

# **CLIMATRAC**

*Model 400*

*Installation and Operation Manual*

**VAL**  
**ENVIRONMENTAL**  
**SYSTEMS**

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## ENVIRONMENTAL PRODUCTS WARRANTY

**PLEASE READ THIS WARRANTY CAREFULLY. IF YOU (THE PURCHASER) DO NOT AGREE WITH THE WARRANTY LIMITATIONS OR ITS TERMS AND CONDITIONS, PROMPTLY RETURN THIS PRODUCT, UNUSED, TO THE PLACE WHERE YOU OBTAINED IT FOR A FULL REFUND.**

**LIMITED WARRANTY:** Blue Earth Research, Inc. (hereinafter BEaR) warrants this Product to be free from defects in material and workmanship and agrees to repair or replace any Product which proves defective under these terms and conditions.

**IMPROVEMENTS:** BEaR reserves the right to alter or improve this Product without notice and without incurring obligation to alter or improve existing Products.

**LENGTH OF WARRANTY:** This Product is warranted for a period of twelve (12) months from the date of installation. Sensors are warranted for a period of twelve (12) months from the date of manufacture or six (6) months from the date of installation.

**WHO IS PROTECTED:** This warranty is valid only for the original installation and is not transferable.

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- 1) Damage, deterioration or malfunction resulting from, but not limited to: power fluctuations or surges, accident, misuse, abuse, neglect, fire, water, corrosion, lightning or other acts of nature, improper storage, unauthorized Product repair or modification, damage in shipment, removal or installation of this Product, or any other cause not related to a Product defect.
- 2) Cartons, batteries, and other accessories used in connection with this Product.
- 3) Product returned without customer identification.
- 4) Service required as a result of third party components.

**WHAT IS NOT REIMBURSABLE:** The following items are not reimbursable:

- 1) Troubleshooting, removal or installation charges.
- 2) Setup, calibration, adjustment or maintenance of this Product.
- 3) Shipping and insurance charges for returning this Product to BEaR.
- 4) Customer training.
- 5) Travel expenses.

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THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE IN THE UNITED STATES OF AMERICA.

PURCHASER AGREES THAT THE SALE OF THIS PRODUCT BEARS A REASONABLE RELATIONSHIP TO THE STATE OF MINNESOTA AND THE LAWS OF THE STATE OF MINNESOTA SHALL GOVERN THE VALIDITY, CONSTRUCTION AND ENFORCEABILITY OF THIS WARRANTY, WITHOUT GIVING EFFECT TO THE CONFLICT OF LAWS PRINCIPLES THEREOF.

THE PURCHASER OF THIS PRODUCT AGREES THAT ALL CLAIMS BROUGHT IN RESPECT OF THIS WARRANTY SHALL BE BROUGHT IN A COURT LOCATED IN THE STATE OF MINNESOTA.

## Table of Contents

<b>OVERVIEW .....</b>	<b>4</b>
OPERATING MODES.....	4
CONTROL BOARD DIAGRAM.....	5
OUTPUT BOARD DIAGRAM .....	5
<b>INSTALLATION .....</b>	<b>6</b>
YOU’VE HEARD IT BEFORE.....	6
CIRCUIT PROTECTION .....	6
POWER SUPPLY .....	7
CONTROLLER.....	8
CONDUIT AND CONNECTIONS .....	8
SENSOR WIRING .....	8
SENSOR PLACEMENT .....	9
SENSOR CONNECTIONS .....	10
OUTPUT CHANNELS .....	12
<b>OPERATION.....</b>	<b>14</b>
SELECT AN OPERATING MODE.....	14
CONFIGURE THE CONTROL .....	14
OPERATING CYCLES.....	16
FUNCTION SELECTIONS FOR MODE 1.....	19
FUNCTION SELECTIONS FOR MODE 2.....	22
FUNCTION SELECTIONS FOR MODE 3.....	25
FUNCTION SELECTIONS FOR MODE 4.....	27
STRESS INDEX FOR EVAPORATIVE COOLING.....	30
STRESS INDEX—CELSIUS CONVERSION .....	31
HOW DO I RUN DEVICES . . .	32
PROGRAMMING THE CONTROLLER .....	35
<b>TROUBLESHOOTING.....</b>	<b>38</b>
<b>SPECIFICATIONS .....</b>	<b>40</b>
<b>PARTS DIAGRAM.....</b>	<b>41</b>
<b>SERVICE .....</b>	<b>42</b>

AS WITH ANY SOPHISTICATED CONTROL SYSTEM, THIS CONTROLLER CANNOT BE GUARANTEED TO PERFORM WITHOUT INCIDENT FOREVER. THERE ARE MANY CONDITIONS SUCH AS LIGHTNING STRIKES, PROGRAMMING ERRORS, AND EQUIPMENT FAILURE THAT COULD RESULT IN THIS CONTROLLER FAILING TO PERFORM ITS INTENDED FUNCTION. YOU MUST BE AWARE OF THIS AND BE WILLING TO TAKE THE NECESSARY PRECAUTIONS TO PREVENT FINANCIAL LOSS.

TO PROTECT AGAINST LOSS RELATED TO THE FAILURE OR MALFUNCTION OF THIS CONTROLLER, THE FOLLOWING SAFEGUARDS ARE REQUIRED:

1. A MANUAL BACKUP SYSTEM MUST BE INSTALLED. THIS SYSTEM MUST TAKE OVER IN THE EVENT OF A CONTROL SYSTEM MALFUNCTION.
2. AN ALARM SYSTEM MUST BE INSTALLED. THIS SYSTEM MUST PROVIDE A VISUAL INDICATION AND AUDIBLE WARNING OF ABNORMAL CONDITIONS.
3. A WEEKLY TEST OF THE MANUAL BACKUP SYSTEM AND ALARM SYSTEM MUST BE PERFORMED. THIS TEST CONFIRMS THAT THESE SYSTEMS ARE FUNCTIONING PROPERLY.
4. A DAILY CHECK OF THE CONTROL SYSTEM MUST BE PERFORMED. THIS CHECK CONFIRMS THAT THE SYSTEM IS OPERATING PROPERLY.
5. NON-FUNCTIONAL ALARMS OR BACKUPS MUST BE FIXED IMMEDIATELY.

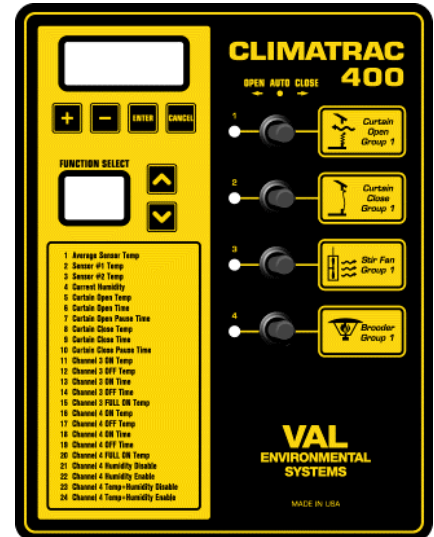
## Overview

Thank you for purchasing a ClimaTRAC 400. The ClimaTRAC 400 is a versatile microprocessor-based, four-channel controller that provides optimum operation of curtains and other ventilation devices. It can be set up to run devices on time or temperature. Each channel gives two-stage operation for temperature-controlled devices.

Sensors provide temperature and humidity information to the controller. The ClimaTRAC 400 will control curtains, evaporative cooling, or any other ventilation device on the basis of temperature. Evaporative cooling can be disabled if humidity rises too high in the building.

You can choose either Fahrenheit or Celsius mode with one switch.

The ClimaTRAC 400 is designed to control equipment in one zone (area). Choose one of the four modes below.



## Operating Modes

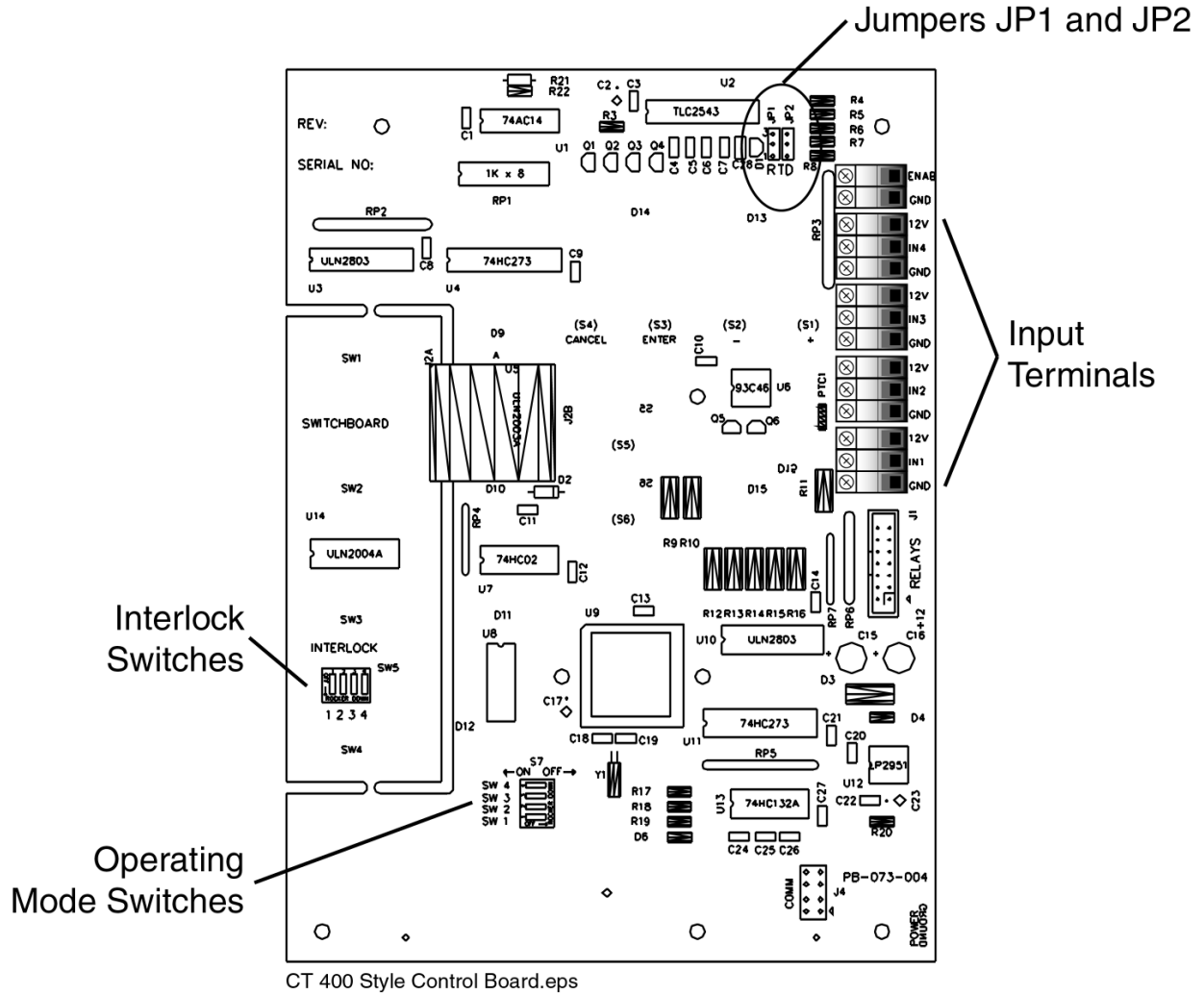
The ClimaTRAC 400 can be set up to run in one of four different modes:

- **Mode 1** - Curtain plus two temperature controlled devices.
- **Mode 2** - Four independent temperature controlled devices.
- **Mode 3** - Two independent curtains.
- **Mode 4** - Curtain plus fogger/drain mode.

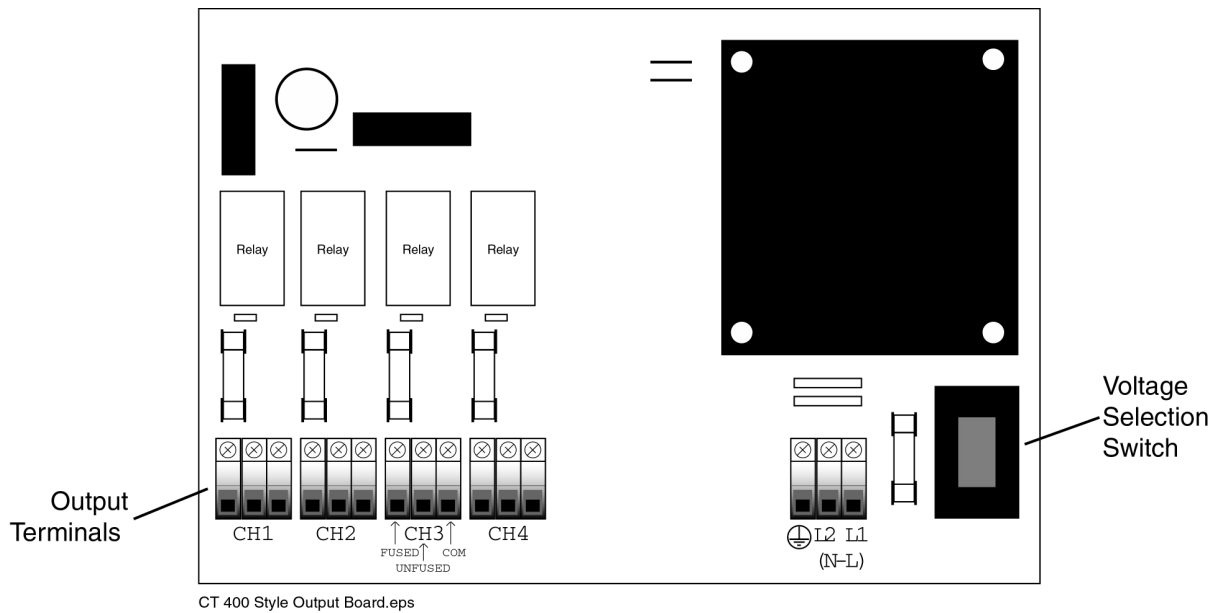
Each mode will display a different number of menu choices. Attach the proper menu sticker to the face of the controller and set the controller to the proper mode using setup switches (refer to the *Operation* section).

Another set of stickers enclosed with the controller allows you to label each channel with the device it controls.

## Control Board Diagram



## Output Board Diagram



## Installation

### You've Heard It Before...

Do not connect or disconnect wires while the power is on. Warranty does not cover damage caused by improper handling.

Always touch a grounded surface before working on electronic equipment. Static shocks can destroy sensitive electronic circuits.

A good ground for your electrical system and the controller is essential. A good ground could be a water pipe or a buried copper rod. Electrical conduit is often **not** grounded.

When attaching wires to terminals, first strip about ¼ inch of insulation. If you attach more than one wire to a terminal, twist the leads together before securing them to the terminal.

Tighten terminal screws securely, being careful not to over tighten them. Gently tug on the wires to make sure they are tight.

### Circuit Protection

The controller should be wired to an independent circuit breaker. Ideally each equipment output channel should have its own breaker to insure that tripping one breaker will not affect other devices in the ventilation system.

Motors must have a thermal overload protection device or impedance protection. The overload should auto-reset for any essential part of your ventilation system.

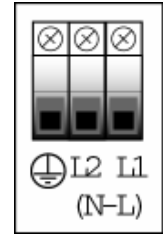
### Power Surges

The controller is protected against *normal* voltage surges, but lightning induced surges could damage the equipment. We recommend use of a surge suppressor to prevent damage from lightning. Lightning damage is not covered by the warranty.



## Power Supply

The controller can be operated on 115 or 230 VAC. The input voltage is selected by changing the transformer switch in the lower right corner of the enclosure.



Set the switch and connect 115 or 230 VAC to the power terminal block.

### Single-Phase Operation – (115 or 230 VAC)

Set your voltage switch to the correct voltage. Connect the hot line to L1, neutral to L2, and ground to ground ⊕.

### 3-Phase Operation – (220 VAC between phases)

Set your voltage switch to the correct voltage. Connect any two phases of the 3-phase supply line to terminals L1 and L2. Connect equipment ground to the ground terminal ⊕.

### 3-Phase Operation – (380 or 440 VAC between phases)

Set your voltage switch to the correct voltage. Connect a single phase of the 3-phase supply line to terminal L2 and **Neutral** to L1. Connect equipment ground to the ground terminal ⊕.



A qualified electrician should install the control. Failure to comply with all national and local electrical codes may void the warranty. Failure to seal all electrical conduit openings and cable entry points may also void the warranty. The manufacturer is not responsible for moisture damage or for the failure of the electrician to comply with electrical codes.

## Controller

The controller should be mounted indoors where the temperature will remain between 30 degrees Fahrenheit (- 1 degree Celsius) and 110 degrees Fahrenheit (43 degrees Celsius). Do not mount the unit in direct sunlight. Place the unit away from motors and relays/contactors that switch high current. Do not install the unit in the same room where the animals live since the air tends to be corrosive to electronic circuits. A separate room or control office is a preferred location.

Mounting brackets for the ClimaTRAC 400 are enclosed with the unit. Attach these to the back of the controller before mounting the enclosure in the building.

Drill holes in the controller enclosure with care. Make sure you do not drill into circuit boards or cables.

**Note:** Unless absolutely necessary, do not remove the electrical boards. They are static sensitive and should always be handled with appropriate grounding.

## Conduit and Connections

High voltage wires should enter the controller's enclosure from the bottom so they can be easily connected to the relays.

To avoid electrical shorts or damage due to moisture, you should never run conduit openings through the top of the box. Conduit and hubs should be corrosion resistant plastic or fiberglass. Use only UL approved NEMA 4X rated conduit hubs. Connect hubs to conduit before connecting to the controller enclosure. Use only liquid-tight strain-relief connectors to bring cables into the enclosure.

## Sensor Wiring

Use shielded 16 to 24 gauge (.5 to 1.5mm) stranded wire, such as Carol<sup>®</sup> AWM style 2426, to connect sensors to input channels. Wire can be twisted pair or straight type.

## Wire Spacing

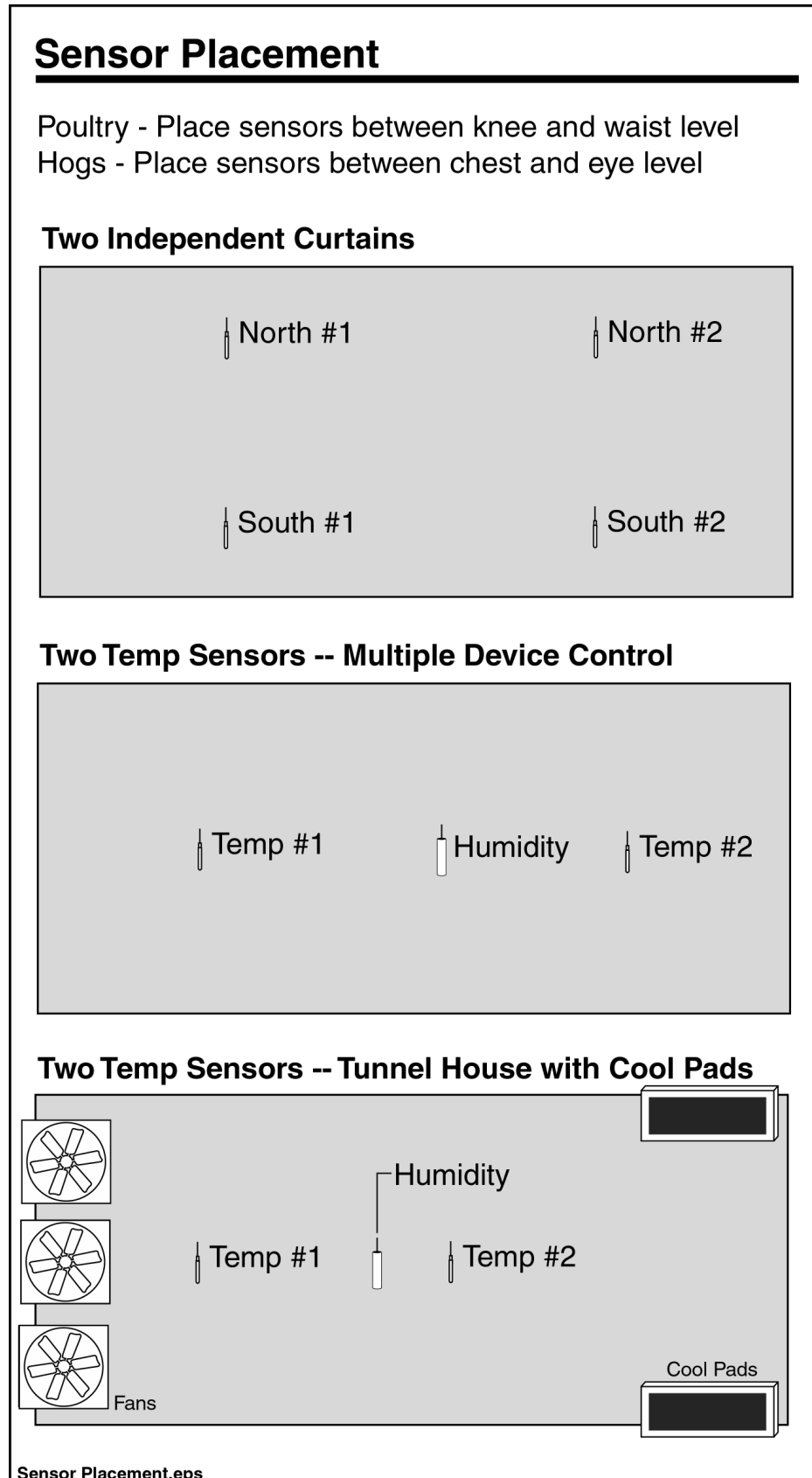
If a sensor cable runs parallel to power cables, allow a separation of at least 12" (30cm) to avoid interference.

**Note:** Do not run sensor cables through conduit with power wires.

## Sensor Placement

Sensors should be placed near the animals—your knee to waist level for poultry and your chest to eye level for hogs—out of direct sunlight and away from heaters. They should be placed where they will stay dry.

Humidity sensors should be located approximately in the middle of the building. Single temperature sensors should usually be hung in the middle the building.



Sensors for Mode 3—Two Independent Curtains—should be hung about 6 to 10 feet (2 to 3 meters) from the curtains and about one-third of the building length from each end when using two sensors per curtain.

For control of multiple devices, it is usually best to hang sensors under the roof peak and approximately equal distance from each other and the ends of the building. If the building is tunnel ventilated with evaporative cooling, move sensors farther toward the exhaust fans.

## Sensor Connections

### Temperature Sensors

The ClimaTRAC 400 temperature sensors are resistance-based electronic devices. Therefore, the cable gauge and length affect their readings. During installation, record cable gauge and length for each temperature sensor. This information will be entered into the controller (refer to the *Programming the Controller* section). Wire gauge and length do not affect humidity readings.

When connecting the temperature sensors, connect the black lead to the GND terminals, and the red lead to the INput terminal.

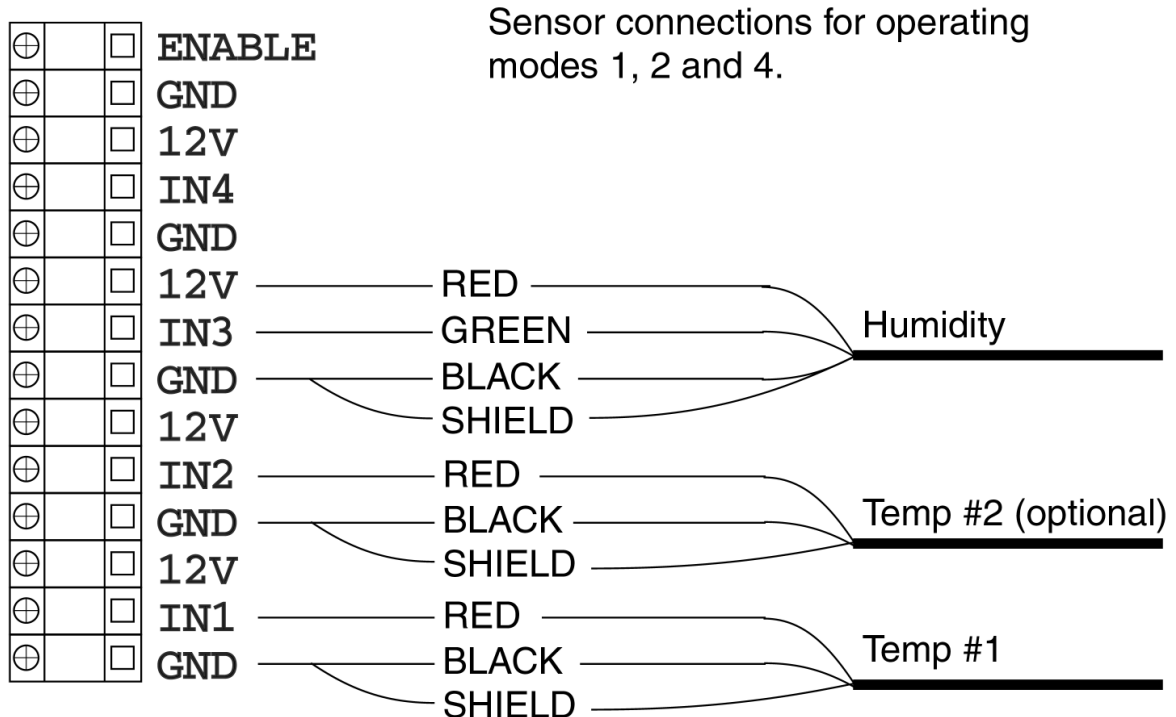
### Humidity Sensors

When connecting the humidity sensor, connect the black lead to the GND terminal, the red lead to the 12V terminal, and the green lead to the INput terminal.

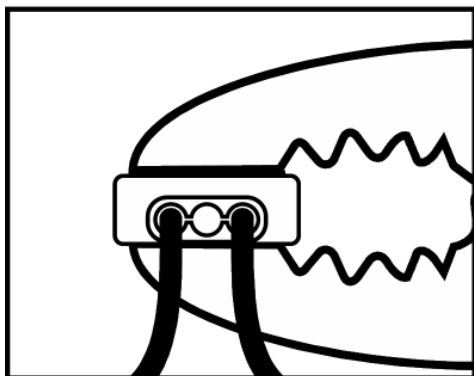
Input	Mode 1, 2, 4	Mode 3 — Two curtains
1	Temp Sensor 1	North Temp Sensor #1
2	Temp Sensor 2 (optional)	North Temp Sensor #2 (optional)
3	Humidity Sensor *	South Temp Sensor #1
4	Not used	South Temp Sensor #2 (optional)
5 (Enable)	Not used	Not used

\* Humidity Sensor is optional when not using humidity enable/disable.

## Input Terminals












CT Style Input Terminals.eps



3M Scotchlok<sup>®</sup> connectors are recommended for splicing (22-24 gauge wire only). Apply firm, even pressure to a button to ensure good contact. The button will be flush when properly sealed.

### Output Channels

Connect output devices to the output relays based on your choice of operating mode. Follow the chart shown below for connecting devices.

<b>Model 400: Four Modes of Operation</b>					
		<b>Mode 1</b> Curtain plus two temperature-controlled devices.	<b>Mode 2</b> Four independent temperature-controlled devices.	<b>Mode 3</b> Two independent curtains.	<b>Mode 4</b> Curtain plus a fogger/drain
<b>Channel (Relay)</b>	1	Curtain Open 	Temp Device #1	North Curtain Open 	Curtain Open 
	2	Curtain Close 	Temp Device #2	North Curtain Close 	Curtain Close 
	3	Temp Device #1	Temp Device #3	South Curtain Open 	Fogging
	4	Temp Device #2 or Evaporative Cooling Device	Temp Device #4 or Evaporative Cooling Device	South Curtain Close 	Pump Drain
<b>Notes</b>		JP1 and JP2 on upper pins. Mode Switch 1 OFF Mode Switch 2 OFF	JP1 and JP2 on upper pins. Mode Switch 1 OFF Mode Switch 2 ON	JP1 and JP2 on lower pins. Mode Switch 1 ON Mode Switch 2 OFF	JP1 and JP2 on upper pins. Mode Switch 1 ON Mode Switch 2 ON
	 = Interlock				

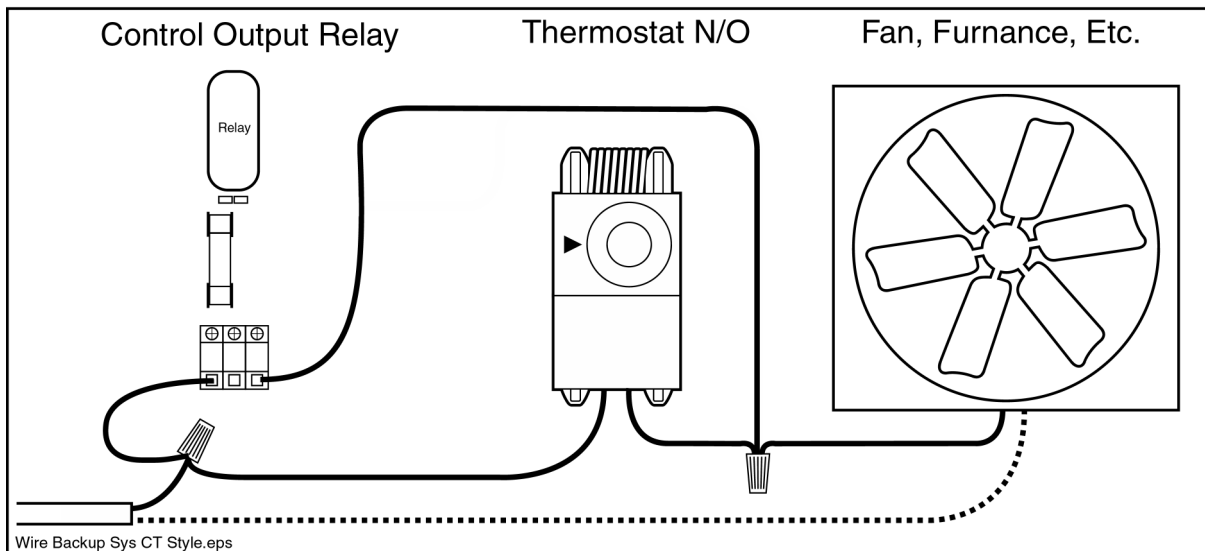
Modes.vsd

## Output Connections and Backup



It is essential for the safety of the animals that you set up backup devices that will turn on heat and ventilation in case of controller failure.

Make all connections through the fused and common terminal connections as shown in the diagram below.



Thermostats should be installed to backup heaters, fans, and curtains. Natural ventilated buildings should have curtain drops. Thermostats can be wired in parallel with the output relay to achieve effective backup.

### Using an Auxiliary Relay

An auxiliary relay (also called a contactor) can be mounted inside the ClimaTRAC 400 to switch high amperage pumps for fogging. The auxiliary relay should be controlled from an output relay on the board (typically channel 3), but you must supply a power source of the proper voltage to switch the auxiliary relay.

### Drain Channel

Under Mode 4 operation, channel 4 can be used to open a drain channel after the fogging pump has run. This will require a power source of the proper voltage to control the solenoid.

## Operation

### Select an Operating Mode

The ClimaTRAC 400 controller can function in four different operating modes:

- **Mode 1** - Curtain plus two temperature controlled devices
- **Mode 2** - Four independent temperature controlled devices
- **Mode 3** - Two independent curtains
- **Mode 4** - Curtain plus fogger/drain mode

### Configure the Control

#### DIP Switches

The controller must be set up to operate in the mode you want to use. To do this, open the front cover and set DIP switch S7 for the following settings (refer to the *Control Board Diagram* section for the location of the operating mode switches).

**Note:** DIP switch settings should be made with the power off. The changes take effect when the power is turned back on.

#### *Temperature*

Celsius operation—Switch 4 ON

- Metric calibration measurements in half degree increments.
- Cable length must be entered in meters and cable gauge in AWG.

Fahrenheit operation—Switch 4 OFF (default)

- American calibration measurements

#### *Control Mode*

**Mode 1** - Curtain plus two temperature controlled devices

Switch 1 OFF, Switch 2 OFF (default)

**Mode 2** - Four independent temperature controlled devices

Switch 1 OFF, Switch 2 ON

**Mode 3** - Two independent curtains



Switch 1 ON, Switch 2 OFF

**Mode 4** - Curtain plus fogger/drain mode

Switch 1 ON, Switch 2 ON

## Jumpers

Move the jumpers JP1 and JP2 according to the operating mode you are using. Refer to the *Control Board Diagram* section for the location of the jumpers.

**Mode 3**

Jumpers JP1 and JP2 must jumper the bottom pins.

**Mode 1, 2, and 4**

Jumpers JP1 and JP2 must jumper the upper pins (default setting).

## Interlock Settings

The DIP switches marked INTERLOCK create an interlock between channels 1 and 2 and/or channels 3 and 4. Interlocking will prevent channels from turning on at the same time, a feature made to protect motors that both open and close curtains. When a switch is moved to OFF, the interlock is enabled. Refer to the *Control Board Diagram* section for the location of the interlock switches.

**Mode 1** - Curtain plus two temperature controlled devices

Interlock 1 and 2 OFF, Interlock 3 and 4 ON

**Mode 2** - Four independent temperature controlled devices

Interlock 1 and 2 ON, Interlock 3 and 4 ON

**Mode 3** - Two independent curtains

Interlock 1 and 2 OFF, Interlock 3 and 4 OFF

**Mode 4** - Curtain plus fogger/drain mode

Interlock 1 and 2 OFF, Interlock 3 and 4 ON

## Operating Cycles

The ClimaTRAC 400 operates curtains, temperature-controlled devices, or evaporative cooling systems.

**Note:** The displayed temperature is *rounded*. The controller will operate on the *actual* temperature. Devices will turn on when the exact temperature is reached. For example, the controller displays 80 degrees when the actual temperature is 79.5 to 80.4 degrees. So, if you have a channel set to turn on at 80.0 degrees, the display may indicate 80 degrees before the channel turns on since the *actual* temperature could be 79.5 degrees.

### Curtains

#### *Open Cycle*

- If the temperature rises to a level at or above the Open Temp, the open cycle runs.
- The curtain moves open for the Open Time then stops.
- The curtain pauses for the Open Pause Time and then the controller checks the temperature.
- If the temperature is still at or above the Open Temp, the open cycle runs again.

#### *Close Cycle*

- If the temperature drops to a level at or below the Close Temp, the close cycle runs.
- The curtain closes for the Close Time then stops.
- The curtain pauses for the Close Pause Time and then the controller checks the temperature.
- If the temperature is still at or below the Close Temp, the close cycle runs again.

## Heating Devices

### *Off Temp is Higher than On and Full On Temps*

- When the temperature drops to the On Temp, the device cycles on for the On Time and off for the Off Time.
- If the temperature continues to drop and reaches the Full On Temp, the device will remain on until the temperature rises above the Full On Temp again.
- The on/off cycle will continue until the temperature rises to the Off Temp.

## Cooling/Ventilation Devices

### *Off Temp is Lower than On and Full On Temps*

- When the temperature rises to the On Temp, the device cycles on for the On Time and off for the Off Time.
- If the temperature continues to rise and reaches the Full On Temp, the device will remain on until the temperature drops below the Full On Temp again.
- The on/off cycle will continue until the temperature drops to the Off Temp.

## Cool Pad Systems

Cool Pad Systems can be added in the following modes to these channels:

- Mode 1 – Channel 4
- Mode 2 – Channel 4
- Mode 4 – Channel 3

Evaporative cooling uses the same time on/off cycle and full on functions as cooling and ventilation devices. In addition, there are humidity and stress index disables/enables available to prevent the grower from adding water to overly humid air.

Set Humidity Disable about 5% or more above the Humidity Enable. The evaporative cooling channel will shut off when humidity rises to or above Humidity Disable. When humidity drops to the Humidity Enable setting, evaporative cooling will continue based on the time cycles described in the previous section.

## Fogging Systems

Fogging Systems can be added in Mode 4 to channels 3 and 4.

Fogging will run in the same way that cool pad systems do with the addition of the drain operation. High pressure fogging requires a drain channel to open as soon as the pressure pump stops. This allows water to drain from the lines without wetting the inside of the building. As soon as channel 3 shuts off, the channel 4 drain will open for the Drain Time setting.

## Function Selections for Mode 1

### *Curtain plus two temperature controlled devices*

*Be sure the proper sticker showing 24 functions for this operating mode is applied to the front of the control. Each operating mode has different function menus.*

**Note:** Refer to the *Programming the Controller* section for detailed instructions on changing a setting.

### Current Conditions

#### *Function 1 – Average Sensor Temp*

Displays the average of the temperature sensors connected to the controller.

#### *Functions 2 & 3 – Sensor #1 Temp/Sensor #2 Temp*

Displays the temperature for each installed sensor. Damaged sensors or sensors not installed read – – – –.

#### *Function 4 – Current Humidity*

Displays the relative humidity if a humidity sensor is installed.

### Channel 1 – Curtain Open

#### *Function 5 – Curtain Open Temp*

Sets and displays the temperature at which the curtain will open.

#### *Function 6 – Curtain Open Time*

Sets and displays minutes and seconds (M.SS) that the curtain will open when the temperature is at or above the Curtain Open Temp.

#### *Function 7 – Curtain Open Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Curtain Open Time.

### Channel 2 – Curtain Close

#### *Function 8 – Curtain Close Temp*

Sets and displays the temperature at which the curtain will close.

#### *Function 9 – Curtain Close Time*

Sets and displays time minutes and seconds (M.SS) that the curtain will close when the temperature is at or below the Curtain Close Temp.

### *Function 10 – Curtain Close Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Curtain Close Time.

## **Channel 3 – Temperature-Controlled Device**

### *Function 11 – Channel 3 On Temp*

Sets and displays the temperature at which channel 3 turns on the device.

### *Function 12 – Channel 3 Off Temp*

Sets and displays the temperature at which channel 3 turns off the device.

### *Function 13 – Channel 3 On Time*

Sets and displays minutes and seconds (M.SS) of time the device will run during time cycle.

### *Function 14 – Channel 3 Off Time*

Sets and displays minutes and seconds (M.SS) of time the device will remain off during time cycle.

### *Function 15 – Channel 3 Full On Temp*

Sets and displays the temperature at which the device begins to run constantly instead of cycling on and off.

## **Channel 4 – Temperature-Controlled Device**

### *Function 16 – Channel 4 On Temp*

Sets and displays the temperature at which channel 4 turns on the device.

### *Function 17 – Channel 4 Off Temp*

Sets and displays the temperature at which channel 4 turns off the device.

### *Function 18 – Channel 4 On Time*

Sets and displays minutes and seconds (M.SS) of time the device will run during time cycle.

### *Function 19 – Channel 4 Off Time*

Sets and displays minutes and seconds (M.SS) of time the device will remain off during time cycle.

### *Function 20 – Channel 4 Full On Temp*

Sets and displays the temperature at which the device begins to run constantly instead of cycling on and off.

## Channel 4 – Humidity Control for Evaporative Cooling

**Note:** Functions only if a relative humidity sensor is installed.

### *Function 21 – Channel 4 Humidity Disable*

Sets and displays relative humidity cutoff for channel 4. Humidity at this level or above turns channel 4 off.

### *Function 22 – Humidity Enable*

Sets and displays relative humidity enable for channel 4. After the humidity rises to the Humidity Disable percentage, channel 4 will not turn on again until the humidity drops to or below the Humidity Enable setting.

### *Function 23 – Channel 4 Temp + Humidity Disable*

Sets and displays the stress index cutoff for channel 4. The stress index is equal to the temperature (Fahrenheit degrees) plus relative humidity (percent). High temperature and humidity at this level or above turns channel 4 off.

### *Function 24 – Channel 4 Temp + Humidity Enable*

Sets and displays the stress index enable for channel 4. The stress index is equal to the temperature (Fahrenheit degrees) plus relative humidity (percent). After the stress index rises to the Temp + Humidity Disable setting, channel 4 will not turn on again until the index drops to or below the Temp + Humidity Enable setting.

Refer to the *Stress Index for Evaporative Cooling* section for more information about stress index.

## Function Selections for Mode 2

### *Four independent temperature-controlled devices*

*Be sure the proper sticker showing 28 functions for this operating mode is applied to the front of the control. Each operating mode has different function menus.*

**Note:** Refer to the *Programming the Controller* section for detailed instructions on changing a setting.

### Current Conditions

#### *Function 1 – Average Sensor Temp*

Displays the average of the temperature sensors connected to the controller.

#### *Functions 2 & 3 – Sensor #1 Temp/Sensor #2 Temp*

Displays the temperature for each installed sensor. Damaged sensors or sensors not installed read – – – –.

#### *Function 4 – Current Humidity*

Displays the relative humidity if a humidity sensor is installed.

### Channel 1 – Temperature-Controlled Device

#### *Function 5 – Channel 1 On Temp*

Sets and displays the temperature at which channel 1 turns on the device.

#### *Function 6 – Channel 1 Off Temp*

Sets and displays the temperature at which channel 1 turns off the device.

#### *Function 7 – Channel 1 On Time*

Sets and displays minutes and seconds (M.SS) of time the device will run during time cycle.

#### *Function 8 – Channel 1 Off Time*

Sets and displays minutes and seconds (M.SS) of time the device will remain off during time cycle.

#### *Function 9 – Channel 1 Full On Temp*

Sets and displays the temperature at which the device begins to run constantly instead of cycling on and off.



## Channel 2 – Temperature-Controlled Device

### *Function 10 – Channel 2 On Temp*

Sets and displays the temperature at which channel 2 turns on the device.

### *Function 11 – Channel 2 Off Temp*

Sets and displays the temperature at which channel 2 turns off the device.

### *Function 12 – Channel 2 On Time*

Sets and displays minutes and seconds (M.SS) of time the device will run during time cycle.

### *Function 13 – Channel 2 Off Time*

Sets and displays minutes and seconds (M.SS) of time the device will remain off during time cycle.

### *Function 14 – Channel 2 Full On Temp*

Sets and displays the temperature at which the device begins to run constantly instead of cycling on and off.

## Channel 3 – Temperature-Controlled Device

### *Function 15 – Channel 3 On Temp*

Sets and displays the temperature at which channel 3 turns on the device.

### *Function 16 – Channel 3 Off Temp*

Sets and displays the temperature at which channel 3 turns off the device.

### *Function 17 – Channel 3 On Time*

Sets and displays minutes and seconds (M.SS) of time the device will run during time cycle.

### *Function 18 – Channel 3 Off Time*

Sets and displays minutes and seconds (M.SS) of time the device will remain off during time cycle.

### *Function 19 – Channel 3 Full On Temp*

Sets and displays the temperature at which the device begins to run constantly instead of cycling on and off.

## Channel 4 – Temperature-Controlled Device

### *Function 20 – Channel 4 On Temp*

Sets and displays the temperature at which channel 4 turns on the device.

### *Function 21 – Channel 4 Off Temp*

Sets and displays the temperature at which channel 4 turns off the device.

### *Function 22 – Channel 4 On Time*

Sets and displays minutes and seconds (M.SS) of time the device will run during time cycle.

### *Function 23 – Channel 4 Off Time*

Sets and displays minutes and seconds (M.SS) of time the device will remain off during time cycle.

### *Function 24 – Channel 4 Full On Temp*

Sets and displays the temperature at which the device begins to run constantly instead of cycling on and off.

## Channel 4 — Humidity Control for Evaporative Cooling

**Note:** Functions only if a relative humidity sensor is installed.

### *Function 25 – Channel 4 Humidity Disable*

Sets and displays relative humidity cutoff for channel 4. Humidity at this level or above turns channel 4 off.

### *Function 26 – Humidity Enable*

Sets and displays relative humidity enable for channel 4. After humidity rises to the Humidity Disable percentage, channel 4 will not turn on again until humidity drops to or below the Humidity Enable setting.

### *Function 27 – Channel 4 Temp + Humidity Disable*

Sets and displays the stress index cutoff, equal to temperature (Fahrenheit degrees) plus relative humidity (percent), for channel 4. High temperature and humidity at this level or above turns channel 4 off.

### *Function 28 – Channel 4 Temp + Humidity Enable*

Sets and displays stress index enable, equal to temperature (Fahrenheit degrees) plus relative humidity (percent), for channel 4. After the stress index rises to the Temp + Humidity Disable index, channel 4 will not turn on again until the index drops to or below the Temp + Humidity Enable setting.

## Function Selections for Mode 3

### *Two independent curtains*

*Be sure the proper sticker showing 19 functions for this operating mode is applied to the front of the control. Each operating mode has different function menus.*

**Note:** Refer to the *Programming the Controller* section for detailed instructions on changing a setting.

### Current Conditions

#### *Function 1 – Average Temperature (All Sensors)*

Displays the average of all temperature sensors connected to the controller. Up to four sensors can be installed.

#### *Functions 2 & 3 – Average North/South Sensor Temp*

Displays average temperature for the north or south group of installed sensors. Damaged sensors or sensors not installed read – – – –.

#### *Functions 4 & 5 – North Sensor #1 and #2 Temp*

Displays individual north sensor temperature readings.

#### *Functions 6 & 7 – South Sensor #1 and #2 Temp*

Displays individual south sensor temperature readings.

### Channel 1 – North Curtain Open

#### *Function 8 – North Curtain Open Temp*

Sets and displays the temperature at which the curtain will open.

#### *Function 9 – North Curtain Open Time*

Sets and displays minutes and seconds (M.SS) that the curtain will open when the temperature is at or above the Curtain Open Temp.

#### *Function 10 – North Curtain Open Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Open Time.

### Channel 2 – North Curtain Close

#### *Function 11 – North Curtain Close Temp*

Sets and displays the temperature at which the curtain will close.

### *Function 12 – North Curtain Close Time*

Sets and displays minutes and seconds (M.SS) that the curtain will close when the temperature is at or below the Curtain Close Temp.

### *Function 13 – North Curtain Close Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Close Time.

## Channel 3 – South Curtain Open

### *Function 14 – South Curtain Open Temp*

Sets and displays the temperature at which the curtain will open.

### *Function 15 – South Curtain Open Time*

Sets and displays minutes and seconds (M.SS) that the curtain will open when the temperature is at or above the Curtain Open Temp.

### *Function 16 – South Curtain Open Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Open Time.

## Channel 4— South Curtain Close

### *Function 17 – South Curtain Close Temp*

Sets and displays the temperature at which the curtain will close.

### *Function 18 – South Curtain Close Time*

Sets and displays minutes and seconds (M.SS) that the curtain will close when the temperature is at or below the Curtain Close Temp.

### *Function 19 – South Curtain Close Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Close Time.

## Function Selections for Mode 4

### *Curtain plus fogger/drain mode*

*Be sure the proper sticker showing 20 functions for this operating mode is applied to the front of the control. Each operating mode has different function menus.*

**Note:** Refer to the *Programming the Controller* section for detailed instructions on changing a setting.

### Current Conditions

#### *Function 1 – Average Sensor Temp*

Displays the average of the temperature sensors connected to the controller.

#### *Functions 2 & 3 – Sensor #1 Temp/Sensor #2 Temp*

Displays the temperature for each installed sensor. Damaged sensors or sensors not installed read – – – –.

#### *Function 4 – Current Humidity*

Displays the relative humidity if a humidity sensor is installed.

### Channel 1 – Curtain Open

#### *Function 5 – Curtain Open Temp*

Sets and displays the temperature at which the curtain will open.

#### *Function 6 – Curtain Open Time*

Sets and displays minutes and seconds (M.SS) that the curtain will open when the temperature is at or above the Curtain Open Temp.

#### *Function 7 – Curtain Open Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Open Time.

### Channel 2 – Curtain Close

#### *Function 8 – Curtain Close Temp*

Sets and displays the temperature at which the curtain will close.

#### *Function 9 – Curtain Close Time*

Sets and displays minutes and seconds (M.SS) that the curtain will close when the temperature is at or below the Curtain Close Temp.

### *Function 10 – Curtain Close Pause Time*

Sets and displays minutes and seconds (M.SS) of pause time after each Close Time.

### **Channel 3 – Fogging System**

#### *Function 11 – Fogger/Mister On Temp*

Sets and displays the temperature at which channel 3 turns on fogging.

#### *Function 12 – Fogger/Mister Off Temp*

Sets and displays the temperature at which channel 3 turns off fogging.

#### *Function 13 – Mister/Fogger On Time*

Sets and displays minutes and seconds (M.SS) that the fogger will run during time cycle.

#### *Function 14 – Fogger/Mister Off Time*

Sets and displays minutes and seconds (M.SS) of time the fogger will remain off during time cycle.

#### *Function 15 – Fogger/Mister Full On Temp*

Sets and displays temperature at which the fogger begins to run constantly instead of cycling on and off.

### **Channel 4 – Fogging Drain**

#### *Function 16 – Drain Channel (Channel 4)*

Sets and displays seconds of drain time after the pump turns off.

### **Channel 3 – Humidity Control for Evaporative Cooling**

**Note:** Functions only if a relative humidity sensor is installed.

#### *Function 17 – Humidity Disable*

Sets and displays relative humidity cutoff for channel 3. Humidity at this level or above turns channel 3 off.

#### *Function 18 – Humidity Enable*

Sets and displays relative humidity enable for channel 3. After humidity rises to the Humidity Disable percentage, channel 3 will not turn on again until humidity drops to or below the Humidity Enable setting.

*Function 19 – Temp + Humidity Disable*

Sets and displays the stress index cutoff, equal to temperature (Fahrenheit degrees) plus relative humidity (percent), for channel 3. High temperature and humidity at this level or above turns channel 3 off.

*Function 20 – Temp + Humidity Enable*

Sets and displays the stress index enable, equal to temperature (Fahrenheit degrees) plus relative humidity (percent), for channel 3. After the stress index rises to the Temp + Humidity Disable index, channel 3 will not turn on again until the index drops to or below the Temp + Humidity Enable setting.

## Stress Index for Evaporative Cooling

Either high temperature or high humidity can stress animals, but a combination of high temperature *and* high humidity is very stressful and may be deadly. Tunnel houses have a critical lethal temperature-plus-humidity index of about 180. Non-tunnel houses will reach a lethal stress index at about 160.

The following chart illustrates how different combinations of temperature and humidity could produce a Stress Index of 175. Temperature plus percent humidity equals stress index.

Temperature	Humidity	Stress Index
75	100	175
80	95	175
85	90	175
90	85	175
95	80	175
100	75	175
105	70	175
110	65	175



## Celsius Conversion for Stress Index

Find your temperature in Celsius in the left-hand column, and then find the relative humidity percentage at the top of the column. The box at the intersection of the row and column gives you the proper Stress Index based on the Celsius temperature and humidity you have chosen. Remember, as a rule of thumb, 160 and above is a threat to animal health in a naturally ventilated building, 180 and above in a tunnel ventilated building.

Degrees C	Relative Humidity—Percentage													
	100.0	95.0	90.0	85.0	80.0	75.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0
20.0	168	163	158	153	148	143	138	133	128	123	118	113	108	103
21.0	170	165	160	155	150	145	140	135	130	125	120	115	110	105
22.0	172	167	162	157	152	147	142	137	132	127	122	117	112	107
23.0	173	168	163	158	153	148	143	138	133	128	123	118	113	108
24.0	175	170	165	160	155	150	145	140	135	130	125	120	115	110
25.0	177	172	167	162	157	152	147	142	137	132	127	122	117	112
26.0	179	174	169	164	159	154	149	144	139	134	129	124	119	114
27.0	181	176	171	166	161	156	151	146	141	136	131	126	121	116
28.0	182	177	172	167	162	157	152	147	142	137	132	127	122	117
29.0	184	179	174	169	164	159	154	149	144	139	134	129	124	119
30.0	186	181	176	171	166	161	156	151	146	141	136	131	126	121
31.0	188	183	178	173	168	163	158	153	148	143	138	133	128	123
32.0	190	185	180	175	170	165	160	155	150	145	140	135	130	125
33.0	191	186	181	176	171	166	161	156	151	146	141	136	131	126
34.0	193	188	183	178	173	168	163	158	153	148	143	138	133	128
35.0	195	190	185	180	175	170	165	160	155	150	145	140	135	130
36.0	197	192	187	182	177	172	167	162	157	152	147	142	137	132
37.0	199	194	189	184	179	174	169	164	159	154	149	144	139	134
38.0	200	195	190	185	180	175	170	165	160	155	150	145	140	135
39.0	202	197	192	187	182	177	172	167	162	157	152	147	142	137
40.0	204	199	194	189	184	179	174	169	164	159	154	149	144	139

## How Do I Run Devices . . .

### On Time Only

#### **Cycle a fan or cooling device on time only (and ignore temps):**

- Set the On Temp *below* the lowest temperature you will ever reach.
- Set the Off Temp *below* the On Temp.
- Set the Full On Temp *above* the highest temperature you will ever reach.
- Set the Time On to the minutes and seconds (M.SS) of operation for the on part of the cycle.
- Set the Time Off to the minutes and seconds for the off part of the cycle.

**Example:** Make the fan run 30 seconds out of every 5 minutes.

Temp On	25°F
Temp Off	24°F
Time On	0.30
Time Off	4.30
Full On Temp	120°F

## On Temperature Only

### **Run a fan or cooling device on temperature only.**

- Set the On Temp for the desired on temperature.
- Set the Off Temp below the On Temp.
- Set the Full On Temp equal to the On Temp.
- Set the Time On to zero.
- Set the Time Off to zero.

**Example:** Make the fan run above 77° F.

Temp On	77°F
Temp Off	75°F
Time On	0.00
Time Off	0.00
Full On Temp	77°F

## Control Heat

### **Run a furnace or heating device.**

- Set the On Temp for the desired on temperature.
- Set the Off Temp above the On Temp.
- Set the Full On Temp equal to the On Temp.
- Set the Time On to zero.
- Set the Time Off to zero.

**Example:** Keep the temperature at 70° F.

Temp On	68°F
Temp Off	70°F
Time On	0.00
Time Off	0.00
Full On Temp	68°F

## Two-Stage Temperature and Time

### **Run a fan or cooling device on temperature with timed on/off cycles.**

- Set the On Temp for the desired on temperature.
- Set the Off Temp below the On Temp.
- Set the Full On Temp above the On Temp.
- Set the Time On to desired time for on cycle.
- Set the Time Off to desired time for off cycle.

**Example:** At or above 70° F, make the fan run one minute on and one minute off. At or above 80° F make the fan run all the time.

Temp On	70°F
Temp Off	68°F
Time On	1.00
Time Off	1.00
Full On Temp	80°F

## Programming the Controller

After you have set up the ClimaTRAC 400 for the proper operating mode using the DIP switches and properly wired the control, it can be programmed.

To program the values:

1. Press the Function Selection Up or Down buttons and select the function to be programmed.
2. Press the + or – value buttons until the display reads the value you wish to enter.
3. Press the ENTER button to confirm your change.
4. Press the CANCEL button if you decide *not* to change the setting.
5. Move to the next function by pressing the Up or Down button.

**Note:** For cooling, ON temperatures must be higher than OFF temperatures. For heating, ON temperatures must be lower than OFF temperatures.

### First Time Setup

Set the ClimaTRAC 400 for metric operation if necessary (see the *Metric Operation* section).

When the ClimaTRAC 400 is programmed the first time, you must calibrate any sensors attached to the unit. Calibration requires the following numbers:

#### *Temperature*

- Cable gauge (AWG—American wire gauge conversion chart on next page)
- Sensor wire length (American feet/Metric meters)

#### *Humidity*

- Sensor calibration numbers (use default values suggested by the ClimaTRAC 400)



*Straight lines in the display indicate a disconnected or bad temperature or humidity sensor.*

To display the setup functions, press and hold down *both* the + *and* the Up arrow buttons at the same time until Function 80 appears. (Release the Up arrow button first.) Now you can move between functions with the Down arrow button.

To return to the operating menu, push the Down arrow button until the display starts with function 1 again. After one minute without any keypad input the ClimaTRAC 400 will automatically return to function 1.

## Setup for Mode 1, Mode 2 and Mode 4

### Function 80: Sensor #1 Cable Length

- Press the + or – buttons until the correct length of the cable (0-1000 feet 0-300 meters) is displayed. (In metric setup, enter meters. DIP switch 4 must be on for metric use)
- Press the ENTER button.
- Press the Down arrow to move to Function 81.

### Function 81: Sensor #1 Cable Gauge (18, 20, 22, or 24 AWG only)

Programming is the same process as for Function 80.

Verify the reading with an accurate thermometer. Add more cable length to function 80 setting if sensor #1 reads too high.

#### *AWG Equivalent for Metric Wire Gauge*

AWG	mm diameter	mm area
24	.51	.21
22	.64	.32
20	.81	.52
18	1.02	.82

If a second temperature sensor is installed:

- **Function 82:** Sensor #2 Cable Length
- **Function 83:** Sensor #2 Cable Gauge (AWG only)

Follow the same process used for Functions 80-81.

If a humidity sensor is installed:

- **Function 84:** Humidity sensor #1 CAL1
- **Function 85:** Humidity sensor #1 CAL2

### Setup for Mode 3

**Function 80:** North Sensor #1 Cable Length.

- Press the + or – buttons until the correct length of the cable (0-1000 feet 0-300 meters) is displayed. (In metric setup, enter meters. DIP switch 4 must be on for metric use)
- Press the ENTER button.
- Press the Down arrow to move to Function 81.

**Function 81:** North Sensor #1 Cable Gauge (18, 20, 22, or 24 AWG).

Programming is the same process as for Function 80.

Verify the reading with an accurate thermometer. Add more cable length to Function 80 setting if north sensor #1 reads too high.

Follow the same procedure for the other sensors in the building.

If a second North temperature sensor is installed:

- **Function 82:** North Sensor #2 Cable Length
- **Function 83:** North Sensor #2 Cable Gauge (AWG only)

**Function 84:** South Sensor #1 Cable Length.

**Function 85:** South Sensor #1 Cable Gauge (AWG only)

If a second South temperature sensor is installed:

- **Function 86:** South Sensor #2 Cable Length
- **Function 87:** South Sensor #2 Cable Gauge (AWG only)

After the initial setup, settings for Functions 80-87 should not be changed unless:

- The wire length or gauge is in error.
- Temperature sensor wires are changed.
- Sensors are added.

## Troubleshooting

### **A channel is not working.**

- Is the switch on auto? If it works when the controller is set to manual on, then the function settings are probably set incorrectly.
- Is the light coming on without turning the output on? If it does, the controller is sending a signal to turn that channel on. Check the wiring. Check the fuse for that channel. Check the device's circuit breaker.

### **A channel will not turn on even though the controller displays a temperature at or above the temp on setting.**

- The display is a *rounded* value. The device will turn on when the *actual* temperature is reached. Refer to the *Operating Cycles* section for more information.
- You must enter an ON time of at least 1 second or the full on temp must be low enough to be useful. You can leave the OFF time at zero.
- On a channel with humidity enable/disable, make sure the disable settings are set at maximum to avoid shutting off the device on high humidity.

### **Channels 1 and 2/Channels 3 and 4 will not turn on at the same time when they are supposed to.**

- The interlock switches on the back of the switch circuit board must all be turned ON (up) to allow each channel to operate independently.

### **The DIP switches are set for one mode but the controller is doing another.**

- You must disconnect power from the controller and re-apply power before the changes become effective.

### **The reading for one of the sensors shows only straight lines.**

- The sensor is broken or not connected. Check an input by connecting a good sensor directly to the controller terminal.
- If you are using Mode 3, be sure the jumpers JP1 and JP2 are across the lower set of pins.



**I tried to program a temperature for full on but the display temperature would not change.**

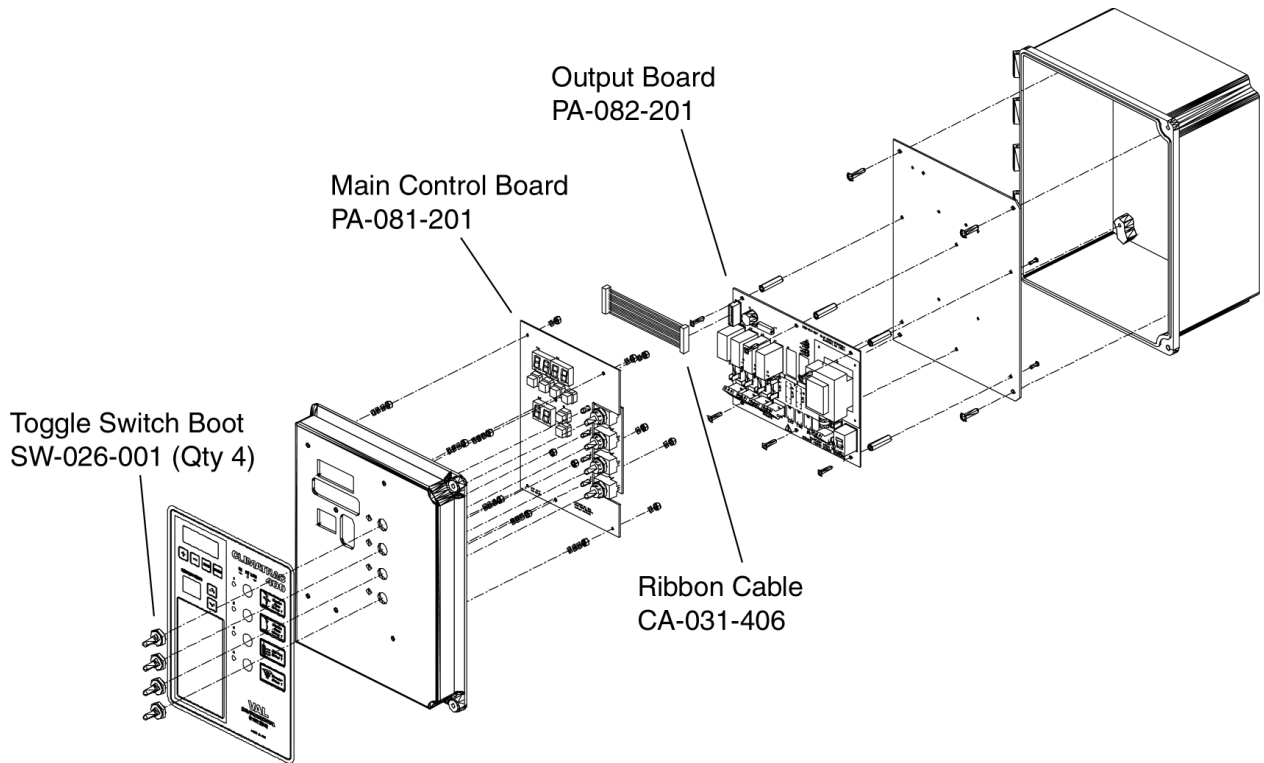
- Are you trying to put a full on temp that is between your on and off temps? If so, change the other settings first.
- Did you press ENTER after changing the temperature?

**A channel is on until the temperature rises and then the channel turns off.**

- Are you running Mode 1 or 2 and is Channel 4 stopping? Or Mode 4 and Channel 3 is stopping? You probably have the humidity disable too low or the Temp + Humidity Stress Index disable set too low.



## Parts Diagram



## **Service**

For assistance, make sure you have checked the parameters in your controller and have reviewed the appropriate sections of this manual.

If you still need assistance, contact Val Environmental Systems.

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