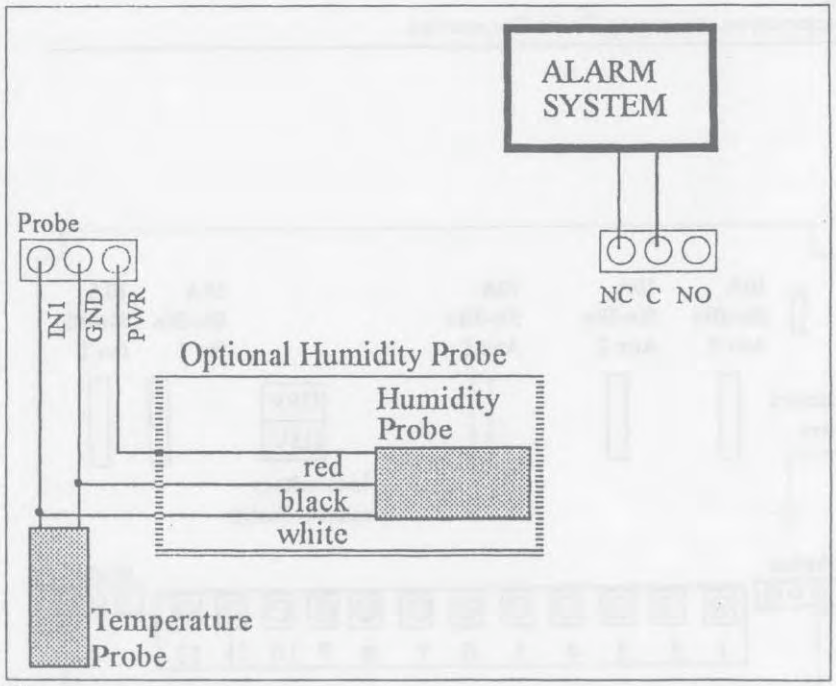


Fig. 5
Probes and Alarm Wiring

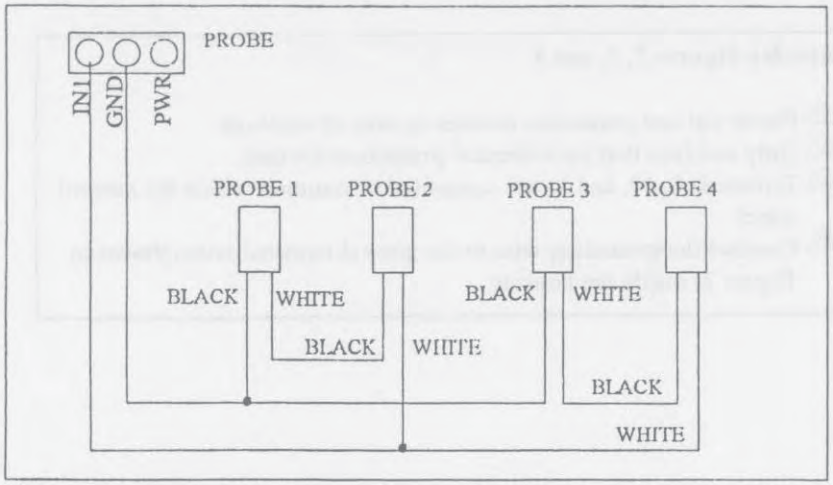


Fig. 6
Temperature Averaging Probe Connection

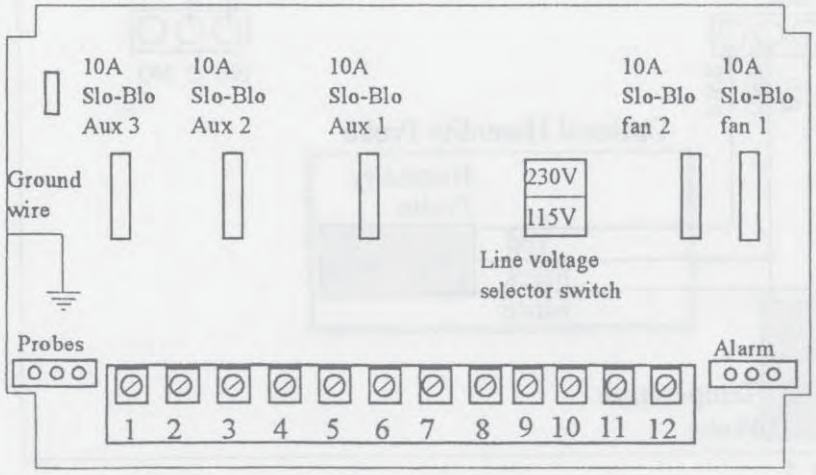


Fig. 7
Main Board: Terminal Blocks, Switches, Fuse Location and Ground

RAMPING



The ramping function automatically reduces the main set point by the set amount every 24 hours.

The ramping setting is adjusted in 0.01 degree decrements from a minimum setting of OFF, -0.01°F (-0.01°C) to a maximum setting of -0.99°F (-0.50°C)

Adjusting ramping:

- rotate the Selector dial to position (9),
- rotate the Adjustor dial counterclockwise to decrease the ramping rate, clockwise to increase it.

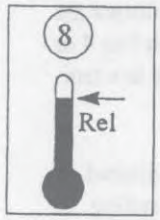
The ramping setting is displayed on the front panel.

NOTE: When ramping is activated or enabled, the main set point temperature cannot be manually adjusted.

Ramping automatically turns OFF when the minimum temperature limit is reached!

Example: The main set point temperature is set to 70°F and ramping is adjusted to -0.01°F. The following day the main set point temperature drops to 69.99°F followed by 69.98°F on the next.

HEATER/FAN 5 RELATIVE SET POINT



The Heater/Fan *5* relative set point is the relative set point at which Heater/Fan 5 begins to operate. This value is the temperature difference from the main set point.

When a heater is being controlled the relative set point is below the main set point. When a fan is being controlled the relative set point is above the main set point.

The Heater/Fan 5 relative set point temperature is adjusted in 0.5 degree increments from a minimum setting of -9.0°F (-5.0°C) to a maximum setting of 30.0°F (16.0°C).

Adjusting the Heater/Fan 5 relative temperature:

- rotate the Selector dial to position (8),
- rotate the Adjustor dial counterclockwise to decrease the temperature setting, clockwise to increase it.

The relative temperature setting is displayed on the front panel.

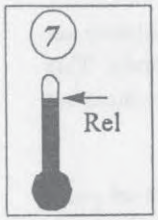
Example: The main set point temperature is adjusted to 70°F. A heater is in use and the relative set point is adjusted to -5°F. When the room temperature reaches 65°F the heater begins to operate.

A fifth fan is in use and the relative set point is adjusted to 15°F. When the room temperature reaches 85°F the fifth fan begins to run.

CHAPTER 3

USER'S GUIDE

FAN 4/DRIP COOL RELATIVE SET POINT



The Fan 4/Drip Cool relative set point establishes the temperature above the main set point at which Fan 4 or a Drip Cool unit begins to operate. The value is a temperature **difference** from the main set point.

The Fan 4/Drip Cool relative set point is adjusted in 0.5 degree increments from a minimum setting of 0.0°F (0.0°C) to a maximum setting of 30.0°F (16.0°C).

Adjusting the relative set point of Fan 4/Drip Cool:

- rotate the Selector dial to position (7),
- rotate the Adjustor dial counterclockwise to decrease the relative set point, clockwise to increase it.

The Fan 4/Drip Cool relative set point is displayed on the front panel.

Example:
A main set point of 70°F along with a Fan 4/Drip Cool relative set point of 10°F is selected. When the temperature of the room reaches 80°F, Fan 4 or a Drip Cool unit begins to operate.

FAN 3 RELATIVE SET POINT



The Fan *3* relative set point establishes the temperature above the main set point at which Fan *3* begins to operate. The value is a temperature **difference** from the main set point.

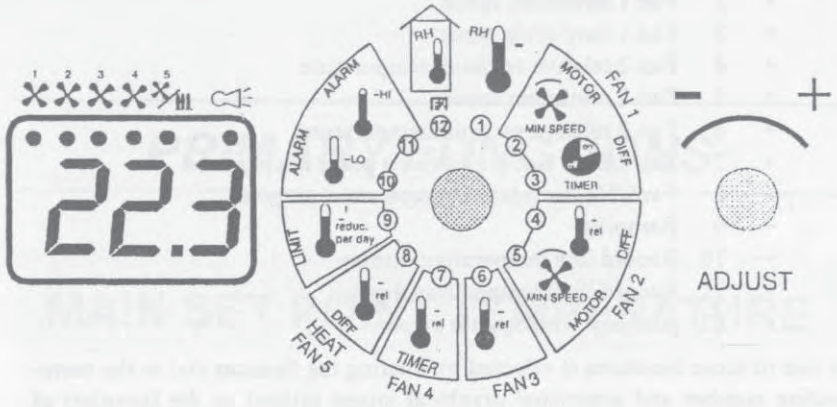
The Fan *3* relative set point is adjusted in 0.5 degree increments from a minimum setting of 0.0°F (0.0°C) to a maximum setting of 18.0°F (10.0°C).

Adjusting the relative set point of Fan *3*:

- rotate the Selector dial to position (6),
- rotate the Adjustor dial counterclockwise to decrease the relative set point, clockwise to increase it.

The Fan *3* relative set point is displayed on the front panel.

Example:
A main set point of 70°F along with a Fan *3* relative set point of *8*°F is selected. When the temperature of the room reaches *78*°F, Fan *3* begins to operate.



The ECS 5+ front panel shown above features a LED status window and two control dials which are respectively used to select a function and adjust a setting.

LED STATUS WINDOW

The LED status window features a 3 digit LED readout for the display of temperature in Fahrenheit or Celsius, humidity level, and programmable settings.

In addition, the LED status window displays the operational status of stages 1 through 5 via six additional LEDS (shown above in LED window). When illuminated, each LED indicates that its associated fan, heater, or drip cool unit is operating. The sixth LED lights to indicate a low or high temperature alarm condition.

CONTROL DIALS

The center dial is the Selector dial and is used to select one of the control panel's 12 primary or 11 secondary functions. The dial located to the right of the Selector dial is the Adjustor dial and is used to enter secondary function mode and to adjust the setting of each function.

The 12 primary functions are:

- 1 Main set point temperature
- 2 Fan 1 minimum speed
- 3 Fan 1 duty cycle timer
- 4 Fan 2 relative set point temperature
- 5 Fan 2 minimum speed
- 6 Fan 3 relative set point temperature
- 7 Fan 4/Drip Cool relative set point temperature
- 8 Fan5/Heater relative temperature set point
- 9 Ramping
- 10 Record low temperature display
- 11 Record high temperature display
- 12 Ambient temperature display

Any one of these functions is selected by rotating the Selector dial to the corresponding number and associated graphical image printed on the faceplate of the panel. When primary functions 1 through 11 are selected, the LED status window displays a blinking value. Function 12 displays ambient temperature.

The 11 secondary functions are:

- 1 Relative humidity setting
- 2 Fan 1 motor compatibility
- 3 Fan 1 differential temperature
- 4 Fan 2 differential temperature
- 5 Fan 2 motor compatibility
- 7 Drip Cool duty cycle timer
- 8 Fan 5/Heater differential temperature
- 9 Ramping minimum temperature limit
- 10 Low temperature alarm
- 11 High temperature alarm
- 12 Relative humidity display

Select any one of these secondary mode functions by:

- rotating the Selector dial to (12)
- rapidly rotating the Adjustor dial back and forth to enter secondary mode.
- rotating the Selector dial from function (12) to any other function.

When secondary functions 1 through 5, and 7 through 11 are selected the status window displays a blinking value along with a scrolling LED display. Selection of function 12 removes the control panel from the secondary function mode.

FAN 2 MINIMUM SPEED



When the room temperature is at the Fan 2 relative set point, Fan 2 runs at minimum speed set by this function. This value is entered as a percentage of maximum speed. The Fan 2 minimum speed is adjusted in 2% increments from a minimum setting of 12% to a maximum setting of 100%.

Adjusting the minimum speed of Fan 2:

- rotate the Selector dial to position (5),
- rotate the Adjustor dial counterclockwise to decrease fan speed, clockwise to increase it.

The minimum fan speed is displayed on the front panel.

NOTE: Upon start-up, Fan 2 will run at its maximum speed for one second.

This ensures that Fan 2 does not stall in the event of a freeze-up.

FAN 2 RELATIVE SET POINT



The Fan 2 relative set point establishes the temperature above the main set point at which Fan 2 begins to operate at its minimum speed. The value is a temperature **difference** from the main set point.

The Fan 2 relative set point is adjusted in 0.5 degree increments from a minimum setting of 0.0°F (0.0°C) to a maximum setting of 18.0°F (10.0°C).

Adjusting the relative set point of Fan 2:

- rotate the Selector dial to position (*4*),
- rotate the Adjustor dial counterclockwise to decrease the relative set point, clockwise to increase it.

The Fan 2 relative set point is displayed on the front panel.

Example:
A main set point of 70°F along with a Fan 2 relative set point of 5°F is selected. When the temperature of the room reaches 75°F, Fan 2 begins to operate at minimum speed.

PRIMARY FUNCTIONS

MAIN SET POINT TEMPERATURE



The main set point establishes the target temperature in the building. This value is used as the reference point for other temperature settings. The main set point temperature is adjusted in 0.5 degree increments from a minimum setting of 42.0°F (5.5°C) to a maximum setting of 111°F (44.0°C).

Adjusting the main set point temperature:

- rotate the Selector dial to position (1),
- rotate the Adjustor dial counterclockwise to decrease the temperature setting, clockwise to increase it.

The main set point temperature is displayed on the front panel.

Note: The ramping feature (primary function 9) must be off to adjust the main set point.

FAN 1 MINIMUM SPEED



This function sets the minimum speed of Fan 1 when room temperature is below the main set point. This value is entered as a percentage of maximum speed. The Fan 1 minimum speed is adjusted in 2% increments from a minimum setting of 12% to a maximum setting of 100%.

Adjusting the minimum speed of Fan 1:

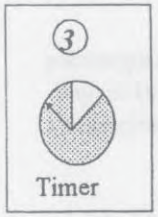
- rotate the Selector dial to position (*2*),
- rotate the Adjustor dial counterclockwise to decrease fan speed, clockwise to increase it.

The minimum fan speed is displayed on the front panel

NOTE: Upon start-up, Fan 1 will run at its maximum speed for one second.

This ensures that fan 1 does not stall in the event of a freeze-up.

FAN 1 DUTY CYCLE



As long as the actual temperature is below the main set point, Fan 1 operates at the minimum speed set by Fan 1 Minimum Speed (primary function 2). The Fan 1 duty cycle sets the percentage of time the fan is ON versus the percentage of time the fan is OFF. The ON time is entered as a percentage of the total time which is known as the period.

The Fan 1 duty cycle is adjusted in 5% increments from a minimum setting of OFF, 5%, 10% etc., up to a maximum setting of ON corresponding to continuous operation.

Adjusting the duty cycle of Fan 1:

- rotate the Selector dial to position (*3*),
- rotate the Adjustor dial counterclockwise to decrease the duty cycle, clockwise to increase it.

The duty cycle is displayed on the front panel.

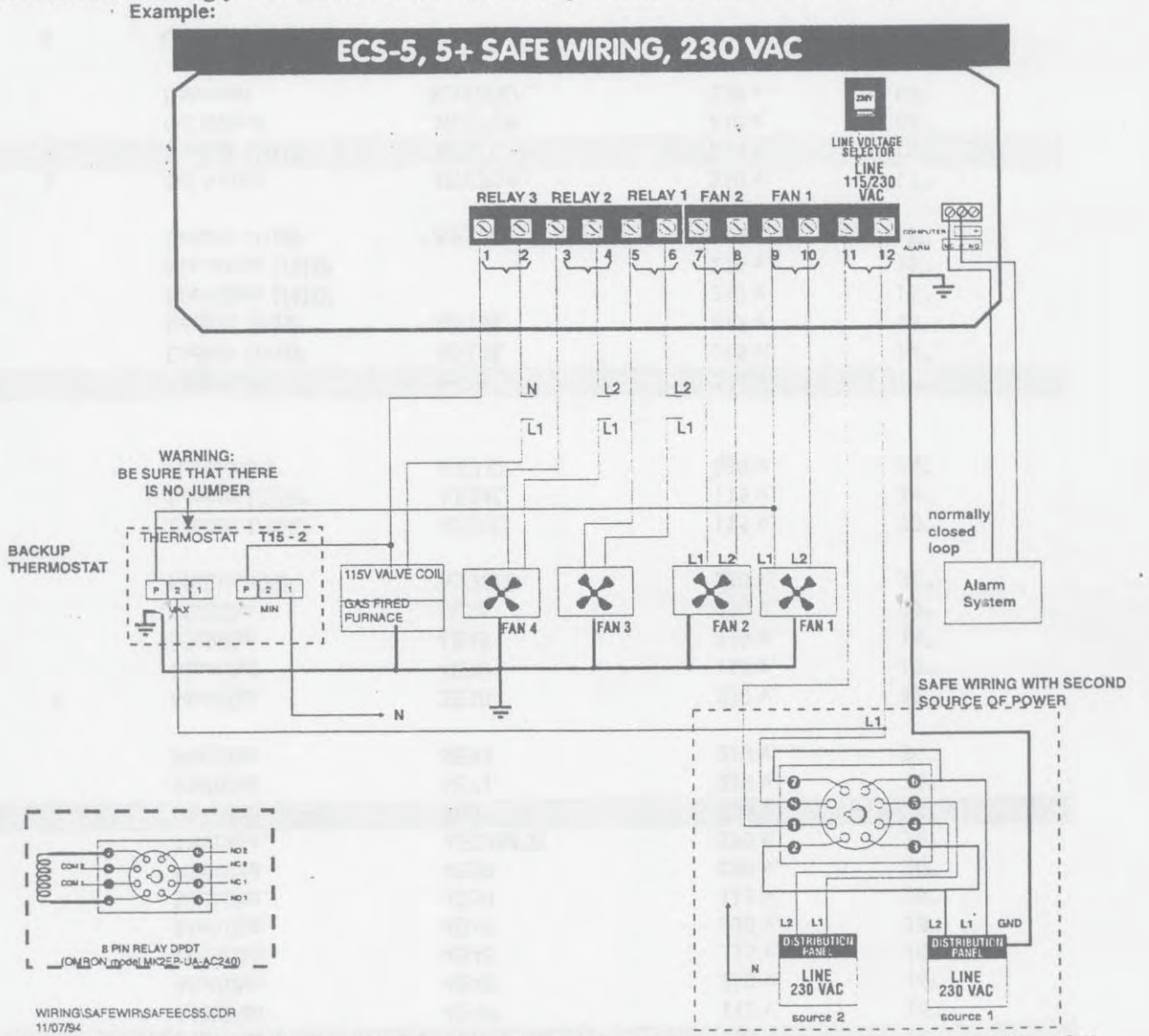
Example:
The period of Fan 1 is set to 5 minutes by the software settings DIP switch, while the duty cycle is set to 50%. As long as the main set point temperature of the room has not been reached, the fan operates at a minimum speed for 2.5 minutes, and OFF for 2.5 minutes.

Varifan RECOMMENDED CONTROL BACKUP

WARNING AND PRECAUTIONS

Equipment failure, blown fuses and/or tripped breakers may prove harmfull to the content of the building. It is therefore **strongly recommended** to install backup devices and alarm or warning devices

Example:



BACKUP THERMOSTAT. If the Varifan control fails, then the thermostat will start the dedicated fan at full speed when the temperature will reach the high T15-2 set value or it will turn on the heater if the temperature reaches the lower set value. Therefore, the T15-2 should be accessible for its adjustment and it should be set at the same temperature as the alarm, i.e. approximately 5°F above the main set point for the MAXIMUM setting and at 2° below the heating set point of the Varifan control, for the T15-2 MINIMUM setting.

BACKUP POWER SOURCE. The DPDT relay connects to the source 1 in normal operation but it will switch to the source 2 if source 1 is off. The relay shall be chosen to support the load connected to it.

ALARM CIRCUIT. In normal operation, the alarm circuit of the Varifan Control is a short circuit. But if the Varifan control is defective or if there is no power applied to it, then the alarm circuit of the control will be an open circuit.

March 22 1995

ECS-PLUS - CHOICE OF MOTOR CURVES

PROGRAM #: ECS-1 -2 -3P11 -5P8

CURVE#	BRAND	MODEL	VOLT	SIZE
1	Multifan	4E40	230 v.	16"
2	Multifan	2E20	230 v.	8"
	Multifan	4E35	230 v.	14"
	Multifan	4E40	115 v.	16"
	Multifan	4E40	230 v.	16"
	Multifan	4E45	115 v.	18"
	Multifan	4E45	230 v.	18"
	Multifan	4E50	115 v.	20"
	Multifan	4E50	230 v.	20"
	Multifan	AF24M'E	230 v.	24"
	Multifan	6E63	230 v.	24"
	Multifan	6E71	230 v.	28"
	Multifan	8E92	230 v.	36"
3	Multifan	2E30	230 v.	12"
	Multifan	4E30	115 v.	12"
	Multifan	4E45	230 v.	18"
	Multifan	6E56	230 v.	22"
	Multifan/AF	AF36M	230 v.	36"
	Leeson 1/2HP	AF20L	115 v.	20"
	Leeson 1/2HP	AF24L	115 v.	24"
	Aerotech-F	AT242	230 v.	24"
4	Multifan	2E25	230 v.	10"
	Leeson 1/4HP	AF14L	115 v.	14"
	Leeson 1/4HP	AF16L	115 v.	16"
	Marathon 1/4HP		230 v.	16"
	Marathon 1/3HP		230 v.	18"
	Leeson 1/3HP	AF18L	115 v.	18"
5	GE Motor	5KCP39...	230 v.	12"
	Leeson 1/4HP	AF12L	230 v.	12"
	GE Motor	5KCP39...	230 v.	14"
	Emerson	K55HXJ...	230 v.	14"
6	Oversized motors			
7	Multifan	4E30	230 v.	12"
	Multifan	2E35	230 v.	14"
8	Multifan	4E25	230 v.	10"