EnviroSTEP

INTEGRATED CONTROL

WADSWORTH *Control Systems* | *1.800.821.5829 wadsworthcontrols.com*

Read Me First

The EnviroSTEP integrated control has been pre-programmed to your specifications. Installing the system is a four-step process:

1. Mount the control panel
2. Wire the control relays
3. Wire the sensors
4. Set stroke/running time

Step 1 Mount the control panel

- Mount the control panel in an area away from direct sunlight, dust and condensing humidity. A head house or packing room is ideal. Remember that distance affects the efficiency of your wiring. Refer to the NGMA pamphlet, *Greenhouse Electrical Design Considerations* for guidelines.
- For proper operation, the system MUST be kept between 40-100º
- The control panel consists of two main assemblies: the cabinet and the back pan, which carries the control electronics and relays. Use mounting ears provided on the back of the cabinet. Mount the cabinet on a solid surface free from vibration.
- To protect the system from moisture **it is important to keep the door closed at all times** except when changing settings or using override switches.

Step 2 Wire the control relays.

Each job is unique. Refer to the engineering schematics for proper control point terminations, or refer to diagrams in back of manual.

Step 3 Wire the sensors.

Connecting the temperature and humidity aspirator

- Hang aspirator near crop level. Hanging it above or below gives temperature and humidity readings that are not representative of what the crop is experiencing.
  Note: The aspirator is electronic and should not be in an area where it will be under a mist or irrigation system. If you have these systems we suggest protecting the sensor with a bucket or hanging the sensor above where the mist or irrigation will impact it. Please refer to the aspirator photos in the back of the manual for more information.
- Connect T/RH aspirator to terminal block J1 points 1-8. See diagram in the back of this manual.
- Connect either the outdoor temperature sensor, or if purchased, connect the Weather Station.
  - If using an outdoor temperature sensor, connect it to terminal block J3 on points 8 & 9.
  - If using a Weather Station connect to terminal blocks J2, J3, J4 (refer to diagrams in back of manual).
  - If additional sensors are being used, refer to the engineering schematics.

Step 4 Set stroke/running time

- Program the stroke time for all pieces of equipment that have two relays.
- Identify equipment that utilizes two relays: Vent machines, valves and shade systems are the most common examples.
- Determine how many seconds the equipment requires to move from full open to full close position. This is the stroke or running time.
- To determine the stoke/running time - manually operate the equipment and measure how many seconds elapse for the system to move from full close to full open For control valves, the manufacturer's specification sheet may include the running time.

  See diagram of front panel.
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**.
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Settings
- Select item from equipment list – use down arrow to view complete list
  - Enter equipment # press **GO**
- Enter the stroke (running time) for selected piece of equipment.
  - To input the stroke time push arrow key to move cursor to Stroke or Running Time position.
  - Enter the new Stroke (Running Time) using the keypad. The new numbers will automatically replace the previous setting.
- Press **GO** to return to Equipment Settings screen. Complete entries for all pieces of equipment that have two relays.

Programmed settings

Are the temperature setpoints correct for your environment?
The current setpoints are:

Period	Heating	Cooling	Humidity
Day	64º F	70º F	70%
Night	62º F	68º F	70%
DIF	Disabled	Disabled	Disabled

To adjust these settings, refer to temperature setpoints section in manual.

Are the temperature lock-out limits correct for your environment?
Factory preset
    Cold lock out starts when outside temp is 10ºF (vents fully restricted)
    Cold lock out ends when outside temp is 20 ºF (vents fully operational)

Is the wind speed limit correct for your environment?
The current settings are:
Leeward facing vents:
    Restriction starts at 25 mph. Restriction ends at 35 mph
Windward facing vents:
    Restriction starts at 20 mph. Restriction ends at 30 mph

To adjust these settings, refer to wind speed limit section in manual.

Are the rain limits correct for your environment?
The current settings are:
Roof and side vents close completely if there is rain.
    These settings were updated in the fall of 2008 to protect merchandise from becoming wet. Prior to this, settings allowed
    the roof vent to be 10% open and the side vents were set to be 25% open.

To adjust these settings, refer to limit section in manual.

Is the watering schedule appropriate for your crop?
If you use your EnviroSTEP to control irrigation, you'll want to review these settings.
Currently, water will turn on once an hour for 30 seconds.

Irrigation can be triggered by time, VPG (Vapor Pressure Gradient) and/or sun intensity. To adjust these settings, refer to watering schedule section in manual.

Once these settings are updated the system is ready to use. This manual contains full instructions on how to reprogram your integrated controller. This EnviroSTEP has been programmed to your specifications so changes should not be necessary, unless there is a change in equipment.

WARNING!

INTEGRATED STEP CONTROL SYSTEMS ALLOW FOR INPUT FROM A FIRE ALARM SENSOR. DEPENDING ON THE SETTINGS, THE SYSTEM MAY THEN OPERATE EQUIPMENT IN A SPECIFIC MANNER UNLESS THE EQUIPMENT SWITCH IS PLACED IN THE MANUAL POSITION. IF THE SWITCH IS PLACED IN THE MANUAL POSITION, THE SYSTEM WILL NOT CONTROL THE EQUIPMENT.

INTEGRATED STEP CONTROL EQUIPMENT MAY ALSO MALFUNCTION OR NOT OPERATE PROPERLY IF DAMAGED BY FIRE OR OTHER CIRCUMSTANCES OUTSIDE THE CONTROL OF THE MANUFACTURER. THE SYSTEM IS NOT DESIGNED TO BE USED AS A FIRE SUPPRESANT OR CONTROL MECHANISM.

Find updated versions of this manual at https://wadsworthcontrols.com/manual-request/

What is an EnviroSTEP?

Wadsworth's EnviroSTEP is a computerized control for one environment. It can be linked to other EnviroSTEPs or microSTEPs to provide multi-zone greenhouse control.

What can the EnviroSTEP control?

The EnviroSTEP provides twelve control relays. Any single relay can be used to control a stage of heating, cooling, lighting, irrigation, fogging, CO_2 or humidification. Any pair of relays can proportion a vent, valve or curtain. The EnviroSTEP controls a single zone of equipment.

How does it work?

The system is continuously monitoring environmental conditions and operating equipment to create a specific growing climate. The program runs off a series of 'if… then…' statements. For example, '**if** the sun's intensity is less than the desired intensity, **then** turn on the HID lights'.

How many settings/periods does the system have?

The EnviroSTEP has three setpoint periods per day: Day, Night and an optional DIF period for growth regulation. The system offers ramping between periods for gradual change in settings from one period to the next. In addition, equipment can be locked out and not allowed to operate during certain hours. Equipment can be further adjusted through the Night Shift option, which allows the grower to alter the way a given piece of equipment operates at night.

What type of records and reports can the system generate?

The EnviroSTEP records all sensor readings and equipment status four times an hour and retains this data for a week. STEPsaver, Wadsworth's software for integrated controls like the EnviroSTEP, connects the control to a PC where data can be stored indefinitely. STEPsaver also allows remote access from the PC and a Smartphone.

Do I need to program my EnviroSTEP after I install it in my greenhouse?

No. Your EnviroSTEP has already been custom configured for your greenhouse – no configuration changes need to be made. (See page 2 of this manual.) In addition, it has been programmed with a "known-good" sequence of operation, as well as with day and night setpoints. You may need to change the setpoints to match your crop requirements.

Should you wish to change the settings provided to you by Wadsworth Control Systems, detailed step-by-step instructions are provided in this manual.

Do I need a personal computer to use the EnviroSTEP?

No. The EnviroSTEP is a fully self-contained computer with its own keypad, and an 8-line screen for settings, graphs, and reports. It provides the power to monitor or adjust right in the greenhouse. However, it is possible to connect your EnviroSTEP to a PC and use our STEPsaver software to facilitate operation of your greenhouse, access all controls via the PC or a Smartphone and store settings and data on your PC.

Can I connect the EnviroSTEP to a personal computer?

Yes. The optional windows-based STEPsaver software program connects an EnviroSTEP to a PC to create an even more powerful tool. This does not require a dedicated computer. The STEPsaver and a PC let the grower manage the greenhouse's current conditions, monitor controls, and make changes to the program, such as changing setpoints or addressing alarms, all from a central location.

The STEPsaver Program uses the computer's hard disk to store the log memory, enabling indefinite storage of records. It also provides more options for looking at the data it collects. Color graphs let you see daily, weekly and monthly conditions at a glance. With a few simple clicks, you can verify that your environmental program is on track.

The STEPsaver allows the EnviroSTEP greenhouse data to be shared with other programs, eliminating the need to re-enter data.

If seasonal crops like poinsettias or lilies are grown, the STEPsaver program can take a snapshot of all the settings to later recreate an identical environment - eliminating tedious documentation and reprogramming.

With a laptop or home computer and an Internet connection, you can connect to the PC located at your greenhouse from anywhere, including your Smartphone. This feature offers the convenience of checking any information, from a remote location. One common use of this feature is checking alarm status from home. With your permission, a Wadsworth technician can log into your STEPsaver program and help you troubleshoot or adjust your settings.

Are there other ways to optimize performance?

When equipped with the optional Weather Station, the EnviroSTEP can monitor and respond to outdoor weather conditions such as temperature, humidity, wind speed and direction, precipitation and light level. This allows growers to create more sophisticated 'if…then…' statements. Control curtains, irrigation, fog, and HID lights can be adjusted based on sun intensity and outdoor temperature. Vents can be controlled based on wind speed and direction, outdoor temperature and precipitation.

Will networked controllers share generator signal information?

No, each controller must be connected to the generator and configured individually.

How to Use Your EnviroSTEP

Understanding the Front Panel and Using the Keypad
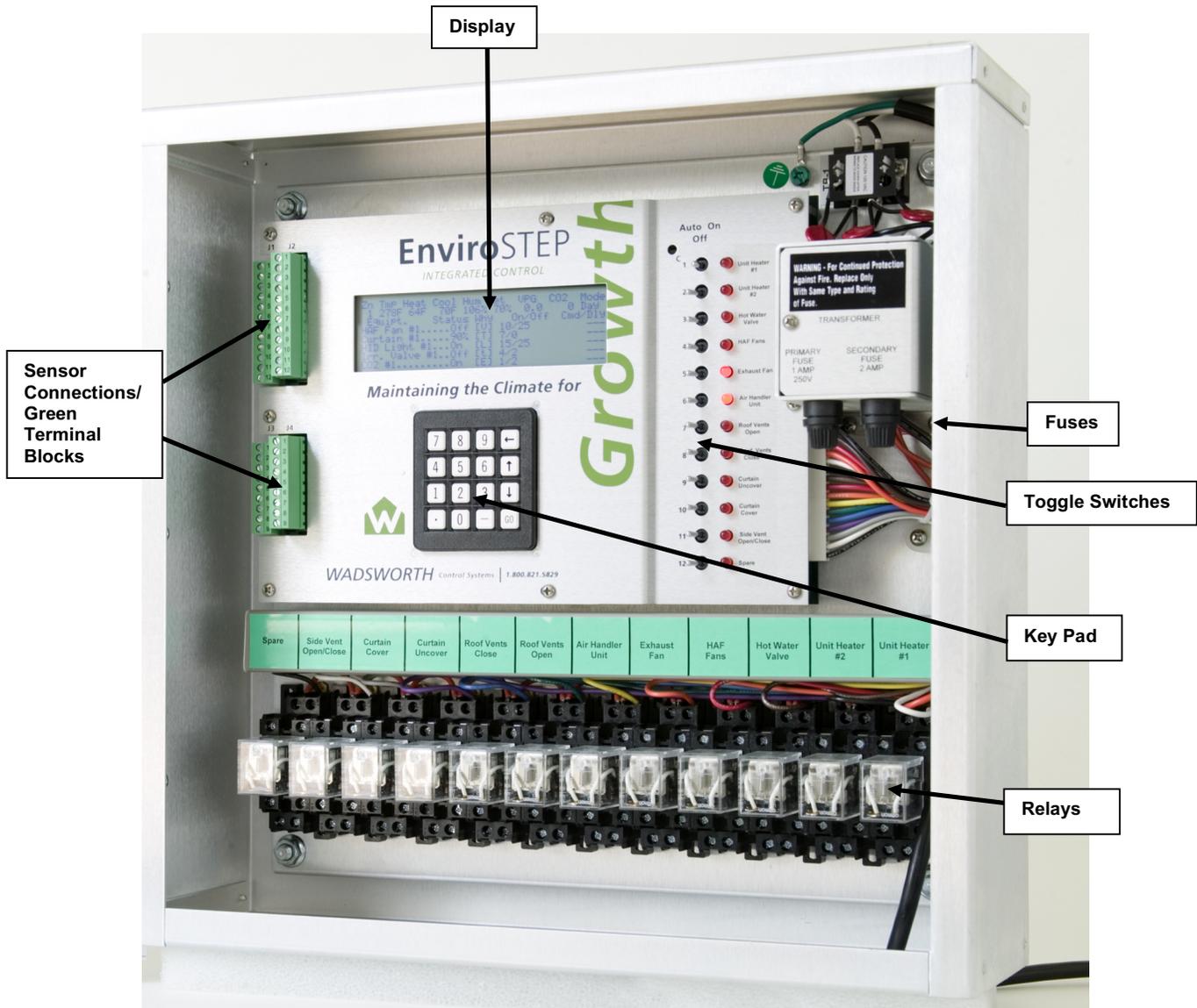
The EnviroSTEP panel has three sections: toggle switches, keypad and the view screen.

The toggle switches are labeled for your system configuration. There are three positions: Auto, Off and On. The lights illuminate when a piece of equipment is on. Equipment managed by the control when toggle switches are in the Auto position. To manually override the program and take control of the equipment, switch the toggle to On or Off.

The EnviroSTEP computer cannot detect which position the toggle switches are set (Auto, Off, On).

The keypad is used to interface with the display screen.

The display screen is the information center where up to 8 lines of text appear. The information displayed on the screen changes depending on where you are in the program. Read the top line of the display screen to determine which menu is currently displayed.

<<<Main Menu>>>

The **<<<Main Menu>>>** is the central navigation point. All the other screens and menus are accessed by selecting from this screen.

To reach the **<<<Main Menu >>>** from any place in the program:

- Press the **GO** key repeatedly until **<<<Main Menu>>>** appears on the top of the screen.

```
                    <<<Main Menu>>>
    0---Currently            4---Water Report
     1---Equipment…          5---Examine logs..
    2---Alarms               6---Make graphs…
    3---Weather              7---Settings…


             YOUR CHOICE? >>>
```
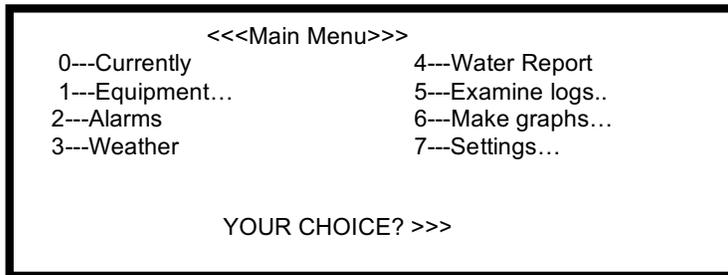
Reading the <<<Main Menu>>> screen

There are eight choices: (0-7):

0---Currently	Displays current conditions in the greenhouse zone such as temperature and humidity.
1---Equipment	Displays current equipment status in the greenhouse zone.
2---Alarms	Reports alarm conditions.
3---Weather	Displays current weather conditions outside the greenhouse.
4---Water Report	Shows the time and date of the most recent watering if the computer is responsible for any irrigation valves.
5---Examine logs	Provides a menu of reports on logged data.
6---Make graphs	Allows graphing of sensors and setpoints.
7---Settings	Provides a menu of settings – this is where setpoint, sequence-of-operation, and equipment configuration changes are made.

Each menu choice provides information about the program or the current conditions in the greenhouse. Choices 0-3 are the most frequently used on a day-to-day basis. Choice 7 will access all the programming for your EnviroSTEP.

The computer is easy to operate. The same actions are repeated making it simple for you to learn how to navigate.

To operate the cotroller:

- Select from the menu.
- Enter the number of the selected item using the keyboard.
- Press **GO** or ↓ the down arrow key.

The manual explains each choice starting with 0.

Viewing the Currently Screen

This screen displays current conditions in the greenhouse zone.

To reach this screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **0** then **GO** to reach the **Current Conditions** screen.
- Press **GO** to return to the **<<<Main Menu>>>**

Sample Currently Screen:

```
Zn   Tmp   Heat   Cool   Hum   Set   VPD   CO2   Mode
 1    67F    64F    70F    70%   80%   21.9    0    Day




13:41:53              Running [Utility]
01/30/17          Sunrise   8:15AM        Sunset    6:10PM
```

Reading the Currently Screen

Zn	Indicates what zone the computer is connected to and reading.
Tmp	Displays the current temperature in the zone (59ºF).
Heat	Indicates the heating setpoint (the temperature when the heat turns on).
Cool	Indicates the cooling setpoint (the temperature when the cooling will turn on).
Hum	Displays the current humidity in the zone.
Set	Indicates the relative humidity (RH) setpoint.
VPD	Indicates the Plant Stress Index, which is calculated from temperature and humidity. Estimates the rate at which the plants will dry out. The higher the number the faster the plants become dry.
CO2	Displays the current carbon dioxide level. The system displays a 0 if no CO_2 sensor is connected.
Mode	Indicates what program is in use (Day, Night, DIF).
Time	Displays current time in the lower left corner using a 24-hour clock. This screen displays 13:41:53 meaning it is 1:41 PM and 53 seconds.
Running [Utility]	Indicates the system is using public utility power.
Running [Standby]	Indicates the system is using stand-by generator. If there is not a generator being used, this information will not display.
Halted [Utility] Halted [Standby]	Indicates the computer is not controlling the greenhouse and must be restarted.
Date	Displays current date.
Sunrise	Indicates time of sunrise, determined by longitude & latitude.
Sunset	Indicates time of sunset, determined by longitude & latitude.

Viewing the Equipment Screen

This screen displays current equipment status in the greenhouse zone.

> To reach this screen:
> - Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
> - Press **1** then **GO** to reach the **Equipment Settings** screen.
> - Press **GO** to return to the **<<<Main Menu>>>**

Reading the Equipment Screen

Sample Equipment Screen:

```
Zn    Tmp    Heat   Cool   Hum    Set    VPG    CO2    Mode
 1    59F    60F    70F    70%    80%    21.9    0     Day
Equipt.       Status         Why      On/Off       Cmd/Dly
Heater #1……..On           [T]        59/61         65F
Heater #2……..Off          [T]        58/60        ----------
Exh Fan #1…...Off          [T]        72/70        ----------
Exh Fan #2…...Off          [T]        74/72        ----------
Exh Fan #3…...Off          [T]        76/74        ----------
```

The top two rows of the screen display the current conditions for the specified zone. It is the same information found on the *Currently* screen (choice 0).

Zn	Indicates what zone the computer is connected to and reading (zone 1).
Tmp	Displays the current temperature in the zone (59°F).
Heat	Indicates the heating setpoint 60°F (the temperature when the heat turns on).
Cool	Indicates the cooling setpoint 70°F (the temperature when the cooling will turn on).
Hum	Displays the current humidity in the zone (70%).
Set	Indicates the humidity (RH) setpoint (80%).
VPD	Indicates the Vapor Pressure Deficit, formerly referred to as Plant Stress Index. This calculation of temperature and humidity estimates the rate at which the plants will dry out. The higher the number the faster the plants become dry (21.9). It can be used to trigger irrigation.
CO2	Displays the current carbon dioxide level. The system displays a **0** if no CO_2 sensor is connected, which is the case in this example.
Mode	Indicates what program is in use (Day, Night, DIF). In this example, it is in Day mode.

The four columns of the display show the detailed status of up to six pieces of equipment controlled by the EnviroSTEP. If there are more than six, use the up and down arrow keys to move the list up and down.

Equipt	Lists the equipment assigned to the computer (heater, exhaust fan). This example displays Heater #1, Heater #2, Exh Fan # 1-# 3.
Status	Displays the On/Off status for the assigned equipment. In this example, all the equipment is off except Heater #1.
Why	Indicates why the equipment is in its current stage (On/Off). All the equipment in this example turns On/Off based on [T] temperature setpoints. To view the definitions for the **Why** codes from the **Equipment** screen, press the ← key on the keypad.
On/Off	Indicates the temperatures when the equipment will turn On/Off.
Cmd/Dly	Indicates any programmed time delay for the equipment. Three dashed lines mean no delay has been programmed. If there is a temperature reading in the delay column, and that piece of equipment is configured to respond to a specific sensor instead of average temperature, the specific reading from the sensor is displayed.

Equipment Screen and 'Why' Code

Under the Equipment Screen, you will see the '**Why**' Column that will have a Letter, such as **T** in the example below. This tells you why a piece of equipment is running or not running.

Sample Equipment Screen:

```
Zn    Tmp    Heat   Cool   Hum    Set    VPG    CO2    Mode
 1    59F    60F    70F    70%    80%    21.9    0     Day
Equipt.        Status      Why     On/Off     Cmd/Dly
Heater #1……...On          [T]      59/60       65F
Heater #2……...Off         [T]      58/59     ----------
Exh Fan #1…...Off         [T]      72/70     ----------
Exh Fan #2…...Off         [T]      74/72     ----------
Exh Fan #3…...Off         [T]      76/74     ----------
```

'Why' Column

To view the definitions for the **Why** codes from the **Equipment** screen, press the ← key on the keypad.

Why Codes Screen:

```
WHY Codes:                  !—Cycle Timer
B—Boosting                  R—Rain Limit
C—C02 Conc.                 S—Snow
D—Dry limit                 T—Temperature
E—Defaulted                 V—Vent position
F—Follows a fan             W—Weather lockout
H—Humidity                  X—Time lockout
L—Light Shade               N—In Night mode
```

To return to the **Equipment** screen, press the **GO** key.

Viewing the Alarms Screen

This screen reports alarm conditions (Hot/Cold/Wet/Dry).

To silence an alarm and view the reason for the alarm:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **2** then **GO** to reach the **Alarm** screen.
- Pressing **GO** from the Alarm Report returns you to the **<<<Main Menu>>>** unless the computer has reset since you last examined the alarm report. If there have been resets, the computer will report the reset count. Pressing **GO** a second time returns to the **<<<Main Menu >>>**

A reset occurs and is counted any time the computer must restart its program. The most common causes of resets are power interruptions. If you often have alarms and reset counts greater than five, call Wadsworth Control Systems Technical Support for troubleshooting help 1-800-821-5829.

Reading the Alarms Screen

This sample screen indicates that Zn (zone) 1 is OK, meaning no alarm has sounded.

Sample 1 Screen No Alarm:

```
                                                    Zn  1 OK



```

The sample screen below indicates that the alarm in Zn (zone) 1 sounded because the greenhouse temperature fell below the cold alarm setting.

Sample 2 Screen for **Cold** Setpoint Alarm:

```
                                                    Zn  1 Cold



```

What causes an alarm to sound?
Alarms can be programmed to sound for a variety of conditions. You will find instructions for setting up alarms in the Settings|Setpoints section.

- The factory default sets two alarms:
    1. *Hot/Cold* alarms are factory set at 20 and -10 meaning an alarm will sound if the temperature is 20 over the setpoint or if it drops 10 below the setpoint.
    2. . *Wet/Dry* alarms are factory disabled at 99 and –99 because most growers find it difficult to control humidity. In general, an alarm will sound if the humidity varies from the set humidity by more than these amounts.

Viewing the Current Weather Screen

This screen displays current weather conditions outside the greenhouse. To use this option, you must have the optional Wadsworth Controls Weather Station designed for the EnviroSTEP.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **3** then **GO** to reach the **Current Weather** screen.
- Press **GO** to return to the **<<<Main Menu>>>**

Sample Weather Screen with Weather Station Installed:

```
                    Current Weather
        Temp            59F
        RH              42%
        Sun             36mW        41mW Avg.
        WSpd            4MPH
        WDir            NE
        Rain            No
     Accumulated Sun =              1286W-H/sq-m
```

Sample Weather Screen without the Weather Station Installed:

```
                    Current Weather
        Temp            82F
        RH              0%
        Sun             0mW         0mW Avg.
        WSpd            0MPH
        WDir            N
        Rain            No
     Accumulated Sun =              0W-H/sq-m
```

In a multiple EnviroSTEP installation with a Weather Station, one unit monitors the outside weather and sends information (with time/date) over the network wires to other EnviroSTEP units.

Reading the Current Weather Screen

This section only applies if you have purchased the optional Wadsworth Controls Weather Station system.

Temp	Current temperature outside the greenhouse.
RH	Relative humidity outside the greenhouse.
Sun	Displays the current 36mW sun intensity and the moving average of 41mW.
WSpd	Current wind speed.
Wdir	Current wind direction, resolved to one of eight directions (N, NE, E, SE, S, SW, W, NW).
Rain	Indicates if there is precipitation (Yes/No). The computer interprets snow based on precipitation reading and the temperature. It is not displayed as 'Snow' but rather *Rain*, *Yes* and *Temp below 32*. The program will understand that it is snowing and operate accordingly based on your program specifications.
Accumulated Sun	The total amount of solar energy received since sunrise today, in Watt-hours per square meter. Summer totals can be over 8000, while Winter totals may be less than 2000.

Weather data is updated once per second. If the EnviroSTEP receives its weather from another EnviroSTEP unit, the information updates once per minute.

The average value for the sun is a twenty-minute moving average. Equipment that responds to wind or light uses the average values rather than an instantaneous reading. Averaging prevents equipment cycling when light level varies rapidly under broken clouds. This can be adjusted with the smoothing option.

Viewing the Water Report Screen

This screen provides details on recent watering activities:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **4** then **GO** to reach the current conditions screen.
- Press **GO** to return to the **<<<Main Menu>>>**

Sample Water Report Without Water Valves Configured:

```
No Valves Configured.
```
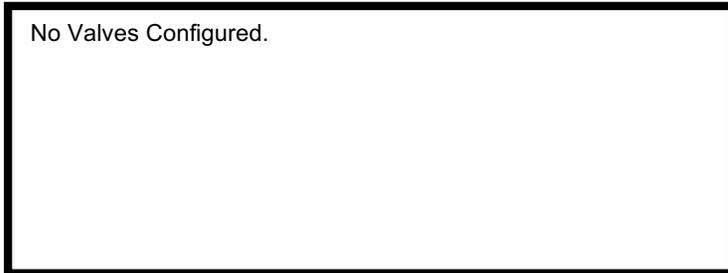
Sample Water Report With Water Valves Configured:

```
Zn   Valve   Last Watered        W-Hr   VPD
1    1       01/30/03   3:31PM    4      25
1    2       01/28/03   5:05AM    2
```

Reading the Water Report Screen

Zn	Indicates what zone is being watered.
Valve	Indicates which valve is being used as a water source.
Last Watered	Displays date that zone was last watered and time.
W-Hr	Column shows the amount of sun since the last watering.
VPD	Shows the amount of plant stress accumulated since the last watering.
No Values Configured	Displayed when the system is not programmed to water.

Viewing the Logs Screen

This screen provides a menu of reports and logs:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **5** then **GO** to reach the **<<<Log Menu>>>**
- Press **GO** to return to the **<<<Main Menu>>>**

Sample Log Menu Screen:

```
                    <<< Log Menu >>>

                    0---Report Menu.
                    1---Zone Logs…
                    2---Weather Log.
                    3---Alarms Log.
                    4---Switch Use Log
                 YOUR CHOICE? >>>
```
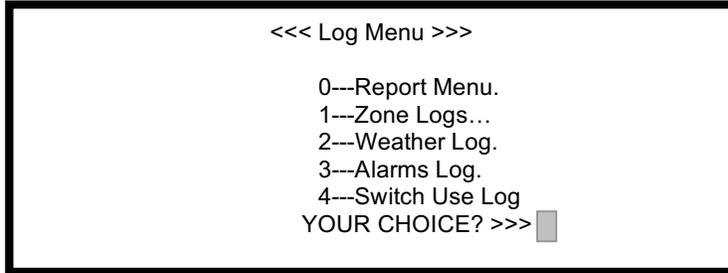
0---**Report Menu**	Returns to **<<<Main Menu>>>**
1---**Zone Logs**	Survey of Temperature, Relative Humidity, Heating and Cooling Setpoints.
2---**Weather Log**	Provides weather log (Date/Time/Temp/RH/Sun/Mph/Wind…).
3---**Alarms Log**	Shows any alarms the EnviroSTEP has recorded. This report may be blank, or contain the most recent 32 alarm events.
4---**Switch Use Log**	Provides readings on switches/pieces of equipment. More detail on reading and adjusting these logs is provided in the **Reading Logs** section of the manual.

Viewing the Zone Logs Screen

This screen provides a log of zone readings. (Temp/RH/Heat/Cool)

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **5** then **GO** to reach the **<<Log Menu>>**
- Press **1** then **GO** to reach the **Zone Logs**
- Press **GO** to return to the **<<<Main Menu>>>**

Sample Zone Logs Screen:

```
Zone 1                  Temp    RH     Heat    Cool
02/03   6:45AM          68F     76%    62F     68F
02/03   7:00AM          68F     77%    62F     68F
02/03   7:15AM          68F     78%    62F     68F
02/03   7:30AM          68F     76%    62F     68F
02/03   7:45AM          68F     75%    63F     69F
02/03   8:00AM          68F     76%    64F     70F
        Arrows page up & down.  GO exits.
```

Reading the Zone Logs Screen

The information displayed is the average value for the 15-minute time period ending at the time/stamp shown on the report on the display. The most recent log entry is the last line of this report.

Zone	Indicates what zone is being read including the date and the time of the reading.
Temp	Displays average temperature in the zone during the 15-minute interval ending at the time of the log entry.
RH	Displays the average humidity in the zone during the 15-minute interval ending at the time of the log entry.
Heat	Indicates the average heating setpoint temperature in the zone.
Cool	Indicates the average cooling setpoint temperature in the zone.

Use the arrow keys to move the page up/down to view previous times/dates.

Weather Logs Screen

This section only applies if you have purchased the optional Wadsworth Controls Weather Station system.

This screen provides a log of outdoor weather readings (Temp/RH/Heat/Cool).
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **5** then **GO** to reach the **<<Log Menu>>**
- Press **2** then **GO** to reach the **Weather Log** data.
- Press **GO** to return to **<<Log Menu>>**
- Press **GO** repeatedly to return to **<<<Main Menu>>>**

Sample Weather Logs Screen:

```
Weather          Tmp     %RH     Sun     MPH     Dir  R    W-H
04/03  6:45AM    58      50      40      8       SE   N    1003
04/03  7:00AM    58      50      42      7       S    N    1009
04/03  7:15AM    60      52      42      4       S    N    1013
04/03  7:30AM    60      52      43      0       SE   N    1016
04/03  7:45AM    60      54      45      2       SE   N    1016
04/03  8:00AM    61      55      46      1       SE   N    1020
          Arrows page up & down.  GO exits.
```

Reading the Weather Logs Screen

This section only applies if you have purchased the optional Wadsworth Controls Weather Station system.

Weather	Indicates the date and time of the reading, updated in 15-minute increments. Note that this report always begins at midnight of the current date. The down arrow key moves the report toward the present time.
Temp	Displays the average outdoor temperature for the 15-minute log interval shown.
%RH	Displays the average outdoor RH for the 15-minute log interval shown.
Sun	Indicates the average amount of light, mW/cm2 for the 15-minute log interval.
MPH	Indicates the average wind speed for the 15-minute log interval shown.
Dir	Indicates the direction of the wind at the time of the log entry.
R	Indicates rain (Y)es (N)o at the time of the log entry.
W-H	Indicates the running total of watt-hours solar energy accumulated since midnight of the day the log is viewed.

A reading of 0 indicates no Weather Station is connected.

Viewing the Alarms Logs Screen

This screen allows you to view the 32 most recent alarms.
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **5** then **GO** to reach the **<<<Log Menu>>>**
- Press **3** then **GO** to reach the **Alarms Logs**
- Press **GO** to return to **<<<Log Menu>>>**
  Press **GO** repeatedly to return to **<<<Main Menu>>>**

Sample Alarms Logs Screen:

```
07/25          3:01PM       1 Cold   Ch 2  =  50
08/04          12:01PM      1 Dry    Ch 1  =  59


              Arrows page up & down. GO exits
```

Reading the Alarms Log Screen

The EnviroSTEP records the 32 most recent alarms in its alarm log. It is interpreted as follows:
- The first two columns show the date and time of the alarm.
- The third column shows the zone number where the alarm originated.
- The fourth column shows the description of the alarm: Hot, Cold, Wet, or Dry.
- The sixth column shows the sensor channel where the reading that caused the alarm was recorded, and the value read from that channel at the time of the alarm.
- Press **GO** to return to the previous menu or Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Switch Use Logs Screen

This screen provides equipment readings in 15-minute intervals and indicates if equipment has been running. For modulating equipment, it indicates the average position. It is a two-level screen.
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **5** then **GO** to reach the **<<<Log Menu>>>**
- Press **4** then **GO** to reach the **Switch Use Logs**.

Sample Switch Use Logs Screen:

```
Enter a switch no. to view:
```

Enter a switch number and press ↓ (switch numbers are laser printed and can be located by each switch on the faceplate of the computer).

```
Zone 1   Heater   #1
04/03    6:45AM            0
04/03    7:00AM            0
04/03    7:15AM            0
04/03    7:30AM            0
04/03    7:45AM            50
04/03    8:00AM            100
         Arrows page up & down.  GO exits.
```

Reading the Switch Use Logs Screen

Zone	Indicates the zone and the date of the reading.
Unit Htr #1	Indicates what equipment is being read, in this example it is a Unit Heater.
Date	Displays what date is being displayed. The information is stored in the EnviroSTEP for 7 days, for longer or permanent storage purchase the software to connect the EnviroSTEP to your personal computer.
Time	Displays what 15-minute period is being displayed.
Status	Column indicates if the equipment has been running. For On/Off, a "%" of the time the equipment operated during the past 15 minutes will be displayed. For proportional equipment, such as vents or shade systems, the number will depict the average position for the fifteen-minute period.

In the example above, Unit Heater 1 was off until the 15-minute log period ending at 7:45 AM, when it ran 50% of the time or seven and one half minutes. During the interval ending at 8:00 AM, the heater was on 100% of the time, or for the full 15 minutes.

Graphing with the EnviroSTEP

The EnviroSTEP graphing function (choice 6, Make Graphs on the **<<<Main Menu>>>**) allows you to display a graph of any two values from the computer's log memory. This memory records all the important sensor and status data for your EnviroSTEP once every fifteen minutes, and retains this data for a week.

All EnviroSTEP graphs show data for one twenty-four-hour interval. The interval shown begins twenty-four hours prior to the time you request the graph, and extends forward to the most recent entry in the EnviroSTEPs log, which is within the past fifteen minutes. You may redraw the same graph for older data by pressing the up-arrow key on the keypad. The computer will fetch data one day older than that currently shown and redraw the graph. In this way, you can page through the entire seven-day memory of the computer.

Viewing the Make Graphs Screen

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **6** then **GO** to reach the Graph screen

```
GRAPH:    2 = Solid Line    0 = Dashed Line
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
CODES:    1…7    For Sensor Channel Readings
Setpoints:         Heat: 65         Cool: 73         RH:  81
Outdoor Temperature:  89
Outdoor Humidity:  90
Light Sensor:  91
Wind Speed:  92
```

To make a graph:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **6** then **GO** to reach the Graph screen
- Enter # ↓ or the solid line
- Enter # for the dashed line GO to display the graph
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

If you wish to plot a graph that shows data from only one column of the log memory "spreadsheet", leave one of the two settings at 0.

Reading the Graphs

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **6** then **GO** to reach the Graph screen

Solid Line	Enter the # for the channel (equipment or sensor reading) that you want graphed.
Dashed Line	Enter the # for the channel (equipment or sensor reading) that you want graphed.
Codes 1…7 for Sensor Channel Readings	The information below the double dashed line (= = =) is a reference guide of the most commonly graphed information.

Codes	Data Graphed	Notes
1	Sensor Channel 1	Log Code 1 records greenhouse **humidity** on a standard EnviroSTEP
2	Sensor Channel 2	Log Code 2 records greenhouse **temperature** on a standard EnviroSTEP
3	Sensor Channel 3	Log Code 3 records **outdoor humidity** if an optional weather station is installed; otherwise see your configuration sheet for the use of this channel.
4	Sensor Channel 4	Log Code 4 records **outdoor temperature** on a standard EnviroSTEP
5	Sensor Channel 5	Log Code 5 records **outdoor light intensity** if an optional weather station is installed, otherwise see your configuration sheet for the use of this channel.
6	Sensor Channel 6	Log Code 6 has no standard use. See your configuration sheet for the use of this channel.
7	Sensor Channel 7	Log Column/Code 7 has no standard use. See your configuration sheet for the use of this channel.
17-28	Switch 1-12	Log Column/Codes 17-28 record the commands that the computer sent to each of the twelve switches. Add 16 to a switch number to chart the data for that switch. On/Off equipment displays as percentage of the time it was on, and proportional equipment displays as average position.
73	Cooling Setpoint	The **cooling setpoint** as it varies according to your settings.
81	Humidity Setpoint	The **relative humidity** setpoint as it varies according to your settings.
89	Weather Station Temperature	**Outdoor temperature**. Duplicates Code 4 on an EnviroSTEP wired to a weather station. Records the temperature from the weather broadcast on a system with one weather station and two or more EnviroSTEPs.
90	Weather Station Humidity	Duplicates Code 3 on an EnviroSTEP wired to a weather station. Records the **outdoor humidity** from the weather broadcast on a system with one weather station and two or more EnviroSTEPs.
91	Weather Station Light	Duplicates Code 5 on an EnviroSTEP wired to a weather station. Records the **outdoor sunlight intensity** from the weather broadcast on a system with one weather station and two or more EnviroSTEPs.
92	Weather Station Wind Speed	The **wind speed** as recorded by an optional weather station.

To make a graph:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **6** then **GO** to reach the Graph screen.
- Enter # ↓ or the solid line.
- Enter # for the dashed line GO to display the graph.
- To redraw the graph one day earlier in time, press the ↑ key.
- To redraw the graph one day later in time, press the ↓ key.
- Remember that there are exactly seven days of history that you can page through on the graph.
- To stop displaying graphs and return to the **<<<Main Menu>>>**, press the **GO** key.
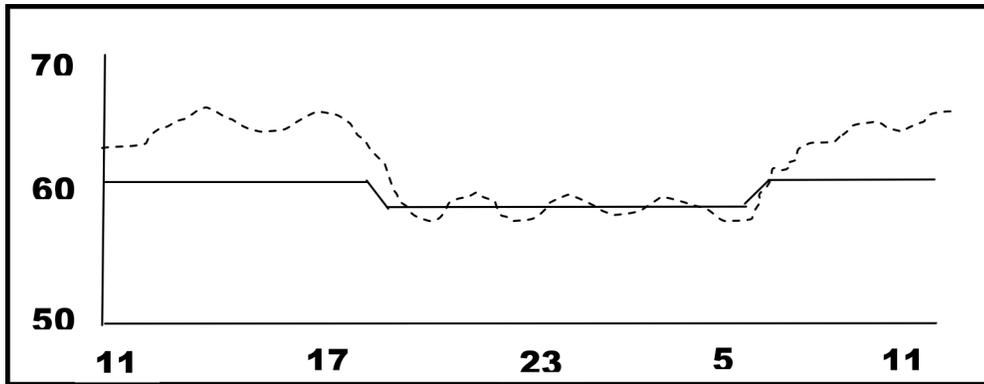
You can graph more information with the optional STEPsaver software program that connects your EnviroSTEP to your PC.

Setting	Function of Setting
Solid Line	Displays information from the computer's log memory to plot as a solid line on the graph. Information displayed depends on what you have selected to graph. The solid line shows the way the heating setpoint varied during the day the graph displays. Notice that it ramps down to 58° at night, and back up to 60° during the daytime hours.
Dashed Line	Displays information from the computer's log memory to plot as a dashed line on the graph. Information displayed depends on what you have selected to graph. The dashed line shows the way the greenhouse temperature varied during the day the graph displays. It tracks close to the heating setpoint at night, but tends to stay well above it during the daytime hours. This is typical of a graph of temperature versus the heating setpoint, and shows the computer is performing well during the hours when heat is needed. You may also want the graph temperature versus the cooling setpoint to verify performance during the day when cooling is needed.
Date	Displays the date of the start of the graph. 9/25
Bottom Row	Displays the hour of the day. One number is shown on the graph for every six hours of elapsed time. 11 17 23 5 11
Left Column	Displays the range of values plotted. In the example, these refer to temperature, but depending on the data you choose to plot, they may also mean humidity, light level, average position, or percentage of time in operation. 50 60 70

<<<Setting Menu>>>

This screen provides a menu of settings. It is the central access point for the values you enter to adapt your computer to your greenhouse and crops. Most often, you will use this menu to access setpoints. Remember this computer has already been customized for your greenhouse. If you wish to make changes to your equipment setup, or its sequence of operation, carefully follow the instructions in this section.

> **Be aware that any changes you make in the <<<Setting Menu>>> will replace the program that Wadsworth Control Systems has customized for your greenhouse.**

To reach the **<<<Setting Menu>>>**:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**

Sample Setting Screen:

```
            <<< Setting Menu >>>
         0---Return to <<<Main Menu>>>
      1---Setpoints          6---Time/Date
      2---Equipment          7---Configuration
      3---Calibration        8---Start!
      4---Access Code        9---Cycle Timers
      5---Limits
            YOUR CHOICE? >>> ▮
```

Reading the <<<Setting Menu>>>

0----Return to <<<Main Menu>>>	Returns user to the **<<<Main Menu>>>**.
1----Setpoint	Allows you to see and change the master climate control settings for the computer.
2----Equipment	Access to equipment settings.
3----Calibration	Allows sensor calibration.
4----Access Code	Establishes, clears, or changes access code.
5----Limits	Offers settings to limit vent opening according to outdoor conditions.
6----Time/Date	Sets clock and calendar, geographic coordinates, time zone, and daylight/standard time.
7----Configuration	Displays the <<<Configuration Menu>>>.
8----Start	Dual-purpose setting. The first use is to begin controlling after initial configuration. Also, immediately puts new setpoints into effect without delays for ramping.
9___Cycle Timers	Sets schedule for any of the four optional cycle timers.

Setpoint Screens

The Setpoint screen displays current setpoints and permits modifications to existing parameters. Setpoints define the desired conditions for the environment. There are two screens related to setpoints. This section discusses the first screen and is followed by information on the second screen.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<Setting Menu>>**
- Press **1** then **GO** to reach **Setpoints** screen.

Sample Setpoints:

```
Setpoints for Zone:  1
        SetPt  Type    Start   Heat    Cool     RH      Ramp
Day:     1      60      64      70      60       5
Night:   0      18:00   62      74      60       5
"Diff":  1      -60     60      64      60       1
---------------------Humidity Control Limits -------------------
         0 = Max degrees change from Heat S.P.
         0 = Max degrees change from Cool S.P.
```

Reading the Time Period Setpoint Screens

Setpoints for Zone	Indicates current zone the system is reading.
SetPt	Column heading for the three available setpoint periods in a day: Day, Night, and the optional DIF period between Night and Day.
Type	Indicates how a period of time (day/night/DIF) is determined. Time can be measured in two ways – fixed or relative. With fixed time, choice 0, the period begins at the same time each day (for example 6:00 AM). With relative time, choice 1, the period begins relative to sunrise/sunset (for example 60 minutes after sunset).
Start	Indicates when the period starts. It is based on the type of time that was selected (relative/fixed). Relative time (Type 1) is entered in minutes. Negative numbers start the period before sunrise/sunset. Fixed time (Type 0) is entered using the 24-hour clock. In this example, the day period is set using Relative Time (Type 1) and will start 60 minutes after sunrise. The night period uses Fixed Time (Type 0) and will start at 18:00 (6:00 PM). DIF uses Relative Time (Type 1) and the period will start 60 minutes before sunrise.
Heat	Represents heating setpoints for each period. In this example, the day heat setpoint is 64, night is 62, and DIF is 60.
Cool	Represents cooling setpoints. Day is 70, night 68 and DIF 64 in this example.
RH	Represents humidity setpoints. In this example, both day and night have a setpoint of 60; RH is set at 60% during the DIF period.
Ramp	Indicates how many minutes it will take to change between periods (temperature/humidity). This example uses 5, meaning that it will take 5 minutes per unit change. Given the two-degree difference between day and night cooling setpoints, it will take 10 minutes for the change in temperature to take effect. This adjusts the temperature gradually, allowing the greenhouse to naturally cool down at night and warm up during the day. This minimizes the use of equipment and reduces energy use. The system can immediately change from 65 to 50, but it does not model the real world. Further, it can be a tremendous waste of energy and stress the plants. When the system makes an immediate shift from 65 to 50 it dumps the warm air out of the house. By utilizing the ramp feature, a more gradual temperature shift occurs, allowing for natural cooling through outdoor temperatures. Ramp controls Relative Humidity setpoint changes the same way.

Diff Ramp	Diff Ramp is the exception. To ensure maximum benefit for this programmed cold period near sunrise, growers usually want the change in temperature to occur quickly because it is a short period. Use a 1-2 minute ramp time. The DIF period might vary per crop, general guidelines are to start DIF from sunrise to two hours after sunrise. DIF is not programmed by Wadsworth Controls unless the grower makes a specific request and provides us with the parameters. Growers should research and set appropriate parameters for the crop.
Humidity Control Limits	When cooling to humidity, the control can continue to cool if the temperature changes from heat setpoint by more than this amount. Set to zero to prevent simultaneous heating and cooling to dehumidify. Use a small negative number (-1, 2-) to let heating and cooling overlap, or to let fog humidification continue even if it drops the temperature below the heating setpoint max degrees change from cool setpoint. When heating to dehumidify, the control can heat if the temperature rises above the cooling setpoint. Set to zero to prevent heating past the cooling setpoint and causing simultaneous heating and cooling. Set to a small positive number (1,2) to allow heating and cooling to overlap, as may be needed if the house is very wet and you have a fungal disease outbreak.

Setpoint Adjustment Screen

This is the second of two setpoint screens. This screen allows you to program automatic setpoint adjustments in response to weather and carbon dioxide levels. This is where the alarm parameters are set.

To reach this screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **1** then **GO** to reach **Setpoints** screen.
- Press **GO** to reach the **Setpoint Adjustments** screen.
- Use up/down ↓↑ arrows to navigate to desired setpoint (Night/Temp/Cool/RH).

Sample Setpoint Adjustments Screen:

```
Setpoint Adjustments for Zone:   1
SetPt     Change    Due-To        Lo       Hi
Night:     0        Accum        0.0       0.0     KW-H
Temp:      0        Light        0         0       mW-cm2
Cool:      0        CO2          0         0       ppm
RH:        0        Light        0         0       mW-cm2
-10 = Cold Alarm                    -99 = Dry Alarm
 20 = Hot Alarm                      99 = Wet Alarm
```

Reading the Setpoint Adjustment Screen

The EnviroSTEP provides four automatic setpoint adjustments that are driven by conditions inside and outside the greenhouse. You are not required to use any of the adjustments; they are included to help tailor the computers performance to your needs.

Each adjustment is proportional over the low to high range of a measured condition. At or below the low end of the range, the computer makes no adjustment. At or above the high end, the computer makes the entire range you program with your settings. Between the low and high points, the computer makes a change in proportion to conditions.   These settings are detailed in the table below.

Column Headings:

Setpoint Adjustments for Zone	Indicates what zone the system is reading.
SetPt	Column heading identifies what setpoint (Night/Temp/RH) is being adjusted.
Change	This column heading indicates degrees or percentage points of change in the temperature or humidity setpoint.
Due-To	The column heading shows the measurement that causes the setpoint change (light, CO_2, accumulated light). These independent measurements can help anticipate heating and cooling needs in the greenhouse, or save energy.
Light	Measures intensity of light in units of milliwatts per sq centimeter (mW-cm2). This is the sunlight intensity as it changes from minute to minute.
CO2	Measures CO_2 in parts per million (PPM).
Accum	Measures accumulated light in kilowatts per sq meter (KW-H). This is the energy from the sun as it accumulates through the course of a day.
Lo	Indicates low end of range when adjustment will take effect.
Hi	Indicates high end of range when adjustment will take effect.

Affected Setpoints:

Night	Adjusts night temperature setpoints to account for light accumulation over the course of a long or especially bright day.
Temp	Adjusts heating and cooling setpoints in response to light intensity. Since light intensity at night is 0, it affects only daytime operation.
Cool	Adjusts daytime cooling setpoint in response to CO_2 concentration.
RH	Adjusts daytime humidity setpoint in response to light intensity.
KW-H	The unit-of-measure label for **Accum** light based changes
mW-cm2	The unit of measure label for **light** intensity based changes.
PPM	The unit of measure label for **CO_2** concentration based changes.
Cold Alarm	Indicates degrees from heat setpoint when alarm sounds. Should be a negative (-) number to indicate degrees below heat setpoint.
Hot Alarm	Indicates degrees from cool setpoint when alarm sounds. Should be a positive number to indicate degrees above the cooling setpoint.
Dry Alarm	Activates alarm if the RH % drops below RH setpoint. –99 = disabled.
Wet Alarm	Activates alarm if the RH % rises above RH setpoint. 99 = disabled.

Changing the Setpoints Screen 1

This example will walk you through how to create your setpoints to control your heating and cooling choices during different times of the day. You should enter information that is pertinent to the requirements of your specific crop.

Sample Setpoint Screen:

```
Setpoints for Zone:  1
     SetPt Type   Start   Heat   Cool    RH    Ramp
Day:    1      60       64      70      60      5
Night:  0      18:00    62      74      60      5
"Diff": 1     -60       60      64      60      1
----------------------Humidity Control Limits -------------------
          0 = Max degrees change from Heat S.P.
          0 = Max degrees change from Cool S.P.
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **1** then **GO** to reach **Setpoints** screen.
- Use up/down ↓↑ arrow keys to navigate.
- Navigate to desired time period (Day/Night/DIF).
- Under the **Type** column, indicate type of time setting.
- Press **1↓** for time period relative to sunrise for Day/DIF or sunset for Night.
- Press 0 for fixed time period, always occurs at same time.
    - The example day above uses Type 1 for the Day and DIF periods meaning relative time and Type 0 for night meaning fixed time.
- Enter # ↓for **Start** time. This varies based on what type of time 0/1 was selected. 0 will display 00:00 to enter a time using the 24-hour clock. 1 will display 0 to enter number of minutes before or after sunrise or sunset.
    - This example Day uses Relative Time, Type, and 60 meaning the period will start 60 minutes after sunrise. It uses Fixed Time, Type 0 for night, and 18:00 meaning the night period will start at 6:00 PM. DIF uses relative time and begins -60 minutes before sunrise.
- Enter # ↓for **Heat** setpoint
    - This example uses 64 for day, meaning the heat will turn on if the temperature inside the zone drops below this 64 during the day.
- Enter # ↓for **Cool** setpoint
    - This example uses 70 for Day, meaning the cooling equipment will turn on if the temperature inside the zone exceeds 70 during the day.
- Enter # ↓for **RH** (humidity) Setpoint
    - This example uses 60 for Day, meaning the programmed equipment will turn on if the relative humidity inside the zone exceeds 60% during the day.

> **If you don't have equipment that you intend to use for humidity control, use a relative humidity setpoint of 70 – 90%. This will keep the alarm from going off.**

- Enter # ↓ for **Ramp** Rate in minutes.
    - In this example, there are 5 for day, meaning it will take 5 minutes per degree of temperature change or percentage point of relative humidity setpoint change. Assuming setpoints are set at 70 for day and 60 for night, there is a 10º difference. It will take 5 minutes per degree, therefore 50 minutes before the night temperature is reached. Note: Generally the ramp speed for DIF is shorter than for the other periods.
- Repeat process to modify setpoints for any time period.
- Enter # ↓   for **Max** degrees from **heat** setpoint

This example uses 0 meaning the computer will not allow heating and cooling to run at the same time when controlling humidity.

- Enter # ↓ for **Max** degrees from **cool** setpoint
  This example uses 0 meaning the computer will not allow heating and cooling to run at the same time when controlling humidity.
- Press **GO** to go to the second Setpoint screen or press **GO** repeatedly to return to the **<<<Main Menu>>>**

Changing the Setpoints Adjustments

Sample Setpoint Adjustments Screen:

```
Setpoint Adjustments for Zone:  1
SetPt     Change     Due-To      Lo       Hi
Night:      3        Accum       5.0      8.0      KW-H
Temp:      -4        Light       30       50       mW-cm2
Cool:       5        CO2         600      1100     ppm
RH:         10       Light       30       50       mW-cm2
 -10 = Cold Alarm                    -99 = Dry Alarm
  20 = Hot Alarm                      99 = Wet Alarm
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **1** then **GO** to reach **Setpoints** screen.
- Press **GO** to reach the **Setpoint Adjustment** screen.
- Use up/down ↓↑ arrows to navigate to desired Setpoint (Night/Temp/Cool/RH).
- The computer automatically fills in the Setpoint Adjustments for Zone.
  The example above uses Zone 1.
- Enter #↓ for degrees of change to **Night** setpoint. Negative (-) changes lower the setpoint. Positive changes raise it.
  This example uses 3 for the Night setting meaning that the night temperature will be raised as much as three degrees, depending on the amount of light accumulated during the previous day.
- The computer automatically fills in the Due-To field.
  This example uses Accum; meaning accumulated light energy in a day. This value ranges from less that 1 KW-H in winter, to 8KW-H or more in mid-summer.
- Enter #↓ to define the **Lo** light level
  This example uses 5KW-H defining at what point the accumulated light level will start to impact the night temperature setpoint.
- Enter #↓ to define the **Hi** light level
  This example uses 8KW-H defining the maximum accumulated light level adjustment. When the accumulated light reaches 8KW-H the maximum adjustment will be made to the night setpoint temperature, causing a 3º rise in night temperature.

*Between the **Lo** and **Hi** settings, the program will make a partial and proportionate change to the setpoint based on the actual amount of light accumulated. The program makes no change if the accumulated light is less than the **Lo** setting, and factors in the entire amount of change for accumulated light amounts at or above the **Hi** setting.*

- The last column is automatically filled in by the computer based on what is being measured.
  - **KW-H** – the unit-of-measure label for **Accum** light based changes.
  - **mW-cm2** – the unit of measure label for **light** intensity based changes. Because the sensor is calibrated in these units, the computer can only accurately report mW-cm^2. If you are used to thinking in foot-candles, multiply this number by 100 to get a rough foot-candle estimate. (For example, 45 mW-cm^2 is about the same as 4500 foot-candles.)
  - **PPM** – the unit of measure label for **CO$_2$** concentration based changes.

Repeat process to modify any of setpoints (Night/Temp/Cool/RH).

- Enter #↓ for **Cold Alarm**
  - This example uses –10, meaning the cold alarm will sound and signal when the greenhouse temperature falls 10º below the heating setpoint.
- Enter #↓ for **Hot Alarm**
  - This example uses 20, meaning the hot alarm will sound and signal when the greenhouse temperature rises 20º above the cooling setpoint.
- Enter #↓ for **Dry Alarm**
  - This example uses –99, meaning it is disabled; no alarm will sound if the RH is too low.
- Enter #↓ for **Wet Alarm**
  - This example uses 99, meaning it is disabled. No alarm will sound if the RH is too high.
- Press **GO** repeatedly to return to **<<<Main Menu>>>**

Considerations for Setpoint Adjustments

Night Setpoint Adjustments allows adjustments based on the light accumulation. Changing these settings affects both heating and cooling and may raise or lower temperatures.

The computer multiplies the Hi/Lo settings for accumulated light by 1,000. Meaning a setting of 2.0 equals 2000 W-Hr/sq-m. A typical setting is 3 degrees of change factored in over a range of 2.0-5.0. Given these settings, the following adjustments would be made to the night heating and cooling temperatures:

Accumulated Light for Day	Changes in Night Setpoint
1800 W-Hr/sq-m	None
3000 W-Hr/sq-m	1º
4000 W-Hr/sq-m	2º
5000 W-Hr/sq-m	3º
6000 W-Hr/sq-m	3º

Day Cooling Setpoint Adjustments for Light allows adjustments based on the light intensity. The setpoint can be adjusted according to the amount of sunlight. Any change will alter the cooling setpoint at the daytime ramp rate.

Light intensity varies constantly throughout the day. The maximum light intensity can vary from less than 10 mW/cm2 on a cloudy winter day to over 90 mW/cm2 at noon on a clear summer day. One milliwatt equals approximately 100 foot-candles.

A typical set of cooling adjustments for light intensity is -3 degrees as light varies from 30 to 60 mW/cm2. Given these settings the following adjustments would be made to the cooling setpoints:

Light Intensity	Change in Cooling Setpoint
10 W-Hr/sq-m	None
40 W-Hr/sq-m	-1º
50 W-Hr/sq-m	-2º
90 W-Hr/sq-m	-3º

Day Cooling Setpoint Adjustments for CO_2 allows adjustments based on the CO_2 concentration. Generally, the goal is to raise the cooling setpoint to increase the CO_2 injection time before the cooling starts. Any change will alter the cooling setpoint at the daytime ramp rate.

CO_2 concentration varies according to the rate at which the CO_2 is injected and the rate that the plants absorb the CO_2. Most growers inject 1000 PPM. Without injection, CO_2 concentration is approximately 300 PPM. CO_2 becomes hazardous to humans at 5000 PPM.

A typical set of cooling adjustments for CO_2 is 5 degrees as concentration varies from 600 to 1100 PPM. Given these settings the following adjustments would be made to the cooling setpoints:

CO_2 Concentration	Change in Cooling Setpoint
300 PPM	None
800 PPM	2°
1000 PPM	4°
1200 PPM	5°

Day Humidity Setpoint Adjustments for Light allows adjustments based on the light intensity. The setpoint can be adjusted according to the amount of sunlight. Typically, growers raise RH as light increases.

Light intensity varies constantly throughout the day. The maximum light intensity can vary from less than 10 mW/cm2 on a cloudy winter day to over 90 mW/cm2 at noon on a clear summer day. One milliwatt equals approximately 100 foot-candles.

A typical set of humidity adjustments for light intensity is 15% as light varies from 30 to 60 mW/cm2. Given these settings the following adjustments would be made to the cooling setpoints:

Light Intensity	Change in Relative Humidity Setpoint
10 mW/cm^2	None
40 mW/cm^2	+5%
50 mW/cm^2	+10%
60 mW/cm^2	+15%
90 mW/cm^2	Still +15%

Alarm Setpoints

Alarms can be programmed to set off the computer's internal buzzer and activate its dedicated alarm-signaling relay. If the alarm signaling relay is wired to an optional external device such as the Alarm Manager (Wadsworth part number M-5800), it can place a telephone call to you and inform you of an alert. The alarm settings determine how far from the appropriate setpoint the greenhouse can be before an alarm will sound. As you change setpoints for different crops, the alarm settings float with the varying conditions you command for the greenhouse.

If –10 = Cold alarm, an alarm will always sound when the temperature reaches 10 degrees below the heating setpoint. If actual temperatures were used, each time a grower changed his setpoint, updates would need to be made in multiple screens. So, when the grower changes crops and adjusts the heat/cool setpoints, the alarm setpoints do not need to be adjusted.

> **Remember: –10 = Cold Alarm does not mean it is set to alert when temperatures reach –10ºF but 10º below the heating setpoint.**

Typical Alarm Settings

Cold alarm is usually set at -10 meaning it sounds if temperatures reach 10 degrees below heat setpoint. Remember that the temperature can continue to drop even after an alarm is triggered. You may need to set the cold alarm closer to the heating setpoint than –10 degrees if it will take you a significant time to travel to the

greenhouse and resolve a problem. Remember you can make changes to equipment settings and access the alarm from a remote location if you have our STEPsaver software and an internet connection.

Hot alarm is usually set at 20 meaning it sounds if temperatures reach 20 degrees above the cooling setpoint. Remember that even the best-equipped greenhouse may run much warmer than desired on bright summer days. Set this alarm far enough above the cooling setpoint so that you do not receive nuisance alarms when the greenhouse is maintaining the coolest conditions it physically can.

Wet and Dry alarms are usually disabled unless it is a crop of seedlings. To disable wet alarm, enter 99. An alarm would sound if the humidity was 99% above the setpoint, which is impossible. To disable dry alarm, enter –99. An alarm would sound if the humidity was 99% below the setpoint, which is impossible.

Equipment Settings

The zone settings covered in the previous section establish general rules for zone control. This section provides detailed rules on how to achieve zone setpoints through equipment settings. Once appropriate equipment settings are established, changes are rare. This is especially true if used in conjunction with the STEPsaver PC software program, which allows crop settings to be saved and sent to the EnviroSTEP each time there is a crop change.

This section provides detailed instructions on how to program each piece of equipment. The required information varies depending on the type of equipment. The EnviroSTEP takes advantage of similarities between equipment types to simplify and coordinate settings as much as possible. The equipment settings are explained in groups that share similarities such as modulating equipment, and On/Off equipment. Because the steps are the same for all equipment in a category, only one example of how to program is given for each group of equipment.

The Equipment Settings are organized into three primary sections:

> **Heater Equipment Settings**
> **Cooling Equipment Settings**
> **Other Controlled Equipment**

Equipment is programmed to turn On/Off based on degrees above or below the Heating, Cooling, or RH setpoints. Each piece of equipment has its own On/Off settings, which can be staged depending the grower's preference. Before you start programming, use a copy of the configuration worksheet found in the back of this manual to record the On/Off settings for each stage to ensure the appropriate numbers are entered.

Heating S.P.	65	Cooling S.P.	72
Htr Stage 1	-2 / 0 (On 63 / Off 65)	Fan Stage 1	2 / 0 (On 74 / Off 72)
Htr Stage 2	-4 / -2 (On 61 / Off 63)	Fan Stage 2	4 / 2 (On 76 / Off 74)
Htr Stage 3	-6 / -4 (On 59 / Off 61)	Fan Stage 3	6 / 3 (On 78 / Off 75)

> **Remember, your computer is factory programmed with reasonable equipment settings. You need only change these settings if you are not satisfied with the way your computer controls your greenhouse.**

Equipment Screen

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment Settings** screen.
- There are two screens. Use the up/down ⇅ arrow keys to navigate between screens to view all equipment.
- Press **GO** to return to the **<<<Setting Menu>>>**

Sample Equipment Screen 1:

```
EQUIPMENT SETTINGS:
            1 ……. .Heater 1
            2……. . Heater 2
            3 ……. .Exh Fan 1
            4……. . Exh Fan 2
            5……. . Exh Fan 3
            6……. . Exh Fan 4
Scroll or Select Here [ ▯ ]
```

Sample Equipment Screen 2:

```
EQUIPMENT SETTINGS:
            7 ....... .Vent 1
            8 ....... .Curtain 1
            9 ....... .Irr. Valve 1
Scroll or Select Here [ ▓ ]
```

Reading the Equipment Screen

These screens list all of the equipment that has been programmed for this sample greenhouse. The lists will vary depending on equipment. This example lists Heaters, Exhaust Fans, Vents, Curtains and an Irrigation Valve.

The numbers to the left of the name of each piece of equipment are menu choice numbers. They are not necessarily the same as the switch numbers for that piece of equipment. The computer lists equipment names in the order that the program will work with the equipment as it runs. This is usually different that the order in which switches are wired to the equipment.

Heating Equipment

On/Off Heating Equipment

This section covers the programming steps for heating equipment that is either On or Off, but does not proportion or modulate. The computer uses essentially the same program for all such equipment.

On/Off heating equipment types that follow the same basic program are:

Equipment Name	Code	Notes
Hot Water Pumps	9	Provides a timed running period to circulate cold water out of the greenhouse and prevent boiler shock.
Heaters	11	The program identifies unit heaters of all types as "Heater." A heater may be gas fired, or have a steam or hot water heat exchanger.
Heat Valves	12	A steam or hot water control valve, usually used for overhead or perimeter heat.
Root-Zone Heating	13	A steam or hot water control valve, or a simple low volume boiler used for under-bench heat.
Gutter Line	23	A steam or hot water control valve for lines under a gutter. Used for supplemental heat, and is turned on to melt snow.
Ringline	42	The program for a ringline pump controls the main hot water circulation pump for a low volume boiler heating system. It can be configured to shut down in the event of a boiler alarm. The program will check for any code 10 or code 25 mixing valves in the greenhouse and hold the pump on as long as they are open.

Hot Water Pump (Code 9) Setting Screen

Sample Hot Water Pump Equipment Screen:

```
Zone: 1                 Description:   HW Pump # 1
-2 / 0  = TEMP ON / OFF
     0  = NIGHT SHIFT
  0 / 0 = RH  ON / OFF          0  = CYCLE TIMER
   40   = Exercise Temp    (Outdoors)
Type Exercise - Time
1   0 Begin                    0  = Minimum minutes
1   0 End                      1  =  GENERATOR?
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
- Find the Hot Water Pump on the list of equipment on the display screen, enter the line number to the left of the heater's name, and press **GO**.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Reading the Hot Water Pump Setting Screen

Zone	Shows the zone number assigned to this EnviroSTEP
Description	Identifies what equipment/stage is shown. In this example, Hot Water Pump # 10.
Temp ON/ OFF – *ON*	Sets when the heat turns on based on degrees away from the heating setpoint. In this example, the heat will turn on when it is -2 below the heat setpoint of 65, meaning the heat will turn on at 63º. Generally, heaters are set to come on at or below the heating setpoint: typical settings are -1 or -2
Temp OFF/	Sets when the heat turns off based on degrees from the heating setpoint. In this example, the heat will turn off at 0, meaning the heat will turn off at setpoint, in this example it is 65. Generally, heaters are set to turn off at or above the heating setpoint: typical settings are 0, 1, 2
Night Shift	Adjusts the On/Off temperature offsets during the night setpoint period. This value is added to both the On setting and the Off setting. The operating points of the equipment can be raised or lowered, but are generally left unchanged. This setting exists to accommodate unusual equipment combinations. When night setpoints are in effect, the computer adds this setting to the values in **Temp ON and Temp OFF**. The **NIGHT SHIFT** setting is almost always. An example of when you might use this is if you want to maintain a 70º day air temperature and a 64º night air temperature, but maintain soil temperature at 70º all the time. To do this you would use a **NIGHT SHIFT** setting of 6º in an under-bench heating system. When the setpoint drops to 64º at night, heating systems like unit heaters will follow the night setpoint down. For the under-bench heating system, the **NIGHT SHIFT** adds back 6º to hold the 70º temperature for the soil through the night. During the day, the **NIGHT SHIFT** setting has no effect.
RH ON/OFF	Sets how the heater responds to humidity deviations from the RH setpoint. The heater can be programmed to help dehumidify. When the RH rises above the ON level, the stage will come on and remain on until RH falls below the OFF level. When set to 0/0, the heater will not respond to humidity, only to temperature.
Type Exercise Time	These settings define the hours of the day when the pump must run, regardless of greenhouse temperature. The computer will force the pump to run on this schedule when the outdoor temperature is at or below the **Exercise Temp** set above. There are two *Type* options for setting the time. Setting *Type* **to 0** establishes fixed time settings, meaning the pump starts and/or stops at the same time each day (for example, 16:00). Enter fixed times using 24-hour clock (13:00 for 1:00 PM) Setting *Type* **to 1** establishes relative time settings defined by minutes away from sunrise for the start of the exercise period, and minutes away from sunset for the end of the exercise period. Negative numbers set times before sunrise or sunset, while positive numbers set times after these events. A setting of -30 under *Exercise-Time, Earliest* means 30 minutes before sunrise. A setting of 60 under *Exercise-Time, Latest* means 60 minutes after sunset.
Begin/End	These settings define the hours of the day when the pump runs to circulate cold water from the heat pipes back to the boiler. These settings allow you to manage the startup of your heating and boiler systems at the end of bright winter days when the sun has heated the greenhouse and the water in your heating pipes has cooled off. To avoid boiler shock, schedule each pump at a different time in the late afternoon.
Minimum minutes	When the pump comes on due to temperature, the computer will hold the pump on for at least the number of minutes set here, even if the greenhouse temperature raises enough to shut the pump off sooner. You may set this value to 0 to have the pump turn on and off strictly according to temperature.
Generator?	Sets whether the heater is authorized to run while the greenhouse is powered from its standby generator. 0 means the equipment is NOT allowed, 1 means the equipment is allowed to operate off a standby generator. The default setting is 1 and should usually not be changed.
Cycle timer	Assigns the pump to follow one of four-cycle timers. When the cycle timer comes into its "On" periods, the pump will be forced on. When the timer returns to its "Off" period, the pump will shut off unless its temperature or humidity settings require it to remain on. Using a cycle time with a heater may be useful in an aggressive dehumidification scheme, as when combating a fungal disease. See the index for information on programming the Cycle Timer.

Changing the Hot Water Pump Setting Screen

Sample Hot Water Pump Screen:

```
Zone: 1                    Description:   HW Pump # 10
-2 / 0   = TEMP ON / OFF
    0   = NIGHT SHIFT           0 = CYCLE TIMER
10 / 5 = RH  ON / OFF
   10  = Exercise Temp    (Outdoors)
Type Exercise - Time
0   15:30  Begin                11 = Minimum minutes
0   15:45  End                  1  =  GENERATOR?
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
- Find the Hot Water Pump on the list of equipment on the display screen, enter the line number to the left of the heater's name, and press **GO**.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Temp ON**. Enter # ↓ for **Temp OFF**.
    This example uses –2 and 0. Assuming a heat setpoint of 65, the heater will turn off at 63º, 2º below the heat setpoint, and the heater will turn off at 65º, 0 degrees away from the heating setpoint.
- Enter # ↓ for **NIGHT SHIFT**. When night setpoints are in effect, the computer adds this setting to the values in **Temp ON and Temp OFF**. The **NIGHT SHIFT** setting is almost always 0. Using values other than 0 lets you manage complex or arbitrary equipment in a zone. For example, you may want to maintain a 70º day air temperature and a 64º night air temperature, but maintain soil temperature at 70º all the time. To do this you would use a **NIGHT SHIFT** setting of 6º in an under-bench heating system. When the setpoint drops to 64º at night, heating systems like unit heaters will follow the night setpoint down. For the under-bench heating system, the **NIGHT SHIFT** adds back 6º to hold the 70º temperature for the soil through the night. During the day, the **NIGHT SHIFT** setting has no effect.
- Enter # ↓ for **RH ON**. Enter # ↓ for **RH OFF**.
    This example uses 10/5 and assumes the RH setpoint is 80%. The heater will turn On when RH is 90% and Off when it drops to 75%. To disable the dehumidify option for the heating stage, set 0/0 for RH ON/OFF.
- Enter # ↓**Exercise Temp (Outdoors)**.
    This example uses 10º. The pump will exercise when the outdoor temperature is 10º or colder.
- Enter # ↓ for **Minimum Minutes**.
    This example uses 11 minutes. The computer will run the pump for at least 11 minutes after each time it turns it on.
- Enter # ↓ # ↓ for **Type Exercise–Time, Begin**
    This setting defines the start of the exercise time for the pump. This example uses the default 0 meaning fixed time, and 15:30, meaning 3:30 PM.
- Enter # ↓# ↓ for **Type Exercise–Time End**
    This setting defines the end of the exercise period for the pump. This example uses the default 0 meaning fixed time, and 15:45, meaning 3:45 PM.
- Enter # ↓ for **CYCLE TIMER**
    This example uses 0, the default setting. This means that the heater is not assigned to track a cycle timer, and will operate only according to its temperature and humidity settings.
- Enter # ↓ **GENERATOR.**   Indicates if the equipment is allowed to use the generator (1 = yes   0 = no).

This example uses 1, which enables the heater to use the generator.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Unit Heater (Code 11) Equipment Setting Screen

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment Settings** screen.
- Use up/down ⇅arrows to navigate between the two screens.
- Press the screen choice number (1 in our example) and **GO** to reach the Unit Heater Screen.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Heater 1 Screen:

```
Zone: 1                 Description:   Heater  #1
-2 / 0  = Temp ON / OFF              = MIN %  VENT
    0  = NIGHT SHIFT                = RAIN LCKOUT
0 /  0  = RH  ON / OFF          0  = CYCLE TIMER
    /   = D/N FROST                 = CO2
Type Allowed - Time        = WIND O/R SPEED
0  00:00 Earliest           = WIND O/RACTION
0  24:00 Latest         1 = GEN   0=FIRE
```

Reading the Heater Equipment Setting Screen

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is shown – in this example, Heater #1.
Temp ON/	Determines when the heat turns on based on degrees from the heating setpoint. In this example, the heat will turn on when it is –2 below the heat setpoint of 65, meaning the heat will turn on at 63. Generally, heaters are set to come on at or below the heating setpoint: typical settings are 0, -1, -2
Temp OFF/	Determines when the heat turns off based on degrees from the heating setpoint. In this example, the heat will turn off at 0, meaning the heat will turn off at setpoint, which is 65. Generally, heaters are set to turn off at or above the heating setpoint. Typical settings are 0, 1, 2.
Night Shift	Adjusts the On/Off temperature for night. Night setpoint temperatures can be raised or lowered using the Night Shift option. Night shift should almost always be set to zero. It can be used to compensate for the effect of the daytime fogging or irrigation on soil temperature sensors.
RH ON/OFF	Determines how the heating responds to humidity based on the RH setpoints. The heater can be programmed to help dehumidify. When the RH rises above the ON level, the stage will come on and remain on until RH falls below the OFF level.
Day/Nite Frost Lockout	The cursor skips over settings of 0/0 meaning "ignore humidity".

Sample Heater Equipment Screen:

```
Zone: 1                 Description:   Heater  #1
-2 / 0  = Temp ON / OFF              = MIN %  VENT
    0  = NIGHT SHIFT                = RAIN LCKOUT
10 / 5 = RH  ON / OFF          0 = CYCLE TIMER
    /   = D/N FROST                 = CO2
Type Allowed - Time        = WIND O/R SPEED
0  00:00 Earliest           = WIND O/RACTION
0  24:00 Latest         1 = GEN   0=FIRE
```

Type Allowed - Time	Defines the hours when the equipment can run. All On/Off equipment can be disabled due to the time of day meaning the equipment runs only during set hours. There are two options for setting the time. 0 = fixed time meaning the equipment turns On/Off at the same time each day (6:00 AM). Enter time using 24-hour clock. 1 = relative time defined by minutes before/after sunrise. Negative numbers allow equipment to turn on before sunrise. –30 means 30 minutes before sunrise.
Earliest/Latest	Defines the hours when the equipment can run. Time is entered using the 24-hour clock for Type 0, fixed time or using +/- minutes to specify time before or after sunrise. Generally, growers enable heating and cooling equipment to turn On/Off 24 hours a day. The computer automatically sets the Earliest Time to 00:00, and the Latest Time to 24:00, enabling equipment to run any time it is needed.
Min % Vent	The cursor skips over this section if it does not apply to this equipment.
Cycle Timer	This setting allows you to link the operation of the equipment to any of four built-in cycle timers. The computer runs these timers just like an electromechanical time clock with pegs to set 'On' time and 'Off' times. When you link a piece of equipment to a cycle timer, the equipment turns on when the cycle timer is on, regardless of its other settings. When the cycle timer turns off, so does the equipment, unless any of its other settings still require it to be on. A setting of 0 ignores all cycle timers. A setting of 1,2,3 or 4 links the equipment to the timer with that number. The settings for the timers themselves are found under item **9** of the **<<<Setting Menu>>>**.
MIN Minutes	The cursor skips over this section if it does not apply to this equipment.
Wind O/R Speed	The program used the same basic screen for most On/Off heating and cooling. The cursor skips past settings that do not apply for a particular piece of equipment.
Wind O/R Action	The cursor skips over this section if it does not apply to this equipment.
GEN	Indicates if equipment is authorized to run on generator power. 0 means the equipment is NOT allowed. 1 means the equipment is allowed to operate off a standby generator. This allows the computer to do "load shedding". Note that for heating equipment, the computer requires TEMP ON to be less than TEMP OFF, and RH ON to be greater than RH OFF. This is because heating raises temperature and lowers humidity. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Gutter Line (Code 23) Equipment Setting Screen

This heater melts snow in the gutter and serves as a supplemental heat source. To reach the Equipment Screen:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
- Press **#↓** then **GO** to reach **Gutter Line**.
  This example will use 2 then **GO** to select Gutter Line #1.

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

  Sample Gutter Line Equipment Screen:

```
 Zone: 1                    Description:  Gutter Line  # 1
  38    = SNOW Temp outdoors
  -4    = ON for Backup Heat
  -2    = OFF for Backup Heat
------------------------------------------------------------Boiler Pump Setting
        = Minutes to run after boiler stops firing
```

Reading the Gutter Line (Code 23) Equipment Setting Screen

Zone	Indicates the zone number assigned to this computer.
Description	Indicates what equipment is shown. In this example, gutter line #1.
Snow Temp Outdoors	Determines when the outdoor temperature indicates snow. Settings vary regionally.
On for Backup Heat	Determines when the supplemental heat turns on. Based on degrees from heat setpoint.
Off for Backup Heat	Determines when the supplemental heat turns off based on degrees from heat setpoint.
Boiler Pump Setting = Minutes to run after boiler stops firing	Does not apply to this equipment.

Since standby generators may not produce enough power to run all the equipment in a greenhouse, the computer can "shed loads". This means it only tries to operate the equipment you designate while on standby power. To do this, your computer must be wired to monitor the status of the transfer switch that selects generator power or the electric utility grid. Letting the computer handle this function can significantly reduce the cost of the greenhouse power wiring as well as protect your generator from stalling due to overload.

Changing Gutter Line Equipment Settings (Code 23)

Sample Gutter Line Equipment Screen:

```
 Zone: 1                    Description:  Gutter Line  # 1
  38    = SNOW Temp outdoors
  -4    = ON for Backup Heat
  -2    = OFF for Backup Heat
----------------------------------------------------------Boiler Pump Setting
        = Minutes to run after boiler stops firing
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
- Enter # **GO** to select equipment to be programmed.
  - This example will use 2 then **GO** to select Gutter Line #1.
  - Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- The computer automatically fills in Zone & Description.
  - This example uses zone 1 and gutter line #1.
- Enter # for **Snow Temp outdoors**.
  - This example uses 38 meaning the computer will assume it is snowing if there is precipitation and it is 38ºF or cooler outside.
- Enter # ↓ for **On for Backup Heat**.
  - This example uses -4 meaning the gutter line heat valve will open allowing supplemental heat when the temperature is –4 below setpoint. Assuming a setpoint of 70ºF the backup heat will turn on at 66ºF.
- Enter # ↓ for **Off - Backup Heat**.
  - This example uses -2 meaning the gutter line heat valve will close, stopping supplemental heat when the temperature is –2 below setpoint. Assuming a setpoint of 70ºF the backup heat will turn off at 68ºF.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Blower (Code 32) Setting Screen

Some unit heaters allow separate control of their fans and their heat source. The computer allows the use of the fan in such heaters as a blower for air circulation. The setting for a blower parallels those for a jet fan. Note that the air circulation function of jet fans has often been taken over by horizontal air flow (HAF) fans in new and renovated greenhouses.

To reach the Blower setting screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment screen**.
- Press **2** then **GO** to reach Blower #1.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Blower Settings Screen:

```
Zone: 1           Description:  Blower # 1
  2/     1 = TEMP ON / OFF              1 = GENERATOR
 10/     5 = RH ON / OFF               0 = FIRE
         10 = DELAY
     3/  5 = SOFT START   (#   times/10ths  sec)
Type  Allowed - Time
0  00:00 Earliest
0  24:00 Latest
```

Reading the Blower (Code 32) Screen

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is being read. The system fills this in automatically.
Temp On/Off	Sets the number of degrees from the 'cooling setpoint' where the computer turns the blower on and off. Remember that these settings let you use the blower for air circulation rather than heating. Temp Off must be higher than Temp On; the computer automatically reverses your On and Off settings if you enter them in the wrong order. Generally, growers shut off the blowers when the exhaust fans are running. For example, if the cooling setpoint is 72, and the first exhaust fan stage comes on at +2 degrees, the blower would be set to go off at +2 degrees. The *Off* setting can be any value lower than the *On* setting: +1,0,-1, etc.
RH On / Off	Tells the computer how to operate a blower *in response to humidity*. Both settings describe changes from the set humidity for the zone. When RH rises above the ON level, the stage will come on. It will remain on until RH falls below the OFF level. For this example, let's assume the RH setpoint is 80%. The RH On setting is 10, meaning when the RH reaches 90%, 10% points higher than the humidity setpoint, the blower will turn on. The RH Off setting must be less than RH On. This example uses 5, which is a reasonable setting. With RH Off at five, the fan will stay on for humidity until RH falls back to 85%, five percentage points above your set humidity of eighty percent. If you don't want a blower to try to dehumidify, set both RH On and RH Off to zero. When both settings are zero, the computer ignores humidity and operates the equipment on temperature only.
Delay	Determines the number of minutes the blower must stay on after the blower has been in operation. This helps extract the available heat from the heating element, and prevents

	the fan from cycling on and off needlessly. Values from 10 to 30 minutes are typical settings. This example uses a setting of 10 meaning the blower will stay on for 10 minutes after the blower is turned on.
Soft Start	This setting is provided for blowers that feed air into a perforated polyethylene tube ("poly tube") that extends down the length of the greenhouse. If a blower charges such a tube with air too rapidly, it can pop the tube off its hangers, blow the end closure out of the tube, or otherwise shorten its life. The *Soft Start* settings pulse the blower motor in such a way that it fills the poly tube with several puffs of air instead of a single continuous blast. These settings establish the number of puffs to use, and the duration of each. The right setting for SOFT START depends on the length of the poly-tube and the size of the fan. This example uses 3/5, meaning the computer will start and stop the blower three times, and that each time it will run the blower for five tenths of a second. The computer will pause between puffs for the same time as the puff itself.
Type Allowed-Time, Earliest and Latest	This is a two-part time setting that defines a time period when the blower can be disabled. The equipment can only run during the defined hours. This can be useful if a blower is mounted above a curtain system. The blower can be locked out at night when the shade is closed. The first part of each setting is a Type, meaning what type of time. The choices are 0 or 1. Zero sets a fixed time of day, entered using a 24-hour clock (e.g., 18:00 means the system will start the action at 6:00 PM). One sets a time of day relative to sunrise or sunset. For example, 30 means 30 minutes after sunrise or sunset. The second part of the setting defines the actual time the blower can run. *Earliest* sets the start of the period, and *Latest* sets the end of this period. When Type is 1 (for relative settings) the *Earliest* value is relative to sunrise, and the Latest value is relative to sunset. Growers generally want to enable blowers 24 hours a day. When the blower is installed, the factory default sets both Types to 0, the Earliest Time to 00:00, and the Latest Time to 24:00. These settings let the blower run any time its other settings indicate it is needed.
GEN	If one of the computers detector inputs is assigned to monitor the generator, the computer can disable individual blowers while the generator is running. This allows essential equipment to turn on, and drops unnecessary equipment if the generator does not have enough capacity to run everything. To allow the equipment to run from the generator, enter a 1. Make this setting 0 if this equipment stage must be dropped while the greenhouse is on the generator. When configuring the computer, it automatically sets 'GENERATOR?' to 1 for each piece of equipment. Growers must change this setting to 0 for each piece of equipment that cannot be carried when using standby power.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing the Blower (Code 32) Screen Setting

Sample Blower Settings Screen:

```
Zone: 1           Description:  Blower # 1
  2/    1 = TEMP ON / OFF              0 = GENERATOR
 10/    5 = RH ON / OFF                0 = FIRE
         10 = DELAY
     3/ 5 = SOFT START  (# times/10ths sec)
Type  Allowed - Time
0  00:00  Earliest
0  24:00  Latest
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment screen**.
- Find Blower #1 on the list of equipment; enter the line number shown to its left, and press **GO**.
- Enter # ↓　for **Temp On**
    This example uses 2, meaning the number of degrees away from the cooling setpoint where the blower turns on.
- Enter # ↓　for **Temp Off**
    This example uses 1, meaning the number of degrees away from the cooling setpoint where the blower turns off.
- Enter # ↓　for **RH On**
    This example uses 10 meaning the number of percentage points away from the humidity setpoint where the blower turns on.
- Enter # ↓　for **RH Off**
    This example uses 5 meaning the number of percentage points away from the humidity setpoint where the blower turns off.
- Enter # ↓　for **Delay**
    This example uses 10 meaning that the blower will continue to run for ten minutes after its associated heating element turns off.
- Enter # ↓　for **Soft Start # times**
    This example uses 3 meaning the computer will pulse the blower 3 times to fill an attached poly tube gently with air.
- Enter # ↓　for **Soft Start 10th sec.**
    This example uses 5 meaning that each *Soft Start* pulse will last five tenths of a second with a delay of five tenths of a second between pulses.
- Enter # ↓　for **Type Allowed – Time Earliest**
    This example uses 0 meaning fixed time.
- Enter # ↓　for **Earliest Time**
    This example uses 0:00 meaning midnight as the first minute of the day.
- Enter # ↓　for **Type Allowed – Time Latest**
    This example uses 0 meaning fixed time.
- Enter # ↓　for **Latest Time**
    This example uses 24:00 meaning midnight as the last minute of the day.
- Enter # ↓　for **GEN**.
    This example uses 0 meaning the computer will not turn on this blower when the greenhouse is powered from its standby generator.
- Enter # ↓ **FIRE**
    This example uses 0, which means the equipment will turn off in the event of a fire alarm.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Boiler (Code 22) Settings

This program is designed to control firing for large steam and hot water boilers. It uses outdoor temperature and sunlight intensity to predict when the boiler will be needed. It uses these same measurements to anticipate when the boiler can safely be shut down. The program provides for a minimum firing time in order to guarantee the boiler thoroughly heats its fire tubes and drives out any condensation.

The computer uses light and outdoor temperature to anticipate when a boiler is needed.

> **An outdoor temperature sensor and a light sensor <u>MUST</u> be connected to your system in order to control boilers. The Wadsworth Weather Station provides these readings.**

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment screen.
- Press **2** then **GO** to reach Heater 2 Mixing Valve.
     This example will use 2 then **GO** to select Boiler.

   Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

   Sample Boiler Equipment Screen:

```
 Zone 1:              Description:  Boiler #1

   10 = LIGHT ON          -6 = OVERRIDE
   15 = TEMP ON           30 =  MIN.TIME
   20 = LIGHT OFF
   2 = TEMP OFF
 ----------------------------------------------Low Volume Setting
       = Min. Return Water Temp.
       = Max. Return Water Temp.
```

Reading the Boiler (Code 22) Equipment Setting Screen

Zone	Indicates the zone number assigned to this EnviroSTEP. The system fills this in automatically.
Description	Indicates what equipment/stage is being read. The system fills this in automatically.
Light On / Temp On	When the outdoor temperature is at or below the TEMP ON setting, *and* it is darker than the LIGHT ON setting, the computer starts the boiler. **Both conditions must be met before the boiler comes on.** **Light On** determines minimum level of outdoor light before boiler will come start. Unit is milliwatts per square centimeter, the same units that the light sensor provides. Appropriate settings range from 0 to 20. Zero is full darkness, while 20 mW/sq-cm is a typical light reading about ninety minutes before full dark. **Temp On** is outdoor temperature. Common settings range from 20 to 60 degrees Fahrenheit. It is important to set this temperature high enough that the computer can allow the boiler to stay on to provide steady heat for the warmest zone in your range.
LIGHT OFF / TEMP OFF	When the outdoor temperature is at or above the TEMP OFF setting, *or* the sun is brighter than the LIGHT OFF light setting, the computer stops the boiler. Either condition will make the boiler shut off.

	LIGHT OFF determines when there is enough solar gain that the boiler is not needed to heat the greenhouse. Glasshouses will hold 65 degrees with 30 milliwatts per square centimeter of sun, even with outdoor temperatures near zero. Typical settings for LIGHT OFF range from 5 to 30 mW/sq-cm. The computer requires this setting to be higher than LIGHT ON. **TEMP OFF** determines when the outdoor temperature is warm enough that the boiler is not needed. A setting slightly above the heating setpoint in your warmest zone is usually satisfactory. The computer requires this setting to be higher than TEMP ON.
OVERRIDE	Allows the boiler to be fired based on indoor temperature. If the temperature in any zone falls below the heat setpoint by more than the OVERRIDE value, the computer starts the boiler regardless of conditions outdoors. The boiler will stay on until the coldest zone reaches setpoint. OVERRIDE settings of -3 to -10 are usually appropriate. The computer will keep the boiler on in the morning until every zone it controls is warmer than the heating setpoint. If your boiler runs after the light level is above LIGHTS OFF, or the temperature outdoors is above TEMP OFF, look at the current conditions report to see which zones are still colder than their heating setpoints.
MIN. TIME	Sets the shortest allowed running time for the boiler. Once the boiler starts, the computer will not shut it off again until at least the number of minutes set in MINIMUM TIME has passed. A setting of about 30 minutes will prevent the boiler from cycling on and off in the early evening and prevent condensation in the fire tubes.

Changing the Boiler (Code 22) Settings

Sample Boiler Screen:

```
Zone 1:          Description:  Boiler #1
   5 = LIGHT ON          -6 = OVERRIDE
  40 = TEMP ON           30 =  MIN.TIME
   7 = LIGHT OFF
  50 = TEMP OFF
-----------------------------------Low Volume Setting
     = Min. Return Water Temp.
     = Max. Return Water Temp.
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment screen**.
- Enter # ↓ **GO** to select equipment to be programmed.
    - This example will use **2** then **GO** to select Boiler
    - Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Light ON**
    - This example uses 5. This setting indicates the light level when the boiler will start. A light level of 5 mW/sq-cm is a typical light reading about thirty minutes before full dark.
- Enter # ↓ for **Temp ON**
    This example uses 40. This setting indicates the outdoor temperature level. When it is colder than this setting, the boiler will start.
    NOTE: Both Light On and Temp On conditions must be met before the boiler starts.
- Enter # ↓ for **Light Off**
    This example uses 7. This setting indicates the light level when there is enough solar gain that the boiler is no longer needed. This setting must be higher than LIGHT ON.
- Enter # ↓ for **Temp Off**
    This example uses 50. This setting indicates when the outdoor temperature is warm enough that the boiler is no longer needed. This setting must be higher than Temp ON.

- Enter # ↓ for **Override**

    This example uses –6. Even if the light and outdoor temperature settings are not met, the boiler will fire if the greenhouse temperature falls six degrees below the heating setpoint.
- Enter # ↓ for **Min Time**

    This example uses 30. Sets the MINIMUM TIME for the boiler to run. Once the boiler starts, the computer will not shut it off again until at least the number of minutes set in MINIMUM TIME have passed.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Low Volume Boiler Settings (Code 44)

This program extends the basic Code 22 boiler program to serve modern low volume hot water boilers. In addition to firing the boiler according to outdoor light and temperature conditions, the program will cycle the boiler on and off as needed to maintain the temperature of the water returning from the greenhouse within your set range. Your computer identifies a low volume boiler simply as "Boiler" on the display screen.

This program uses outdoor temperature and sunlight intensity to predict when the boiler will be needed. It uses these same measurements to anticipate when the boiler can safely be shut down. The program provides for a minimum firing time, although for low mass boilers this can be set to 0.

An outdoor temperature sensor and a light sensor <u>MUST</u> be connected to your system in order to control boilers.

To reach the Boiler Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment screen.
- Enter # ↓ **GO** to select equipment to be programmed.

    This example will use **2** then **GO** to select Boiler

    Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

    Example of Low Volume Boiler Equipment Screen:

```
Zone 1:          Description:  Boiler #1
   20 = LIGHT ON              -6 = OVERRIDE
   40 = TEMP ON               30 =  MIN.TIME
   15 = LIGHT OFF
   50 = TEMP OFF
-----------------------------------Low Volume Setting
  160  = Min. Return Water Temp.
  180  = Max. Return Water Temp.
```

Reading Low Volume Boiler Settings (Code 44)

Zone	Indicates the zone number assigned to this EnviroSTEP. The system fills this in automatically.
Description	Indicates what equipment/stage is being read. The system fills this in automatically.
Light On / Temp On	When the outdoor temperature is at or below the TEMP ON setting, *and* it is darker than the LIGHT ON setting, the computer starts the boiler. **Both conditions must be met before the boiler comes on.**

	Light On – determines minimum level of outdoor light before boiler will come start. The unit is milliwatts per square centimeter; the same units that the light sensor provides. Appropriate settings range from 0 to 20. Zero is full darkness, while 20 mW/sq-cm is a typical light reading about ninety minutes before full dark. **Temp On -** outdoor temperature. Common settings range from 20 to 60 degrees Fahrenheit. It is important to set this temperature high enough that the computer can allow the boiler to stay on to provide steady heat for the warmest zone in your range.
LIGHT OFF / TEMP OFF	When the outdoor temperature is at or above the TEMP OFF setting, *or* the sun is brighter than the LIGHT OFF light setting, the computer stops the boiler. Either condition will make the boiler shut off. **LIGHT OFF** determines when there is enough solar gain that the boiler is not needed to heat the greenhouse. Glasshouses will hold 65 degrees with 30 milliwatts per square centimeter of sun, even with outdoor temperatures near zero. Typical settings for LIGHT OFF range from 5 to 30 mW/sq-cm. The computer requires this setting to be higher than LIGHT ON. **TEMP OFF** determines when the outdoor temperature is warm enough that the boiler is not needed. A setting slightly above the heating setpoint in your warmest zone is usually satisfactory. The computer requires this setting to be higher than TEMP ON.
OVERRIDE	Allows the boiler to be fired based on indoor temperature. If the temperature in any zone falls below the heat setpoint by more than the OVERRIDE value, the computer starts the boiler regardless of conditions outdoors. The boiler will stay on until the coldest zone reaches setpoint. OVERRIDE settings of -3 to -10 are usually appropriate. The computer will keep the boiler on in the morning until every zone it controls is warmer than the heating setpoint. If your boiler runs after the light level is above LIGHTS OFF, or the temperature outdoors is above TEMP OFF, look at the current conditions report to see which zones are still colder than their heating setpoints.
MIN. TIME	Sets the shortest allowed running time for the boiler. Once the boiler starts, the computer will not shut it off again until at least the number of minutes set in MINIMUM TIME have passed. A setting of about 30 minutes will prevent the boiler from cycling on and off in the early evening and prevent condensation in the fire tubes.
Min. Return Water Temp.	Sets the lowest temperature desired of the heating water as it returns to the boiler from the greenhouse. If the water temperature falls below this setting, the computer will turn the boiler on regardless of the outdoor light and temperature settings.
Max. Return Water Temp.	Sets the highest temperature desired of the heating water as it returns to the boiler from the greenhouse. If the water temperature rises above this setting, the computer will shut the boiler off, regardless of the outdoor light and temperature settings.

Changing Low Volume Boiler Settings (Code 44)

Sample Boiler Screen:

```
 Zone 1:            Description:  Boiler #1
    20 = LIGHT ON                  -6 = OVERRIDE
    40 = TEMP ON                   30 =  MIN.TIME
    15 = LIGHT OFF
    50 = TEMP OFF
 -----------------------------------Low Volume Setting
   160  = Min. Return Water Temp.
   180  = Max. Return Water Temp.
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **2** then **GO** to reach **Equipment** screen.
- Enter #↓ to select Low Volume Boiler

This example will use 2 then **GO** to select Low Volume Boiler.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

- Enter # ↓ for **Light ON**

  This example uses 20. The computer will start the boiler when the light reading is at or below 20 mW/sq-cm. Twenty milliwats per square centimeter is a typical light reading about ninety minutes before full dark.

- Enter # ↓ for **Temp ON**

  This example uses 40. When the outdoor temperature is at or below 40 the boiler will start.

  NOTE: Both Light On and Temp On conditions must be met before the boiler starts.

- Enter # ↓ for **Light Off**

  Sets the sunlight level that gives enough solar gain that you don't need the boiler to heat the greenhouse. This example uses 15, meaning fifteen mW/sq-cm. This setting must be higher than LIGHT ON.

- Enter # ↓ for **Temp Off**

  Sets the outdoor temperature where it is warm enough that the boiler is not   needed. This example uses 50, meaning fifty degrees. This setting must be   higher than Temp ON

- Enter # ↓ for **Override**

  This example uses –6 which allows the boiler to turn on regardless of outdoor temperatures if the indoor temperature drops 6 degrees below the heat setpoint.

- Enter # ↓ for **Min Time**

  This example uses 0. Sets the MINIMUM TIME that the boiler must run. Once the boiler starts, the computer will not shut it off again until at least the number of minutes set in MINIMUM TIME have passed. Zero is typical for low volume boilers.

- Enter # ↓ for **Min. Return Water Temp.**

  This example uses 160 meaning the boiler must turn on if the water temperature is at or below 160°.

- Enter # ↓ for **Max. Return Water Temp**.

  This example uses 180 meaning the boiler must turn off if the water temperature is at or above 180°.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Boiler Pump Settings (Code 45)

The computer starts a boiler pump any time a low volume boiler starts. This setting determines how long the pump will run *after* the boiler stops. Running the pump after the boiler stops firing allows the heating system to extract all the heat from the firebox of the boiler, and prevents the boiler from converting internal stagnant water into steam. The boiler manufacturer's design documents will recommend a time setting.

To reach the Boiler Pump Equipment Screen:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Find the Boiler Pump on the list of equipment on the display screen, enter the line number to the left of the pumps name, and press **GO**.

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Boiler Pump Equipment Screen:

```
Zone:  1 Description:  Boil.  Pump #1
    = Snow Temp outdoors
    = ON for Backup Heat
    = OFF for Backup Heat
-------------------------Boiler Pump Setting
10 = Minutes to run after boiler stops firing
```

Reading the Boiler Pump Settings (Code 45)

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment is being read. The system fills this in automatically.

Note: the Boiler pump shares a setting screen template with the gutter line-heating program. The following three settings do not apply to the pump and remain blank and inaccessible:

Snow Temp outdoors	Does not apply to this equipment.
On for backup heat	Does not apply to this equipment.
Off for backup heat	Does not apply to this equipment.
Minutes to run after boiler stops firing	Indicates how long the pump will continue circulating water through the heat pipes after the boiler stops firing.

Changing the Boiler Pump Settings (Code 45)

This section goes through the programming steps for changing Boiler settings.

Sample Boiler Screen:

```
Zone:  1                           Description:  Boil.  Pump #1
    = Snow Temp outdoors
    = ON for Backup Heat
    = OFF for Backup Heat
-------------------------Boiler Pump Setting
10 = Minutes to run after boiler stops firing
```

Refer to the manufacturer's recommendations for low volume boiler for the correct value to use on this setting screen.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **2** then **GO** to reach **Equipment** screen.
- Press **2** then **GO** to reach the Boiler Pump Settings screen.
    This example will use 2 then **GO** to select Boiler Pump.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- The Zone and Description settings will automatically fill.
- The next settings do not apply to this equipment; the cursor will skip over them.
- Enter # ↓ for **Minutes to run after boiler stops firing**

This example uses 10 meaning the boiler will continue circulating water through the heat pipes for 10 minutes after the boiler stops firing.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Boiler Pump Settings (Code 55)

This program operates a boiler coupled to a hot water storage tank. The boiler maintains the water temperature in the storage tank in proportion to the outdoor temperature. It monitors the tank temperature with three temperature probes. It averages the three readings to estimate the tank temperature.

The setting screen for the program looks as follows:

```
Zone: 1    Description: Boiler #1
125/180  = Min/Max Tank Temp
140/195  = Min/Max Water Temp
 0/50    = Min/Max Outdoor Temp


3/ 5/ 7 = Tank Sensor Channel 1/2/3
```

Use the settings as described in the table below:

Setting	Use
Min/Max Tank Temperature	The lowest and highest water temperature desired for the tank. The program will operate the boiler to raise the temperature to the Max value as the outdoor temperature falls.
Min/Max Water Temperature	The lowest and highest output temperature expected from the boiler that feeds the tank.
Min/Max Outdoor Temperature	The range of outdoor temperatures used to regulate the tank temperature. At or below the Min setting, the program will try to raise the Tank Temperature to its Max setting. As the outdoor temperature rises, the program reduces the tank temperature target proportionally until it is set a Min Tank Temperature when the outdoor temperature is at or above its Max setting.
Tank Sensor Channel	Site dependent setting. Enter the sensor channels of each of up to three tank temperature sensors in the three slots provided. If there is only one sensor, enter its channel number in all three slots.

The Equipment report from the Main Menu will display the Tank Boiler's status as:

Equipt	Status	Why	On/Off	Cmd/Dly
Boiler #1	On (or Off)	**[I]** if incoming water sensor temp low, or **[K]** if tank temperature is low.	**On**=Calculated Water Temperature needed. **Off** = Calculated Tank Temperature needed	**Cmd**=Measured Boiler Temperature. **Dly**=Average. Tank Temperature

Equipment Code 56, Heating Demand
Equipment Code 57, Cooling Demand

These programs provide a voltage output signal to an actuator or external controller. The voltage signal tells the actuator or controller how much heating or cooling the greenhouse requires. The signal varies from 0% to 100% of any range of voltages between 0VDC and 10VDC. The range may include the whole 0-10V span, or any span within that range, 2V to 6V for example. The voltage can be set to be direct acting or reverse acting. For direct action, the 100% demand will produce the highest voltage in the desired range. For reverse action, 100% demand will produce the lowest voltage in the desired range.

Demand percentage is calculated using the standard Proportional, Integral, Derivative (PID) method:
- ☐ P: Demand changes in direct proportion to the difference between the desired (setpoint) temperature, and the actual (measured) temperature.
- ☐ I: Demand changes in proportion to the length of time that the desired temperature has been different than the measured temperature.
- ☐ D: Demand changes in proportion to how fast the measured temperature is changing as it approaches or moves away from the desired temperature.

The setting screen for the heating demand program looks as follows. The cooling demand settings are the same with the description changed to C Demand:

```
Zone: 1     Description: H Demand #1
   0 = Operating Point (Set point offset)
   5 = Hold Time (secs between changes)
   1 = Proportional Gain
10.0 = Integral Time (secs)
 0.0 = Derivative Time (secs)
 2.0/6.0 = Min/Max action voltage
 6.0 Relay Switch %age point
```

Use the settings as described in the table below:

Setting	Use
Operating Point (Set point offset)	The number of degrees above or below the actual heating (for H Demand) or cooling (for C Demand) set point where the voltage begins to respond. This allows coordination with other heating and cooling systems.
Hold Time (secs between changes)	The number of seconds to maintain each new voltage signal before making a change.
Proportional Gain	Strength of direct voltage response to differences between measured and set temperature. The larger this value, the faster the response, but the more likely it is that the demand voltage will hunt or oscillate above and below the correct amount to maintain temperature.
Integral Time (secs)	The time base for factoring in the duration of an error between desired and actual temperature. Larger values will slow down the controller's drive to set point. Smaller values will drive to set point faster, but make it more likely it is that the demand voltage will hunt or oscillate above and below the correct amount to maintain temperature.

Derivative Time (secs)	The time base for measuring how fast the measured temperature is changing. Larger values will cause bigger changes in the total output of the controller from one hold time to the next when the temperature is changing. Smaller values pass smaller changes and lead to smoother results. In most cases, this value should be 0.0 as non-zero values make it likely that the demand voltage will hunt or oscillate above and below the correct amount to maintain temperature.
Min/Max action voltage	The voltage output desired for the least (Min) and most (Max) amount of action from the attached actuator or controller. Must be in the range 0.0 to 10.0
Relay Switch %age Point	The percentage of action (0-100%) from the controller above which the relay for this output channel will switch on. If set to 0, the relay will switch on any time there is a non-zero action called for. If set to 100, the relay will never switch on. Set to 99 if the relay is only desired for 100% action.

Mixing Valve (Code 10) Equipment Settings

This mixing valve program uses the idea of *outdoor reset* to choose a heating water temperature, and positions the valve to achieve that temperature. Outdoor reset means that the program computes the desired temperature of the heating water according to the difference between indoor and outdoor air temperature. It can also consider the indoor air temperature relative to setpoint, and the relative humidity of the air. The settings provided by the program give you freedom to modify the way the program performs. Based on your settings, the computer will calculate a heating water temperature that will replace the heat loss from the greenhouse when heating is needed. This water temperature is adjusted automatically if air temperature remains above or below the heating setpoint. The rate of adjustment can be fine-tuned with the setting called 'Air Factor'.

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Press **2** then **GO** to reach Mixing Valve.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Example of a Mixing Valve Settings Screen:

```
Zone: 1                 Description:      Mix Valve #1
     0 = On Temp (Air)         160 = Boost Temp
   2.0 = Initial Rate          145 = RH Temp
   1.5 = Final Rate             10 = RH   Rise
 130/195 = Min/Max Pipe          3 = Sensor Lag
 Type Boost – Time               5 = Tolerance
 0   00:01 Begins                1 = Air Factor
 0   07:00   Ends              130 = Valve Time
```

*Note:
This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.*

Reading the Mixing Valve (Code 10) Equipment Settings

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment is being read. The system fills this in automatically.
On Temp (Air)	Indicates the temperature when the valve is open, indicated by how many degrees from **heating** setpoint. Positive settings mean that air temperature above the setpoint will allow the valve to open. Negative settings mean that the air temperature must fall below the heating setpoint before allowing the valve to open. For example, a setting of 3 means that when temperatures are 3 degrees above heating setpoint, say 73, the hot water valve begin to open. If the setting is -3, the valve cannot open until temperatures are 3 degrees below setpoint, say 67. The factory setting is 0, meaning that the valve opens at the heating setpoint. Positive and negative offsets from zero permit staging multiple valves for top and bottom heating loops.
Initial Rate	Indicates how the Mixing Valve will operate in response to a drop in outdoor temperature 0-20 degrees below the heating setpoint. The initial rate determines how the valve will operate during the first period which is the first 20 degrees the temperature drops below the heating setpoint. It is intended to get heat into the greenhouse quickly. For example, let's say that the Initial Rate is 2.0, the heating setpoint is 68 and the outdoor temperature is 58. The program will subtract the outdoor temperature from the heating setpoint (68-58=10) then multiply the difference (10) by the Initial Rate setting of 2.0 (2.0x10 =20). This number (20) is added to the Minimum Pipe Temperature to determine how much the water temperature should increase for the first 20-degree drop in outdoor temperature. In this example, 20 + 130 = 150). 150 is the temperature that the water will be heated.
Final Rate	Determines how the Mixing Valve will operate in response to a drop in outdoor temperature that is greater than 20 degrees. The Final Rate determines the rate at which the valve will operate if the temperature drops more than 20 degrees below the heating setpoint. For example, if the Final Rate is 1.5, the Initial Rate is 2.0, heating setpoint is 68 and the outdoor temperature is 38 there is a 30 degree difference between the outdoor temperature and the heating setpoint. The program will apply the Initial Rate setting (2.0) to the first 20 degrees (2.0x20 =40) then apply the Final Rate setting (1.5) to the other 10 degrees (1.5x10=15). Then the program adds those two figures (40+15=55) to determine how many degrees should be added to the Minimum Pipe Temperature (55+130=185 degrees).
Min / Max Pipe	Indicates the temperature range for the heating system. The minimum value is the minimum water temperature to be maintained in the water pipe. NOTE: Valid only when the system is in the heating mode as established by **On Temp**. The program will not calculate a heating water temperature above Max. The 'Max' setting is provided for installations with plumbing components that cannot withstand the temperatures that their boilers can supply**. It is essential that you set 'Max' at the highest value consistent with your plumbing system**: typically, 180 to 220 degrees. Use lower values only for low temperature root zone systems supplemented by backup space heaters.

Reading the Mixing Valve (Code 10) Settings

Example of a Mixing Valve Settings Screen:

```
Zone: 1                    Description:        Mix Valve #1
    0 = On Temp (Air)            160 = Boost Temp
  2.0 = Initial Rate             145 = RH Temp
  1.5 = Final Rate                10 = RH   Rise
130/195 = Min/Max Pipe            3 = Sensor Lag
Type Boost – Time                 1 = Tolerance
0 08:00   Begins                 60 = Air Factor
0 07:00   Ends                   130 = Valve Time
```

Type Boost - Time	This is a two-part time setting that defines a time period when an *optional* alternate minimum water temperature is in effect. The first part of each setting is Type, meaning what type of time. The choices are 0 = fixed time of day (must be entered using a 24-hour clock (e.g. 18:00 means the system will start the action at 6:00 PM). 1 = relative time of day (e.g., 30 means the system will start 30 minute before sunset).
Time Begins/Ends	This is a two-part time setting that defines a time period when an *optional* alternate minimum water temperature is in effect. The second part of each setting is a Boost time. The boost period starts at the time set in *Begins*, and concludes at the time set in *Ends*. *Begins* defines the start of the time period when the computer will use the BOOST TEMP. *Ends* determines when the period finishes. To disable the boost period, use zeros for all four settings.
Boost Temp	Sets the minimum heating water temperature used during the optional boost period. This is most useful in a zone with a heat retention curtain and an overhead-heating loop. To prevent temperature, drop, force the top loop to heat prior to opening the curtain. Remember that the Boost Temp is only in effect during the interval between Boost-Time Begins and Boost-Time Ends.
RH Temp	Sets the minimum heating water temperature for use when the program is dehumidifying. RH Temp is a minimum; the heating water temperature will be higher if the zone requires any significant heating to maintain air temperature. Note that you may use the 'Max degrees change from Heat and Cool setpoints' settings (see section on Setpoint Settings) on the zone setpoint screen to control the amount of heating allowed due to excess humidity.
RH Rise	Determines at what point the program may begin to hear for dehumidification. This setting indicates the percentage increase above the zones humidity setpoint where the program may begin to heat for dehumidification.
Sensor Lag	Sets the time required for the pipe temperature sensor to respond to a change in valve position. Uses minutes for the unit measurement. Recommended initial setting is 3.
Tolerance	Sets the number of degrees' error in heating water temperature required to cause a valve movement. The error is the difference between measured and desired heating water temperature. When the measured water temperature is above or below the desired water temperature by more than **Tolerance** degrees, the program will command the valve to move. Recommended initial setting is 5. The equipment status report shows the current desired water temperature, plus and minus the tolerance in the 'On/Off' column. The desired water temperature is the temperature the program calculates based on your settings.
Air Factor	Allows the heating loop temperature to self-adjust for imperfections in the Rate settings. Air Factor can adjust the heating water temperature up or down by as much as 50 degrees if the outdoor reset settings turn out to under-heat or overheat the greenhouse air. The Air Factor setting is the number of degrees per minute by which to change the heating water temperature for each degree of error in the indoor air temperature. Recommended initial setting is 1.
Valve Time	Sets the number of seconds it takes the valve motor to fully open or close the mixing valve. Typical value is about 130 seconds.

Changing the Mixing Valve (Code 10) Settings

Sample Mixing Valve Settings Screen:

```
Zone: 1                Description:        Mix Valve #1
    0 = On Temp (Air)        160 = Boost Temp
   2.0 = Initial Rate        145 = RH Temp
   1.5 = Final Rate           10 = RH   Rise
130/195 = Min/Max Pipe         3 = Sensor Lag
Type Boost – Time              5 = Tolerance
0   00:01   Begins             1 = Air Factor
0   07:00   Ends             130 = Valve Time
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **2** then **GO** to reach **Equipment** screen.
- Enter # **GO** to select equipment to be programmed.
     This example will use **2** then **GO** to select Mixing Valve #1.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Temp ON**
     This example uses the default setting of 0. This allows the mixing valve to begin modulating at the heating setpoint temperature.
- Enter # ↓ for **Initial Rate**
     This example uses 2 screens for more details.
- Enter # ↓ for **Final Rate**
     This example uses 1.5
- Enter # ↓ for **Min/Max Pipe**
     This example uses 130/195.

> **MAX setting MUST be set at the highest value consistent with your plumbing system**.

- Enter # ↓ to indicate what **type of time** 0 = fixed time (18:00). Enter time using 24-hour clock. 1 = relative time, minutes before or after sunrise. Negative numbers turn equipment on before sunrise.
     This example uses 0 meaning Boost-Time begins at a fixed time every day.
- Enter # ↓ to define time when alternate minimum water temperature is in effect. See previous section on Reading the Mixing Valve Screen for more details.
     This example uses 00:00 for the 'Begins' time and 07:00 for the 'Ends' time. The boost period here begins at midnight and lasts until seven in the morning.
- Enter # ↓ for **Boost Temp**. This sets the minimum heating water temperature used during the optional boost period.
     This example will use 160 meaning that the minimum heating water temperature during the Boost-Time will be 160º instead of the 130º used at all other times.
- Enter # ↓ for **RH Temp**. This indicates the minimum temperature for heating water when the program is dehumidifying.
     This example uses 145 degrees. The computer will move the mixing valve to maintain a heating water temperature of at least 145º when the humidity rises too much above the setpoint.
- Enter # ↓ for **RH Rise**. This establishes the difference from the zones humidity setpoint where the program may begin to heat for dehumidification.
     This example uses 10 meaning that at the RH setpoint for the zone, plus ten percentage points, the program will use the RH Temp value as the minimum heating water temperature, and adjust the valve accordingly.

- Enter # ↓ for **Sensor Lag**. This sets the time, in minutes, required for the pipe temperature sensor to respond to a change in valve position. Uses minutes for the unit measurement.
    - This example uses 3.
- Enter # ↓ for **Tolerance –** determines the number of degrees above or below the current calculated water temperature that the program will tolerate before adjusting the valve position.
    - This example uses 5 degrees.
- Enter # ↓ for **Air Factor -** determines how much weight the program gives the variation in air temperature from setpoint when calculating the temperature for heating water. Sets the number of degrees per minute by which to change the heating water temperature for each degree of error in the indoor air temperature.
    - This example uses 1 meaning that the program will raise or lower the heating water temperature by one degree for each minute that the greenhouse air temperature is too low or too high. This is the recommended initial setting.
- Enter # ↓ for **Valve Time -** indicates the number of seconds it takes the valve motor to fully open or close the mixing valve.
    - This example uses 130 (seconds) meaning that it takes 130 seconds for the valve to move through its entire range of travel. This is a typical setting.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Floor Heat (Code 12) Equipment Screen

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment Settings** screen.
- Use up/down ↕arrows to navigate between the two screen.
- Press the screen choice number (1 in our example) and **GO** to reach the Floor Heat Screen.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Heat Valve #1 Screen:

```
   Zone: 1                   Description:  Heat Valve #1
  -2 / 0   = TempON / OFF           = MIN % VENT
     0   = NIGHTSHIFT               = RAIN LCKOUT
   0/ 0  = RH ON / OFF          0 = CYCLE TIMER
    /    = D/N FROST               = CO2
  Type Allowed - Time         = WIND O/R SPEED
  0   00:00 Earliest          = WIND O/RACTION
  0  24:00 Latest           1 = GEN   0=FIRE
```

Reading the Floor Heat Equipment Setting Screen

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is shown – in this example, Heater Valve.
Temp ON/	Determines when the heat turns on based on degrees from the heating setpoint. In this example, the heat will turn on when it is –2 below the heat setpoint of 65, meaning the heat will turn on at 63. Generally, heaters are set to come on at or below the heating setpoint: typical settings are 0, -1, -2. Note that for heating equipment, the computer requires TEMP ON to be less than TEMP OFF because heating raises the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Temp OFF	Determines when the heat turns off based on degrees from the heating setpoint. In this example, the heat will turn off at 0, meaning the heat will turn off at setpoint, which is 65. Generally, heaters are set to turn off at or above the heating setpoint. Typical settings are

	0, 1, 2. Note that for heating equipment, the computer requires TEMP OFF to be greater than TEMP ON because heating raises the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Night Shift	Adjusts the On/Off temperature for night. Night setpoint temperatures can be raised or lowered using the Night Shift option. Night shift should almost always be set to zero. It can be used to compensate for the effect of the daytime fogging or irrigation on soil temperature sensors.
RH ON/OFF	Determines how the heating responds to humidity based on the RH setpoints. The heater can be programmed to help dehumidify. When the RH rises above the ON level, the stage will come on and remain on until RH falls below the OFF level. If you don't want the floor heat to heat because of humidity, set these values to 0/0. Note that the computer RH ON to be greater than RH OFF, because heating lowers the greenhouse humidity.
Day/Nite Frost Lockout	The cursor skips over settings because they don't apply to floor heat heating.
Type Allowed - Time	All On/Off equipment can be disabled due to the time of day, that is, the equipment runs only during set hours. Type and Allowed-Time are column headings for a table that defines the hours when the equipment can run. Type sets the way the computer interprets your time settings, while Allowed-Time is where you enter the actual times of day. You may set Type to 0 or 1. 0 = fixed time meaning the equipment turns On/Off at the same time each day (for example, 6:00 AM). Enter time using 24-hour clock. 1 = relative time defined by minutes before/after sunrise. Negative numbers allow equipment to turn on before sunrise. –30 means 30 minutes before sunrise.
Earliest/Latest	Earliest and Latest are the row titles for the time-of-day settings. Type and Allowed time in the Earliest row set the start of the time when the floor heat is allowed to heat. These same settings in the Latest row set the end of the time when the floor heat can heat. Time is entered using the 24-hour clock for Type 0, fixed time or using +/- minutes to specify time before or after sunrise. For Type=1, Earliest Allowed-Time is relative to sunrise, and Latest Allowed-Time is relative to sunset. Generally, growers enable floor heat to heat as needed 24 hours a day. The computer automatically sets the Type and Earliest Allowed-Time to 0 and 00:00, and the Type and Latest Allowed-Time to 24:00, enabling floor heat to heat any time it is needed.
Min % Vent	The cursor skips over this section as it does not apply to floor heat.

Cycle Timer	This setting allows you to link the operation of the equipment to any of four built-in cycle timers. The computer runs these timers just like an electromechanical time clock with pegs to set 'On' time and 'Off' times. When you link a piece of equipment to a cycle timer, the equipment turns on when the cycle timer is on, regardless of its other settings. When the cycle timer turns off, so does the equipment, unless any of its climate control settings still require it to be on. A setting of 0 ignores all cycle timers. A setting of 1,2,3 or 4 links the equipment to the timer with that number. The settings for the timers themselves are found under item 9 of the <<<Setting Menu>>>.
MIN Minutes	The cursor skips over this section as it does not apply to floor heat.
Wind O/R Speed	The cursor skips over this section as it does not apply to floor heat.
Wind O/R Action	The cursor skips over this section as it does not apply to floor heat.
GEN	Indicates if equipment is authorized to run on generator power. 0 means the equipment is NOT allowed. 1 means the equipment is allowed to operate off a standby generator. This allows the computer to do "load shedding".
FIRE	Setting FIRE to 0 forces the floor heat OFF in the event of a fire alarm. Setting FIRE to 1 forces the floor heat ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

4-Way Valve (Code 25) Setting Screen

This is a modulating valve that typically controls the heating water temperature in a ring line or transport line that delivers hot water from a central boiler plant to the zones of a greenhouse. Such valve may also regulate the output of a low volume boiler plant. Each zone taps off of the transport line with its own valve and pump. The program can issue a modulating control voltage at the same time that it operates an open and close relay for the valve motor.

This program uses outdoor reset to determine how to operate the valve. As the outdoor temperature falls, the program raises or resets the desired heating water temperature. As the outdoor temperature rises, it lowers the heating water temperature. This action helps match the amount of heat delivered to the greenhouse with the likely demand for heat to maintain indoor temperature. The computer opens and closes the valve as needed to maintain the appropriate heating water temperature.

Setting up a 4-way valve requires an outdoor temperature sensor which is part of a Weather Station and a sensor to measure water temperature.

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Press **2** then **GO** to reach 4-way valve.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample 4-way Valve Equipment Screen:

```
Zone: 1 Description:          4-Way Vlv #1
130/180 = Min / Max Wtr Tmp       5 = Tmp band
20 / 60  = Min / Max. Outside     7 = Idle pos
   2    = Min Voltage
   6    = Max Voltage             3 = Snsr Lag
Type  Boost – Time               30 = Vlv Time
0    00:00 Earliest               0 = Boost Temp.
0    00:00 Latest
```

> *Note:*
> *This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.*

Reading the 4-Way Valve Equipment Setting Screen

Zone	Indicates the zone number assigned to this EnviroSTEP. The system fills this in automatically.
Description	Indicates what equipment is being read. The system fills this in automatically.
Min / Max Wtr Tmp	Sets the temperature range for the water in the transport line. This example has a minimum temperature of 130 and a maximum temperature of 180. The actual heating water temperature is calculated by the computer using these settings, the outdoor temperature, and the range set in the 'Min / Max Outdoor' setting.
Min / Max Outside	Setting up a 4-Way Valve requires an outdoor temperature sensor, which is part of a Weather Station. With the outdoor setting, you are setting a temperature range that the computer uses to adjust the 'Min / Max H20'. As the temperature outdoors reaches the 'Min Outdoor' setting of 20º, the hot water temperature is driven up toward the 180-degree setting. When the outdoor temperature reaches the 'Max Outdoor' setting of 60º, the water temperature in the transport line is allowed to drop down toward the minimum H2O setting of 130º.
Min Voltage and Max Voltage	By default, this program uses an open and close relay to operate the actuator that positions the 4-way valve. At the same time, it sends an optional voltage command that can also be used to position a valve that accepts such commands. The Min Voltage determines when the valve actuator will close. The Max Voltage determines when the valve actuator will be

	open fully. When the computer requires the valve to be partially open, it will send the appropriate voltage between these two values. The computer can use any voltage in the range of zero to ten volts DC for these settings. If your valve actuator requires these commands, the manufacturers leaflet will document the correct values to use. The voltage command must be enabled in configuration to make these settings appear. If it is not enabled in configuration, these settings are blank.
Type Boost – Time	This is a two-part time setting that defines a time period when an *optional* alternate minimum water temperature is in effect. The first part of each setting is a Type, meaning what type of time. The choices are 0 or 1. Zero = fixed time of day (must be entered using a 24-hour clock, e.g., 18:00 means the system will start the action at 6:00 PM). One = relative time of day (e.g., 30 min before sunset). The second part of each setting is a Boost time. Here the two times need to be defined, begin and end. *Begins* defines the start of the time period when the computer will use the BOOST TEMP. *Ends* determines the end of this period. To disable the boost period, use zeros for all four of these settings.
Tmp band	Sets the water temperature tolerance in the line. A setting at 5 will allow the water temperature to vary + / - 5 degrees from the calculated temperature without causing a change in valve position.
Idle pos	This setting determines the valve position when the heating system is idle, that is, when there is no heating demand. In many cases, it can and should be 0, meaning 0% or closed. Some low volume boiler systems perform better if there is always a heating load present any time the boiler might start. In this case, a non-zero setting is appropriate so that the boiler is guaranteed a heating load to buffer it and prevent it from overheating itself.
Snsr Lag	Determines the minutes needed for the sensor to see a water temperature change after moving the valve. Three minutes as shown in the example is a typical setting.
Vlv. Time	Determines how many seconds it takes the actuator valve to completely open or close.
Boost Temp	Sets the minimum heating water temperature used during the optional boost period. This is most useful in a zone with a heat retention curtain and an overhead-heating loop. To prevent temperature drop, it can force the top loop to heat prior to opening the curtain. Boost Temp is active during the time period set with Type and Boost-Time above.

Changing the 4-Way Valve Equipment Setting Screen

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Enter #↓ to select 4-Way Valve
     This example will use 2 then **GO** to select 4-way valve.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

  Sample 4-Way Valve Setting Screen:

```
Zone:  1 Description:          4-Way Vlv #1
130/180 = Min / Max Wtr Tmp          5 = Tmp band
20 / 60   = Min / Max. Outside       7 = Idle pos
    2     = Min Voltage
    6     = Max Voltage              3 = Snsr Lag
Type  Boost – Time               30 = Vlv Time
0    00:00 Earliest                0  = Boost Temp.
0    00: 00 Latest
```

  Zone & Description will automatically be filled in the blinking cursor block will appear to the left of the first setting you can change.
- Enter # ↓ for **Min Wtr**

This example uses 130 meaning the computer will maintain the transport line at a minimum temperature of 130º.

- Enter # ↓ for **Max Wtr**. This example uses 180 meaning the computer will raise the transport line to a maximum temperature of 180º, as needed.
- Enter # ↓ for **Min Outdoor**. This sets the coldest outdoor design temperature for the heating system. At or below this temperature, the computer will open the valve to maintain the maximum heating water temperature. This example uses 20. At or below 20º, the computer will maintain the heating water at 180º.
- Enter # ↓ for **Max Outdoor**. This sets the warmest outdoor design temperature for the heating system. At or above this temperature, the computer will close the valve to maintain the minimum heating water temperature.

    This example uses 60. At or above 60º outdoors, the computer will maintain the heating water at 130º.
- Enter # ↓ for **Min Voltage**. Note: Unless voltage is enabled in configuration, this setting is blank and the cursor will skip directly to Tmp band.

    This example uses 2 meaning the computer will send 2 volts to the valve to command it to close.
- Enter # ↓ for **Max Voltage** (Note: Unless voltage is enabled in configuration, this setting is blank and the cursor will skip directly to Tmp band).

    This example uses 6 meaning the computer will send 6 volts to the valve to command it to open 100%.
- Enter # ↓ for **Tmp Band**

    This example uses 5, meaning that if the heating water temperature is within 5º of the desired temperature. The computer will not adjust the valve position.
- Enter # ↓ for **Idle pos**.

    This example uses 7, meaning that the valve will remain 7% open, even if there is no requirement for heat. Leaving the valve open assures there is always some load available for a boiler that requires it.
- Enter # ↓ for **Snsr Lag**

    This example uses 3, meaning that the program will wait 3 minutes for the water temperature sensor to respond to the effect of each change in valve position.
- Enter # ↓ for **Vlv Time**

    This example uses 30, meaning that it takes the actuator 30 seconds to completely open or close this valve.
- Enter # ↓ for **Type of Earliest Boost-Time**

    This example uses 0 meaning the computer will interpret the earliest boost-time as a fixed time, meaning the boost time will start at the same time every day.
- Enter # ↓ for **Earliest Boost-Time**

    This example uses 00:00 meaning the computer will start the boost time at twelve midnight.
- Enter # ↓ for **Type of Latest Boost-Time**

    This example uses 0 meaning the computer will interpret the latest boost-time as a fixed time in the range 00:00 to 24:00
- Enter # ↓ for **Latest Boost-Time**

    This example uses 00:00 meaning the computer will end the boost time at twelve midnight.

> **When Earliest Boost-Time is the same as Latest Boost-Time, the temperature boost is disabled**.

- Enter # ↓ for **Boost Temp.**

    This example uses 0. This is appropriate because in the example, the boost-times are set to disable the boost.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Proportional Valve (Code 33) Setting Screen

Originally designed for modulating steam valves, this program can also be used for hot water. It makes small open or close adjustments in the valve position until it finds a position that maintains the desired temperature in the greenhouse. Changes in greenhouse conditions cause the valve to readjust.

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Press **2** then **GO** to reach Proportional Valve.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Proportional Valve Screen:

```
Zone: 1 Description:        Prop. Vlv. #1
   -1 / 1 = Temp Open /Close
       0 = Night Shift
     0/0 = RH Open / Close
      21 = % Minimum Opening
      10 = % Step Size
       3 = Minutes between steps
     130 = Valve time is seconds
```

*Note:
This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.*

Reading the Proportional Valve (Code 33) Setting Screen

Zone	Indicates the zone number assigned to this EnviroSTEP. The system fills this in automatically.
Description	Indicates what equipment/stage is being set. The system fills this in automatically.
Temp Open / Close	Sets the number of degrees difference from the heating setpoint where this valve starts to open/close.
	Temp **Open:** Numbers greater than zero cause the valve to open *above* the heating setpoint. Numbers less than zero (-1, -2, etc.) cause the valve to open below setpoint. As a practical matter, it makes sense to turn a valve on, at or below the heating setpoint: settings of 0, -1, -2, etc.
	Temp **Close** sets the number of degrees difference from the heating setpoint where the valve should move closed. Numbers greater than zero start to close the valve above setpoint. Settings less than zero (-1, -2, etc.) begin to close the valve off below the heating setpoint. The 'Temp Close' setting must be greater than the 'Temp Open' setting because heating equipment raises the temperature in the greenhouse.
NIGHT SHIFT	At night, the computer adds this setting to both 'Temp Open' and 'Temp Close'. It can raise or lower the operating point. It provides the option of locking out most of the heating during the day, without disabling it in case of severe cold weather.
HUMIDITY SETTINGS: RH Open/Close	Determine the percentage points of changes from the set humidity for the zone. When RH rises above the Open level, the valve will begin to open. It will remain open until RH falls below the Close level. A reasonable setting for RH Close in this example is 5. With RH Close at five, the valve will stay on for humidity until RH falls back to 85%. Either temperature or humidity can cause the valve to open, but both the temperature and humidity settings must be satisfied in order for the valve to close. When both settings are zero, the computer ignores humidity and operates the equipment on temperature only.
% Minimum Opening	Set the minimum opening for the valve. Steam valves erode their seats if not opened a certain minimum amount. Usually the safe setting here would be 20%.

% Step Size	Sets the amount the valve will move each time the computer adjusts its position. The valve will never open less than the amount set in "%Minimum Opening," but thereafter each movement will be of this size. If a movement of this size would cause the valve to close below "%Minimum Opening," the program will close the valve completely.
Minutes between steps	Sets the time that must elapse between changes in valve position. This allows time for the sensor(s) in the house to respond to the heating change caused by moving the valve. Usually a setting of 2 minutes will be a good point to start.
Valve Time in Seconds	The total run time for the valve to go from full close to full open. The run time of the valve actuator usually is given in the manufacturer's specification sheet. If not, use a watch to measure the time it takes to completely open or close the valve.
	In the example settings, the valve starts to open when the temperature in the zone drops one degree below the heating setpoint, and starts to close when the temperature reaches the heating setpoint. No 'Night Shift' is being used. Because the RH Open/Close settings are not zero, this valve will be used in controlling humidity. The valve will begin to open if the humidity rises 10 percentage points above the humidity setpoint, and close once the humidity falls within 5 percentage points above the humidity setpoint. The valve will open to 20% on its first activation. After the two- minute time between steps has elapsed, if the greenhouse temperature has not risen back to the heating setpoint, the valve will open another 10% step to 30% open. This 10% step is what is set up for the *% Step Size*. **It is important to have the correct valve run time entered. The computer will use this setting to determine how long to operate the valve to achieve each percentage of opening or closing.** When the valve should be fully open (100%) or fully closed (0%), the computer will send an open or close signal to the valve every time the 'Minutes between steps' time elapses. This guarantees the valve is fully open or closed as needed.

Changing the Proportional Valve (Code 33) Settings

This section goes through the programming steps for changing Proportional Valve settings.

Sample Proportional Valve Screen:

```
Zone: 1 Description:        Prop. Vlv. #1
   -1 / 0 = Temp Open /Close
       0 = Night Shift
   10/5  = RH Open / Close
     21 = % Minimum Opening
     11 = % Step Size
      3 = Minutes between steps
  130   = Valve time is seconds
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Enter # then **GO** to select equipment to be programmed.
    This example will use 2 then **GO** to select Proportional Valve.
    Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Zone & Description will automatically be filled in.
- Enter # ↓ for **Temp Open**
    This example uses –1 for meaning the valve will push open at or below 69º (70º + -1º = 69º)
- Enter # ↓ for **Night Shift**
    This example uses 0 meaning the equipment setting will not change for night. For more detail, see previous section on Reading Proportional Valve settings.

- Enter # ↓ for **RH Open**

  This example uses 10 meaning the valve will start to open 10 percentage points above the humidity setpoint. With a humidity setpoint of 80% and these settings, the valve will push open at 90% (80% + 10% = 90%) humidity.

- Enter # ↓ for **% Minimum Opening**

  This example uses 20, which protects valves from erosion by having it open at least 20% any time it opens at all.

- Enter # ↓ for **% Step Size**

  This example uses 10; meaning after the initial opening (20% Minimum Opening) the valve will then open in increments of 10%.

- Enter # ↓ for **minutes between steps**

  This example uses 2, meaning sensors will have 2 minutes to respond to heating effect of each change in the valves position.

- Enter # ↓ for **Valve Time in Seconds**

  This example uses 130 representing the total run time for the valve to go from full close to full open. The run time of the valve actuator usually is given in the manufacturer's specification sheet. If not, use a watch to time the assembly.

Proportional Hot Water Valve (Code 37)

To reach the Equipment Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Press **2** then **GO** to reach Proportional Hot Water Valve.

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Proportional Hot Water Valve Screen:

```
Zone:  1              Description:    Prop. HW #1
  -2 = ON TEMP            135 = BOOST TIME
   4 = DAY RANGE          Type Boost-Time
   3 = NIGHT RANGE          0    23:00 Earliest
120 = MIN WTR TEMP          0    07:00 Latest
0.00 = RH BOOST           130 = STROKE
  15  = PUMP DELAY           0 = REVERSAL
```

> Note:
> This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.

Reading the Hot Water Valve (Code 37)

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is being set. The system fills this in automatically.
ON TEMP	Indicates the difference from the heating setpoint where the valve will start opening. Settings usually range from 0 to –2. This example uses –2 meaning the proportional hot water valve will start to open two degrees *below* the heating setpoint. For example, the valve starts open at 68º when the heating setpoint is 70º.
DAY RANGE	Indicates the temperature span to open and close the valve during the daytime. A setting of 3 - 4 degrees is typical. This example uses a value of 4 meaning the valve will open and close in response to a total change of four degrees in greenhouse temperature. If the heating setpoint is 70º, the valve will start to open at 68º and gradually open all the way if the temperature falls another four degrees to 64º. Between 64º and 68º, the valve will modulate open and closed in response to temperature changes.
NIGHT RANGE	Defines the temperature span for the valve to open and close during the night hours. A setting of 3 - 4 degrees is typical. This setting works at night exactly as DAY RANGE works during the

	day. It allows you to heat more aggressively at night when heat loss from the greenhouse is typically greatest. With a night time heating setpoint of 68°, a NIGHT RANGE of 3°, and an ON TEMP of -2°, the valve will begin to open at 66°, and open fully if the temperature falls to 63°. Between 63° and 66°, the valve will modulate open and closed as needed.
MIN WTR TEMP	Sets a minimum water temperature to maintain when the heat is needed. The valve will adjust the valve position to maintain the heating water temperature at or above this minimum setting. Settings usually range from 100 to 130 degrees. This example uses 120 meaning the valve will open enough to keep the heating water at or above 120° Any time the greenhouse temperature falls by the amount set in ON TEMP.
RH BOOST	This setting allows the valve to open in order to reduce humidity. It sets the number of degrees the water temperature must rise for each percentage point that the greenhouse RH rises above the set RH. A non-zero setting for RH BOOST forces the computer to heat the greenhouse slightly when the humidity is high. This lowers the humidity, and may force some ventilation, which further dries the air. A setting of zero causes the computer to ignore humidity when operating the valve.
PUMP DELAY	In some cases, a mixing valve is associated with a water-circulating pump. The program turns on such a pump any time the valve opens in order to circulate heating water through the valve and into the greenhouse. PUMP DELAY allows the circulating pump to continue running after the mixing valve closes. It sets the time in minutes that the pump will run after the valve is closed. This example uses 15, meaning the pump will run for 15 minutes after the valve is closed. Running the pump after the valve closes improves temperature uniformity in the greenhouse.
BOOST TEMP	The valve can be set to cause a temperature boost at times when extra heating demand is expected, as at the time when an energy curtain re-opens in the morning. BOOST TEMP sets the minimum heating water temperature used during the optional boost period. This example uses 135, meaning that the heating water temperature will be raised to at least 135° during the boost period explained below.
Type, Boost–Time	These settings define the time period when the *optional* BOOST TEMP minimum water temperature is in effect. *Type* and *Boost-Time* are column headings for a table of settings that have two rows called *Earliest* and *Latest*. The *Earliest* Type and Boost-Time settings establish the beginning of the time the BOOST TEMP is in effect, while the *Latest* Type and Boost-Time settings establish its end. *Type* may be zero or one, and controls how the computer interprets the *Earliest* and *Latest* settings under *Boost-Time*. When Type is zero, the computer reads the Boost-Time setting as a fixed time of day entered as a value read from a 24-hour digital clock: that is, 18:00 means 6:00 PM. When Type is set to one, the computer will interpret the setting in BOOST-TIME as a number of minutes difference from sunrise for *Earliest*, or sunset for *Latest*. This example uses *Type* settings of **0** to set fixed times for *Earliest* and *Latest*, with an Earliest time of 23:00, and a *Latest* time of 07:00. This means that the BOOST TEMP setting of 135° will be in effect from 11:00 PM each evening until 7:00 AM the following morning.
STROKE	Determines the time in seconds that it takes the valve to operate from full open to close or vice versa. This value needs to be entered in seconds. This example uses 130 meaning it takes 130 seconds for the valve to move between full open and full close.
REVERSAL	Some valve actuators have a gear train that takes extra time before being able to reverse the direction of valve movement. This value should be left at 0, unless you observe that your valve stops for a time before reversing its direction of movement. If entering a value, enter time in seconds.

Changing the Hot Water Valve (Code 37)

This section shows the programming steps for Proportional Hot Water Valve settings.

Sample Proportional Hot Water Valve Screen:

```
Zone: 1              Description:   Prop. HW #1
 -2 = ON TEMP              135 = BOOST TIME
  4 = DAY RANGE            Type Boost-Time
  3 = NIGHT RANGE            0    23:00 Earliest
120 = MIN WTR TEMP           0    07:00 Latest
0.00 = RH BOOST           130 = STROKE
 15  = PUMP DELAY            0 = REVERSAL
```

> *Note:*
> *This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.*

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Enter # **GO** to select equipment to be programmed.
  This example will use **2** then **GO** to select Proportional Hot Water Valve #1. Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.* Zone & Description will automatically be filled in.
- Enter # ↓ for **Temp On**
  This example uses –2 meaning if the setpoint is 70º the proportional HW valve will begin to open at 70º + -2º = 68º.
- Enter # ↓ for **Day Range**
  This example uses 4 meaning the temperature span for daytime operation will be 4 degrees. With a heating setpoint of 70º and an ON TEMP of -2, the valve will modulate open and closed as the air temperature varies in the range of 64º to 68º.
- Enter # ↓ for **Night Range**
  This example uses 3 meaning the temperature span for night operation range will be 3 degrees. With a heating setpoint of 64º and an ON TEMP of -2, the valve will modulate open and closed as the air temperature varies in the range of 59º to 62º.
- Enter # ↓ for **Min WTR Temp**
  This example uses 120 meaning the minimum water temperature will be 120 degrees.
- Enter # ↓ for **RH Boost**
  This example uses 0 meaning this equipment will not be used to dehumidify.
- Enter # ↓   for **Pump Delay**
  This example uses 15 meaning the pump will run for 15 minutes after the valve is closed.
- Enter # ↓ for **Boost Temp**
  This example uses 135 meaning the water will be at least 135º during the optional boost period
- Enter # ↓ for **Type Boost - Time**
  This example uses 0↓   23:00 ↓   0↓   7:00↓   The zeros indicate the computer will read fixed time based on a 24-hour clock. The 23:00 defines 11:00 PM as the earliest or beginning of the time period when the computer
  will boost the temperature. 7:00 AM is the latest the temperature will be boosted.
- Enter # ↓ for **Stroke**
  This example uses 130, meaning it takes 130 seconds to move from full open to full close.
- Enter # ↓ for **Reversal**
  This example uses 0. This setting should be left at 0, unless a valve that has a built-in delay mechanism is being used.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Mixing Valve, Voltage Controlled (Code 24) Equipment Settings

This mixing valve control program adjusts the position of the control valve according to the greenhouse air temperature and the relative humidity of the air. This program requires a valve actuator that accepts a voltage signal to set its position.

As the greenhouse temperature varies, the program modulates the voltage signal it sends to the valve. As the temperature rises, the computer changes the voltage toward the 0% Voltage signal, closing the valve and reducing or shutting off the heat. As the temperature falls, the computer changes the voltage toward the 100% Voltage setting. This opens the valve and puts more heat into the greenhouse. The program will move the valve to a position that is proportional to conditions in the greenhouse. That position may be 0% when no heat is needed, 100% when maximum heat is needed, or an intermediate position when the greenhouse temperature is near, but not at, the desired temperature.

To reach the Equipment Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Enter #↓ to select Mixing Valve
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Mixing Valve Settings Screen:

```
 Zone: 1                    Description: Mix Valve #1
-2/  0 = Temp ON/OFF              0 = Min % ON
 0/  0 = RH ON/OFF                0 = Hold Time
  0.0 = 0% Voltage                  = FIRE
 10.0 = 100% Voltage
```

Reading the Mixing Valve, Voltage Controlled (Code 24) Equipment Settings

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is being set. The system fills this in automatically.
Temp ON/OFF	These settings define the temperature range over which the valve opens and closes. The values are set as differences from the heating setpoint for the zone. When the greenhouse air temperature is at or below the heating setpoint plus the *ON* setting, the valve will be completely open. When the greenhouse temperature is at or above the heating setpoint plus the *OFF* setting, the valve will be closed. Inside this range of temperatures, the valve will be partially open: more open for colder temperatures, and less for warmer ones.
RH ON/OFF	These settings define the humidity range over which the valve opens and closes. The values are set as differences from the humidity setpoint for the zone. When the greenhouse humidity is at or below the humidity setpoint plus the *ON* setting, the valve will be completely open. When the greenhouse humidity is at or above the heating setpoint plus the *OFF* setting, the valve will be closed. Inside this range of humidity, the valve will be partially open: more open for higher humidity, and less for lower ones. If you do not wish to have the valve operate in response to humidity in the greenhouse, set *RH ON/OFF* to 0/0.
0% Voltage	Sets the voltage level the computer should send to the valve actuator to make the valve close completely.

100% Voltage	Sets the voltage level the computer should send to the valve actuator to make the valve open completely.
Min % ON	Sets the minimum amount the valve will open. The computer will always open the valve by at least this amount when heat is needed. This setting is useful when the valve controls steam which tends to erode the valve seat for openings less than 10-20%. If the valve controls hot water, this setting can be zero.
Hold Time	This setting is not implemented in current versions of the program. It should be set to zero.

Changing Mixing Valve, Voltage Controlled Settings (Code 24)

Sample Mixing Valve Settings Screen:

```
Zone: 1                    Description: Mix Valve #1
-2/  2 = Temp ON/OFF              0 = Min % ON
 0/  0 = RH ON/OFF                0 = Hold Time
  2.0 = 0% Voltage                  = FIRE
  6.0  = 100% Voltage
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Find the Mix Valve on the list of equipment on the display screen and enter the line number to the left of the valve's name. Enter the number and press **GO** to select the Mix Valve.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Temp ON**
  This example uses the default setting of -2, meaning that at two degrees below the heating setpoint, the valve will be 100% open and fully on.
- Enter # ↓ **Temp OFF**
  This example uses 2, meaning that at two degrees above the heating setpoint, the valve will be closed and off.
- Enter # ↓   # ↓ for **RH ON/OFF**
  This example uses 0/0, meaning that this valve will not operate due to humidity. Ignoring humidity is the typical case for a heat control valve. In most cases, the cost of heating to reduce humidity is not justified.
- Enter #.# ↓ for **0% Voltage**
  This example uses 2.0, meaning that a signal of two volts commands this valve to close. Any value from 0.0 to 10 may be used. Obtain the correct value from the manufacturer's data sheet for the valve actuator.
- Enter #.# ↓ for **100% Voltage**
  This example uses 6.0, meaning that a signal of six volts commands this valve to open all the way. Any value from 0.0 to 10 may be used. Obtain the correct value from the manufacturer's data sheet for the valve actuator.
- Enter # ↓ for **Min % ON –** sets the minimum amount of valve opening
  This example uses 0, meaning that any amount of valve opening is acceptable. This is a typical setting for a hot water control valve. Steam valves should use 10-20 in this setting for a 10-20% minimum opening.
- Enter # ↓ for **Hold Time** – This is a setting that has no effect in this version of the program.
  This example uses 0. Zero should always be used in this setting in order to ensure trouble free upgrades to future program releases.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Fin Tube (Code 48) Equipment Screen

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment Settings** screen.
- Use up/down ⇅arrows to navigate between the two screens.
- Press the screen choice number (1 in our example) and **GO** to reach the Fin Tube Screen.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Fin Tube 1 Screen:

```
Zone: 1                  Description:  Fin Tube #1
-2 / 0  =  Temp ON / OFF              =  MIN %  VENT
     0  =  NIGHT SHIFT                =  RAIN LCKOUT
 0 /  0 =  RH  ON / OFF         0  =  CYCLE TIMER
     /   =  D / N FROST               =  CO2
Type Allowed - Time            0  =  WIND O/R SPEED
0    00:00  Earliest           0  =  WIND  O/R ACTION
0    24:00  Latest             1  =  GEN    0 =FIRE
```

Reading the Fin Tube Equipment Setting Screen

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is shown – in this example, Fin Tube #1.
Temp ON/	Determines when the heat turns on based on degrees from the heating setpoint. In this example, the heat will turn on when it is –2 below the heat setpoint of 65, meaning the heat will turn on at 63. Generally, heaters are set to come on at or below the heating setpoint. Typical settings are 0, -1, -2. Note that for heating equipment, the computer requires TEMP ON to be less than TEMP OFF because heating raises the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Temp OFF/	Determines when the heat turns off based on degrees from the heating setpoint. In this example, the heat will turn off at 0, meaning the heat will turn off at setpoint, which is 65. Generally, heaters are set to turn off at or above the heating setpoint. Typical settings are 0, 1, 2. Note that for heating equipment, the computer requires TEMP OFF to be greater than TEMP ON because heating raises the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Night Shift	Adjusts the On/Off temperature for night. Night setpoint temperatures can be raised or lowered using the Night Shift option. Night shift should almost always be set to zero. It can be used to compensate for the effect of the daytime fogging or irrigation on soil temperature sensors.
RH ON/OFF	Determines how the heating responds to humidity based on the RH setpoints. The heater can be programmed to help dehumidify. When the RH rises above the ON level, the stage will come on and remain on until RH falls below the OFF level. If you don't want the fin tube to heat because of humidity, set these values to 0/0. Note that the computer RH ON to be greater than RH OFF, because heating lowers the greenhouse humidity.
Day/Nite Frost Lockout	The cursor skips over settings because they do not apply to fin tube heating.

Sample Fin Tube Screen:

```
Zone: 1                    Description:  Fin Tube  #1
-2 / 0  =  Temp ON / OFF              =  MIN %  VENT
     6  =  NIGHT SHIFT                =  RAIN LCKOUT
10 / 5 =  RH  ON / OFF          0 =  CYCLE TIMER
   /    =  DAY / NITE  FROST  LOCKOUT
Type Allowed - Time          0  =  WIND O/R SPEED
 0   00:00  Earliest          0 =  WIND  O/R ACTION
 0   24:00  Latest            1  =  GEN    0 =FIRE
```

Type Allowed - Time	All On/Off equipment can be disabled due to the time of day, that is, the equipment runs only during set hours. **Type** and **Allowed-Time** are column headings for a table that defines the hours when the equipment can run. Type sets the way the computer interprets your time settings, while Allowed-Time is where you enter the actual times of day. You may set Type to 0 or 1. 0 = fixed time meaning the equipment turns On/Off at the same time each day (for example, 6:00 AM). Enter time using 24-hour clock. 1 = relative time defined by minutes before/after sunrise. Negative numbers allow equipment to turn on before sunrise. –30 means 30 minutes before sunrise.
Earliest/Latest	Earliest and Latest are the row titles for the time-of-day settings. Type and Allowed time in the Earliest row set the start of the time when the fin tube is allowed to heat. These same settings in the Latest row set the end of the time when the fin tube can heat. Time is entered using the 24-hour clock for Type 0, fixed time or using +/- minutes to specify time before or after sunrise. For Type=1, Earliest Allowed-Time is relative to sunrise, and Latest Allowed-Time is relative to sunset. Generally, growers enable fin tube to heat as needed 24 hours a day. The computer automatically sets the Type and Earliest Allowed-Time to 0 and 00:00, and the Type and Latest Allowed-Time to 24:00, enabling fin tube to heat any time it is needed.
RAIN LCKOUT	The cursor skips over this section as it does not apply to fin tube.
Cycle Timer	This setting allows you to link the operation of the equipment to any of four built-in cycle timers. The computer runs these timers just like an electromechanical time clock with pegs to set 'On' time and 'Off' times. When you link a piece of equipment to a cycle timer, the equipment turns on when the cycle timer is on, regardless of its other settings. When the cycle timer turns off, so does the equipment, unless any of its climate control settings still require it to be on. A setting of 0 ignores all cycle timers. A setting of 1,2,3 or 4 links the equipment to the timer with that number. The settings for the timers themselves are found under item **9** of the **<<<Setting Menu>>>**.
MIN Minutes	The cursor skips over this section as it does not apply to fin tube.
Wind O/R Speed	The cursor skips over this section as it does not apply to fin tube.
Wind O/R Action	The cursor skips over this section as it does not apply to fin tube.
GEN	Indicates if equipment is authorized to run on generator power. 0 means the equipment is NOT allowed. 1 means the equipment is allowed to operate off a standby generator. This allows the computer to do "load shedding".
FIRE	Setting FIRE to 0 forces the fin tube OFF in the event of a fire alarm. Setting FIRE to 1 forces the fin tube ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Cooling Equipment Settings

Roof Vent (Code 0) and Side Vent (Code 1)

The display screen on the EnviroSTEP identifies a roof vent as "Vent ? #1". In a working installation, the "1" is replaced by the number of the vent among all the vents in the greenhouse (1, 2, 3 etc.). The "?" symbol is replaced with a letter (determined during configuration) that shows which direction the vent faces (N, S, E, or W). A Side Vent is identified as "Side Vent *? 1*", using the same scheme. The EnviroSTEP includes a program for roof vents and side vents. The computer includes two equipment codes for these vents: code 0 identifies a roof vent, while code 1 identifies a side vent. In either case the program opens and closes the vent to regulate temperature and humidity in the greenhouse. The EnviroSTEP uses identical logic for both Roof Vents and Side Vents. The balance of this section will refer to them interchangeably as "Vent."

The EnviroSTEP finds a vent position that maintains greenhouse conditions within the range determined by its open and close settings for temperature and relative humidity. Either temperature or humidity can cause the vent to open, but the greenhouse must be both cool enough and dry enough before the vent will close.

The program provides additional maintenance and performance tuning settings for the vent. These settings determine how quickly the vent opens and close, and adjust its performance in relation to the size of the greenhouse.

To reach the Vent setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Use Up/Down arrows to navigate.
- Press ↓ to view all equipment. There are two screens.
- Find the Vent on the list of equipment on the display screen.
- Enter the line number to the left of the vents name, and press **GO**.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Vent Setting Screen:

```
Zone: 1      Description:        Vent E # 1
   1 / -1 = TEMP OPEN/CLOSE         0 = IDLE
      0 = NIGHT SHIFT               0 = FUMIGATE
  99/ 98 = RH OPEN/CLOSE          180 = STROKE
100/100 = LIMIT% DAMP/DRY           6 = RELAY
 50 /  5  = LIMIT% FAN/PAD           0 = FIRE
 10/ 25 = CRACK % / STEP%           0 = RELIEF %
      0  = CYCLE TIMER
```

Note:
This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.

Reading the Vent Screen

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is being read. In the example, Vent E #1 (meaning east) is being read.
Temp Open/Close	Sets the number of degrees difference from the cooling setpoint determining when the vent will open/close. The OPEN setting appears to the left of the '/'; the CLOSE setting is to the right. Open and Close may be positive or negative numbers, but Open must be of greater value than Close. Above the Open setting the vent will step open. In between the Open and Close settings, the vent will hold its position, whether closed, partly open, or open all the way. At exactly the Close temperature the vent will step closed. Below the Close temperature, the vent will close completely in a single step. With a cooling setpoint

	of 76°, and Open/Close settings of 2/0, the example table below shows how the vent will move/ **Temperature** **Result** 78° Vent steps open 77° Vent Holds its position 76° Vent steps closed 75° Vent closes completely in a single step.
Night Shift	Adjusts the Open / Close temperatures for night. This allows you to adjust ventilation further from the cooling setpoint, or closer to the cooling setpoint. Typically, you will leave it set at zero.
RH OPEN / CLOSE	Establishes when the vent will open and close relative to the humidity setpoint. The OPEN setting appears to the left of the '/'; the CLOSE setting is to the right. When the zone humidity is more than OPEN percentage points above the RH setpoint, the vent will begin to open. When the zone humidity falls below CLOSE percentage points of the RH setpoint, the vent will begin to close. RH OPEN and CLOSE may be positive or negative numbers, but OPEN must be greater than or equal to CLOSE. The following table shows examples of how RH Open/Close works: **RH Open Close** **RH Setpoint** **Result** 10 / 5 80% Vent begins to open if the humidity rises above 90%, and begins to close when the humidity drops to 85% or lower. 100 / 99 70% Vent ignores humidity. It would only open if the humidity goes above 170%, an impossible value.
LIMIT % DAMP / DRY	Limits the amount the vent can open due to humidity. Settings are percentages from 0 (meaning a zero percent limit that does not allow the vent to open) to 100 (meaning a 100% limit that allows the vent to open any amount for greenhouse conditions). Limit % Damp is the maximum amount the vent is allowed to open to help dehumidify the zone. You may want to limit the vent to dehumidify and reduce fungal disease, avoid cold spots and the spread of spores due to a high volume of circulating air. Limit % Dry sets the maximum amount the vent can open if the zone is below its humidity setpoint. Limiting the vent when the house is too dry is useful in hot, dry climates if the zone is cooled with vents and mist system. The Dry Limit is almost always set at 100 so that low humidity will not interfere with maximum cooling from the vent.
LIMIT% FAN/PAD	Allows a roof vent to cooperate with fan and pad air conditioning. The Fan setting establishes the maximum vent position when fans are running. The Pad setting establishes either roof or side vent position when pad cooling is in use. This setting is intended for houses with both roof and pad vents. To close the roof vent and use the pad vent exclusively when the pad pump is on, set *LIMIT % PAD* (to the right of the "/") to zero. If the vent is a side vent that covers an evaporative cooling pad, set *LIMIT % PAD* (to the right of the "/") to 100 so that the vent is open to allow air through the pad. If your greenhouse does not have exhaust fans or a pad system, the computer ignores these settings.
CRACK % / STEP %	As the vent opens, the computer uses the movement size set in CRACK% for the first two increments of opening. The remaining movements use the amount set in STEP. If the zone's temperature remains above the opening temperature after the Crack 's of vent movement, the system will begin to open the vent further using the STEP setting. A small percentage size in STEP causes the system to make many small vent movements as it adjusts the vent. A large STEP setting causes fewer, but larger vent movements.
CYCLE TIMER	Associates the vent with one of four available cycle timers. To let a timer influence a vent, enter the number of the cycle timer (1 - 4) here. When associated with a cycle timer, the vent will open to the crack percentage when the cycle timer is in an 'On' period. When the cycle timer returns to an 'Off' period, the vent will close again, unless temperature or

	humidity settings require it to be open. This type of cycling can be used to force a vent to exchange some fresh air, even when temperature and humidity settings are satisfied.
IDLE	Sets the minutes to delay between movements of the vent. The program defaults to give a one-minute idle time, even when *IDLE* is set to zero. Longer idle times reduce wear and tear on the vent and allow the greenhouse and its temperature sensor time to respond to the effect of a vent position change. Typical settings are three to fifteen minutes. Longer *IDLE* settings are appropriate for larger volume houses (40,000 sq ft. or larger), while shorter times work better for smaller volume houses (15,000 sq. ft. or less).
FUMIGATE	Allows you to close the vents in a house to fumigate. The number determines the minutes the vent will be closed to fumigate. When you press GO after setting *FUMIGATE* to a non-zero value, the computer will close the vent for the number of minutes you enter in this setting. The computer resets the value in *FUMIGATE* to zero every time you leave the vent setting screen, even though it is still sending a close signal to the vent. To interrupt a close signal sent by a *FUMIGATE* setting that was too large, set *FUMIGATE* to one (1); after one minute, the vent will return to normal operation.
STROKE	Sets the total time in seconds to open or close the vent completely. To move the vent to a given percentage position, the computer turns on the vent motor for a percentage of its *Stroke* time. The correct value of this setting must be measured in the greenhouse and entered here. If this value is incorrect, the vent may not open completely, and the computer will not be able to track or report its position correctly.
RELAY	This setting accounts for the action of a time delay relay that may be part of the control box that interfaces your vent motor to your computer. Vent machines from Wadsworth Control Systems typically include such a control box, and these boxes include a time delay relay. These relays prevent the vent from moving until they time out, and the computer must add the time that they consume to every movement command it sends to the vent. This value should be measured in the greenhouse and entered here. If this value is incorrect, the vent may not open completely, and the computer will not be able to track or report its position correctly. Wadsworth vent machines have a typical time delay value of six seconds.
FIRE	Setting FIRE to 0 forces the vent closed in the event of a fire alarm. Setting FIRE to 1 forces the vent open in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing the Vent (Code 0) or Side Vent (Code 1) Settings

Sample Roof Vent Setting Screen:

```
Zone: 1      Description:              Vent E # 1
   1 / -2 = TEMP OPEN/CLOSE           0 = IDLE
       0 = NIGHT SHIFT                0 = FUMIGATE
   99/ 98 = RH OPEN/CLOSE           180 = STROKE
 100/100 = LIMIT% DAMP/DRY            6 = RELAY
   10 / 0  = LIMIT% FAN/PAD           0 = FIRE
   10/ 25 = CRACK % / STEP%
       0  = CYCLE TIMER
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Find the vent on the list of equipment on the display screen.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter the line number to the left of the vent's name, and press **GO**.
- Enter # ↓ for **Temp Open** then Enter # ↓ for **Temp Close**.

This example uses 1 meaning the roof vent will start to open 1 degree over cooling setpoint. –2 means the vent will start to close 2 degrees below the cooling setpoint.

- Enter # ↓ for **Night Shift**

  This example uses 0 meaning it is not activated the 1 Open/ -2 Close settings will be used day & night. If a number were entered, it would be added to the existing settings to make an adjustment to the settings for night. For example, a setting of 2 would adjust the Open/Close settings to 3/0 for the night period.

- Enter # ↓ for **RH Open**   Enter # ↓ for **RH Close**

  This example uses 99/98 deactivating the RH Open/Close. If smaller values were entered the vent would Open/Close based on RH relative to the setpoint.

- Enter # ↓ for **Limit % Damp**. Enter # ↓ for **Limit % Dry**.

  This example uses 100/100 deactivating the Damp/Dry. The vent can open without limit, regardless of high or low humidity in the greenhouse.

- Enter # ↓ for **Limit % Fan**. Enter # ↓ for **Limit % Pad**.

  This example uses 10/0 meaning the roof vent will be open no more than 10% once any exhaust fans turn on, and that the roof vent will close if the pad pump turns on. Leaving the vent cracked open with fans on allows the fans to pull air down through the top of the greenhouse which may help it cool better.

- Enter # ↓ for **Crack %**. Enter # ↓ for **STEP %**.

  This example uses 10/25. Meaning that once the temperature or RH meets the criteria set in TEMP OPEN or RH OPEN the vent will start to crack open in 10% increments. In this case when the temperature is 1 degree over cooling setpoint, the vent will open 10% for the first two increments, cracking the vent open. If the temperature still exceeds the cooling setpoint, the roof vent will continue to open using the second setting – the STEP %. The 25 means the vent will open in 25% increments until full open. Typical values for Crack are 5% -20%. The Crack position allows safe venting on cool days.

- Enter # ↓   for **Cycle Timer**

  This example uses 0 deactivating the Cycle Timer.

- Enter # ↓ for **Idle**

  This example uses 3, meaning there will be a 3 minute delay between movements of the vent. The computer program defaults to give a one-minute idle time. Therefore, even if a 0 is entered, the vent will be delayed one minute between movements.

- Enter # ↓ for **Fumigate**

  This example uses 0, meaning no vent closure for fumigation is desired.

- Enter # ↓ for **Stroke**

  This example uses 180 meaning how many seconds it takes to move from full open to full close.

- Enter # ↓ for **Delay**

  This example uses 6 indicating how many seconds it takes for the control box to send the message to the relay before the vent starts to move.

- Enter # ↓ **FIRE**

  This example uses 0, which means the vent will close in the event of a fire alarm.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Considerations for Vent (Code 0) and Side Vent (Code 1) Settings

CRACK /STEP %	For cold weather ventilation use a small increment for the CRACK% and a larger increment for STEP%. This causes the vent to open faster when the first two small steps cannot maintain temperature in the house. After each movement, the vent will wait the number of minutes set in IDLE before moving again. If the vent is open and the house temperature falls within the OPEN and CLOSE offsets from the cooling setpoint, the vent will hold its position. When the greenhouse temperature falls below the close offset from the cooling setpoint, the vent will close completely. When the greenhouse temperature equals the vent close temperature, the vent will retrace the sequence of steps it made as it opened, and will delay by *Idle* minutes between each movement. If the wind, rain, or outdoor temperature storm limit protections are triggered by the weather, the program will cancel any delays between movements and immediately close the vent.

LIMIT% FAN/PAD	Research at Cornell University suggests that most greenhouses will cool better if the roof vents are open 5% to 10% during fan cooling. This setting in *FAN* (the value on the left side of the '/') circulates hot air out of the attic. When both fans and the pad system are on, most growers prefer the roof vents to be closed. This forces all air entering the house to come in through the pad wall. Setting PAD at 0 forces the roof vent closed when the pad system is on. If you wish to try the Cornell approach with your pad system, set PAD equal to FAN. Side and end wall vents won't usually be restricted. Their LIMIT FAN/PAD settings would be 100 / 100. These setting allow the vent to open 100% during fan and pad ventilation.

Pad Vent (Code 2)

The Pad Vent program operates a vent that lets air pass through an evaporative cooling pad. These vents are often on the side of the greenhouse behind the pad. They also may be located in the roof of a head house or pad house with pads on one or more walls.

The program opens and closes the vent according to the number of fans that are on at a given time. The program opens the vent in one step or in increments for each stage of fan that is on. As fan stages shut off, the program closes the vent by one step for each stage that shuts off. If you wish, you may program the pad vent to ignore the first one or more stages of fan. This allows other air sources such as motorized shutters or roof vents to admit cool air to the greenhouse before the pad vent is allowed to open. The program provides two step sizes or increments of movement for the pad vent: a warm step, for use when it's warm outside, and a cold step for use when cold air outside cools the greenhouse more rapidly and might damage plants growing near the vent. The cold step is typically smaller than the warm step.

To reach the Pad Vent Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Use Up/Down arrows ⇅ to navigate.
- Press ↓ to view all equipment. There are two screens.
- Find the Pad Vent on the list of equipment on the display screen.
- Enter the line number to the left of the vent's name, and press **GO**.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Pad Vent Setting Screen:

```
Zone: 1                   Description: Pad Vent E # 1
     25 = % WARM STEP              180   = STROKE
     10 = % COLD STEP                6   = RELAY
     38 = OUTSIDE TEMP               0   = FIRE
      0 = # FAN STAGES TO IGNORE
      0 = DELAY BETWEEN MOVES
```

Note:
This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.

Reading the Pad Vent (Code 2)

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is being set. In this example, Pad Vent E #1 (meaning east). The computer automatically fills in this information.
Warm STEP	Defines the percentage the vent will step open when the temperature is at or above the defined outside temperature setting. In this example, the vent will operate in 25% steps when the temperature is 38º or above.
Cold STEP	Defines the percentage the vent will step open when the temperature is below the defined outside temperature setting. In this example, the vent will operate in 10% steps when the temperature drops below 38º.
Outside Temp	Defines the outside temperature setting used to choose between Warm and Cold STEP. If no outdoor temperature sensor is used, leave 'Outside Temp' at 0. The computer will then use what is set under '% COLD STEP' for operation, '% WARM STEP' will be ignored.
# Fan Stages to Ignore	Indicates how many fan stages to ignore before allowing the vent to open. A pad vent does not *have* to open simply because a fan is on. You may leave it closed as one or more fan stages come on and allow them to draw in air through louvers or a roof vent. A setting of '0' tells the program not to ignore *any* fan stages and to begin opening the vent with the first stage.
Delay between Moves	Sets a delay (in minutes) between vent movements. A delay between moves can reduce wear on the pad vent without adversely affecting climate control. An appropriate value for Delay gives the temperature sensor in the house time to react to the results of each vent movement. Delays may allow more temperature change in the house than you like before the vent is allowed to move again. Typical settings range from 2 - 15 minutes.
Stroke	Sets the total time in seconds to open or close the vent completely. To move the vent to a given percentage position, the computer turns on the vent motor for a percentage of its *Stroke* time. The correct value of this setting must be measured in the greenhouse and entered here. If this value is incorrect, the vent may not open completely, and the computer will not be able to track or report its position correctly.
Relay	This setting accounts for the action of a time delay relay that may be part of the control box that interfaces your vent motor to your computer. Vent machines from Wadsworth Control Systems typically include such a control box, and these boxes include a time delay relay. These relays prevent the vent from moving until they time out. The computer must add the time that they consume to every movement command it sends to the vent. This value should be measured in the greenhouse and entered here. If this value is incorrect, the vent may not open completely, and the computer will not be able to track or report its position correctly. Wadsworth vent machines have a typical time delay value of six seconds.
FIRE	Setting FIRE to 0 forces the vent closed in the event of a fire alarm. Setting FIRE to 1 forces the vent open in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing the Pad Vent (Code 2)

Sample Pad Vent Setting Screen:

```
Zone: 1                    Description: Pad Vent E # 1
        25 = % WARM STEP            195   = STROKE
        10 = % COLD STEP            8     = RELAY
        38 = OUTSIDE TEMP           0     = FIRE
        0 = # FAN STAGES TO IGNORE
        2 = DELAY BETWEEN MOVES
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **2** then **GO** to reach **Equipment** screen.
- Find the Pad Vent on the list of equipment on the display screen.
- Enter the line number to the left of the vent's name, and press **GO**.
- Enter # ↓ for **Warm STEP**
  This example uses 25% meaning the vent will open in 25% increments if the outside temperature is above 38º. To ensure the pad vent opens completely in warm weather, use a *WARM STEP* size that is equal to 100 divided by the number of fan stages that the vent must track. To open with five fan stages, use 20 (for 20% per stage). To open with three fan stages, use 34 (for 34%). The vent will then step 34%, 68%, and 100%. If you used 33%, the vent would step 33%, 66% and 99%).
- Enter # ↓ for **Cold STEP**
  This example uses 10% meaning the vent will open in 10% increments if the outside temperature is below the 38º (the outside temp setting). The *COLD STEP* is typically too small to open the vent all the way in cold weather, even if all the fan stages were to come on.
- Enter # ↓ for **Outside Temp**
  This example uses 38º. When the temperature outdoors is at or above 38º, the computer will move the vent using the *WARM STEP* increment size. When the temperature outdoors is below 38º, the computer will move the vent using the *COLD STEP* increment size.
- Enter # ↓ for **Fan Stages to Ignore**
  This example uses 0 meaning the pad vent begins to open when the first fan stage turns on. If a 2 were entered the pad vent would ignore the first two stages of the fan and not turn on until the 3rd stage turned on.
- Enter # ↓ for **Delay between Moves**
  This example uses 2 meaning the vent will stand still for two minutes after each movement.
- Enter # ↓ for **Stroke**
  This example uses 195 meaning it takes 195 seconds for the vent to move from full close to full open. 8 represents the delay before movement starts.
- Enter # ↓ **FIRE**
  This example uses 0, which means the equipment will close in the event of a fire alarm.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Exhaust Fan – Single Speed and Two-Speed (Codes 4, 5, and 6)

Both single speed and two-speed fans use the same basic On/Off cooling program. They turn on in response to a rise in temperature or humidity, and turn off in response to a fall. In addition, they share the same requirements for frost protection limits on their operation during cold weather, and can play a role in protecting the greenhouse covering during a windstorm. Both these types of fan are treated together in this section, since they share all their settings in common. The program provides different codes simply to allow different names to make identification of each fan easier.

The types of fan covered in this section are:

> FAN (Code 4) – A single speed exhaust fan.
> LOW FAN (Code 5) – The low speed of a two-speed exhaust fan.
> HI FAN (Code 6) – The high speed of a two-speed exhaust fan.

FAN (Code 4), LOW FAN (Code 5), and HI FAN (Code 6)

These three equipment codes identify a single speed exhaust fan, and the low and high speeds of a two-speed exhaust fan. The computer operates identically for all three codes; only the descriptions are different. Note that contactor panels furnished by Wadsworth Control Systems connect two-speed fans in such a way that the low speed *must* be energized before the high speed will work. This means you should always set the On/Off temperatures for a low fan below those for a high fan. The example shown is for a single speed fan, but the information also applies to LO FAN and HI FAN configurations.

To reach the Fan Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Setting selection screen.
- Find the fan on the list of equipment on the display screen.
- Enter the line number to the left of the fan name, and press **GO**.

    Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

    Sample Fan Setting Screen:

```
Zone: 1                       Description: Fan # 1
        2 / 0 = TEMP ON/OFF            0 = MIN % VENT
             0 = NIGHT SHIFT           0 = RAIN LCKOUT
        0/ 0 = RH ON/OFF               0 = CYCLE TIMER
        0/ 0 = D/N FROST               0 = CO2
     Type Allowed – Time        0 = WIND O/R SPEED
     0 00:00 Earliest           0 = WIND O/R ACTION
     0 24:00 Latest             0 = GEN?  0 = FIRE
```

Reading the Fan Settings Screen (Code 4, 5, or 6)

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates what equipment/stage is being set. The system fills this in automatically.
TEMP ON/OFF	Sets the number of degrees difference from the cooling setpoint where this fan turns on and off. ON and OFF may be positive or negative numbers, but ON must be greater than or equal to OFF. In this example, the fan turns on whenever the temperature in the greenhouse is 2° above the cooling setpoint and it turns off when the temperature is 1° below the cooling setpoint.

	In a greenhouse with independent control of multiple fans or fan stages, you can establish a "sequence of operation" for the fans as the computer reacts to changes in the greenhouse temperature. Using different On/Off settings for different fan stages allows you to define this sequence of operation. The table below illustrates some possible sequences of operation for a computer that controls three fans or fan stages. Ways of creating three stages in an actual greenhouse include three groups of single speed fans, or one single speed fan and one two-speed fan.
NIGHT SHIFT	The value in this setting optionally adjusts the On/Off settings at night. When the computer is maintaining the night setpoint regime according to the day/night schedule you have established, the program adds *NIGHT SHIFT* to *both* the *TEMP ON* and *TEMP OFF* settings. Temperatures can be raised or lowered. The NIGHT SHIFT allows a shift further from or closer to the cooling setpoint. Typically, this is left at zero – disabled.
RH ON/OFF	Optionally enables this fan to operate to help dehumidify the greenhouse. Like *TEMP ON/OFF,* these settings are entered as offsets, but from the relative humidity setpoint rather than from the cooling setpoint, When RH rises above the *ON* level, the stage will come on. It will remain on until RH falls below the *OFF* level. To set a fan stage to ignore humidity and operate only due to temperature, set *RH ON/OFF* to 0/0.
DAY/NITE FROST LOCKOUT	If you have an outdoor temperature sensor, you can lock out cooling equipment according to the temperature outside. This can prevent a gravity operated shutter over the fan from freezing in the open position. The setting to the left of the slash mark sets the lowest outdoor temperature where the equipment is allowed to run during the day. The setting to the right of the slash mark sets the lowest outdoor temperature where the equipment is allowed to run at night. The night settings typically are above freezing, while the day setting may be above or below freezing.
Type Allowed-Time	Defines the hours when the fan can run. *Type* defines how the computer interprets *Allowed-Time,* while the value in *Allowed-Time* sets the time itself. There are two pairs of *Type, Allowed-Time* settings. These are marked "Earliest" and "Latest." Together, they define the beginning (*Earliest)* and end (*Latest)* of the range of times when this fan is allowed to operate. There are two options for *Type*. A *Type* of 0 sets a fixed time according to a 24-hour clock. A *Type* of 1 sets a relative time that varies each day according to the time of sunrise for *Earliest* and sunset for *Latest.* A relative time is an offset in minutes from the time of sunrise or sunset. Positive relative times (30, 60, 90) set times *after* sunrise or sunset. Negative relative times (-30, -60, -90) set times *before* sunrise or sunset. Generally, you will want to enable a fan to run 24 hours a day, as needed for temperature or humidity control. As shipped, the computer automatically sets the Earliest *Type* and *Allowed-Time* to 0 and 00:00, and the Latest *Type* and *Allowed-Time* to 24:00, enabling equipment to run twenty-four hours a day. If your cultural practice allowed you to disable a fan during nighttime hours (as an energy conservation measure, for example) you could set both the Earliest and Latest *Type* and *Allowed-Time* to 0 and 0, meaning that the fan is allowed to run between the times of sunrise and sunset.

MIN % VENT	This setting allows you to synchronize this fan with a vent opening. The computer will not turn on the fan until a vent in the greenhouse is open by at least the percentage amount set here. Use this setting to require a vent to be open before the fan can turn on. This prevents the fan from pulling a vacuum in the greenhouse. **Caution:** If your Limit Settings prevent any vents from opening due to bad weather, the *MIN % VENT* setting will also lock out the fan, even if you have a louver or inlet shutter that can still allow air into the greenhouse.
CYCLE TIMER	Associates the fan with one of four available cycle timers. To let a timer influence a vent, enter the number of the cycle timer (1 - 4) here. When associated with a cycle timer, the fan will turn on when the cycle timer is in an 'On' period. When the cycle timer returns to an 'Off' period, the fan will shut off again, unless temperature or humidity settings require it to be open. This type of cycling can be used to turn a fan on to exchange some fresh air, even when temperature and humidity settings are satisfied. Forced air exchange can be a useful approach to dehumidifying a very wet house. To make the fan ignore all cycle timers, set *CYCLE TIMER* to zero.

RAIN LCKOUT	The rain setting allows you to shut off a fan when it is raining. Set it to 1 to shut off a fan during rain or set it to 0 to ignore rain. You may want to shut off a fan for rain if the vent it draws air from has a fine screen that rain would obstruct, making the fan draw a vacuum on the greenhouse.
Wind O/R Speed And Action	**If you have a wind speed sensor connected to your system (part of a Weather Station), the computer can override the normal operation of the fan. These two settings tell the computer what to do in case of high winds.** **WIND O/R SPEED** sets the wind speed where the wind override should take effect. **WIND O/R ACTION** sets the override action for the fan when the override speed is reached. If *ACTION* is 1, the computer will force the equipment *ON* when the wind speed is higher than the *O/R SPEED* setting. A '0' will force the fan *OFF* at wind speeds above the *O/R SPEED* setting. Use these fan settings in combination with the wind override settings for louvers, shutters and vents. Override the fan to come on during a windstorm, even if it is not needed for cooling. Override the louvers, shutters, and vents to close at the same time. Running the fan and closing all the air inlet sources creates a slight vacuum that helps hold the covering on the greenhouse. If experience tells you that wind damage occurs at 50 MPH, set the *WIND O/R SPEED* below 50, for example at 45, and the *ACTION* at '1' to force the fan on in anticipation of trouble. To ignore the override settings and operate the fan strictly according to temperature, set the value of *WIND O/R SPEED* to zero.
GENERATOR	Indicates if the fan is allowed to open and close while the greenhouse is powered from the standby generator. Set *GENERATOR* to 0 if the fan is *not* allowed to operate off a standby generator or to 1 if the fan *is* allowed to operate from a standby generator.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Equipment Settings – Exhaust Fan – Single Speed and Two-Speed Fans

This section covers the programming steps for an exhaust fan of any kind.

Sample Exhaust Fan Screen:

```
Zone: 1                    Description: Fan #1
   4 / 2 = Temp ON / OFF        10 =  MIN %  VENT
        0 = NIGHT SHIFT          0 = RAIN LCKOUT
   0 /  0 = RH  ON / OFF          0  = CYCLE TIMER
  35/40 = DAY / NITE  FROST  LOCKOUT
Type Allowed - Time        45 =  WIND O/R SPEED
0    00:00  Earliest         1 =  WIND O/R ACTION
0    24:00  Latest           1 =  GEN?   0 = FIRE
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment Settings screen.
- Find the fan on the list of equipment on the display screen, enter the line number to the left of the fan's name, and press **GO**
- Enter # ↓ for **Temp ON** Enter # ↓ for **Temp OFF**

This example uses 4 and 2. With a cooling setpoint of 70º the fan will turn off at 74º, 4º above the cooling setpoint. It will turn off again when the temperature falls to 72º, 2º above the cooling setpoint.

- Enter # ↓ for **NIGHT SHIFT**
  This example uses zero, meaning no night shift, the most typical setting.
- Enter # ↓ # ↓   for **RH ON/OFF**
  This example uses 0/0. This setting disables the humidity response of the fan. It will respond only to temperature.
- Enter # ↓ for # ↓ for **DAY/NITE FROST LOCKOUT**
  This example uses 35 and 40 for these settings. When the outdoor temperature falls below 35 º during the
  day or 40 º at night, the computer will lock out the fan.
- Enter # ↓   # ↓ for **Type Allowed-Time Earliest**
- Sets the earliest time when the fan is allowed to run. This example uses 0 for *Type*, meaning a fixed time each day, and 00:00 for *Allowed-Time*, meaning midnight as the first minute of the day.
- Enter # ↓   # ↓   for **Type Allowed-Time Latest**
  Sets the latest time when the fan is allowed to run. This example uses 0 for Type, meaning a fixed time each day, and 24:00 for Allowed-Time, meaning midnight as the last minute of the day.
- Enter # ↓   for **MIN % vent**
  This example uses 10, meaning that this fan cannot turn on until a vent in the greenhouse is at least 10% open.
- Enter # ↓   for **RAIN LCKOUT**. This example uses 0, which means the fans will continue to run should it be
  raining.
- Enter # ↓ for **CYCLE TIMER**
  This example uses 0 the default setting. This fan will not be influenced by a cycle timer. Entering 1, 2, 3, or 4 allows one of four available cycle timers to force the fan on periodically. The four-cycle timers are scheduled using choice '9' from the **<<<Setting Menu>>>**
- Enter # ↓ for **WIND O/R SPEED**
  This example uses 45, meaning that if the wind speed reaches 45, the fan will be forced into its programmed *WIND O/R ACTION* state.
- Enter # ↓ for **WIND O/R ACTION**
  This example uses 1, meaning the fan will be forced on if the wind speed reaches or exceeds the programmed *WIND O/R SPEED.*
- Enter # ↓ for **GEN**
  This example uses 1 which enables the fan to run on the generator.
- Enter # ↓ **FIRE**
  This example uses 0, which means the equipment will turn off in the event of a fire alarm.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Pad Pump (Code 7)

A pad pump pulls water from a sump and distributes it over an evaporative cooling pad. When an exhaust fan system pulls outside air through the pad, some of the water evaporates, cooling (and moistening) the air. This program can also be used to control the pump in a packaged evaporative cooler ("swamp cooler"). A pad pump uses the same on-off cooling logic as an exhaust fan.

Pad Pump (Code 7) Settings Screen

To reach the Pad Pump Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment setting selection screen.
- Find the pad pump on the list of equipment on the display screen.
- Enter the line number to the left of the pad pump name, and press **GO**.

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Pad Pump Setting Screen:

```
Zone: 1                    Description: Pad Pump # 1
      6/ 2 = TEMP ON/OFF              = MIN % VENT
         0 = NIGHT SHIFT             = RAIN LCKOUT
     0 / 0 = RH ON/OFF           0 = CYCLE TIMER
     0 / 0 = D/N FROST           0 = CO2
    Type Allowed – Time     0 = WIND O/R SPEED
    1      0 Earliest         0 = WIND O/R ACTION
    1      0 Latest           1 = GEN?   0 = FIRE
```

Reading the Pad Pump (Code 7) Settings Screen

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is being set. The system fills this in automatically.
TEMP ON/OFF	Sets the number of degrees difference from the cooling setpoint where the pad pump turns On and Off. ON and OFF may be positive or negative numbers, but ON must be greater than or equal to OFF. In this example, the pad pump turns on whenever the temperature in the greenhouse is 6° above the cooling setpoint and it turns off when the temperature is 2° above the cooling setpoint.

When you establish a "sequence of operation" for the On/Off cooling equipment in your greenhouse, set the pad pump to be the one of the last stages of cooling. Use an *ON* setting greater than all, or all but one of the fan stage *ON* settings. This means that the pad pump turns on after some or all of the fan stages. If you have a large greenhouse with several fans on each cooling stage, using the pad pump as the second to last cooling stage can save energy. The pad pump is typically a smaller motor load than even a single fan, and turning it on may provide enough cooling power that the last fan stage is not needed on some days. |
NIGHT SHIFT	This setting optionally adjusts the On/Off settings at night. When the computer is maintaining the night setpoint regime according to the day/night schedule you have established, the program adds *NIGHT SHIFT* to *both* the *TEMP ON* and *TEMP OFF* settings. Temperatures can be raised or lowered. The NIGHT SHIFT allows a shift further from or closer to the cooling setpoint. Typically this is left at zero – disabled.
RH ON/OFF	Optionally enables this pad to operate to help humidify the greenhouse. Water evaporating from the pad raises the humidity in the air that passes through it. Like *TEMP ON/OFF,* these settings are entered as offsets, but from the relative humidity setpoint rather than from the cooling setpoint. When RH falls below the *ON* level, the pad will come on and will remain on until RH rises above the *OFF* level. To set a pad pump to ignore humidity and operate only due to temperature, set *RH ON/OFF* to 0/0.
DAY/NITE FROST LOCKOUT	If you have an outdoor temperature sensor, you can lock out the pad pump. This allows you to prevent cold air from freezing the water on the pad. The setting to the left of the slash mark sets the lowest outdoor temperature where the pad pump is allowed to run during the day. The setting to the right of the slash mark sets the lowest outdoor

	temperature where the pump is allowed to run at night. The night setting is typically higher than the day setting, but both should be at least ten degrees above freezing (42ºF or 10ºC).
Type Allowed-Time	Defines the hours when the pad pump can run. *Type* defines how the computer interprets *Allowed-Time,* while the value in *Allowed-Time* sets the time itself. There are two pairs of *Type, Allowed-Time* settings. These are marked "Earliest" and "Latest." Together, they define the beginning (*Earliest)* and end (*Latest)* of the range of times when this fan is allowed to operate. There are two options for *Type*. A *Type* of 0 sets a fixed time according to a 24-hour clock. A *Type* of 1 sets a relative time that varies each day according to the time of sunrise for *Earliest* and sunset for *Latest.* A relative time is an offset in minutes from the time of sunrise or sunset. Positive relative times (30, 60, 90) set times *after* sunrise or sunset. Negative relative times (-30, -60, -90) set times *before* sunrise or sunset. You may want to enable a pad pump to run 24 hours a day, as needed for temperature or humidity control. As shipped, the computer automatically sets the Earliest *Type* and *Allowed-Time* to 0 and 00:00, and the Latest *Type* and *Allowed-Time* to 24:00, enabling equipment to run twenty-four hours a day. If your cultural practice allows, you can disable a pad pump during the late afternoon and night hours as a way of allowing the pad to dry completely each day. Drying the pad can lengthen its life and slow or stop the growth of bacteria and algae on the pad medium. The example screen sets both the Earliest and Latest *Type* to 1, and the *Earliest* and *Latest Allowed-Times* to 60 and -120, meaning that the pad pump is allowed to run from one hour after sunrise to two hours before sunset. These settings establish ample drying time for the pad.
MIN % VENT	This setting is not available for a pad pump.
RAIN LCKOUT	This setting is not available for a pad pump.
CYCLE TIMER	Associates the pad pump with one of four available cycle timers. To let a timer influence a pad pump, enter the number of the cycle timer (1, 2, 3, or 4) here. When associated with a cycle timer, the pump will turn on when the cycle timer is in an 'On' period. When the cycle timer returns to an 'Off' period, the pad pump will shut off again, unless temperature or humidity settings require it to be on. This type of cycling can be used to force a pad pump to wet the pad and introduce a small amount of extra humidity to the house, even when temperature and humidity settings are satisfied. Forcing the pad pump on with a cycle timer can be a useful approach to maintaining humidity in a house that lacks a humidity sensor. To make the pad pump ignore all cycle timers, set *CYCLE TIMER* to zero.

Wind O/R Speed And Action	If you have a wind speed sensor connected to your system (part of a Weather Station), the computer can override the normal operation of the pad pump. These two settings tell the computer what to do in case of high winds. Note: Although the computer allows you to make these settings for a pad pump, it is unlikely that they have any value in the event of high wind. Set both to zero.
	
	    WIND O/R SPEED sets the wind speed where the wind override should take effect.
	
	    WIND O/R ACTION sets the override action for the fan when the override speed is reached. If *ACTION* is 1, the computer will force the equipment *ON* when the wind speed is higher than the *O/R SPEED* setting. A '0' will force the fan *OFF* at wind speeds above the *O/R SPEED* setting.
	
	To ignore the override settings and operate the pad strictly according to temperature, set the value of *WIND O/R SPEED* to zero.

GENERATOR	Indicates if the pad pump is allowed to run on the standby generator to maintain zone setpoints. Set *GENERATOR* to 0 if the pump is *not* allowed to operate off a standby generator or to 1 if the pump *is* allowed to operate off a standby generator.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Equipment Settings – Pad Pump

This section covers the programming steps for a pad pump.
Sample Pad Pump Screen:

```
Zone: 1                    Description: Pad Pump #1
   6 / 2 =  Temp ON / OFF          =  MIN %  VENT
       0 =  NIGHT SHIFT            = RAIN LCKOUT
  -5 /  0 =  RH  ON / OFF        0 = CYCLE TIMER
  35/40 =  DAY / NITE  FROST  LOCKOUT
Type Allowed - Time    0 =  WIND O/R SPEED
1      60  Earliest        0 =  WIND O/R ACTION
1    -120  Latest          1 =  GEN    0 = FIRE
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment Settings screen.
- Find the Valve on the list of equipment on the display screen.
- Enter the line number to the left of the valve name, and press **GO**.
- Enter # ↓ for **Temp ON**. Enter # ↓ for **Temp OFF**
    This example uses 6/2. With a cooling setpoint of 70º the pad pump will turn off at 76º, 6º above the cooling setpoint. It will turn off again when the temperature falls to 72º, 2º above the cooling setpoint.
- Enter # ↓ for **NIGHT SHIFT**
    This example uses zero, meaning no night shift, the most typical setting.
- Enter # ↓ # ↓   for **RH ON/OFF**
    This example uses -5/0. With an RH setpoint of 80%, the pad pump will turn on when RH is 75% and off when it rises back to 80%. To disable the humidity response for the pad pump, set RH ON/OFF to 0/0.
- Enter # ↓ for # ↓ for **DAY/NITE FROST LOCKOUT**
    This example uses 35/40 for these settings. When the outdoor temperature falls below 35 º during the day or 40 º at night, the computer will lock out the pad pump.
- Enter # ↓   # ↓ for **Type Allowed-Time Earliest**
    Sets the earliest time when the pad pump is allowed to run. This example uses 1 for *Type*, meaning a time relative to sunrise, and 60 for *Allowed-Time*, meaning 60 minutes after sunrise.
- Enter # ↓   # ↓   for **Type Allowed-Time Latest**
    Sets the latest time when the pad pump is allowed to run. This example uses 1 for *Type*, meaning a time relative to sunset, and -120 for *Allowed-Time*, meaning 120 minutes before sunset.
- Cursor skips **RAIN LCKOUT** – it is not applicable.
- Enter # ↓ for **CYCLE TIMER**
    This example uses 0 the default setting. This pad pump will not be influenced by a cycle timer. Entering 1, 2, 3, or 4 allows one of four available cycle timers to force the pad pump on periodically. The four cycle timers are scheduled using choice '9' from the **<<<Setting Menu>>>**
- Cursor skips MIN Minutes – it is not applicable for a pad pump
- Enter # ↓ for **WIND O/R SPEED**
    This example uses 0; no action will occur.
- Enter # ↓ for **WIND O/R ACTION**

This example uses 0; no action will occur.

- Enter # ↓ **GEN**

   This example uses 1, which enables the pad pump to run on the generator.

   Enter # ↓ **FIRE**

   This example uses 0, which means the equipment will turn off in the event of a fire alarm.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Louver (a) (Code 8) Settings Screen

Louver (a), Code 8, operates a shutter that must be open in the early stages of air conditioning, but closed during later stages. Such shutters have been used in the gable ends of greenhouses above the bottom chord of the truss for cold weather ventilation. They often admit air to a poly-tube that inflates and distributes cold outdoor air when the first stage of exhaust fans turns on. Typically a vent or large bank of shutters will open for the second and later stages of fans in warmer weather. In this latter case, it is desirable to re-close the louver to avoid drawing down hot air from the greenhouse attic.

To reach the Louver (a) Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Setting selection screen.
- Find the fan on the list of equipment on the display screen.
- Enter the line number to the left of the louver (a) name, and press **GO**.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Louver (a) Setting Screen:

```
Zone: 1                    Description: Louver (A) # 1
      2/ 0 = TEMP ON/OFF              = MIN % VENT
         0 = NIGHT SHIFT              = RAIN LCKOUT
      0/ 0 = RH ON/OFF            0 = CYCLE TIMER
      0/ 0 = D/N FROST            0 = CO2
      Type Allowed – Time         0 = WIND O/R SPEED
      0 00:00 Earliest            0 = WIND O/R ACTION
      0 24:00 Latest              1 = GEN?  0 = FIRE
```

Reading the Louver (a) Settings Screen (Code 8)

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is being set. The system fills this in automatically.
TEMP ON/OFF	Sets the temperature range relative to the cooling setpoint where the louver is open. Within this range, the louver opens. Outside this range, the louver closes.
NIGHT SHIFT	The value in this setting optionally adjusts the On/Off settings at night. When the computer is maintaining the night setpoint regime according to the day/night schedule you have established, the program adds *NIGHT SHIFT* to *both* the *TEMP ON* and *TEMP OFF* settings. Temperatures can be raised or lowered. The NIGHT SHIFT allows a shift further from or closer to the cooling setpoint. Typically this is left at zero – disabled.
RH ON/OFF	Optionally enables this fan to operate to help dehumidify the greenhouse. Like *TEMP ON/OFF,* these settings are entered as offsets, but from the relative humidity setpoint rather than from the cooling setpoint, When RH rises above the *ON* level, the stage will come on. It will remain on until RH falls below the *OFF* level. To set a fan stage to ignore humidity and operate only due to temperature, set *RH ON/OFF* to 0/0.
DAY/NITE FROST LOCKOUT	If you have an outdoor temperature sensor, you can lock out cooling equipment according to the temperature outside. This can prevent a gravity operated shutter over the fan from freezing in the open position. The setting to the left of the slash mark sets the lowest outdoor temperature where the equipment is allowed to run during the day. The setting to the right of the slash mark sets the lowest outdoor temperature where the equipment is allowed to run at night. The night settings typically are above freezing, while the day setting may be above or below freezing.

Type Allowed-Time	Defines the hours when the fan can run. *Type* defines how the computer interprets *Allowed-Time,* while the value in *Allowed-Time* sets the time itself. There are two pairs of *Type, Allowed-Time* settings. These are marked "Earliest" and "Latest." Together, they define the beginning (*Earliest)* and end (*Latest)* of the range of times when this fan is allowed to operate. There are two options for *Type.* A *Type* of 0 sets a fixed time according to a 24-hour clock. A *Type* of 1 sets a relative time that varies each day according to the time of sunrise for *Earliest* and sunset for *Latest.* A relative time is an offset in minutes from the time of sunrise or sunset. Positive relative times (30, 60, 90) set times *after* sunrise or sunset. Negative relative times (-30, -60, -90) set times *before* sunrise or sunset. Generally, you will want to enable a louver the ability to open and close 24 hours a day, as needed for temperature or humidity control. As shipped, the computer automatically sets the Earliest *Type* and *Allowed-Time* to 0 and 00:00, and the Latest *Type* and *Allowed-Time* to 24:00, enabling equipment to run twenty-four hours a day.
RAIN LCKOUT	This setting is not available or applicable with Louver (A). No value will show for it on the display screen, and you cannot enter a number.
CYCLE TIMER	Associates the fan with one of four available cycle timers. To let a timer influence a vent, enter the number of the cycle timer (1 - 4) here. When associated with a cycle timer, the fan will turn on when the cycle timer is in an 'On' period. When the cycle timer returns to an 'Off' period, the fan will shut off again, unless temperature or humidity settings require it to be open. This type of cycling can be used to turn a fan on to exchange some fresh air, even when temperature and humidity settings are satisfied. Forced air exchange can be a useful approach to dehumidifying a very wet house. To make the fan ignore all cycle timers, set *CYCLE TIMER* to zero.
Wind O/R Speed And Action	**If you have a wind speed sensor connected to your system (part of a Weather Station), the computer can override the normal operation of the fan. These two settings tell the computer what to do in case of high winds.** **WIND O/R SPEED** sets the wind speed where the wind override should take effect. **WIND O/R ACTION** sets the override action for the louver when the override speed is reached. If *ACTION* is 1, the computer will force the equipment *ON* when the wind speed is higher than the *O/R SPEED* setting. A '0' will force the fan *OFF* at wind speeds above the *O/R SPEED* setting. Use these louver settings in combination with the wind override settings for fans and vents. Override the louver to come on during a windstorm, even if it is not needed for cooling. Override the louvers, shutters, and vents to close at the same time. Running the fan and closing all the air inlet sources creates a slight vacuum that helps hold the covering on the greenhouse. If experience tells you that wind damage occurs at 50 MPH, set the *WIND O/R SPEED* below 50, for example at 45, and the *ACTION* at '0' to force the louver closed in anticipation of trouble. To ignore the override settings and operate the fan strictly according to temperature, set the value of *WIND O/R SPEED* to zero.
GEN	Indicates if the louver is allowed to open and close while the greenhouse is powered from the standby generator. Set *GENERATOR* to 0 if the fan is *not* allowed to operate off a standby generator or to 1 if the fan *is* allowed to operate from a standby generator.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Louver (a) Equipment Settings (Code 8)

This section covers the programming steps for an exhaust fan of any kind.

Sample Exhaust Fan Screen:

```
Zone: 1                        Description: Louver (A) # 1
      2/ 0  = TEMP ON/OFF              = MIN % VENT
         0 = NIGHT SHIFT              = RAIN LCKOUT
      0/ 0 = RH ON/OFF            0  = CYCLE TIMER
      0/ 0 = DAY/NIGHT FROST LOCKOUT
   Type Allowed – Time       45 = WIND O/R SPEED
   0 00:00 Earliest           0 = WIND O/R ACTION
   0 24:00 Latest             1 = GEN  0 = FIRE
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment Settings screen.
- Find the louver on the list of equipment on the display screen, enter the line number to the left of the louver's name, and press **GO**
- Enter # ↓ for **Temp ON** Enter # ↓ for **Temp OFF**
    This example uses 2 and 0. With a cooling setpoint of 70º the louver will open at 72º, 2º above the cooling setpoint. It will close again when the temperature falls to 70º, 2/-2º above the cooling setpoint.
- Enter # ↓ for **NIGHT SHIFT**
    This example uses zero, meaning no night shift, the most typical setting.
- Enter # ↓ # ↓   for **RH ON/OFF**
    This example uses 0/0. This setting disables the humidity response of the louver. It will respond only to temperature.
- Enter # ↓ for # ↓ for **DAY/NITE FROST LOCKOUT**
    This example uses 35 and 40 for these settings. When the outdoor temperature
- falls below 35 º during the day or 40 º at night, the computer will lock out the louver and keep it closed.
- Enter # ↓   # ↓ for **Type Allowed-Time Earliest**
- Sets the earliest time when the louver is allowed to run. This example uses 0 for *Type*, meaning a fixed time each day, and 00:00 for *Allowed-Time*, meaning midnight as the first minute of the day.
- Enter # ↓   # ↓   for **Type Allowed-Time Latest**
    Sets the latest time when the louver is allowed to run. This example uses 0 for Type, meaning a fixed time each day, and 24:00 for Allowed-Time, meaning midnight as the last minute of the day.
- Cursor skips **MIN % VENT** and **RAIN LCKOUT** – It is not applicable for a louver.
- Enter # ↓ for **cycle timer**
    This example uses 0 the default setting. This louver will not be influenced by a cycle timer.
    Entering 1, 2, 3, or 4 allows one of four available cycle timers to force the louver on periodically.
    The four-cycle timers are scheduled using choice '9' from the **<<<Setting Menu>>>**
- Enter # ↓ for **WIND O/R SPEED**
    This example uses 45, meaning that if the wind speed reaches 45, the louver will be forced into its programmed *WIND O/R ACTION* state.
- Enter # ↓ for **WIND O/R ACTION**
    This example uses 0, meaning the louver will be forced closed if the wind speed reaches or exceeds the programmed *WIND O/R SPEED.*
- Enter # ↓ for **GEN**
    This example uses 1 which enables the louver to run on the generator.
- Enter # ↓ for **FIRE**
    This example uses 0, meaning the equipment will turn off in the event of a fire alarm.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Jet Fan (Code 14) Settings Screen

The computer operates jet fans to provide air circulation when the house is closed up, and to distribute warm air from unit heaters. A jet fan will run when unit heaters are on. These settings control the way the jet fan runs for air circulation.

To reach this screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Find the Jet Fan on the list of equipment on the display screen, enter the line number to the left of the fan name, and press **GO**.

   Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

   Sample Jet Fan Setting Screen:

```
Zone: 1                          Description: Jet Fan # 1
  10/ 25 = VENT % ON / OFF       1 = GENERATOR
    0/ 0 = RH ON / OFF           0 = FIRE
       0 = DELAY
     3/ 3 = SOFT START (# times / 10ths sec)
Type Allowed - Time
  0 00:00 Earliest
  0 24:00 Latest
```

Reading the Jet Fan (Code 14) Settings Screen

Zone	Indicates the zone number assigned to this EnviroSTEP**.**
Description	Indicates what equipment is being set - this example Jet Fan #1.
VENT % ON / OFF	Defines the vent position when the jet fan comes on. The jet fan comes on when vents close below the percentage of opening set in *VENT % ON*. The jet fan turns off again when a vent opens farther than the percentage amount set in *VENT % OFF*. The computer looks at all vents in a zone, whether roof, side, or pad vents, and uses the largest opening it finds to compare with the *VENT% ON/OFF* settings.
RH ON / OFF	Defines how the jet fan operates in response to humidity. When RH rises above the ON level, the jet fan will come on and will remain on until RH falls below the OFF level.
Delay	Sets the number of minutes the jet fan must stay on if it comes on. This helps prevent the fan from cycling on and off constantly. Values from 10 to 30 minutes are typical settings.
Soft Start	This setting is provided for jet fans that feed air into a perforated polyethylene tube ("poly tube") that extends down the length of the greenhouse. If a jet fan charges such a tube with air too rapidly, it can pop the tube off its hangers, blow the end closure out of the tube, or otherwise shorten its life. The *Soft Start* settings pulse the jet fan motor in such a way that it fills the poly tube with several puffs of air instead of a single continuous blast. These settings establish the number of puffs to use, and the duration of each. The right setting for *SOFT START* depends on the length of the poly-tube and the size and power of the jet fan. This example uses 3/5, meaning the computer will start and stop the jet fan three times, and that each time it will run the jet fan for five tenths of a second. The computer will pause between puffs for the same time as the puff itself lasts. Three puffs of 0.5 seconds is a typical setting but can adjusted to fill a poly tube with air according to your best judgment. When a poly-tube is not used, settings in soft start should be 0 / 0 to allow the fan to start immediately, with no soft start action.

GEN	Indicates if the equipment can run off of generator power. A setting of '1' enables the equipment to run off the generator '0' prevents the equipment from running off the generator.
Type Allowed-Time, Earliest and Latest	This is a two-part time setting that defines a time period when the jet fan can be disabled. The equipment can only run during the defined hours. This can be useful if a jet fan is mounted above a curtain system. The jet fan can be locked out at night when the shade is closed. The first part of each setting is a Type, meaning what type of time. The choices are 0 or 1. Zero sets a fixed time of day, entered using a 24-hour clock (e.g., 18:00 means the action will start at 6:00 PM). One sets a time of day relative to sunrise or sunset. (For example 30 means 30 minutes after sunrise or sunset). The second part of the setting defines the actual time the jet fan can run. *Earliest* sets the start of the period, and *Latest* sets the end of this period. When Type is 1 (for relative settings) the *Earliest* value is relative to sunrise, and the Latest value is relative to sunset. Growers almost always want to enable jet fans 24 hours a day. When the jet fan is configured, the computer automatically sets both Types to 0, the Earliest Time to 00:00, and the Latest Time to 24:00. These settings let the jet fan run any time it is needed.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing the Jet Fan (Code 14) Settings Screen

Sample Jet Fan Setting Screen:

```
Zone: 1                    Description: Jet Fan # 1
10/ 25 = VENT % ON / OFF        1 = GENERATOR
10/ 5  = RH ON / OFF            0 = FIRE
   30  = DELAY
   3/ 5= SOFT START (# times / 10ths sec)
Type Allowed - Time
  0  00:00 Earliest
  0  24:00 Latest
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Enter **3** then **GO** to select Jet Fan settings.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Vent % On**.   Enter # ↓ for **Vent % Off**.
  This example uses 10/25 meaning the jet fan will run until the vent reaches 25% of opening. It won't come back on until the vent closes below the 10% amount of opening.
- Enter # ↓ for **RH On**.   Enter # ↓ for **RH Off**.
  This example uses 10/5 if we assume the RH setpoint is 80% the fan will turn on when the RH reached 90% or 10 points above 80. The RH OFF setting must be less than RH ON, since the fan reduces humidity. The RH OFF 5 means the fan will stay on for humidity until RH falls back to 85%, five percentage points above the RH setpoint. To disable the jet fan so it does not dehumidify, set both RH ON /OFF at zero and the computer will ignore humidity and operate the equipment on temperature only.
- Enter # ↓ for **Delay**
  This example uses 30 meaning the fan must stay on for 30 minutes if it starts.
- Enter # ↓ for **Soft Start**
  This example uses 3/5, which is a standard setting. The fan will pulse on three times for a duration of 510ths of a second each time before having the fan remain on.
- Enter # ↓ for **Type, Earliest**
  This example uses 0, fixed time.

- Enter # ↓ for **Allowed Time, Earliest**
  This example leaves the default setting 0:00 enabling the jet fan at midnight considered as the first minute of the day.
- Enter # ↓ for **Type, Latest**
  This example uses 0, fixed time.
- Enter # ↓ for **Allowed Time, Latest**
  This example uses the default setting of **24:00,** enabling the jet fan though midnight considered as the last minute of the day.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

HAF (Horizontal Air Flow) Fan (Code 19) Settings Screen

HAF (Horizontal Air Flow) Fans are used to circulate air in the greenhouse and make temperatures throughout the house more uniform. In some species, research suggests that air movement driven by HAF fans flexes the stems of growing plants and stimulates them to become stronger or more rigid. HAF fans have largely replaced jet fans in greenhouse practice. Because jet fans and HAF fans share many of the same uses in the greenhouse, they share a setting screen template in the computer. The screen for the HAF does not implement the soft start settings, as they are only useful with jet fans.

To reach this screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Find the HAF Fan on the list of equipment on the display screen, enter the line number to the left of the fan's name, and press **GO**.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample HAF Fan Setting Screen:

```
Zone: 1 Description: HAF Fan # 1
 10/20 = VENT% ON/OFF                1 = GENERATOR
  0/ 0 = RH ON / OFF                 0 = FIRE
    10 = DELAY
   /   = SOFT START (# times/10ths sec)
 Type Allowed - Time
 0    00:00 Earliest
 0    24:00 Latest
```

Reading the HAF Fan (Code 19) Settings Screen

Zone	Indicates the zone number assigned to this piece of equipment.
Description	Indicates which HAF fan or group of fans these settings control. Usually there will be only one such group, and it will be described, as in the example screen, as HAF Fans #1.
VENT % ON / OFF	Because HAF fans circulate air, the computer turns them on and off according to whether there is any other active source of air circulation in the greenhouse. The program tracks air circulation by monitoring vent position. When the vents are open far enough, there is adequate circulation through the vents themselves, or from exhaust fans that draw air through an open vent. You use these settings to establish when the house is effectively closed up and the HAF Fan is needed. The HAF Fan comes on when vents close below the percentage of opening you set in *VENT % ON*. The HAF Fan turns off when a vent opens farther than the percentage amount you set in *VENT % OFF*. The computer will look at all vents in a zone, whether roof, side, or pad vents, and control the HAF Fans according to the largest opening it finds. Because the vents are closed during heating, the HAF Fans will run when the greenhouse heat is on.

RH ON / OFF	HAF Fans can be used to circulate air due to high humidity. These settings tell the computer how to operate an HAF fan in response to humidity. Both settings describe changes from the RH setpoint for the zone. When RH rises above the *ON* level, the stage will come on. It will remain on until RH falls below the *OFF* level.
Delay	Sets the number of minutes the HAF fan must stay on if it comes on. This helps prevent the fan from cycling on and off constantly. Values from 10 to 30 minutes are typical settings.
Generator	If a detector has been assigned to monitor the generator, the computer can disable individual pieces of equipment while the generator is running. This allows the essential equipment to continue running while dropping any unnecessary equipment helping to ensure the generator has enough capacity to run critical equipment. A setting of '1' enables the equipment to run when the generator is on. A '0' prevents the equipment from running off the generator.
Type Allowed - Time	Defines the hours when the equipment can run. All On/Off cooling equipment can be disabled due to the time of day meaning the equipment runs only during the hours you set. There are two options for setting the time. 0 = fixed time meaning the equipment turns on/off at the same time each day (6:00 AM). Enter time using 24-hour clock. 1 = relative time defined by minutes before/after sunrise. Negative numbers allow equipment to turn on before sunrise.
Earliest/Latest	Defines the hours when the equipment can run. Generally growers want to enable cooling equipment to turn On/Off 24 hours a day. Thus, the computer automatically sets the Earliest Time to 00:00, and the Latest Time to 24:00, enabling equipment to run any time it is needed.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Note: If you have fog / high pressure mist (Code 20 or 40) in the same zone as HAF fans, the EnviroSTEP will shut off the HAF fans while the fog system is on. This prevents the fans from drawing fog into their motors.

Changing the HAF Fan (Code 19) Settings Screen

Sample HAF Fan Setting Screen:

```
Zone: 1  Description: HAF Fans # 1
  10/ 25 = VENT% ON / OFF        1 = GENERATOR
   0/  0 = RH ON / OFF           0 = FIRE
      10 = DELAY
   /     = SOFT START (# times/10ths sec)
  Type Allowed - Time
  0    00:00 Earliest
  0    24:00 Latest
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Find the HAF Fan on the list of equipment on the display screen, enter the line number to the left of the valve's name, and press **GO**.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Vent % On**   Enter # ↓ for **Vent % Off**
    This example uses 10/25 meaning the fan will start to run when the vent is 10% open and the fan will continue to run until the vent is 25% open.
-   Enter # ↓ for **RH On**   Enter # ↓ for **RH Off**

This example uses 0/0 disabling the HAF fan so it does respond to humidity. The computer will use HAF fans according to vent position only.

- Enter # ↓ for **Delay**

  This example uses 10 meaning the fan will stay on for 10 minutes each time it turns on. This is to prevent wear and tear from equipment cycling.

- Computer will skip the Soft Start – it does not apply to HAF fans.

- Enter # ↓ for **Type Earliest**

  This example leaves the default setting of 0, a fixed time.

- Enter # ↓ for **Allowed Time, Earliest**

  This example uses 00:00, or midnight as the first minute of the day.

- Enter # ↓ for **Type, Latest**

  This example leaves the default setting 0, a fixed time.

- Enter # ↓ for **Allowed Time, Latest**

  This example uses 24:00, or midnight as the last minute of the day.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Shutter (Code 27) Settings Screen

The computer uses code 27 to configure a switch and relay to control a motorized shutter or a bank of shutters. Most often, these shutters cover an evaporative pad wall. Other uses include a winter ventilation shutter high in a side or gable wall. Shutters are on/off cooling equipment: they are fully open when turned on, and fully closed when turned off.

To reach the Shutter Setting Screen:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Setting selection screen.
- Find the shutter on the list of equipment on the display screen.
- Enter the line number to the left of the shutter name, and press **GO**.

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

  Sample Shutter Setting Screen:

```
Zone: 1                      Description: Shutter # 1
     2/ -1 = TEMP ON/OFF             = MIN % VENT
         0 = NIGHT SHIFT             = RAIN LCKOUT
      0/ 0 = RH ON/OFF           0 = CYCLE TIMER
      0/ 0 = D/N FROST           0 = CO2
    Type Allowed – Time     0 = WIND O/R SPEED
    0 00:00 Earliest         0 = WIND O/R ACTION
    0 24:00 Latest           1 = GEN?  0 = FIRE
```

Reading the Shutter Settings Screen (Code 27)

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is shown – in this example, Shutter #1.
Temp ON/	Determines when the shutter turns on based on degrees from the cooling setpoint. In this example, the shutter will turn on when it is 2º above the cooling setpoint of 65º, meaning it will turn on at 67º. Generally shutters are set to come on at or above the cooling setpoint: typical settings are 0, 2, 4, etc. Note that for cooling equipment, the computer requires TEMP ON to be greater than TEMP OFF because cooling lowers the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.

Temp OFF	Determines when the cooling turns off based on degrees from the cooling setpoint. In this example, the cooling will turn off at 0, meaning the cooling will turn off at setpoint, which is 65. Generally shutters are set to turn off at or above the cooling setpoint. Typical settings are 0, 1, 2. Note that for cooling equipment, the computer requires TEMP OFF to be less than TEMP ON because cooling lowers the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Night Shift	Adjusts the On/Off temperature for night. Night setpoint temperatures can be raised or lowered using the Night Shift option. Night shift should almost always be set to zero. It can be used to compensate for the effect of the daytime fogging or irrigation on soil temperature sensors.

RH ON/OFF	Determines how the shutter responds to humidity based on the RH setpoints. The shutter can be programmed to help dehumidify. When the RH rises above the ON level, the stage will come on and remain on until RH falls below the OFF level. If you don't want the shutter to run because of humidity, set these values to 0/0. Note that the computer RH ON to be greater than RH OFF, because cooling lowers the greenhouse humidity.
Day/Nite Frost Lockout	These settings lock out the shutter based on outdoor temperature. When the outdoor temperature falls below the day setting during the day, or the night setting during the night, the computer will shut off the shutter. In general, day settings at or below freezing are appropriate, while night settings several degrees above freezing prevent the shutter from icing open.
Type Allowed - Time	All On/Off equipment can be disabled due to the time of day, that is, the equipment runs only during set hours. **Type** and **Allowed-Time** are column headings for a table that defines the hours when the equipment can run. Type sets the way the computer interprets your time settings, while Allowed-Time is where you enter the actual times of day. You may set Type to 0 or 1. 0 = fixed time meaning the equipment turns On/Off at the same time each day (for example, 6:00 AM). Enter time using 24-hour clock. 1 = relative time defined by minutes before/after sunrise. Negative numbers allow equipment to turn on before sunrise. –30 means 30 minutes before sunrise.
Earliest/Latest	Earliest and Latest are the row titles for the time-of-day settings. Type and Allowed time in the Earliest row set the start of the time when the shutter is allowed to cool. These same settings in the Latest row set the end of the time when the shutter can cool. Time is entered using the 24-hour clock for Type 0, fixed time or using +/- minutes to specify time before or after sunrise. For Type=1, Earliest Allowed-Time is relative to sunrise, and Latest Allowed-Time is relative to sunset. Generally growers enable shutter to cool as needed 24 hours a day. The computer automatically sets the Type and Earliest Allowed-Time to 0 and 00:00, and the Type and Latest Allowed-Time to 24:00, enabling shutter to cool any time it is needed.
Min % Vent	The cursor skips over this section as it does not apply to shutters.
RAIN LCKOUT	The cursor skips over this section as it does not apply to shutters.
Cycle Timer	This setting allows you to link the operation of the equipment to any of four built-in cycle timers. The computer runs these timers just like an electromechanical time clock with pegs to set 'On' time and 'Off' times. When you link a piece of equipment to a cycle timer, the equipment turns on when the cycle timer is on, regardless of its other settings. When the cycle timer turns off, so does the equipment, unless any of its climate control settings still require it to be on. A setting of 0 ignores all cycle timers. A setting of 1,2,3 or 4 links the equipment to the timer with that number. The settings for the timers themselves are found under item **9** of the **<<<Setting Menu>>>**.
Wind O/R Speed	Sets a wind speed at which the shutter is forced on or off. Set to 0 (disabled) for normal operation.
Wind O/R Action	Forces the shutter on when set to 1, or off when set to 0 if the WIND O/R Speed is not set to 0, and the wind speed exceeds WIND O/R Speed setting. Set 0 as an action to close the shutter during high winds.
GEN	Indicates if the shutter is authorized to run on generator power. 0 means the equipment is NOT allowed. 1 means the equipment is allowed to operate off a standby generator. This allows the computer to do "load shedding".

FIRE	Setting FIRE to 0 forces the shutter OFF in the event of a fire alarm. Setting FIRE to 1 forces the shutter ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Shutter Equipment Settings (Code 27)

Sample Shutter Screen:

```
Zone: 1                 Description: Shutter #1
  4 / 2 =  Temp ON / OFF        =  MIN %  VENT
      0 =  NIGHT SHIFT         0 =  CYCLE TIMER
 0 /  0 =  RH  ON / OFF           =  MIN Minutes
 32/40 =  DAY / NITE  FROST  LOCKOUT
Type Allowed - Time           45 =  WIND O/R SPEED
 0    00:00  Earliest           0 =  WIND O/R ACTION
 0    24:00  Latest             1 =  GEN   0 = FIRE
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment Settings screen.
- Find the shutter on the list of equipment on the display screen, enter the line number to the left of the shutter's name, and press **GO**
- Enter # ↓ for **Temp ON** Enter # ↓ for **Temp OFF**
  This example uses 4 and 2. With a cooling setpoint of 70º the shutter will open at 74º, 4º above the cooling setpoint. It will close again when the temperature falls to 72º, 2º above the cooling setpoint.
- Enter # ↓ for **NIGHT SHIFT**
  This example uses zero, meaning no night shift, the most typical setting.
- Enter # ↓ # ↓ for **RH ON/OFF**
  This example uses 0/0. This setting disables the humidity response of the shutter. It will respond only to temperature.
- Enter # ↓ for # ↓ for **DAY/NITE FROST LOCKOUT**
  This example uses 32 and 40 for these settings. When the outdoor temperature falls below 32 º during the day or 40 º at night, the computer will lock out the shutter.
- Enter # ↓   # ↓ for **Type Allowed-Time Earliest**
- Sets the earliest time when the shutter is allowed to run. This example uses 0 for *Type*, meaning a fixed time each day, and 00:00 for *Allowed-Time*, meaning midnight as the first minute of the day.
- Enter # ↓   # ↓   for **Type Allowed-Time Latest**
  Sets the latest time when the shutter is allowed to run. This example uses 0 for Type, meaning a fixed time each day, and 24:00 for Allowed-Time, meaning midnight as the last minute of the day.
- Cursor skips **MIN Minutes** and **RAIN LCKOUT** – It is not applicable for a shutter.
- Enter # ↓ for **CYCLE TIMER**
  This example uses 0 the default setting. This shutter will not be influenced by a cycle timer. Entering 1, 2, 3, or 4 allows one of four available cycle timers to force the shutter on periodically. The four-cycle timers are scheduled using choice '9' from the **<<<Setting Menu>>>**
- Enter # ↓ for **WIND O/R SPEED**
  This example uses 45, meaning that if the wind speed reaches 45, the shutter will be forced into its programmed *WIND O/R ACTION* state.
- Enter # ↓ for **WIND O/R ACTION**
  This example uses 0, meaning the shutter will be forced closed if the wind speed reaches or exceeds the 45 MPH programmed in *WIND O/R SPEED.*
- Enter # ↓ for **GENERATOR?**
  This example uses 1 which enables the shutter to run on the generator.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Vent (Non-proportional) (Code 30) Settings Screen

Vent is for controlling a vent control system in full open/full close only mode. Unlike roof and side vents, which use two output switches to allow proportional positioning, this code uses only one switch and does not offer proportioning. This screen is identical to the one used for setting up an exhaust fan, except that no settings are made under MIN % VENT and MAX WIND. To reach the Vent Screen:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then GO to reach the **<<<Setting Menu>>>**
- Find the vent on the list of equipment on the display screen.
- Enter the line number to the left of the vent name, and press **GO**.

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Vent (Non-proportional) Setting Screen:

```
Zone: 1            Description: Vent # 1
        2/ -1 = TEMP ON / OFF      = MIN % VENT
        0 = NIGHT SHIFT            = RAIN LCKOUT
        0/ 0 = RH ON / OFF      0 = CYCLE TIMER
        0/ 0 = D / N FROST      0 = CO2
        Type Allowed - Time    45 = WIND O / R SPEED
        0 00:00 Earliest        1 = WIND O / R ACTION
        0 24:00 Latest          0 = GEN   0 = FIRE
```

Reading the Vent (Non-proportional) (Code 30) Settings Screen

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	A confirmation that this setting screen is for an output/switch configured as a vent. The computer fills this in automatically for your reference.
TEMP ON/OFF	Sets the number of degrees difference from the cooling setpoint where this vent opens and closes. ON and OFF may be positive or negative numbers, but ON must be greater than or equal to OFF. In this example, the vent opens whenever the temperature in the greenhouse is 2º above the cooling setpoint and closes when the temperature is 1º below the cooling setpoint. Vent settings should coordinate with any fans that need to draw air through the vent. If there are such fans, set ON for the vent to a value the same as, or smaller than, the ON setting for the first fan that turns on.
NIGHT SHIFT	The value in this setting optionally adjusts the On/Off settings at night. When the computer is maintaining the night setpoint regime according to the day/night schedule you have established, the program adds *NIGHT SHIFT* to *both* the *TEMP ON* and *TEMP OFF* settings. Temperatures can be raised or lowered. The NIGHT SHIFT allows a shift further from or closer to the cooling setpoint. Typically this is left at zero – disabled.
RH ON/OFF	When RH rises above the *ON* level, the vent will open. It will remain open until RH falls below the *OFF* level. To set this vent to ignore humidity and operate only due to temperature, set *RH ON/OFF* to 0/0.
DAY/NITE FROST LOCKOUT	If you have an outdoor temperature sensor (part of a Weather Station), you can lock out a non-proportional vent according to the temperature outside. Be sure to use frost lockout settings cold enough to permit ventilation on bright winter days. The setting to the left of the slash mark sets the lowest outdoor temperature where the vent is allowed to open during the day. The setting to the right of the slash mark sets the lowest outdoor temperature where the vent can open at night. The night setting is typically above freezing while the day setting may be above or below freezing.
Type Allowed-Time	Defines the hours when the fan can run. *Type* defines how the computer interprets *Allowed-Time,* while the value in *Allowed-Time* sets the time itself. There are two pairs of

	Type, Allowed-Time settings. These are marked "Earliest" and "Latest." Together, they define the beginning (*Earliest)* and end (*Latest)* of the range of times when this fan is allowed to operate. There are two options for *Type*. A *Type* of 0 sets a fixed time according to a 24-hour clock. A *Type* of 1 sets a relative time that varies each day according to the time of sunrise for *Earliest* and sunset for *Latest.* A relative time is an offset in minutes from the time of sunrise or sunset. Positive relative times (30, 60, 90) set times *after* sunrise or sunset. Negative relative times (-30, -60, -90) set times *before* sunrise or sunset. Generally, you will want to enable a vent to open 24 hours a day, as needed for temperature or humidity control. As shipped, the computer automatically sets the Earliest *Type* and *Allowed-Time* to 0 and 00:00, and the Latest *Type* and *Allowed-Time* to 24:00, enabling equipment to run twenty-four hours a day.
MIN % VENT and **RAIN LCKOUT**	This setting is not applicable to a non-proportional vent. The computer will not display a number and you cannot enter one here.
CYCLE TIMER	Associates the vent with one of four available cycle timers. To let a timer influence a vent, enter the number of the cycle timer (1 – 4) here. When associated with a cycle timer, the fan will turn on when the cycle timer is in an 'On' period. When the cycle timer returns to an 'Off' period, the fan will shut off again, unless temperature or humidity settings require it to be open. This type of cycling can be used to force the vent to admit some fresh air, even when temperature and humidity settings are satisfied. Forced ventilation can be a useful approach to dehumidifying a very wet house. To make the vent ignore all cycle timers, set *CYCLE TIMER* to zero.

Wind O/R Speed And Action	If you have a wind speed sensor connected to your system (part of a Weather Station), the computer can override the normal operation of the vent. These two settings tell the computer what to do in case of high winds**.** A non-proportional vent uses these settings instead of the wind speed protection limits established under choice 5 (Limits) of the Settings Menu.
	
	   WIND O/R SPEED – sets the wind speed where the wind override should take effect**.**
	
	   WIND O/R ACTION – sets the override action for the vent when the override speed is reached. If ACTION is '1', the computer will force the vent to open when the wind speed is higher than the O/R SPEED setting. A '0' will force the vent to close at wind speeds above the O/R SPEED setting.
	
	 Use these vent settings in combination with the wind override settings for exhaust fans. Override the vent to close during a windstorm, even if it is needed for cooling. Override the exhaust fans to come on at the same time. Running the fan and closing all the air inlet sources creates a slight vacuum that helps hold the covering on the greenhouse. If experience tells you that wind damage occurs at 50 MPH, set the WIND O/R SPEED below 50, for example at 45, and the ACTION at '0' to force the vent closed in anticipation of trouble. To ignore the override settings and operate the vent strictly according to temperature, set the value of WIND O/R SPEED to zero.

GEN	Indicates if the vent is allowed to run on the standby generator to maintain zone setpoints. Set *GENERATOR* to 0 if the vent is *not* allowed to operate off a standby generator or to 1 if the vent *is* allowed to operate off a standby generator.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Vent (Non-proportional) (Code 30) Settings

To reach the vent (non-proportional) Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Find the vent on the list of equipment on the display screen.
- Enter the line number to the left of the vent name, and press **GO**.

   Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

   Sample Vent (Non-proportional) Setting Screen:

```
Zone: 1            Description: Vent # 1
      2/ -1 = TEMP ON / OFF          = MIN % VENT
          0 = NIGHT SHIFT            = RAIN LCKOUT
      0/ 0 = RH ON / OFF           0 = CYCLE TIMER
      0/ 0 = DAY / NITE FROST LOCKOUT
      Type Allowed - Time         45 = WIND O / R SPEED
      0     00:00 Earliest          1 = WIND O / R ACTION
      0     24:00 Latest            1 = GEN  0 = FIRE
```

- Enter # ↓ for **Temp ON**   Enter # ↓ for **Temp OFF**
     This example uses 2/-1 meaning the vent opens whenever the temperature in the greenhouse is 2º above the cooling setpoint and it closes when the temperature is 1º below the cooling setpoint.
- Enter # ↓ for **Night Shift**
     This example uses 0 disabling night shift, leaving on/off settings the same day/night.
- Enter # ↓ for **RH ON** Enter # ↓ for **RH OFF**
     This example uses 0/0 deactivating RH.
- Enter # ↓ for **Day**   Enter # ↓ for **Nite Frost Lockout**
     This example uses 0/0 deactivating Frost Lockout.
-   Enter # ↓   # ↓ for **Type Allowed-Time Earliest**
     Sets the earliest time when the vent is allowed to open. This example uses 0 for *Type*, meaning a fixed time on a 24-hour clock, and 00:00 for *Allowed-Time*, meaning midnight as the last minute of the day.
-   Enter # ↓   # ↓   for **Type Allowed-Time Latest**
     Sets the latest time when the vent is allowed to open. This example uses 0 for *Type*, meaning a fixed time on a 24-hour clock, and 24:00 for *Allowed-Time*, meaning midnight as the last minute of the day.
- Cursor skips **MIN % VENT** and **RAIN LOCKOUT** because it does not apply to a non-proportional vent.
- Enter # ↓   for cycle timer is this measured in minutes.
     This example uses 0 deactivating the cycle timer function.
- Enter # ↓   for **Wind O/R Speed**
     This example uses 45 meaning the equipment will be forced on when the wind speed is higher than 45mph
- Enter # ↓ for **Wind O/R Action**
     This example uses 1 meaning the equipment will be forced on when the wind speed is higher than the SPEED setting
- Enter # ↓ **GEN** (0 = No, 1 = Yes)
     This example uses 1 meaning the vent will open and close when the greenhouse is on generator power.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Louver (b) (Code 31)

There are two louver programs: one called (a), and the other, (b). Louver (a) (Code 8) opens between the On and Off temperatures, and closes if it is either warmer or cooler. This allows you to open it for first stage ventilation, but close it for later stages. This is not always the most satisfactory way to operate a louver, so the program provides logic for a second type of louver called "Louver (b)" that opens and closes according to the number of exhaust fans in operation.

To reach the Louver (b) Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**.
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Settings selection screen.
- Find the louver on the list of equipment on the display screen, enter the line number to the left of the louvers name, and press **GO**.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Louver (b) Setting Screen:

```
Zone: 1          Description: Louver (B) #1

   1 = OPEN WITH THIS FAN/PAD STAGE
   2 = CLOSE WITH THIS FAN/PAD STAGE
  30 = WIND O/R SPEED
   0 = WIND O/R ACTION
   1 = GENERATOR?
   0 = FIRE
```

Reading Louver (b) (Code 31) Settings

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	A confirmation that this setting screen is for an output/switch configured as a vent. The computer fills this in automatically for your reference.
OPEN WITH THIS FAN/PAD STAGE	Identifies the fan stage when the louver opens. Typically, this is 1, the first fan stage.
CLOSE WITH THIS FAN/PAD STAGE	Sets the fan stage where the louver re-closes to force all outside air to enter through a vent. This setting is usually 2, meaning the second fan stage, but may be a higher number. If your greenhouse uses louvers mounted high in the gable or sidewall (above a pad vent, for example), you may prefer to use a higher "CLOSE WITH" fan stage number in winter so that your cold weather ventilation relies mainly on the louvers.

WIND O/R	If you have a wind speed sensor connected to your system (part of a Weather Station), the computer can override the normal operation of the vent. These two settings tell the computer what to do in case of high winds**.** A non-proportional vent uses these settings instead of the wind speed protection limits established under choice 5 (Limits) of the Settings Menu. **WIND O/R SPEED** – sets the wind speed where the wind override should take effect**.** **WIND O/R ACTION** – sets the override action for the louver when the override speed is reached. If ACTION is '1', the computer will force the vent to open when the wind speed is higher than the O/R SPEED setting. A '0' will force the louver to close at wind speeds above the O/R SPEED setting.

	Use these Louver (b) settings in combination with the wind override settings for an exhaust fan. Override the fan to come on during a windstorm, even if it's not needed for cooling. Override the louver(s) to close at the same time. Running the fan and closing the louver(s) creates a slight vacuum that helps hold the covering on the greenhouse. If experience tells you that wind damage occurs at 50 MPH, set the *WIND O/R SPEED* below 50, for example at 45, and the *ACTION* at '0' to force the louver closed in anticipation of trouble. To ignore the override settings and operate the louver strictly according to temperature, set the value of *WIND O/R SPEED* to zero.
GEN	Indicates if the vent is allowed to run on the standby generator to maintain zone setpoints. Set *GENERATOR* to 0 if the vent is *not* allowed to operate off a standby generator or to 1 if the vent *is* allowed to operate off a standby generator.
FIRE	Setting FIRE to 0 forces the equipment OFF in the event of a fire alarm. Setting FIRE to 1 forces the equipment ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Louver (b) (Code 31) Settings

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Find the vent on the list of equipment on the display screen.
- Enter the line number to the left of the vent, and press **GO**.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Vent (Non-proportional) Setting Screen:

```
Zone: 1          Description: Louver (B) #1

    1 = OPEN WITH THIS FAN/PAD STAGE
    2 = CLOSE WITH THIS FAN/PAD STAGE
   30 = WIND O/R SPEED
    0 = WIND O/R ACTION
    1 = GENERATOR?
    0 = FIRE
```
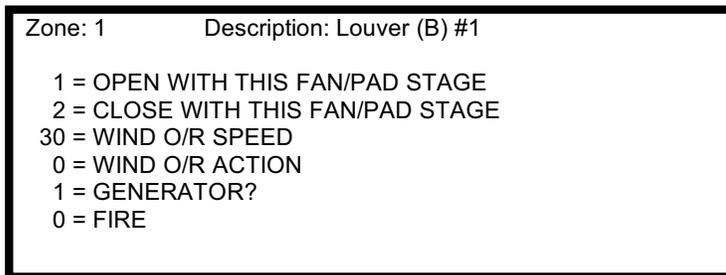
- Enter # ↓ for **OPEN WITH THIS FAN/PAD STAGE**
  This example uses 1 meaning the louver will open when fan stage 1 turns on.
- Enter # ↓ for **CLOSE WITH THIS FAN/PAD STAGE**
  This example uses 2 meaning the louver will close when fan stage 2 turns on.
- Enter # ↓ for **Wind O/R Speed**

  This example uses 30 meaning the louver will perform its assigned wind-speed override action when the wind speed is higher than 30.
- Enter # ↓ for **Wind O/R Action**
  This example uses 0 meaning the louver's assigned wind-speed override action is to shut off and close when the wind speed is higher than the WIND O/R SPEED setting
- Enter # ↓ **Generator?** (0 = No, 1 = Yes)
  This example uses 1 meaning the louver is allowed to operate from the standby generator.
- Enter # ↓ **Fire** (0 = No, 1 = Yes)
  This example uses 0 which means the equipment will turn off in the event of a fire alarm.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Cooler (Code 36) Settings Screen

Cooler (Code 36) is used for walk-in bulb coolers and refrigerated air conditioning units. It provides the same settings and control actions as an exhaust fan, but is identified as "Cooler" in order to make the EnviroSTEPs report and setting screens easier to interpret.

To reach the cooler Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Setting selection screen.
- Find the fan on the list of equipment on the display screen.
- Enter the line number to the left of the cooler name, and press **GO**.

    Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

    Sample Shutter Setting Screen:

```
Zone: 1                     Description: Cooler # 1
 2/ -1 = TEMP ON/OFF            = MIN % VENT
    0 = NIGHT SHIFT              = RAIN LCKOUT
  0/ 0 = RH ON/OFF          0  = CYCLE TIMER
  0/ 0 = D/N FROST          0 = CO2
Type Allowed – Time         0 = WIND O/R SPEED
0 00:00 Earliest            0 = WIND O/R ACTION
0 24:00 Latest              1 = GEN?  0 = FIRE
```

Reading the Cooler Settings Screen (Code 36)

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is shown – in this example, Cooler #1.
Temp ON	Determines when the cooler turns on based on degrees from the cooling setpoint. In this example, the cooler will turn on when it is 2º above the cooling setpoint of 65º, meaning it will turn on at 63º. Generally coolers are set to come on at or above the cooling setpoint: typical settings are 0, 2, 4, etc. Note that for cooling equipment, the computer requires TEMP ON to be greater than TEMP OFF because cooling lowers the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Temp OFF	Determines when the cooling turns off based on degrees from the cooling setpoint. In this example, the cooling will turn off at 0, meaning the cooling will turn off at setpoint, which is 65. Generally coolers are set to turn off at or above the cooling setpoint. Typical settings are 0, 1, 2. Note that for cooling equipment, the computer requires TEMP OFF to be less than TEMP ON because cooling lowers the greenhouse temperature. The program will reverse your settings if you enter them incorrectly. If it allowed them to be to be wrong, the conditions would never cause it to shut the equipment off.
Night Shift	Adjusts the On/Off temperature for night. Night setpoint temperatures can be raised or lowered using the Night Shift option. Night shift should almost always be set to zero. It can be used to compensate for the effect of the daytime fogging or irrigation on soil temperature sensors.
RH ON/OFF	Determines how the cooler responds to humidity based on the RH setpoints. The cooler can be programmed to help dehumidify. When the RH rises above the ON level, the stage will come on and remain on until RH falls below the OFF level. If you don't want the cooler to run because of humidity, set these values to 0/0. Note that the computer RH ON to be greater than RH OFF, because cooling lowers the greenhouse humidity.
Day/Nite Frost Lockout	These settings lock out the cooler or air conditioner based on outdoor temperature. When the outdoor temperature falls below the day setting during the day, or the night setting during the night, the computer will shut off the cooler. In general, disable these settings by entering values of 0/0 for proper operation of the cooler.

Type Allowed - Time	All On/Off equipment can be disabled due to the time of day, that is, the equipment runs only during set hours. **Type** and **Allowed-Time** are column headings for a table that defines the hours when the equipment can run. Type sets the way the computer interprets your time settings, while Allowed-Time is where you enter the actual times of day. You may set Type to 0 or 1. 0 = fixed time meaning the equipment turns On/Off at the same time each day (for example, 6:00 AM). Enter time using 24-hour clock. 1 = relative time defined by minutes before/after sunrise. Negative numbers allow equipment to turn on before sunrise. –30 means 30 minutes before sunrise.
Earliest/Latest	Earliest and Latest are the row titles for the time-of-day settings. Type and Allowed time in the Earliest row set the start of the time when the cooler is allowed to cool. These same settings in the Latest row set the end of the time when the cooler can cool. Time is entered using the 24-hour clock for Type 0, fixed time or using +/- minutes to specify time before or after sunrise. For Type=1, Earliest Allowed-Time is relative to sunrise, and Latest Allowed-Time is relative to sunset. Generally growers enable cooler to cool as needed 24 hours a day. The computer automatically sets the Type and Earliest Allowed-Time to 0 and 00:00, and the Type and Latest Allowed-Time to 24:00, enabling cooler to cool any time it is needed.
Min % Vent and RAIN LCKOUT	The cursor skips over this section as it does not apply to coolers.
CYCLE TIMER	The cursor skips over this section as it does not apply to coolers.
MIN Minutes	Sets the minimum number of minutes the cooler must run each time it turns on. Set to 0 for normal operation.
Wind O/R Speed	Sets a wind speed at which the cooler is forced on or off. Set to 0 (disabled) for normal operation.
Wind O/R Action	Forces the cooler on when set to 1, or off when set to 0 if the WIND O/R Speed is not set to 0, and the wind speed exceeds WIND O/R Speed setting.
GEN	Indicates if the cooler is authorized to run on generator power. 0 means the equipment is NOT allowed. 1 means the equipment is allowed to operate off a standby generator. This allows the computer to do "load shedding".
FIRE	Setting FIRE to 0 forces the cooler OFF in the event of a fire alarm. Setting FIRE to 1 forces the cooler ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Cooler Equipment Settings (Code 36)

Sample Cooler Screen:

```
Zone: 1                    Description:Cooler #1
   4 / 2 =  Temp ON / OFF          =  MIN %  VENT
       0 =  NIGHT SHIFT        0 =  CYCLE TIMER
   0 /  0 =  RH  ON / OFF       =  MIN Minutes
   0 /  0 =  DAY / NITE  FROST  LOCKOUT
Type Allowed - Time        0 =  WIND O/R SPEED
0     00:00  Earliest        0 =  WIND O/R ACTION
0     24:00  Latest          1 =  GEN   0 =  FIRE
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment Settings screen.
- Find the cooler on the list of equipment on the display screen, enter the line number to the left of the coolers name, and press **GO**
- Enter # ↓ for **Temp ON** Enter # ↓ for **Temp OFF**

This example uses 4 and 2. With a cooling setpoint of 70º the fan will turn off at 74º, 4º above the cooling setpoint. It will turn off again when the temperature falls to 72º, 2º above the cooling setpoint.

- Enter # ↓ for **NIGHT SHIFT**
  This example uses zero, meaning no night shift, the most typical setting.
- Enter # ↓ # ↓   for **RH ON/OFF**
  This example uses 0/0. This setting disables the humidity response of the fan. It will respond only to temperature.
- Enter # ↓ for # ↓ for **DAY/NITE FROST LOCKOUT**
  This example uses 0 and 0 for these settings. The cooler will ignore the outdoor temperature.
- Enter # ↓   # ↓ for **Type Allowed-Time Earliest**
- Sets the earliest time when the fan is allowed to run. This example uses 0 for *Type*, meaning a fixed time each day, and 00:00 for *Allowed-Time*, meaning midnight as the first minute of the day.
- Enter # ↓   # ↓   for **Type Allowed-Time Latest**
  Sets the latest time when the fan is allowed to run. This example uses 0 for Type, meaning a fixed time each day, and 24:00 for Allowed-Time, meaning midnight as the last minute of the day.
- Cursor skips **MIN % Vent** and **RAIN LCKOUT** – It is not applicable for a cooler.
- Cursor skips **CYCLE TIMER** – it does not apply to a cooler.
- Cursor skips **MIN Minutes** – It is not applicable for a fan.
- Enter # ↓ for **WIND O/R SPEED**
  This example uses 0, meaning that the cooler will ignore wind speed.
- Enter # ↓ for **WIND O/R ACTION**
  This example uses 0, meaning that the cooler will ignore wind speed.
- Enter # ↓ for **GEN**
  This example uses 1 which enables the cooler to run on the generator.
- Enter # ↓ for **FIRE**
  This example uses 0, meaning that the cooler will shut off in case of a fire alarm.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Hall Vent(Code 60) Settings Screen

The hall vent operates on outdoor temperature and sun readings rather than zone temperatures. This code is typically used in greenhouses that have a center aisle between houses to keep the temperature comfortable.

To reach the cooler Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment Setting selection screen.
- Find the hall vent on the list of equipment on the display screen.
- Enter the line number to the left of the hall vent name, and press **GO**.

Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Hall Vent Setting Screen:

```
Zone: 1                      Description: Hall Vent  #1
40/60   = Temp Range           0 = IDLE Minutes
10/   20 = Sun Range           0 = FIRE O/R
                               0  = CYCLE TIMER
 180 = Seconds to open 100%
   6 = Seconds to control box delay
```

Reading the Hall Vent Settings (Code 60)

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is shown – in this example, Hall Vent # 1.
Temp Range	Sets the outside temperature range for the hall vent to open and close. Above the open limit, the vent will be fully open. In between and the vent will modulate proportionally.
Sun Range	Range for open and close of vent based on sun current conditions. Vent will operate proportionally within the range that is set. Sun range and temperature range will work together to operate the vent. For instance, given 40/60 for outdoor temp open/close if the outdoor temperature was 50 degrees and outdoor sun was 5mW, the vent would be 50% open. Should the outdoor temperature raise to 55 the vent would move to 75%. If the outdoor sun jumps to 25mW the vent would open fully.
IDLE Minutes	The time between vent movements. With a zero, there will be no delay between vent movements. With a number such as 5, the Vent will first check if 5 minutes has passed before opening further.
Fire O/R	Setting FIRE to 0 forces the vent closed in the event of a fire alarm. Setting FIRE to 1 forces the vent fully open in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Cycle Timer	Associates the vent with one of four available cycle timers. To let a timer influence a vent, enter the number of the cycle timer (1 – 4) here. When associated with a cycle timer, the vent will open when the cycle timer is in an 'On' period. When the cycle timer returns to an 'Off' period, the vent will shut again, unless outside temperature or sun levels require it to be open. This type of cycling can be used to force the vent to admit some fresh air, even when temperature and sun settings are satisfied. Forced ventilation can be a useful approach to dehumidifying a very wet house. To make the vent ignore all cycle timers, set *CYCLE TIMER* to zero.

Seconds to open 100 %	The number of seconds it takes the vent to go from fully closed to fully open.
Seconds control box delay	The number of seconds before the relay is activated. When using Wadsworth control panels this number will always be 6.

Changing Hall Vent Equipment Settings (Code 60)

Sample Cooler Screen:

```
Zone: 1                     Description: Hall Vent  #1
40/60   = Temp Range             0 = IDLE Minutes
10/   20 = Sun Range             0 = FIRE O/R
                                 0  = CYCLE TIMER

 180 = Seconds to open 100%
   6 = Seconds to control box delay
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment Settings screen.
- Find the hall vent on the list of equipment on the display screen, enter the line number to the left of the hall vent name, and press **GO**
- Enter # ↓ for **Temp Range On** Enter # ↓ for **Temp Range OFF**
  This example uses 40 and 60. For instance, given 40/60 for outdoor temp open/close if the outdoor temperature was 50 degrees and outdoor sun was 5mW, the vent would be 50% open. Should the outdoor temperature raise to 55 the vent would move to 75%. If the outdoor sun jumps to 25mW the vent would open fully.
- Enter # ↓ for **Sun Range**
  This example uses 10/20, meaning the vent would close if the mW reading falls below 10mW and will open 100% if the mW reading is above 20.
- Enter # ↓ # ↓   for **Seconds to open 100%**
  This example uses 180. This number will be different for each vent and should be timed using a watch or stop watch. Time must be converted to seconds when entered.
- Enter # ↓ for # ↓ for **Seconds to control box delay.**
  This example uses 6 for this setting as a Wadsworth time delay device is in use.
- Enter # ↓   # ↓   for **IDLE Minutes**
  Increase idle time if the hall vent cycles open or closed too often.
- Enter # ↓   # ↓   for **Fire 0/R**
  This example uses 0, meaning that the vent will shut close in case of a fire alarm.
- Enter **CYCLE TIMER** if you choose to use one. If not, leave at 0.

Other Controlled Equipment

CO$_2$ Settings Screen (Code 15)

The computer can control CO$_2$ injectors with or without a CO$_2$ sensor. When a CO$_2$ sensor is present, the computer controls the actual concentration of CO$_2$ in the greenhouse air according to the settings. When a sensor is not available the computer obeys all the settings that control fan overrides and time-of-day scheduling for injection.

The CO$_2$ program follows a schedule that breaks the day into four periods. Each period has a parts-per-million (PPM) concentration setpoint. Each of the four periods begins at the set starting time, and lasts until the next period begins.

The computer can turn off CO$_2$ injection when fans are running or when the vents are open. For CO$_2$ systems based on natural gas burners, the computer can control the injector as a backup heater. If the greenhouse cannot hold the set temperature, the computer will run the CO$_2$ burner. When burners are used for backup heat, they run even if they would normally be locked out because of the time of day.

To reach this screen:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment screen.
- Enter **3** then **GO** to select CO$_2$ #1 settings.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample CO$_2$ Settings Screen:

```
Zone:  1 Description:    CO2 # 1
        Per     Clk     Starts    PPM          Default     = 300
       [ 1 ]     1         0     1000         PPM Band     = 50
       [ 2 ]     0      10:00     650        Max % Vent    = 10
       [ 3 ]     0      15:00     400        Max # Fans    = 0
       [ 4 ]     2         0      300         Temp ON      = 0
                                              Temp OFF     = 0
```

Reading the CO$_2$ Settings Screen (Code 15)

Zone	Indicates what zone the injector is assigned.
Description	Indicates what equipment is shown. In this example CO$_2$ #1.
Per	Indicates the period: there are 4 periods.
"Clk" – Short for "Clock-Type"	Indicates the way time is being measured. There are 3 options: 1. Clock '0' uses a fixed time, using a 24-hour clock; the period begins at the same time each day. 2. Clock '1' uses relative time, based on the number of minutes before or after sunrise; the period begins relative to the time the sun rises. 3. Clock '2' uses relative time, based on the number of minutes before or after sunset. The period begins relative to the time the sun sets. In the example screen, period 1 begins at sunrise and lasts until the start of period 2 at 10:00 AM. Period 2 continues until the start of period 3 at 3:00 PM. Period three lasts from 3:00 PM

	until sunset, when period 4 goes into effect and continues until the next period 1 start at sunrise the following morning.
PPM	Sets the CO_2 concentration for each period.
Starts	Indicates the time when the period begins, using either minutes before or after sunrise/sunset or time using the 24-hour clock.
PPM	Sets the CO_2 concentration for each period in parts per million.
Default	Specifies the CO_2 concentration in PPM that the program should use if vent opening or exhaust fans exceed set limits for injection.

Since the EnviroSTEP computer does not check the validity of these time settings, you must observe the following precautions:

- **Each time period must start later than the period before, i.e. period 2 must begin after period 1.**
- **Each time period must use a different starting time, and all four periods must be used. If you need less than four different PPM settings, assign the same settings to multiple periods. To leave the CO_2 injection off, set PPM during that period to zero.**
- **The PPM settings for period 4 remain in effect until period 1 begins.**

Sample CO_2 Settings Screen:

```
Zone:  1 Description:   CO2 # 1
          Per    Clk      Starts   PPM        Default    = 300
          [ 1 ]    1          0    1000     PPM Band     = 50
          [ 2 ]    0       10:00    650     Max % Vent   = 10
          [ 3 ]    0       15:00    400     Max # Fans   = 1
          [ 4 ]    2          0     300      Temp ON     = 0
                                             Temp OFF    = 0
                                            Min ON Time  = 0
```

PPM Band	Indicates the PPM setting required to start the injection system. When the injector system has returned the CO_2 concentration to the PPM setting, the computer will shut it off.
Max % Vent	Indicates the maximum amount in percentage the vent can open before the program returns to the default setting.
Max # Fans	Sets the number of exhaust fan stages allowed before the program returns to the default setting.
Temp ON, Temp OFF	Controls the use of the injection system as backup heat. If burners are used to vent CO_2 into the greenhouse, these settings can turn them on for their heating value. To deactivate this feature, leave both settings at zero. To use backup heating, set Temp ON at the number of degrees below the heating setpoint where the burners should fire. Set Temp OFF the number of degrees away from the heating setpoint where the burners should turn off. These settings will fire the CO_2 burners anytime it is too cold in the zone, regardless of your PPM settings.
Min ON Time	Indicates the minimum number minutes the injection system should stay on. Used with CO_2 burners to allow time for the jets to heat and burn off any carbon deposits. Settings shown will allow only two hours before sunrise for CO_2 to be injected or burners to be on. If a vent opens or an exhaust fan turns on, the injectors or burners would turn off (because of the 0 settings under Max % Vent and Max # Fans). Before the system can turn off, it needs to run for the minimum time of 10 minutes as shown.
The CO_2 program can	Use the four periods to establish the times of day when you want to add CO_2. Set the PPM for each period to 300. Set the Default value to '0', and the PPM band to 50. Use the Max

be used with no CO₂ sensor	% Vent and Max # Fans settings to lock out injection during ventilation. With these settings, the program will act as a simple timer that locks out injection when there is enough ventilation going on to meet the settings.

Sample CO_2 Settings Screen - no CO_2 Sensor:

```
Zone:  1 Description:    CO2  # 1
        Per     Clk     Starts    PPM           Default = 0
        [ 1 ]    1       -120      300      PPM Band =  50
        [ 2 ]    1         0        0       Max % Vent = 0
        [ 3 ]    1        30        0       Max # Fans =  0
        [ 4 ]    1        60        0         Temp ON =   0
                                            Temp OFF =   0
                                          Min ON Time =  10
```

Changing the CO2   Settings Screen (Code 15)

Sample CO_2 Settings Screen:

```
Zone:  1 Description:    CO2  # 1
        Per     Clk     Starts    PPM          Default     = 300
        [ 1 ]    1         0      1000       PPM Band     = 50
        [ 2 ]    0       10:00     650      Max % Vent    = 10
        [ 3 ]    0       15:00     400      Max # Fans    = 1
        [ 4 ]    2         0       300       Temp ON      = 0
                                            Temp OFF     = 0
                                          Min ON Time    = 0
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment** screen.
- Enter **3** then **GO** to select CO_2 #1 settings.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- The system automatically fills in Zone and Description.
- Enter # ↓ for **Clk**
  This example uses 1 for period 1, meaning time is relative to sunrise. 0 for periods 2-3 meaning fixed times as entered. 2 for period 4 meaning time relative to sunset.
- Enter # ↓ for **Starts**
  This example uses 0 for period 1 meaning at the time of sunrise, 10:00 for period 2 meaning ten o'clock in the morning, 15 for period 3 meaning fifteen hundred hours, or three o'clock in the afternoon, and 0 for period 4 meaning at the time of sunset.
- Enter # ↓ for **PPM**
  This example uses 1000 PPM for period 1, 650 PPM for period 2, 400 PPM for period 3 and 300 PPM for period 4. This is an arbitrary CO_2 concentration profile. Your cultural practice will be different.
- Enter # ↓ for **Default**
  This example uses 300 indicating the CO_2 concentration in that the program should use if vent opening or exhaust fans exceed set limits for injection.
- Enter # ↓ for **PPM Ban**
  The example setting is 50 PPM, meaning that the computer will turn on the injection system if the PPM drops 50 below the setting for the current period. The injectors will remain on until the CO_2 concentration returns to the setting for the period, or an override disables them.
- Enter # ↓ for **Max % Vent**
  This example uses 10%. This is the amount the vent will be allowed to open before the program falls back to the default PPM setting.

- Enter # ↓ for **Max # Fans**
    - This example uses 1 meaning 1 stage of the exhaust fan will be allowed to be on before the program falls back to the default PPM setting.
- Enter # ↓ for **Temp On**
    - This example uses 0 meaning it is deactivated.
- Enter # ↓ for **Temp Off**
    - This example uses 0 meaning it is deactivated.
- Enter # ↓ for **Min ON Time**
    - This example uses 0 meaning there is no required time the system must stay on.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Curtain (Code 16) and Shade (Code 39) Settings Screens

The EnviroSTEP uses the one curtain setting screen for shade, energy and blackout curtains. Generally, a curtain uses two of the computers outputs or switches. This enables the curtain to move to any position and hold that position. A Code 39 shade system uses only one output or switch, and can only be used to fully open/uncover or fully close/cover. Both types of systems use the same settings, but the computer ignores the running time and relay settings for a Code 39 system, and can only position it to 0% or 100% open.

Shade and energy curtains cover for heat retention at night based on a time schedule, and uncover and cover during the day according to light intensity and temperature. The light intensity settings require a light reading like on the Weather Station, and operate the curtain to prevent too much light in the greenhouse from stressing or damaging plants. The temperature settings allow the curtain to operate as a component of the greenhouse cooling system. When covered for high temperature, the curtain reduces solar heating of the greenhouse and makes it possible to maintain temperatures as much as 10ºF - 15ºF cooler than in a house with no curtain.

For either code, there is a *Black* setting that indicates if the system is fitted with blackout fabric. If a system is fitted with blackout cloth, the computer operates the curtain for primarily for day length control, and secondarily for heat retention at night. When set for blackout, the computer ignores any settings that might cause it to cover for shade or cooling.

A greenhouse can have two or more curtain systems. Examples of multiple curtains include a shade/energy curtain plus a blackout curtain; or a blackout curtain with overhead panels that are controlled independently of the sidewall panels. In each of these cases, each curtain system has its own switches on the computer and its own independent setting screen.

To reach the Curtain Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Press **8** then **GO** to reach the **Curtain settings** screen.
    Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Shade System Curtain Screen:

```
Zone:  1          Description: Curtain  # 1
         Type     Time    Temp     % Step   Cold    Pause
CLOSE    1        -30      65       - - -    - - -   - - -
OPEN     1         60      34        20       -2      10
0 = FIRE          Amount           Cover @          Uncover @
For Shade         100%             45 mW            20 mW
For Cooling       100%             7 deg            3 Deg


0 = Black     240 = Running Time                6 = Relay
```

Note:
This equipment requires 2 available switch positions. See "Changing the Switch Configuration" section.

Reading the Curtain Settings Screen

Zone	Shows the zone number assigned to this EnviroSTEP the system fills this in automatically.
Description	Shows that these settings are for a 'Curtain'.

The rows beginning with the words **CLOSE** and **OPEN** define how the computer will operate the curtain for heat retention at night. These settings define a heat retention period, and set exceptions to this schedule. Not all column headings apply to both rows. If three dashes appear in place of a setting in a row, that setting does not apply to the row.

Type	Tells the computer how to interpret the *CLOSE* and *OPEN* time settings. 0 = fixed time of day (24-hour clock) 1 = relative time, measured in minutes from sunset for *CLOSE* or sunrise for *OPEN*. This example uses Type 1 meaning relative time.
Time	Sets the time when the curtain opens and closes. When Type is 1, the curtain closes for heat retention at the set number of minutes from sunset, and reopens to end heat retention at the set number of minutes from sunrise. Negative numbers (e.g. -10, -20, etc.) mean minutes before sunrise or sunset, while positive numbers (e.g. 10, 20, etc.) mean minutes after sunrise or sunset. When TYPE is set to 1 , a zero in the Time column means the cloth will move at sunrise or sunset. When the setting in the Type column is zero, the computer treats the Time setting as an actual time of day; time is set using a 24-hour clock. This example uses Type 1 and sets a time of 30 meaning the curtain will close/cover for heat retention thirty minutes before sunset. The setting 60 in the OPEN row means the curtain will open/uncover to end the heat retention period sixty minutes after sunrise.
Temp (on the CLOSE line)	Sets the outdoor temperature, indicating at what point the curtain is not needed for heat retention. If the outdoor temperature is higher than the setting on the *CLOSE* line the curtain will **not** close for heat retention. If the outdoor temperature is below this setting during the scheduled heat retention period, the curtain **will** close. If the curtain is already closed due to light intensity or indoor temperature settings, it will remain closed. This example sets the close temperature at 65º meaning when it is above 65ºF outside, the curtain will not cover when the heat retention time begins.
Temp (on the OPEN line)	Sets the outdoor temperature for detecting precipitation. A curtain system may be opened during cold, wet periods to avoid snow accumulation on the roof and leakage from rain. This determines if the curtain should uncover to let the heat rise, melting the snow. If the outdoor temperature falls below the setting on the *OPEN* line, and the detector indicates precipitation, the computer will assume the precipitation is snow, and open the curtain. The OPEN Temp setting can be set as high as 150° meaning the curtain system will uncover for any precipitation, rain or snow. Entering a high Temp setting may be useful if you have leakage from moisture collecting on a polyethylene blackout cloth.

The following settings on the *OPEN* line affect how a Code 16 curtain system behaves when it reopens after having covered for heat retention.

%Step	Determines the rate at which the curtain steps open. At opening time, the curtain will move by this percentage. Every minute after beginning to open, the curtain will open one % Step further. The '% Step" setting must be at least 1%, or the curtain will not open.
Cold	Determines how the curtain responds to cold temperatures when opening. If the zone temperature drops *Cold* degrees below the heating setpoint, the curtain slows down to control cold air release from the attic. If the greenhouse cannot hold temperature, the curtain halts for *Pause* # of minutes to let the heating system catch up. The Cold setting should be a negative number or zero and works best with small values like -1 or -2. A setting of -1 stops the curtain if the house falls one degree below the heating setpoint.
Pause	Sets the amount of time the system will pause the curtain if the temperature falls below the setpoint – based on 'cold' setting. This gives the heating system time to warm the air from the attic as the curtain opens. The value varies with each heating system and with the volume of air in the attic above the curtain. A good initial value is 5 minutes.

The lines that begin "For Shade" and "For Cooling" tell the computer how to operate the curtain during the day. The settings on the "For Shade" line set when and how far to cover the curtain due to high light-intensity and require a light sensor to work. The "For Cooling" setting covers the curtain to assist in cooling the greenhouse.

Amount	Sets the percentage the curtain will cover for shade or cooling. This example uses 100% meaning the curtain will be pulled all the way to completely cover. If roof vents are used for cooling, set *Amount* to 90-95% in order to leave a gap through which air can circulate.
Cover @	Sets the light level or indoor temperature at which the curtain will cover. For shade the criterion is light intensity, mW. This example tells the curtain to close when the sun reaches 45mW (approx. 4500 foot candles). For cooling, the setting is the number of degrees away from the cooling setpoint for the zone. If the setpoint is 70º F, the curtain will cover/close for cooling if the zone temperature reaches 77º; 7º above setpoint.
Uncover @	Sets the light level and indoor temperature at which the curtain will uncover. It uses the same measures as the cover function. The shade Close-mW settings determines how bright the sun must be before the curtain moves. This example tells the curtain to uncover/open when the sun reaches 20mW (approx. 2000 foot candles). For cooling the measure is zone temperature, the curtain will uncover/open when the zone reaches the cooling setpoint.

The remaining settings on the curtain screen are one-time maintenance settings.

Black	Determines if this curtain is a blackout system for photo period control. Set to 1 if this system **is** a blackout curtain, or to 0 if it is **not**. Blackout systems close at the set time regardless of outdoor temperature. Two hours after sunset, when it is fully dark, the system will uncover if the outside temperature exceeds the 'Temp' setting on the CLOSE line. The system will cover two hours before sunrise, even if it was uncovered for a warm night. With the settings shown in the screen sample above, a blackout system will close 30 minutes before sunset and open 60 minutes after sunrise. It is more typical to schedule a blackout curtain to cover and uncover at fixed times that guarantee the desired number of hours of darkness. Use 0 in the Type column to specify a fixed time, and enter the time in 24-hour clock format. For example, to set a twelve-hour blackout period from 7:00 PM to 7:00 AM, enter 0 under type on both the CLOSE and OPEN rows, and enter 1900 on the close row and 700 on the open row under Time.
Running Time	Sets the number seconds it takes for the curtain to travel from full open to full close. Running Time is used to calculate how much time is needed to move the curtain to various cracked and shaded positions.
Relay	This setting accounts for the running time absorbed by a time delay relay in the curtain control panel. Time delay relays in the curtain control panel protect the curtain from damage by non-computer controls and manual operation. Wadsworth PowerPull curtain systems have a six second time delay relay. Most other manufacturers systems use none.
FIRE	Setting FIRE to 0 forces the curtain to uncover in the event of a fire alarm. Setting FIRE to 1 forces the curtain to cover in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing Curtain Settings (Code 16)

Sample Shade System Curtain Screen:

```
Zone:  1          Description:   Curtain  # 1
          Type      Time    Temp    % Step    Cold    Pause
CLOSE    0        18:00    65       – - –     – - –    – - –
OPEN     1        60       34        20        -2       10
0 = FIRE          Amount           Cover @            Uncover @
For Shade         100%             45 mW              20 mW
For Cooling       100%             7 deg              0 Deg


0 = Black         240 = Running Time                  6 = Relay
```

To reach the Curtain Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment screen.
- Press **8** then **GO** to reach the Curtain settings Screen.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Zone and Description are automatically filled.
- Enter # ↓   (0 or 1) to indicate type of time. 0 = fixed time of day (24 hour clock) or 1 = relative time, based on minutes before or after sunset. This example uses a Type setting of 0 to close at a fixed time.
- Enter # ↓ for **Time**
  This example uses 18:00 for close meaning the curtain will cover at 6:00 PM.
- Enter # ↓   for **Temp**
  This example uses 65 meaning the curtain will not close/cover for heat retention if the outdoor temperature is above 65°F.
- On the CLOSE row, the cursor does not stop under the settings for %Step, Cold, and Pause, as these apply only to opening the curtain.
- Enter # ↓ (0 or 1) to indicate type of time 0 = fixed time of day (24 hour clock) or 1 =   relative time based on minutes before or after sunrise. This example uses 1 for the open/uncover setting.
- Enter # ↓ for **Time**
  This example uses 60 meaning the curtain will open/uncover 60 minutes after sunrise.
- Enter # ↓ for **Temp**
  This example uses 34 meaning the curtain will open/uncover for snow melting if the outdoor temperature is 34°F, and the precipitation detector indicates precipitation.
- Enter # ↓ for **% Step**
  This example uses 20% meaning the system will open in 20% increments unless interrupted by the cold or pause settings.
- Enter # ↓ for **Cold**
  This example uses –2 meaning if the zone temperature drops 2 degrees below the heat setpoint the curtain will pause to allow the heating to work and warm the air before opening the curtain any further.

- Enter # ↓ for **Pause**
  This example uses 10 meaning there will be a 10-minute pause if the system detects the temperature drops too far below the heat setpoint.
- Enter # ↓ for **Amount % For Shade**
  This example uses 100 meaning the cloth will cover/close all the way: 100% if the sun reading indicates that shade is needed.
- Enter # ↓   for **Cover mW**
  This example uses 45mW meaning the cloth will cover/close for shade when the sun is above 45mW
- Enter # ↓   for **Uncover mW**

This example uses 20mW meaning the cloth will uncover/open when the sun is below 20mW and shade is no longer needed.

- Enter # ↓ for **Amount % For Cooling**

  This example uses 100 meaning the cloth will cover all the way 100% if the zone temperature indicates that cooling is needed.

- Enter # ↓ for **Cover deg**

  This example uses 7deg meaning the cloth will cover/close when the temperature is 7 degrees over the cooling setpoint.

- Enter # ↓ for **Uncover deg**

  This example uses 0 meaning the cloth will uncover/open when the temperature is 0 degrees over the cooling setpoint.

- Enter # ↓ for **Black**

  This example uses 0 meaning this is not a blackout system. 1 would mean this system is blackout cloth.

- Enter # ↓ for **Running Time**

  This example uses 720 meaning it takes 720 seconds for the system to move from full open/uncover to full close/cover

- Enter # ↓ for **Relay**

  This example uses 6 meaning the curtain control box includes a time delay relay, like the Wadsworth PowerPull System.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Irrigation Valve (Code 17) & Mist Control (Code 38)

The computer can schedule watering events according to three independent settings. The first setting is based on elapsed time which irrigates and/or mists based on a set number of days, hours, and minutes. The next two settings are based on the accumulated light and the accumulated Vapor Pressure Gradients (VPG) affecting the plants. Light and VPG accumulate faster during times when plants are likely to need more water. Using these settings can make your computer water more like an experienced grower. Each time the computer turns on a valve to water, the three watering events reset preventing the possibility of watering several times in a few minutes as each event reaches the set value. By default, the computer opens only one valve at a time. This limitation is designed so valves that use water pressure to drive them closed will work correctly. You can allow more than one valve at a time to come on by changing the Limits setting (item 5 on the **<<Setting menu>>**).

To reach this screen:

- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
- Enter **9** then **GO** to select Irr Valve (or appropriate #)

  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

  Sample Irrigation (or Mist) Valve Screen:

```
Zone:  1          Description:  Irr. Valve #1
     30 = Seconds to water
 0/ 1 /  0  = TIME:  Max days/hrs/mins
    3000    = SUN:  Tot.  W-Hr between waterings
        35 =  VPD:  Tot.  mB-Hr between waterings
Type Allowed – Time              0 = Now!
0   00:00   Earliest             0 = Wait…
1   24:00   Latest                 = Copy!
```

Reading Irrigation Valve Settings

Zone	Shows the zone where the valve is installed.
Description	A confirmation that this setting screen is for an output/switch configured as a pad pump. The computer fills this in automatically for your reference.
Seconds to water	Sets the number of seconds a valve will be open when it waters. Watering time can range from 1 to 9999 seconds (about 2 hours, 45 minutes). If 'Seconds ON' is set to zero, the valve will not water.
Time	Used for watering based on elapsed time. Sets the number of days, hours, and minutes between waterings. 1/0/0 means one day between waterings, while 0/1/30 means one hour and thirty minutes between waterings. The time that the valve is open is included in the time between waterings. That is, as soon as it opens a valve the computer begins counting down to the time of the next watering. This is a consideration if the watering time is long compared to the time between waterings. For example, if a valve is scheduled to open for 600 seconds (10 minutes) every 0 days, 0 hours and 20 minutes, the valve will only be closed for ten minutes before it is time to water again.

SUN	SUN is based on the solar sensor used. Depending on the sensor, one unit is of watt-hours per square meter (W-HR) and the other unit is moles per square meter (Mole). This setting waters based on how much light energy the sun has put into your crop. The more light energy a crop receives the more water it needs. From the solar sensor, the measured light is accumulated to track the rate of water loss in the crop. On bright days, plants lose more water to evaporation and transpiration that on overcast days. This setting provides a more sophisticated level of control, since elapsed time can't account for this constant variation in water need as conditions change. Sun total settings vary with crops and soils. To determine a good value for your greenhouse, watch the light accumulator reading, and note what it says when you know it is time to water. The current weather screen (choice 3 from **<<Main Menu>>**) shows the 'Accumulated Sun' amount.
VPS	VPD (Vapor Pressure Deficit) is set in units of mB-Hr between waterings. A millibar-hour is one unit of plant stress for one hour. In hot, dry conditions, plant stress in a greenhouse can accumulate at twenty or more units per hour. Like light, plant stress index varies with greenhouse conditions. Watering can be more effective than with elapsed time. The Water Report (choice 4 on the **<<<Main Menu>>>**) shows the amount of VPD since the last watering.
Type and Allowed Time	Establishes what times watering is allowed. If a valve is ready to water, it will water only during the hours set here. If the computer cannot finish all valves needed in the allowed period, it waters as many as it can and postpones the rest until the next day. The Type setting can be 0 = fixed time (uses 24-hour clock) or 1 = relative time based on number of minutes before or after sunrise. When a switch is assigned to a valve at configuration time, the computer will allow the valve to be enabled twenty-four hours a day. Be sure to replace these default settings with the time settings you actually want to use.
Earliest	Defines when the watering period will start. Setting will be entered using the 24-hour clock if type 0, fixed time was selected or in minutes before/after sunrise if type 1, relative time was selected.
Latest	Defines when the watering period will end. Setting will be entered using the 24 hour clock if type 0, fixed time was selected or in minutes before/after sunrise if type 1, relative time was selected.
NOW!	Enter a 1 to force the system to start watering immediately. At the start of the next minute on the computers clock, it will open the valve and water for the set number SECONDS ON. It overrides Time, Sun, and VPD settings. Upon watering, the Time, Sun and Plant Stress counters are all reset.
WAIT	Sets a number of minutes to delay the watering. It postpones a potential watering, as for example, when workers are active in a zone or a class is in session. The computer automatically resets *WAIT* to zero. You must re-enter a setting each time you want to delay. To cancel a *WAIT*, enter '1' in Wait: at the end of one minute, the computer will return to its normal watering schedule for the valve. Note: Do not use manual override to

	pause or delay watering. The computer cannot track activity when it is in manual. This could result in over-watering.
COPY	This setting is not available or applicable the current EnviroSTEP irrigation and mist programs. No value will show for it on the display screen, and you cannot enter a number.

Changing Irrigation Valve Settings

Sample Irrigation (or Mist) Valve Screen:

```
Zone:   1                    Description:   Irr. Valve #1
     30 = Seconds to water
  0/  1 / 0     = TIME:  Max days/hrs/mins
     3000   = SUN:  Tot.  W-Hr between waterings
          0 = VPD:  Tot.  mB-Hr between waterings
Type Allowed – Time              0 = Now!
1   00:00   Earliest             0 = Wait…
1   24:00   Latest                 = Copy!
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** Screen.
- Enter **9** then **GO** to select Irr Valve.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Zone and Description are automatically filled in by the system.
- Enter # ↓ for seconds to water.
  This example uses 30 meaning the valve will turn on for 30 seconds. The smallest possible duration is 1, or one second; the largest is 9999 seconds, or about two hours and forty-six minutes.
- Enter # ↓   # ↓   # ↓   **for Days/Hours/Minutes** between waterings.
  This example uses 0/1/0, meaning one hour between waterings. The smallest available setting is 0/0/1, or one minute between waterings. The largest possible interval is 23/99/99, or twenty-three days, ninety-nine hours, and ninety-nine minutes.
- Enter # ↓   for **Sun**
  This example uses 5 meaning the valve will turn on if the accumulated sun level reaches 5 W-Hr. To ignore accumulated sun, set this value to zero.
- Enter # ↓   for **VPD**
  This example uses 0 meaning Vapor Pressure Deficit is not a consideration for operating the valve.
- Enter # ↓   for **Earliest Type**
  This example uses 1 meaning fixed time.
- Enter # ↓   for **Earliest Time**
  This example uses 0 meaning sunrise is the earliest the system will water.
- Enter # ↓   for **Latest Type**
  This example uses 1 meaning relative time.
- Enter # ↓   for **Latest Time**
  This example uses 0 meaning sunset is the latest the system will water.
- Enter # ↓   for **Now**
  This example uses 0 meaning the system will not start watering right now, if a 1 were entered it would cause the system to start watering. Note: Do not use manual override to pause or delay watering. The computer cannot track activity when it is in manual. This could result in over-watering.
- Enter # ↓   for **Wait**
  This example uses 0 meaning there is no delay in watering, if a number is entered it indicates how many minutes the valve will delay before watering.
- The cursor skips over **Copy.** This does not apply to this setting. Note: Do not use manual override to pause or delay watering. The computer cannot track activity when it is in manual. This could result in over-watering.
- Enter **GO** to return to **<<<Settings Menu>>>** or press **GO** repeatedly to return to the **<<<Main Menu>>>**

HID Lights (Code 18) or Photo Period (Code 41) Settings Screen

The screens for HID (high intensity discharge) light and photo period light settings are identical. These settings customize the schedule for automating supplemental lighting. The controller turns the HID lights on during one or two periods. The first period operates HID lights based on time and outside light levels. The second period operates the lights by time only. If a zone light sensor is connected to the system, the controller can then operate the HID lights based on the DLI (daily light integral) or the accumulated light the plants have received.

Sample HID Light Setting Screen:

```
Zone:  1      Description: HID Light  # 1
Type Time – Setting            Light – Setting
-----+----------------------+-------------------------
  1    1st    ON= -30         Sun ON=   10mW
  0    1st    OFF=10:00       Sun OFF=  15mW
  0    2nd    ON= 16:00        Accum=   10.0
  0    2nd    OFF= 19:00
Ballast =   15min.            Generator = 1 FIRE = 0
```

Reading the HID Lights (Code 18) or Photo Period (Code 41) Settings Screen

Zone	Indicates what zone the HID lights are assigned.
Description	Indicates what equipment/stage is shown. In this example, HID Lights.
Type, Time-Setting	Time can be tracked in two different ways. If type is set to 0, the controller interprets time as a fixed time, meaning the action occurs the exact same time every day. Fixed times must be entered using the 24-hour clock: 13:30 means 1:30 PM. If Type is set to 1, the controller interprets time relative to sunrise or sunset. The 'ON' indicates the number of minutes relative to sunrise and the 'OFF' indicates the number of minutes relative to sunset. This example uses 'ON= -30' which means, thirty minutes before sunrise. A positive number would have indicated the number of minutes after sunrise.
1st Time	The desired time period where Sun ON/OFF and Accum set points are evaluated.
2nd Time	Regardless of the Sun ON/OFF and Accum set points, the 2nd Time period will operate the HID lights to turn on.
Sun ON	Indicates when HID lights turn on based on the level of sensed sunlight intensity. Depending on what solar sensor is used, the value could be measured in mW (milliwatts per square centimeter) or uM (micro-moles per square meter per second). If there is less sunlight than the level indicated in the Sun ON setting, the controller will turn the lights on if the time and accumulated light setting allow.
Sun OFF	Determines when the lights should turn off based on the sensed sunlight intensity. When the sun is brighter than the Sun OFF setting, there is enough natural light for the plants and the HID lighting is not needed, turning the HID lights off. If an outside solar sensor is used, the Sun OFF should be set approximately 5 units higher than the Sun ON to prevent the unnecessary activation of the HID lights, due to the passing of clouds. Similarly, if a zone solar sensor is used, a value greater than the HID lights should be used to prevent the shutting off of the HID lights when they should be on.
Accum	The DLI set point is used to ensure the plants have received a desired minimum amount of light. If natural sunlight has accumulated throughout the day to be greater than this set point, the HID lights will not turn on despite the Sun ON setting. Otherwise, the HID lights will turn on until the 1st Time OFF has been reached. If a zone solar sensor is used, the controller will

	automatically keep count of the zone's DLI throughout the day and once the zone (with the HID lights on) reaches the Accum set point, the controller will turn the HID lights off.
Ballast	A delay value indicating how many minutes the HID lights must remain off after they are turned off. When the lights are turned off due to the settings, many HID ballasts require an idle period before they can be operated again. A typical value is 15 minutes.
Generator	Indicates if the equipment is authorized to run while the greenhouse is powered from its standby generator. If Generator is set to 0, HID lights are not allowed to operate on standby power. When set to 1, HID lights are allowed to operate on standby power.
FIRE	In the event of a fire alarm, this setting either forces the equipment OFF (FIRE=0) or ON (FIRE=1). To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Example 1: HID Light Setting Screen:

```
Zone:  1       Description: HID Light  # 1
Type Time – Setting              Light – Setting
-----+----------------------+-------------------------
 1    1st   ON=   0              Sun ON=  10mW
 0    1st   OFF=10:00            Sun OFF=  15mW
 0    2nd   ON= 4:00               Accum=  10.0
 0    2nd   OFF= 7:00
Ballast=   15 min.     Generator = 1 FIRE = 0
```

In this example, the HID lights turn on at sunrise and stay on until 10:00 AM if the light level is below 10 mW/cm^2 and the accumulated solar light is less than 10.0 kWh/m^2. During this time period, the lights will turn off if the solar light level reaches 15 mW/cm^2 or the accumulated solar light reaches 10.0 kWh/m^2. Similarly, if the solar light drops below the 10 mW/cm^2 setpoint during the time period of sunrise and 10:00 AM, the controller then evaluates to the accumulated light set point. If both conditions are met (Sun ON and Accum) the HID lights are turned on. If this setting shuts off the lights, the 'Ballast' delay value will prevent the lamps from relighting for 15 minutes from the time the lights are turned off.

The '2nd' time setting turns the HID lights on from 4:00 AM to 7:00 AM. The lights will remain on during the 2nd time period regardless of the sunlight intensity or the DLI.

Example 2: HID Light Setting Screen:

```
Zone:  1 Description:        HID Light  # 1
Type Time – Setting              Light – Setting
-----+----------------------+-------------------------
 1    1st    ON= -60             Sun ON=10
 0    1st    OFF=10:00           Sun OFF=15
 0    2nd    ON= 16:00             FIRE = 0
 0    2nd    OFF= 19:00
Ballast Delay =   15 minutes   Generator = 1
```

In this example the HID lights turn on 60 minutes before sunrise, and stay on until 10:00 AM. The lights would only turn off during this period if the light level reached 10 mW/cm2. If no light sensor is attached, the Sun ON and OFF settings still needs to be entered but lamps will go on during the set period, and remain on the entire time.

The second lighting period is from 16:00 to 19:00 or 4:00 PM to 7:00 PM. The lights will remain on during the 2nd period, regardless of sunlight intensity, with or without a light sensor. If a power interruption extinguishes the lights, the Ballast Delay will prevent them from relighting and protect the lights from damage.

Changing the HID Lights (Code 18) Settings Screen

Sample HID Lights Setting Screen:

```
Zone:  1 Description:        HID Light  # 1
Type Time – Setting              Light – Setting
----+---------------------+-------------------------
 1    1st   ON= -120              Sun ON=10
 0    1st   OFF=10:00             Sun OFF=15
 0    2nd   ON= 16:00             FIRE = 0
 0    2nd  OFF= 19:00
Ballast Delay =    15 minutes   Generator = 1
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
- Enter **3** then **GO** to select HID Lights.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Type 1** = relative to sunrise, 0 = fixed time using 24 hour clock.
  This example uses 1 for the 1st period On meaning relative time.
- Enter # ↓ for **Time On**
  This example uses –120 minutes meaning the lights will come on 120 minutes before sunrise.
- Enter # ↓ for Type 1 = relative to sunrise, 0 = fixed time using 24 hour clock.
- Enter # ↓   for **Time Off**
  This example uses 10 meaning the lights will turn off at 10:00 AM.
- Enter # ↓   for **Sun Off**
  This example uses 15 meaning when the sun's intensity is 15 mW/cm2 the lights will turn off.
- Enter # ↓ for Type 1 = relative to sunrise, 0 = fixed time using 24-hour clock.
  This example uses 0 for the 1st period Off meaning fixed time.
- Enter # ↓ for **Time Off**
  This example uses 1000 meaning the lights will turn off at 10:00 AM.
- Enter # ↓   for **Type 1 = relative to sunrise**, 0 = fixed time using 24-hour clock.
  This example uses 0 for the 2nd period On meaning fixed time.
- Enter # ↓ for **Time On**
  This example uses 16 meaning the 2nd periods will turn on at 1600 or 4:00 PM.
- Enter # ↓ for **Type 1 = relative to sunrise**, 0 = fixed time using 24-hour clock.
  This example uses 0 for the 2nd period Off meaning fixed time
- Enter # ↓ for **Time Off**
  This example uses 19 meaning the 2nd period will turn off at 1900 or 7:00 PM
- Enter # ↓ for **Ballast Delay**
  This example uses 15, meaning the lights will remain off for 15 minutes if they shut off for any reason.
- Enter **GO** to return to **<<<Setting Menu>>>** or press **GO** repeatedly to return to the **<<<Main Menu>>>**

Variable Speed Exhaust Fan (Code 26) Equipment Settings

This program, called "Var. Fan", adjusts the speed of one or more exhaust fans according to the temperature and the relative humidity. This program requires a variable frequency drive for the fan(s) that accepts a voltage signal to control its frequency. It also consumes one of the computer's relay outputs. Variable speed motor drives control the speed of all the fans in a greenhouse zone simultaneously, which creates uniform airflow across the entire zone in a way that is difficult or impossible to achieve with single speed and two speed fans.

As the greenhouse temperature varies, the program modulates the voltage signal it sends to the fan drive. As the temperature rises, the computer changes the voltage toward the 100% Voltage signal, speeding up the fans and increasing their cooling effect. As the temperature falls, the computer changes the voltage toward the 0% Voltage setting. This slows or stops the fans, reducing cooling in the greenhouse. The program will adjust the fan speed in proportion to conditions in the greenhouse. Speed may be 0% when no cooling is needed, 100% when maximum cooling is needed, or an intermediate speed when the greenhouse temperature is near, but not at, the desired temperature.

To reach the Equipment Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the Equipment screen.
- Find the Var. Fan on the list of equipment on the display screen, enter the line number to the left of the fan's name, and press **GO**.

    Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Variable Speed Exhaust Fan:

```
Zone:  1 Description:        Var Fan # 1
 10/ 15 = Temp ON/OFF              33 = Min % ON
 33/ 22 = RH ON/OFF                 0 = Hold Time
 0.0  =  0% Voltage                 0 = FIRE
 7.0  = 100% Voltage
```

Reading the Variable Speed Exhaust Fan (Code 26) Equipment Settings

Zone	Shows the zone number assigned to this EnviroSTEP. The system fills this in automatically.
Description	Indicates what equipment is being read. The system fills this in automatically.
Temp ON/OFF	Defines the temperature range over which the fan speed modulates. The values are set as differences from the cooling setpoint for the zone. When the greenhouse air temperature is at or above the cooling setpoint plus the *OFF* setting, the fan(s) will start. When the greenhouse temperature is at or above the cooling setpoint plus the *ON* setting, the fan(s) will run at full speed. Inside this range of temperatures, the fan speed will vary up and down: slower for colder temperatures, and faster for warmer ones.
RH ON/OFF	Determines humidity range at which the fan(s) are set to run and modulate. Set as differences from the humidity setpoint. When the greenhouse humidity is at or below the humidity setpoint plus the *OFF* setting, the fan(s) will be off. When the greenhouse humidity is at or above the humidity setpoint plus the *ON* setting, the fan(s) will run at full speed. The fan speed adjusts in proportion to the humidity range. To disable the fan(s) response to humidity, set *RH ON/OFF* to 0/0.

0% Voltage	Sets the voltage level the computer should send to the variable frequency fan drive to make the fan(s) stop. The computer will also switch the relay output for the drive to disconnect the run enable command from the drive.
100% Voltage	Sets the voltage level for the variable frequency fan drive to make the fan(s) run at full speed.
Min % ON	Sets the minimum speed. It will always operate the fans at least this speed if cooling is needed.
Hold Time	This setting is not implemented in current versions of the program. It should be set to zero.
FIRE	Setting FIRE to 0 forces the variable fan OFF in the event of a fire alarm. Setting FIRE to 1 forces the variable fan to full speed in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing the Equipment Settings for a Variable Fan (Code 26)

Sample Exhaust Fan Settings Screen:

```
Zone: 1      Description: Mix Valve #1
  6/ 2 = Temp ON/OFF          10 = Min % ON
  0/ 0 = RH ON/OFF             0 = Hold Time
  0.0 = 0% Voltage             0 = FIRE
 10.0 = 100% Voltage
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach Equipment screen.
  Find the Var. Fan on the list of equipment on the display screen. Enter the line number to the left of the fan's name and press **GO** to select the Mix Valve. Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- Enter # ↓ for **Temp ON**
    This example uses a setting of 6, meaning that at six degrees above the cooling setpoint, the fan(s) will run at full speed.
- Enter # ↓ **Temp OFF**
    This example uses 2, meaning that at two degrees above the cooling setpoint, the fan(s) will be off.
- Enter # ↓   # ↓ for **RH ON/OFF**
    This example uses 0/0, meaning this fan will not operate due to humidity. This is usually disabled. In most cases, the cost to reduce humidity is not justified.
- Enter #.# ↓ for **0% Voltage**
    This example uses 0.0, meaning that a signal of zero volts commands this drive to stop. Any value from 0.0 to 10 may be used. Obtain the correct value from the manufacturer's data sheet for the variable frequency drive.
- Enter #.# ↓ for **100% Voltage**
    This example uses 10.0, meaning that a signal of ten volts commands this drive to run at full speed. Any value from 0.0 to 10 may be used. Obtain the correct value from the manufacturer's data sheet for the variable frequency drive.
- Enter # ↓ for **Min % ON –** sets the minimum operating speed for the fan(s).
    This example is 10, meaning that the fans will start running at 10% of full speed which is the minimum speed.
- Enter # ↓ for **Hold Time** –
    This example uses 0, which should always be used in this setting to ensure trouble free upgrades to future program releases.

Fog System (Code 20 or Code 40) Setting Screen

Fog systems control temperature and humidity in the greenhouse. These programs are intended for use with high-pressure systems that produce a droplet size similar to natural fog. For lower pressure systems that produce water droplets more like drizzle, consider the Mist program also built in to the EnviroSTEP.

There are two programs to operate a fog system. Code 20 is intended for large volume, production greenhouses. It reviews conditions and makes new control decisions once a minute. Code 40 is intended for smaller propagation houses requiring close control of high humidity. It reviews conditions and makes new control decisions once a second.

The two programs share the same setting screen, but use the settings slightly differently. These differences are as follows:

Setting	Code 20 Fog (larger house)	Code 40 Fog (smaller house)
SECONDS ON	When set to 0 seconds, does not run.	When set to 0 seconds, runs continuously until temperature and humidity targets are met.
MINUTES OFF	Set in **minutes**.	Set in **seconds**.
CYCLIC	Enables On/Off cycling for temperature control.	Setting not available.

Sample Fog Setting Screen (Code 20):

```
Zone:  1          Description:  Fog #1
-2 = RH ON              30 =SECONDS ON
 2 = RH OFF              3 = MINUTES OFF
10 = TEMP ON             0 = GENERATOR?
 8 = TEMP OFF            0 = CYCLIC?
Type Allowed –Time
     0    00:00  Earliest
     0    24:00  Latest
```

Zone	The zone number assigned to this EnviroSTEP. Automatically filled in by the computer.
Description	Indicates what equipment is shown. In this example, output/switch configured as a fog system. The computer fills this in automatically.
RH ON	Indicates equipment the fog turn on point to raise humidity, based on percentage points from the zone's RH setpoint.
RH OFF	Indicates when the fog will turn off to stop raising humidity, based on percentage points from the zone's RH setpoint.
TEMP ON	Indicates when the fog will turn on to lower temperature, based on degrees from the zone's cooling setpoint. To prevent the fog system from operating due to temperature, set *TEMP ON/OFF* to 99/98.
TEMP OFF	Indicates when the fog will turn off to stop lowering temperature, based on degrees from the zone's cooling setpoint. To prevent the fog system from operating due to temperature, set *TEMP ON/OFF* to 99/98.
Type Allowed - Time	Establishes the times of day when fogging is allowed. There are two options for setting the time. Use 0 to set a fixed time of day (must use the 24-hour clock) or 1 to set a time relative to sunrise (for *Earliest*) or sunset (for *Latest*).
Earliest	Sets the starting time of the period when the fog system is allowed to operate.
Latest	Sets the ending time of the period when the fog system is allowed to operate.
SECONDS ON	When operating a fog system to raise humidity (and optionally, to lower temperature) the computer will **not** run the fog continuously. Sets how many seconds the fog system will run each time it pulses on. No two fog systems produce the same density or volume of fog, and no two greenhouse installations have the same number of fog nozzles per square foot. Adjust SECONDS ON to be long enough to humidify, but short enough to avoid wetting the crop.

MINUTES OFF	Sets the idle time (in minutes for code 20, or seconds for code 40) between fog pulses. After a pulse of fog, the system cannot fog again until the time set in 'MINUTES OFF' has elapsed. If you set 'MINUTES OFF' to zero, the fog valve will run continuously until the humidity setting is met.
Generator	Indicates if fog is authorized to run while the greenhouse is powered from its standby generator. If Generator is set to 0 fog is not allowed to operate on standby power. When set to 1, the fog system is allowed to operate on standby power.
CYCLIC?	When fogging to cool the house, if CYCLIC is set to 0, the computer will run the fog continuously until the temperature falls to your set reading. To change the cooling behavior to cycle on and off, as it does for humidity control, set CYCLIC to 1.

Changing the Fog System (Code 20 or Code 40) Settings Screen

Sample Fog Setting Screen:

```
Zone:  1          Description:  Fog  #1
-2  = RH ON              30 = SECONDS ON
 2  = RH OFF              3 =  MINUTES OFF
10 = TEMP ON             0 = GENERATOR?
 8 = TEMP OFF            0 = CYCLIC?
Type Allowed –Time
     1    60    Earliest
     0   -120  Latest
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**.
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach **Equipment Settings** screen.
     Find the fog system on the list of equipment. Enter the line number to the left of the name Fog, and press **GO**.
     Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*
- The computer will fill in the zone and description information.
- Enter # ↓ for **RH On**
     This example uses –2 meaning the fog will turn on if the RH drops 2 percentage points below the RH setpoint. To inhibit this feature set On at –99.
- Enter # ↓ for **RH Off**
     This example uses 2 meaning the fog will turn off if the RH reaches 2 percentage points above the RH setpoint. To inhibit this feature set Off at –98.
     With a –99 On/-98 Off setting the system only uses the fog to control temperature.
- Enter # ↓ for **Temp On**
     This example uses 10 meaning the fog will turn on if the temperature is 10 degrees over cooling setpoint.
- Enter # ↓ for **Temp Off**
     This example uses 8 meaning the fog will turn off when the temperature is 8 degrees over cooling setpoint.
- Enter # ↓ for **Type of Time (Earliest)**
     This example uses 1 meaning a time relative to sunrise.
- Enter # ↓ for **Earliest**
     This example uses 60 meaning one hour after sunrise.
- Enter # ↓ for **Type of Time**
     This example uses 1 meaning a time relative to sunset.
- Enter # ↓ for **Latest**
     This example uses -120, meaning two hours before sunset.
- Enter # ↓ for **SECONDS On**

In this example the fog system will run for 30 seconds each time it turns on.

- Enter # ↓ for **MINUTES Off**
  This example uses 3 meaning that after the fog shuts off, it cannot run again until the 3-minute idle time has passed. If you set 'DURATION OFF' to zero, the fog valve will run continuously until the humidity setting is met.

- Enter # ↓ **GENERATOR?** Indicates if the equipment will be allowed to use the generator 1 = yes   0 = no.
  This example uses 0 meaning the equipment will not be allowed to run off the generator.

- Enter # ↓ for **CYCLIC?**
  This example uses 0, enabling the fog system to run continuously when the temperature is too high in the house.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Note: If you have fog / high pressure mist (Code 20 or 40) in the same zone as HAF fans, the EnviroSTEP will shut off the HAF fans while the fog system is on. This prevents the fans from drawing fog into their motors.

Pressure Fan (Code 43)

The pressure fan program controls a fan to maintain positive pressure in the greenhouse. Such a fan blows air into the house instead of exhausting it causing the air pressure to be higher inside the house than outdoors. This can help keep insect pests from gaining entry to the greenhouse. Use of this program requires that the computer be equipped with a pressure sensor able to measure the difference in pressure between the inside and outside of the house in 100ths of an inch of water column.

The program turns the fan on and off according to keep the greenhouse at a higher air pressure than exists in the outdoors. Because blowing cold outdoor air into the greenhouse may cause too low an indoor temperature, a setting lets you shut off the fan when it's too cold indoors. You may also override the normal behavior of the pressure fan in case of very cold outdoor temperatures, or a fire alarm.

To reach the Pressure Fan Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **2** then **GO** to reach the **Equipment** screen.
- Use Up/Down arrows ↓↑ to navigate.
- Find the Pressure Fan on the list of equipment on the display screen.
- Enter the line number to the left of the Fan name, and press **GO**.
  Note: Since all systems are custom configured, the equipment number may not match the example shown. If the equipment does not display in your equipment list, consult the section on *Changing the Switch Configuration.*

Sample Pressure Fan Setting Screen:

```
Zone: 1          Description: Pres. Fan # 1
   10/ 15 = PRESSURE ON/OFF (in 100ths in.
     50   =  MINIMUM INDOOR TEMPERATURE
   45/ 32 = DAY/NIGHT FROST LOCKOUT
        0 = FIRE
```

Reading the Pressure Fan (Code 43)

Zone	Indicates the zone number assigned to this EnviroSTEP.
Description	Indicates what equipment/stage is being set. In this example, Pres. Fan #1. The computer automatically fills in this information.
PRESSURE ON/OFF	Sets the pressure difference desired between the greenhouse and the outdoors. To keep the greenhouse pressure higher than the outdoor pressure, the ON setting must be lower than the OFF setting.
MINIMUM INDOOR TEMPERATURE	Sets the actual minimum indoor temperature allowed. Below this temperature, the fan will shut off.
DAY/NITE FROST LOCKOUT	These settings lock out the fan based on outdoor temperature. When the outdoor temperature falls below the day setting during the day, or the night setting during the night, the computer will shut off the fan. In general, day settings at or below freezing are appropriate, while night settings several degrees above freezing prevent the fan from introducing air cold enough to damage plants.
FIRE	Setting FIRE to 0 forces the fan OFF in the event of a fire alarm. Setting FIRE to 1 forces the fan ON in the event of a fire alarm. To take advantage of these features, the greenhouse must be equipped with a fire alarm system independent of the EnviroSTEP, and that equipment must have a dry contact wired to the EnviroSTEP that switches ON or OFF when it detects a fire.

Changing the Pressure Fan (Code 43)

Sample Pad Vent Setting Screen:

```
Zone: 1          Description: Pres. Fan # 1
   10/ 15 = PRESSURE ON/OFF (in 100ths in.
     51  =  MINIMUM INDOOR TEMPERATURE
   45/ 32 = DAY/NIGHT FROST LOCKOUT
         0 = FIRE
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>** screen.
- Press **2** then **GO** to reach **Equipment** screen.
- Find the Pressure Fan on the list of equipment on the display screen.
- Enter the line number to the left of the fan's name, and press **GO**.
- Enter # ↓ # ↓ for **PRESSURE ON/OFF**
  This example uses 10/15 meaning the fan will turn on at a pressure reading of 10/100th inch of water column, and turn off again if the pressure rises to 15/100th inch of water column.
- Enter # ↓ for **MINIMUM INDOOR TEMPERATURE**
  This example uses 50, meaning that the fan will shut off if the indoor temperature falls below 50º.
- Enter # ↓ for # ↓ for **DAY/NITE FROST LOCKOUT**
  This example uses 45 and 45 for these settings. When the outdoor temperature falls below 45 º during the day or 45 º at night, the computer will lock out the fan.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Calibration

This screen allows calibration of the 7 sensor channels. The EnviroSTEP has been factory calibrated to match your sensors. Entering new calibration settings is simple; obtaining accurate data to enter is more challenging. Obtaining correct data requires an accurate reference instrument such as a thermometer or hygrometer.

This is a two-level screen. Level 1 lists the sensor channels and their installed sensors; level 2 is where calibration settings are entered.

> **You should not need to change the calibration settings as they have been calibrated at the factory.**

Calibration Screen 1

To reach the Calibration Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **3** then **GO** to reach the Calibration Screen

Sample Calibration Screen (Level 1):

```
Channel        Zone      Senses
1              1         RH
2              1         Temp
3                        ---Spare
4              99        Temp
5                        ---Spare
6              1         C02
Scroll or Select Here [   ]
```

Reading Calibration Screen 1

Channel	Indicates the number for each channel, use the up/down arrow keys to see all seven.
Zone	Indicates the zone number assigned to this EnviroSTEP.
Senses	Indicates what the sensor reads: RH= humidity, Temp= temperature, C02, Spare (meaning it is not in use).

Calibration Screen 2

To reach level 2 of the Calibration Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **3** then **GO** to reach the Calibration screen
- Enter a channel # then **GO** to reach level 2 of the Calibration screen.

Sample Calibration Screen (Level 2):

```
Zone: 1 Channel: 1                Sensor:  RH

          Factory Reading:   100.0
       Old Calibrated Reading:   70.0
       New Calibrated Reading:  ▓ 70.0
X^2*
X^1*
X^0*
```

Reading Calibration Screen 2

Zone	Indicates the zone number assigned to this EnviroSTEP.
Channel	Indicates the number of the channel that is being calibrated.
Sensor	Indicates what the sensor reads (humidity, temperature…).
Factory Reading	Is the reading as it came from the factory?
Old Calibrated Reading	Indicates the reading as you last calibrated it.
New Calibrated Reading	Enter your new calibrated reading. Initially shows the same number as the Old Calibrated Reading.
X^2*, X^1*, X^0*	Settings only available for custom sensors that are not one of Wadsworth's standard types (i.e. non-CO_2 sensors).

The bottom three lines are used to set up custom adapted sensors. The computer uses these inputs for quadratic equation formulas.

Changing the Calibration

This is a two-level screen. Level 1 lists the sensor channels and their installed sensors; level 2 is where calibration settings are entered.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **3** then **GO** to reach the Calibration screen.

Sample Calibration Screen (Level 1):

```
Channel        Zone    Senses
1              1       RH
2              1       Temp
3              ---     Spare
4              99      Temp
5              ---     Spare
6              ---     Spare
Scroll or Select Here [    ]
```

- Enter a channel # **GO** to reach the calibration screen for that channel.
      This example uses channel 1.

Sample Channel Reading Screen:

```
Zone:  1 Channel:  1              Sensor:  RH

           Factory Reading:  76.4
    Old Calibrated Reading:  78.6
    New Calibrated Reading:  ▉ 78.6
    X^2*
    X^1*
    X^0*
```

- The computer fills in the information on this screen. You can change the New Calibrated Reading, and if applicable, the custom sensor formula coefficients. The Factory Reading and the Old Calibrated Reading are for your information only and cannot be changed.
      This example is looking at zone 1, channel 1, which reads humidity. The factory reading is 76.4%, and the Old Calibrated Reading is 78.6%

- Enter a number for the new calibrated reading. (Note that when you first see this screen, the *New Calibrated Reading* will be identical to the *Old Calibrated Reading*.) The number you enter is the value from the thermometer or hygrometer.
    - This example shows the screen before you have entered a reference reading. If your reference hygrometer shows 92.8%, enter 92.8 as the New Calibrated Reading.
- The computer does not grant the user access to **X^2*, X^1* or X^0*.** These settings are only available for custom sensors that are not one of Wadsworth's standard types.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Access Code

The access code is an optional feature that password protects the settings. If you establish an access code, thereafter the correct code must be entered to gain access to the **<<<Setting Menu>>>**. All reports are still available without entering the code, however no changes can be made.

To reach the Access Code Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **4** then **GO** to reach the Access Code screen.
- Enter an access code up to 10 digits long.
- If you have an access code, and wish to change or clear it, navigate to the access code screen as described above. Instead of entering your 1-10-digit access code, press **GO**. This wipes out any access code that has been input.
- The access code must be entered to get to the **<<<Setting Menu>>>**. Once set, it needs to be known to return to the **<<<Setting Menu>>>**. If you forget your access code, contact Wadsworth Control Systems Technical Support.

Sample Access Code Screen:
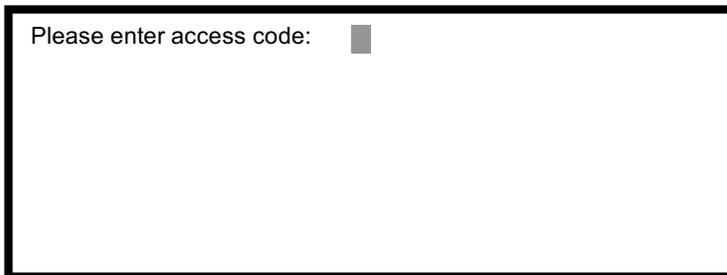
```
Please enter access code:    ▮


```

Limit Settings

Most of the limit settings affect the way the greenhouse vents operate in bad weather. For these settings to be meaningful, a Weather Station must be connected.

> **If you do not have a Weather Station, use the settings from this example anyway. If these settings are left at 0 or entered incorrectly, your vents will not open. Without a Weather Station, the limits can only respond to the outdoor temperature sensor that may be purchased with your EnviroSTEP.**

This is a two-level screen. Screen One sets wind restrictions. Screen two sets additional limits. To reach the second screen, press **GO** while viewing the first screen. Pressing **GO** from the second screen returns to the **<<<Setting Menu>>>**

Limit settings affect irrigation, misting, and the way the computer makes sunlight intensity readings. See section *Special Limit Settings* for more information.

To reach the first Limit Setting Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **5** then **GO** to reach the first limit settings screen.

Sample Limit Settings Screen (Level 1):

```
        Vent Limit Settings
Vent–Limit        :      Wind–Speed
Gale%   Max%    :      Min     Gale
0       100            25      35      Lee Roof Vent
0       100            20      30      Wind Roof Vent
0       100            35      45      Lee Pad Vent
0       100            30      40      Wind Pad Vent
```

Reading the Limit Settings Screen

This screen provides sliding scale limits for the various vents in a greenhouse. They allow you to define a scheme where rising wind speeds restrict a vent more and more, until finally it must move to a storm-safe position, which is typically completely closed.

Separate settings are provided for windward and leeward facing vents. A windward facing vent opens in the direction from which the wind is blowing, while a leeward vent opens facing away from the current wind. The computer uses the wind direction data from the weather station and its programmed knowledge of each vents orientation to determine whether a vent is windward or leeward on a minute-to-minute basis.

This page also allows you to have separate wind protection rules for roof vents and for vents on the side of the greenhouse, here called pad vents. The angle of opening of side or pad vents, and their protected location relative to roof vents usually makes it safe to set higher wind speeds before they must be restricted.

Vent–Limit Gale%	The overall heading for the first two columns of settings.
	Gale % – Sets the vent position when the wind speed is greater than or equal to the max wind speed setting. This value is typically 0, which forces the vents closed during high winds. If you set a value greater than zero, the vent will open to this position when the wind speed exceeds the gale speed setting in the fourth column of this screen. Forcing a leeward facing vent open in a windstorm can make it act like a wing, an effect that creates suction in the greenhouse, helping to hold down the covering.

Vent-Limit Max %	**Max%** Sets the maximum allowed vent opening when the wind speed is at or below the minimum wind speed setting. Typically, this is set to 100%, allowing the vent to open any amount needed on calm days.
Wind—Speed Min	The overall heading for the last two columns of settings. **Min** – Sets the minimum wind speed at which damage to the vents may occur. Below this speed, the computer assumes it is safe to open the vent to the setting under *Vent–Limit-Max%* as needed. At or above this wind speed, the computer will restrict the vent.
Wind-Speed Gale	**Max** – Sets the maximum wind speed at which it is safe to have the vent open at all. Anything above this speed, the computer will restrict the vent, closing it to the position set in *Vent–Limit-Gale%*.

Diagram: How Wind Speed Affects Allowed Vent Position
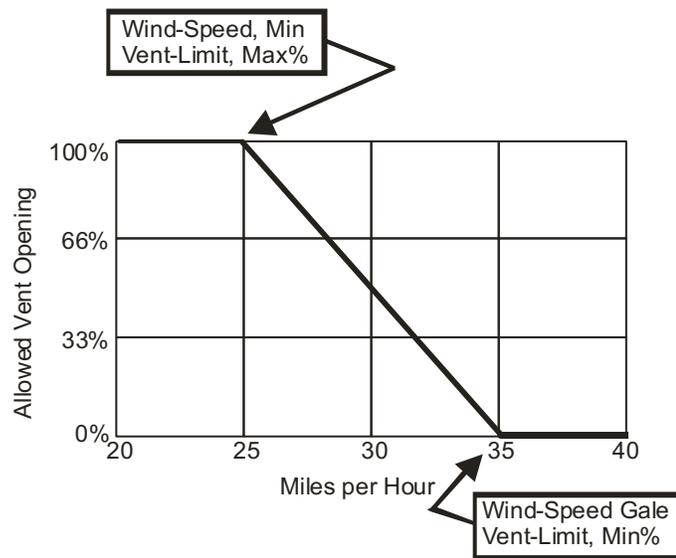
Special Limit Settings

This is the second of two screens used for Limit Settings. Except for the irrigation and mist valve settings, these settings require a Weather Station to be meaningful.

To reach the limit Settings Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **5** then **GO** to reach the first limit settings screen.
- Press **GO** to reach the Special Limit Settings.
- Use up/down arrows to navigate.

Sample Special Limit Settings Screen:

```
          Special limit settings
0/0 =     Max roof/side vent % during rain.
10  =     COLD LOCKOUT: Vents closed
20  =     COLD LOCKOUT ENDS:  Max vent OK
 1  =     Max simultaneous IRRIGATION valves
 1  =     Max simultaneous MISTING valves
 5  =     Light Intensity Averaging Factor
```
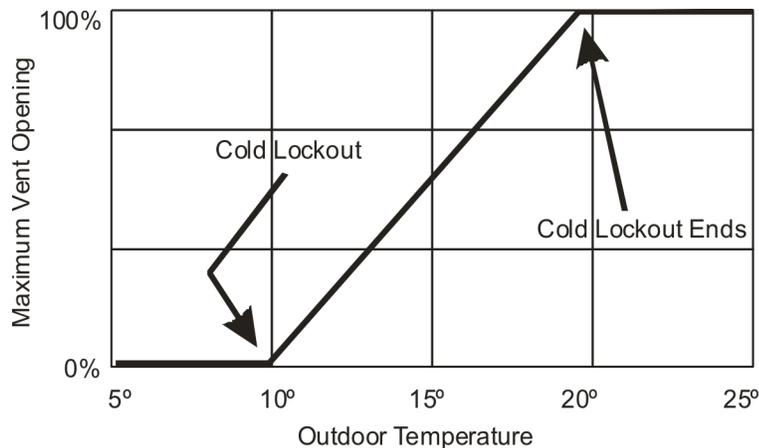
The default settings for roof and side vent limits during rain changed in the Fall of 2008. The settings used to be 10/25 they were changed to 0/0 to protect from rain damage. If you do not have the style of greenhouse with a fully open roof the 10/25 settings may still be appropriate. These settings allow the greenhouse to cool during rain.

Reading the Special Limit Settings Screen

Max roof/side vent % during rain	Defines the maximum % the roof and side vents will open during rain or snow. The roof can have a smaller allowed opening than the side, as the side is less likely to let rain into the house.
Cold Lockout	Defines temperature when the vents lock closed due to cold weather outside the greenhouse. Remember that you may still need some ventilation in sub-freezing weather if the sun is bright. Setting too high a *COLD LOCKOUT* temperature can cause the greenhouse to overheat in winter.
Cold Lockout Ends	Defines temperature when vent restrictions end. When the outdoor temperature falls between Cold Lockout and Cold Lockout Ends vents can open partially on a sliding scale.

Diagram: A view of how vents are limited as the outdoor temperature varies. Lower temperatures allow smaller maximum vent openings, while higher temperatures allow larger openings.

Max Simultaneous Irrigation Valves and Max Simultaneous Misting Valves	Sets the total number of valves that the computer can open at the same time. Controls the number of valves to match it with available water pressure. Use the highest number of simultaneous valves that your water pressure allows.
Light Intensity Averaging Factor	Controls the amount of averaging applied to the sun reading as used by curtains and HID lights. Higher settings smooth out the reading more than lower settings. Light intensity can be used to control irrigation/misting, HID lights and shade curtain operations. See individual settings for details. Also, this information can be used in the setpoint adjustment screen to refine Temperature and Relative Humidity settings. See section on Second Setpoints screen for more information.
Wind Speed	EnviroSTEPs made before 2002 may show this setting instead of Light Intensity Averaging Factor. It adjusts the computer's reaction to wind speed in the same way Light Intensity Averaging Factor affects light: higher numbers are slower to respond, allowing more wind gusts before responding. Units made after 2002 respond to the one-minute average of wind speed. Contact Wadsworth Controls Technical Support to see if your system is eligible for an upgrade.

Changing Limit Settings

Appropriate wind speed settings depend on your greenhouse structure.

Sample Limit Settings Screen (Level 1):

```
            Vent Limit Settings
Vent–Limit         :       Wind–Speed
Gale%   Max%    :        Min    Gale
0       100             25     35     Lee Roof Vent
0       100             20     30     Wind Roof Vent
0       100             25     35     Lee Pad Vent
0       100             20     30     Wind Pad Vent
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu >>>**
- Press **5** then **GO** to reach Limit Settings screen.
- Enter # ↓ for **Gale% (Vent-Limit)**
    This example uses 0% meaning the vents will close completely during high winds. If you enter a number other than 0, the vents will open to that amount during high winds. This can help create suction in a naturally ventilated greenhouse, which may prevent the covering material from being blown off.
- Enter # ↓   for **Max% (Vent-Limit)**
    This example uses 100% meaning the vents can open completely when the winds are calm. Any setting less than 100 limits the vents to that setting at most, regardless of wind speed. **The Max% setting must be greater than the Min% setting. If it is not at least 1% less, the vents will not open.**
- Enter # ↓   for **Min (Wind–Speed)**
    This example uses 25 mph if the wind is 25 mph or lower the vents will be able to open completely. Typical *Min Wind–Speed* settings are 10-25 mph.

- Enter # ↓   for **Gale (Wind–Speed)**
    This example uses 35 mph meaning that is the computers definition of gale wind. If the wind is 35 mph or higher the vents will be at the gale position. In this case, they will close completely. Typical speed settings are 25-50mph for *Gale Wind–Speed*. **The gale setting must be greater than the Min setting by at least 1 MPH, or the vents will not open.**
- Repeat the process to modify the remaining three lines for the *Wind*ward roof vent, and the *Lee*ward and *Wind*ward pad vent.
- Press **GO** to enter second limit settings screen.

Sample Special Limit Settings Screen (Level 2):

```
            Special limit settings
10/25 =  Max roof/side vent % during rain.
10  =     COLD LOCKOUT: Vents closed
20  =     COLD LOCKOUT ENDS:  Max vent OK
 2  =     Max simultaneous IRRIGATION valves
 2  =     Max simultaneous MISTING valves
 5  =     Light Intensity Averaging Factor
```

- Enter # ↓   for Max **ROOF VENT %** during rain. Enter # ↓   for **Max side vent %** during rain.
    This example uses 10/25 meaning the roof vent can open 10% and the side vent can open 25% meaning that during rain, you must have a Weather Station to detect rain.
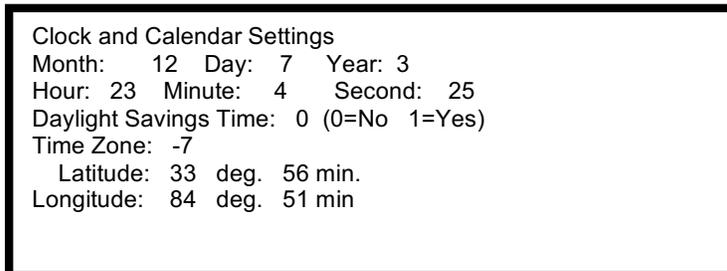
- Enter # ↓   for COLD LOCKOUT Vents closed.
    This example uses 10 meaning that the vent will lock into closed position when the outside temperature is 10ºF or colder.
- Enter # ↓   for **COLD LOCKOUT ENDS:** Max vent OK
    This example uses 20 meaning that vents will be unlocked and allowed to move 100%. If when the outdoor temperature is between Cold Lockout temps, vents will proportion open/closed.
- Enter # ↓   for **max simultaneous irrigation valves**
    This example uses 2 meaning only 2 irrigation valve can operate at a time.
- Enter # ↓   for **max simultaneous misting valves**
    This example uses 2 meaning only 2 misting valve can operate at a time.
- Enter # ↓   for **light intensity**
    This example uses 5 meaning the averaging applied to the sun reading is a moderate level. Higher settings smooth out the reading more than lower settings. A setting of 1 means almost no averaging. 5 yields about a three-minute average, and 9, the maximum allowed value, gives about a twenty-minute average.
- Press **GO** to repeatedly to return to the **<<<Main Menu>>>**

Time & Date Settings

These settings adjust the computer's internal clock and calendar. This data is used to determine the times for sunrise/sunset.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **6** then **GO** to reach Time/Date screen.

Sample Time/Date Settings Screen:

```
Clock and Calendar Settings
Month:     12  Day:  7    Year: 3
Hour: 23   Minute:   4      Second:   25
Daylight Savings Time:  0  (0=No   1=Yes)
Time Zone:  -7
  Latitude:  33  deg.  56 min.
Longitude:  84  deg.  51 min
```

Reading Time & Date Settings Screen

Clock and Calendar Settings:

Month: 2 / **Day**: 7 / **Year**: 3	Indicates the date December 7, 2003
Hour: 23 / **Minute**:4 / **Second:** 25	Indicates time using a 24-hour clock. 11:04:25 PM.
Daylight Savings Time	Indicates if Daylight Savings Time is in effect 0=No 1=Yes. If you observe daylight saving time at your location, this setting needs to be adjusted twice a year. If this adjustment is not made, the computer will not properly calculate sunrise/sunset.
Time Zone	Indicates the time zone, relative to Greenwich Mean Time. -7 is Mountain Time. See the table on the following page for details.
Latitude	Indicates distance in degrees and minutes from the equator. Positive numbers are used to the North, negative to the South.
Longitude	Indicates distance in degrees and minutes from the prime meridian. Positive numbers are used to the West, negative to the East.

Charts for Time & Date Settings

Use the following table to determine the proper time zone setting:

Time Zone	Setting
Atlantic	-4
Eastern	-5
Central	-6
Mountain	-7
Pacific	-8
Alaska	-9
Hawaiian	-10

Use the following table to determine the proper time setting:

Time	24-hour clock	Time	24-hour clock
Midnight	00:00	Noon	12:00
1 AM	01:00	1 PM	13:00
2 AM	02:00	2 PM	14:00
3 AM	03:00	3 PM	15:00
4 AM	04:00	4 PM	16:00
5 AM	05:00	5 PM	17:00
6 AM	06:00	6 PM	18:00
7 AM	07:00	7 PM	19:00
8 AM	08:00	8 PM	20:00
9 AM	09:00	9 PM	21:00
10 AM	10:00	10 PM	22:00
11 AM	11:00	11 PM	23:00

Changing Time & Date Settings

Sample Time/Date Settings Screen:

```
Clock and Calendar Settings
Month:    12   Day:   7    Year: 3
Hour:  23   Minute:   4       Second:   25
Daylight Savings Time:   0  (0=No   1=Yes)
 Time Zone:  -7
   Latitude:  33   deg.  56 min.
 Longitude:   84   deg.  51 min
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Screen>>>**
- Press **6** then **GO** to reach Time/Date screen.
- Press **GO** to reach **Special Limits** setting screen.
- Enter # ↓ for **month**
    This example uses 12 meaning December
- Enter # ↓ for **date**
    This example uses 7 meaning December 7
- Enter # ↓ for **year**
    This example uses 3 meaning 2003
- Enter # ↓ for **hour** (must use 24-hour clock)
    This example uses 23 meaning 11:00 PM
- Enter # ↓ for **minute**

This example uses 4 meaning 23:04 or 11:04 PM

- Enter # ↓ for **second**

    This example uses 25 meaning 23:04:25 or 11:04:25 PM

- Enter 0 ↓ or 1 ↓ for **Daylight Savings**

    This example uses 0 meaning it is not Daylight Savings Time. Daylight Saving Time begins for most of the **United States** at 2:00 AM on the first Sunday of April. Time reverts to standard time at 2:00 AM on the last Sunday of October. In the U.S., each time zone switches at a different time.

- Enter # ↓ for **time zone**

    This example uses –7 meaning Mountain Time. See table for your appropriate number on the previous page.

- Enter # ↓ for **Latitude**

-

    This example uses 33 deg and 56 min meaning the greenhouse is located 33º 56' North of the Equator. This information is provided to you on your configuration sheet when you receive your EnviroSTEP.

- Enter # ↓ for **Longitude**

    This example uses 84 deg and 51 min, meaning the greenhouse is located 84º 15' West of the Prime Meridian.

- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Start!

This menu choice has two uses. First, it is used to start the program. Use it to start the controller after it is installed and you are satisfied with its settings. The second use is to bypass ramp time, making a setpoint change (from choice 1 of the Settings Menu) immediate.

To use this menu item:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **8** then **GO** to make the EnviroSTEP start or restart, and make all setpoints current with the values entered on the setting screen, bypassing any ramp time delays. The computer will confirm that you have started or restarted by displaying:

> STARTED
> The GO key goes back to the menu.

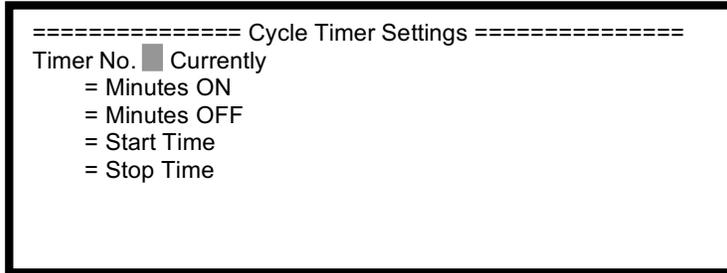- Press repeatedly to return to the **<<<Main Menu>>>**

Cycle Timers

The EnviroSTEP has four internal cycle timers. These behave like electromechanical cycle timer or time clocks, and can be used to influence the operation of most types of equipment.

To reach the screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **9** then **GO** to reach the **Cycle Timer Settings**

Sample Cycle Timers Screen: (before choosing any of the 4 timers)

```
============== Cycle Timer Settings ==============
Timer No. ▓ Currently
        = Minutes ON
        = Minutes OFF
        = Start Time
        = Stop Time
```

Reading the Cycle Timers Screen

Timer No.	Selects a timer.
Currently	Shows the status (off or on) of a timer once one is selected.
Minutes ON	Sets the number of minutes the cycle timer stays on during each of its duty cycles.
Minutes OFF	Sets the number of minutes the cycle timer stays off during each of its duty cycles. Added together, **Minutes ON + Minutes OFF** total one duty cycle.
Start Time	Sets the start of the cycle timer period.
Stop Time	Sets the end of the cycle timer period.

Changing the Cycle Timers Settings

Sample Cycle Timers Screen:
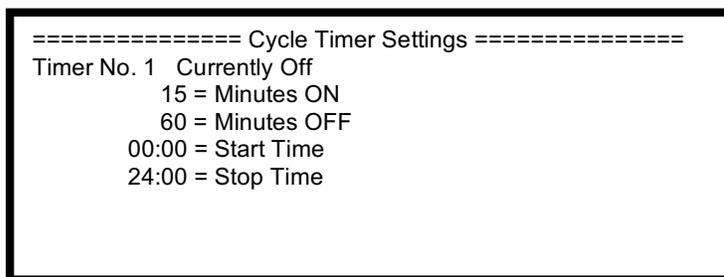
```
============== Cycle Timer Settings ==============
Timer No. 1   Currently Off
        15 = Minutes ON
        60 = Minutes OFF
     00:00 = Start Time
     24:00 = Stop Time
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **9** then **GO** to reach the **Cycle Timer Settings**
- Enter # ↓ for **Timer No**
     This example uses 1 meaning cycle timer number one (of four) is selected
- Currently is filled in by the computer and displays whether the selected timer is on or off
     In this example, the timer is off.
- Enter # ↓ for **Minutes ON**
     This example uses 15 meaning the timer will come on for 15 minutes in each of its duty cycles.
- Enter # ↓ for **Minutes OFF**
     This example uses 60 meaning the cycle timer will be off for 60 minutes during each of its duty cycles.

With these settings, each duty cycle is one hour and fifteen minutes: 15 minutes on followed by 60 minutes off.

- Enter # ↓   for **Start Time** (must use 24-hour clock)
    This example uses 00:00 meaning midnight as the first minute of the day.
- Enter # ↓ for **Stop Time** (must use 24-hour clock)
    This example uses 24:00 meaning midnight as the last minute of the day.
- Press repeatedly to return to the **<<<Main Menu>>>**
-

The <<<Configuration Menu>>>

This screen provides a menu of choices that let you configure your computer for your greenhouse. Configuration identifies the zone number this computer will use, as well as the sensors and equipment it works with.

> **Remember this computer has already been customized for your greenhouse. If you wish to make changes, carefully follow the instructions in this section. Be aware that any changes you make will override the program that Wadsworth Control Systems has customized for your greenhouse.**

To reach the Settings Menu:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**

Sample <<<Configuration Menu>>>:

```
                <<< Configuration Menu >>>
        1___Zones              5___Address
        2___Sensors…           6___Var. Voltage
        3___Switches           7___Units.
        4___Detectors          8___Reverse LCD
              9___Weather On/Off [Off]

                 YOUR CHOICE? >>>
```

Reading the <<<Configuration Menu>>>

There are nine choices from the Settings Menu (1-9):

1 Zones	Assigns the zone a number. **All sensor and equipment configuration settings must use the number you assign here.** You may use any number from 1 to 98. If you have more than one EnviroSTEP, it's helpful to assign a different number to the zone that each controls, though this is not required. When using the Wadsworth Control Systems PC software package, the STEPsaver, each EnviroSTEP must be given a unique address starting from one, and increasing for each additional system (i.e. 2,3,4…).
2 Sensors	Tells the computer what kind of sensors have been connected to its sensor input channels.
3 Switches	Assigns equipment to any of the 12 switches. It tells the computer what equipment to control.
4 Detectors	Assigns functions to any of four detector channels that sense the status of external electrical contacts.
5 Address	Sets the system network address. Default setting is '0' and only needs to be changed when using the Wadsworth Control Systems STEPsaver software package. With STEPsaver, each EnviroSTEP must be given a unique address starting from one, and increasing for each additional system (i.e. 2,3,4…).
6 Var Voltage	Wadsworth uses it for internal testing.
7 Units	Determines the units of measure the EnviroSTEP will use. Can be English or Metric (Fahrenheit / Celsius) - default is English.
8 Reverse LCD	Reverses the display to have a dark background and light letters.

9 Weather On/Off	Switches the Weather Station On/Off.

Reading and Changing the Zone Name Screen

This screen displays the current zone name. To change the zone name:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **1** then **GO** to reach Zones screen.
- Enter # then **GO** to change the Zone name.

Sample Zones Screen:

```
<<<Zone Name>>>
      [  1 ]
```

Sensor Screen

There are two levels to the Sensor Screen. To reach the first Sensor Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **2** then **GO** to reach Sensors screen.

Sample Sensors Screen:

```
Channel Zone      Senses
   1     1        RH
   2     1        Temp
   3              --- Spare
   4     99       Temp
   5              --- Spare
   6              --- Spare
Scroll or Select Here [    ]
```

Reading the Sensor Screen (Screen 1)

Channel	Indicates what channel is being read, the EnviroSTEP has 7 Analog input channels for connecting sensors for temperature, humidity, light intensity, etc.
Zone	Indicates in what zone the sensor is connected. Outdoor sensors and weather station sensors must use with zone 99.
Senses	Indicates what the sensor reads. (RH, Temp, etc.)

Reading the Sensor Configuration Screen (Screen 2)

There are two levels to the Sensor Screen. To reach the Screen 2, the Sensor Configuration Screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**

- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **2** then **GO** to reach Sensors screen
- Press **#↓** then **GO** to reach the Sensor Configuration Screen:

Sample Sensor Configuration Screen:

```
--------------------------Sensor Configuration --------------------------
      Channel:  1
     Activate:  1   (0 = No, 1 = Yes)
 Sensor Code:  0  (0=T,    1=RH,     2=Sun,      8=Tpro)
       Method:  0  (See manual, usually 0)
         Cstm:  0  (See manual, usually 0)
   Smoothing:  0  (0-9 for Least to Most)
 For Weather:   0  (0=Normal,  1= Weather)
```

Activate	Set to 0 to erase the channel and take it out of service. Set to 1 to use the channel.
Sensor Code	Identifies the type of sensor wired to this input channel. The screen shows the common choices. All the available choices are as follows:

Sensor Code	Use for
0	Standard aspirated temperature sensor
1	Relative humidity sensor
2	Sunlight intensity sensor
6	CO_2 (Carbon Dioxide) concentration sensor
7	Potentiometer vent position sensor
8	Temperature probe for soil or hot water

Method	Determines the formula used to interpret light and humidity sensor readings; must match the sensor used. Refer to the table below:

Sensor	Method
Phillips RH sensor before April, 2001	0
Honeywell RH Sensor from April 2001 forward	1
Apogee brand light sensor with gray plastic dome	0
Matrix brand light sensor with glass dome	1

Custom	Optionally enables a custom formula for interpreting data from a sensor. If set to 0, it selects the computer's built-in formula. If set to 1, it enables a user-defined formula for interpreting sensor readings on this channel. The actual formula is entered on the calibration screen for the sensor.
Smoothing	Sets the amount of noise filtering the computer applies to readings from this channel. Settings range from 0 to 9. When set to 0, it turns noise filtering off. Each increment above 0 adds about 2 seconds of averaging to the reading the computer uses, up to a maximum of 18 seconds when set to 9.
For Weather	Identifies this sensor as a weather station sensor or a normal indoor sensor. Set to 0 for indoor sensors. Set to 1 for sensors mounted outdoors to read weather conditions.

Changing the Sensor Settings

If you are configuring sensors yourself, or changing the factory configuration, perhaps to add an additional sensor to your computer, use the blank Configuration worksheet in the back of this manual to document your work.
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**

- Press **7** then **GO** to reach **<<<Configuration Menu>>>**
- Press **2** then **GO** to reach the Sensor screen.

Sample Sensors Screen:

```
Channel Zone    Senses
1          1          RH
2          1          Temp
3                     ---- Spare
4          99         Temp
5                     ---- Spare
6                     ---- Spare
Scroll or Select Here [ ▮ ]
```

Select a sensor # ↓ to reach the Sensor Configuration Screen

Sample Sensor Configuration Screen:

```
------------------------Sensor Configuration --------------------------
        Channel:  1
   Sensor Code:  0  (0=T,    1=RH,    2=Sun,    8=Tpro)
        Method:  1  (See manual, usually 0)
          Cstm:  0  (See manual, usually 0)
     Smoothing:  9  (0-9 for Least to Most)
   For Weather:  0  (0=Normal,  1= Weather)
```

- Enter # ↓ for **Sensor**. The common sensor types are listed on the screen, to the right of this setting.
     This example uses 1, meaning humidity (RH)
- Enter # ↓ for **Method**. Method chooses between alternate ways of interpreting humidity and sun sensor readings.
     This example uses 1, meaning the standard Honeywell RH sensor used since April 2001.
- Enter # ↓ for **Custom**. Enables a user-defined formula for interpreting this sensor.
      This example uses 0 meaning the computer's internal formula will be used.
- Enter # ↓ for **Smoothing** (0 for none, 9 for max.)
     This example uses 0 meaning maximum smoothing. The computer will do the most possible noise filtering.
- Enter # ↓ For **Weather**
     This example uses 0 meaning that this is an indoor sensor, not a weather sensor.
- Press **GO** repeatedly to return to **<<<Main Menu>>>**

Switches Screen

This screen displays the equipment assignments to the 12 toggle switches located on the front panel of the EnviroSTEP.   This is a two-level screen. Level 1, Switches, lists the switches and their configuration; Level 2, the Equipment Configuration Screen, allows you to assign equipment to a switch. To reach the Switches screen:

- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **3** then **GO** to reach Switches screen.
- Use up/down arrow keys to navigate between the 2 screens

Sample Switches Screen 1:

```
Switch          Zone      Use
( 1 )           1         Heater #2
( 2 )           1         Heater #1
( 3 )           1         Exh Fan #1
( 4 )           1         Exh Fan #2
( 5 )           1         Exh Fan #3
( 6 )           1         Exh Fan #4
Scroll or Select Here [     ]
```

Reading the Switches Screen

Switch	Shows the switch number as printed on the faceplate of the EnviroSTEP next to the switch.
Zone	Shows the zone number assigned to this switch. It must match the zone number assigned to this EnviroSTEP.
Use	Indicates what equipment is assigned to the switch (Heater, Exhaust Fan, Vent, Curtain, Irrigation Valve, Spare). Also shows the stage or unit number that distinguishes between multiple pieces of an equipment type within the zone.

Equipment Configuration Screen

This screen assigns equipment to the switches. To reach the Equipment Configuration screen:

- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **3** then **GO** to reach Switches screen
- Enter a switch # **GO** to reach Equipment Configuration.

Sample Equipment Configuration Screen:

```
========== Equipment Configuration Data ==========
                   Switch:  1
                    Zone :  1
           Stage or Unit No. : 2
            Equipment Code : 0
           Sensor Ch/Volt Ch: 0 / 0
   Slave Switch # / # [Spare] : 0 / 0  -  [ 0 ]
             Direction (Vents) : 0   ( 1 = N   2 = S  3 = E  4 = W )
```

Reading the Equipment Configuration Screen

Switch	Automatically filled in by the computer based on what switch was used on the previous screen.
Zone	Indicates the zone number where the equipment is located.
Stage or Unit No.	Indicates number of equipment, in a series of pieces of equipment of the same type. For example, if this zone includes two separately controlled unit heaters, use stage or unit number one for one heater, and two for the other. The computer does not require unit numbers, but using them makes reading status easy to interpret.
Equipment Code	Displays the code for the piece of equipment. Codes are listed on the printed Configuration worksheet as well as in the equipment settings section (i.e. curtain Code 16). The name of the equipment appears to the right of the code if you press the down-arrow (↓) key after the code number is entered.
Sensor Ch/Volt Ch	**Sensor Ch** directs this piece of equipment to refer to a specific sensor channel for its temperature data. In the default case, *sensor channel* is 0, and the equipment (switch or output) responds to the average temperature in its zone. Setting a specific sensor channel is only meaningful if there is more than one temperature sensor in the zone. **Volt Ch** dedicates a voltage output channel to this piece of equipment. The EnviroSTEP provides two variable voltage output channels numbered 1 and 2. You may use either by entering its number here. Equipment Code 24 (Mix Valve) and Equipment Code 26 (Var. Fan) use a voltage channel to signal position or speed. For these codes, enter the channel number to which you have connected your control wires for the equipment. All other equipment codes ignore any setting you enter here.

In principle, the EnviroSTEP is a single zone controller, but by using multiple temperature sensors and associating each with the *sensor channel* of specific pieces of equipment, you can create microclimates within the zone. For example, imagine a zone with an aspirator for air temperature, three soil temperature probes, and three valves for three areas of under-bench heat. The zones cooling equipment and any space heaters could refer to the aspirated temperature reading, but each under-bench heat valve would refer to the *sensor channel* of the soil temperature probe in the part of the greenhouse that it heats. This approach allows the EnviroSTEP to maintain three different soil temperatures in a space with a single air temperature.

You can also use the *sensor channel* for cooling equipment. In a zone with four roof vents and four aspirators, but only one heater, each vent can move based on the temperature at the nearest aspirator. The heating system can use the average of all four aspirators. In this example, the *sensor channel* setting in the configuration screen for the heating equipment would be zero (to use the average of all the aspirators), while each roof vent's *sensor channel* would be set to the channel of the nearest aspirator.

Slave Switch # / # [spare]	Used to set up banks of cyclic lighting. Only the left side of the slash mark is used - enter the total number of controlled light banks. To remove the switch or piece of equipment, change the 0 inside the square and setting brackets to "1" to erase the program for a switch and make it spare.
Direction (Vents)	Indicates what direction the vent faces. The computer compares this setting with the wind direction reading from the weather station to determine whether the vent is windward or leeward. Using this information, it chooses the appropriate *Limit Settings.*

Changing the Switch Configuration

This is a two-level screen. Level 1 shows the switch configuration; level 2 assigns equipment to a switch.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **3** then **GO** to reach Switches screen.
- Use up/down arrow (↑↓) keys to navigate (there are 2 screens).

Sample Switch Screen: (Level 1)

```
Switch          Zone          Use
(  1)            1             Heater #2
(  2)            1             Heater #1
(  3)            1             Exh Fan #1
(  4)            1             Exh Fan #2
(  5)            1             Exh Fan #3
(  6)            1             Exh Fan #4
Scroll or Select Here [   ]
```

- Enter a switch # and **GO** to reach the Configuration screen for a specific switch.
       This example uses switch 1 – Side Vent # 2.
  Use up/down arrow (↑↓) keys to view all switches.

Sample Equipment Configuration Screen: (Level 2)

```
=========== Equipment Configuration Data ===========
                  Switch:  1
                  Zone :  1
        Stage or Unit No. : 2
        Equipment Code : 0
        Sensor Ch/Volt Ch: 0 / 0
  Slave Switch # / # [Spare] : 0 / 0  -  [ 0 ]
        Direction (Vents) : 0   ( 1 = N   2 = S  3 = E  4 = W )
```

- The switch number will automatically be filled in based on the number you entered on the level 1 Switches screen.
- Enter # ↓ for **zone**
       This example uses 1. Remember that this must match the zone number assigned on the <<<Configuration Menu>>>
- Enter # ↓ for **Stage or Unit No**
       This example uses 2 meaning it is the second of two vents. In some cases, you will have just one switch for a given kind of equipment, like HAF Fans or Curtains. Use '1' in those cases. For other kinds of equipment like exhaust fans, you may have three or four stages or units numbered 1, 2, 3, 4 assigned. Remember that these numbers are for your use, so assign values that make sense to you.
- Enter # ↓ for **Equipment Code**
       This example uses 1 meaning Side Vent. The EnviroSTEP contains programs for many kinds of equipment. Each has a number that identifies it in this setting. The numbers and the equipment they describe are documented in the Equipment Settings section of this manual. To see the equipment code translated into a description, press the down arrow (↓) key after you enter a code. The equipment description will appear to the right of the equipment code number.
- Enter # ↓ for **Sensor Channel**
       This example uses 0 meaning the computer uses the temperature reading from the main aspirator in the zone. Even if there is only one aspirator attached to your EnviroSTEP, use the default of 0 here. Only use specific channel numbers from 1 to 7 to establish microclimates within a zone that has multiple temperature sensors.

- Enter # ↓ for **Slave Switch # / #**
    - This example uses 0/0 because it does not pertain to vents.
- Set to 0/0 unless configuring Cyclic Lighting (Code 28).
- Enter # ↓ for **Direction** (Vents)
    - This example uses 3, meaning the vent faces East. Only vents use this setting.

Removing Equipment from the Switch Configuration

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **3** then **GO** to reach Switches screen.
- Use up/down arrow (↑↓) keys to navigate (there are 2 screens).

Sample Switch Screen: (Level 1)

```
Switch          Zone          Use
( 1)            1             Heater #2
( 2)            1             Heater #1
( 3)            1             Exh Fan #1
( 4)            1             Exh Fan #2
( 5)            1             Exh Fan #3
( 6)            1             Pad Pump #6
Scroll or Select Here [   ]
```

- Enter a switch # and **GO** to reach the Configuration screen for a specific switch.
    - This example uses switch 6 – Pad Pump #6.
- Use up/down arrow (↑↓) keys to view all switches.
- Sample Equipment Configuration Screen: (Level 2)

```
=========== Equipment Configuration Data ===========
                    Switch:  6
                    Zone :  1
          Stage or Unit No. : 6
          Equipment Code : 7
          Sensor Ch/Volt Ch: 0 / 0
   Slave Switch # / # [Spare] : 0 / 0  -  [ 0 ]
          Direction (Vents) : 1   ( 1 = N   2 = S  3 = E  4 = W )
```

Press the down arrow until the [Spare] number is selected. Enter **1** to remove a piece of equipment and make "Spare"

Sample Equipment Configuration Screen – Removing Equipment:

```
=========== Equipment Configuration Data ===========
                    Switch:  6
                    Zone :  1
          Stage or Unit No. : 6                    ⟵
          Equipment Code : 7
          Sensor Ch/Volt Ch: 0 / 0
   Slave Switch # / # [Spare] : 0 / 0  -  [ 1 ]
          Direction (Vents) : 1   ( 1 = N   2 = S  3 = E  4 = W )
```

- Press **GO**
- In the Switch Menu, number (6) will now display as 'Spare'.

Sample Switch Screen - Spare: (Level 1)

```
Switch          Zone          Use
( 1)             1            Heater #2
( 2)             1            Heater #1
( 3)             1            Exh Fan #1
( 4)             1            Exh Fan #2
( 5)             1            Exh Fan #3
( 6)             1              Spare      ←──────────────
Scroll or Select Here [   ]
```

Configuring Detectors

The EnviroSTEP has four detector input channels. These channels indicate if the circuit they monitor is an open circuit or has electrical continuity.

If the EnviroSTEP is connected directly to a Weather Station, one channel monitors the precipitation detector, and the remaining three translate signals from the wind vane into the actual wind direction.

Reading the Detector Screens

There are two-levels of detector screens. The first level lists the available detector channels and their assigned uses. The second level is the Detector Configuration screen where you can see or change the use of detector channels.   To reach the first detector screen:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **4** then **GO** to reach Detector screen.

Sample Detector Screen: (Level 1)

```
        Ch      Detects
        1)        1          Spare
        2)        2          Spare
        3)        3          Spare
        4)        4          Spare


        Scroll or Select Here  [ ▓ ]
```

To continue to the second detector screen:
- Enter a channel # and **GO** to reach Detector Configuration
   This example uses channel 1

Sample Detector Configuration Screen: (Level 2)

```
_ _ _ _ _ _ _ Detector Configuration _ _ _ _ _ _ _ _
        Type: ▓  0  Channel: 1
        Causes alarm  ( 0 = No   1 = Yes ):  0
        Normal Status  ( 0 = N. O.  1 = N. C. ): 0
_ _ _ _ _ _ _ _ _ Type Codes _ _ _ _ _ _ _ _ _
        5 = Precipitation   11 = Lo Water
        9 = Misc / Other   12 = Pressure
        10 = Flame Fail    13 = Generator
```

Type	Sets the type of detector connected to this channel. The available type codes are listed on the bottom third of the screen.
Channel	Displays the channel being configured. The computer fills this in, from the selection made on the level 1 screen.
Causes alarm	Sets whether changes on this channel activate the computer's alarm. 0 = No, 1 = Yes
Normal Status	Identifies the normal or non-alarm status of this detector. N.O. means the circuit the detector monitor is normally open. N.C. means that the circuit the detector monitors is normally closed. 0 = N.O. 1 = N.C.
Type Codes	A quick reference list of the available types of detectors.

Changing the Detector Screens

There are two levels of detector screens. The first screen lists the four available detector channels and allows you to choose a specific detector. Once you choose a detector, the second level screen permits you to configure the way the computer uses the detector.

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **4** then **GO** to reach Detector screen.

Sample Detector Screen: (Level 1)

```
        Ch      Detects
        1)      1        Spare
        2)      2        Spare
        3)      3        Spare
        4)      4        Spare

        Scroll or Select Here  [   ]
```

- Enter a detector/channel? # **GO**
- This leads to the Detector Configuration screen
      This example uses detector channel 4.

Sample Detector Configuration Screen: (Level 2)

```
    _ _ _ _ _ _ _ Detector Configuration _ _ _ _ _ _ _ _
            Type: ▓  5  Channel:  1
            Causes alarm  ( 0 = No    1 = Yes ):  0
            Normal Status  ( 0 = N. O.  1 = N. C. ): 0
    _ _ _ _ _ _ _ _ _ Type Codes _ _ _ _ _ _ _ _ _ _
            5 = Precipitation   11 = Lo Water
            9 = Misc / Other    12 = Pressure
            10 = Flame Fail     13 = Generator
```

- Enter # ↓   for **Type** (see codes on bottom of screen)
      This example uses 5 meaning a precipitation detector. Channel four is the standard channel for a precipitation detector on an EnviroSTEP wired directly to a Weather Station.
- Channel is filled in by the computer based on the channel you selected on the level 1 screen.

- Enter 0 or 1 ↓ for **Causes Alarm**
      This example uses 0 meaning no alarm will sound if the precipitation detector triggers. It is simply a source of weather data.
- Enter 0 or 1 ↓ for **Normal Status**

This example uses 0 meaning N. O.
A precipitation detector indicates rain by changing from an open circuit to a closed one.
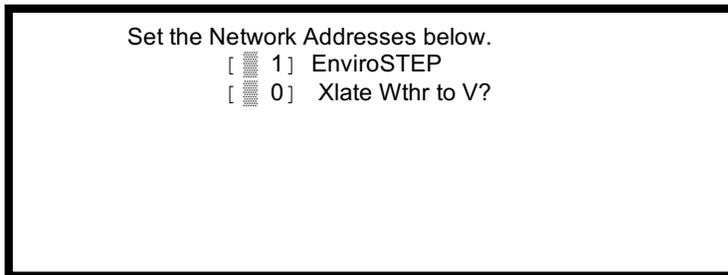- Press **GO** repeatedly to return to the **<<Main Menu>>>**

Wind direction tracking is enabled by connecting a wind vane and using item 9 of the <<<Configuration Menu>>> to set Weather to On. For units without a Weather Station, and units that receive weather data over the RS-485 network from another computer, all four detector channels are available to monitor the status of detectors. Typical detector applications include flame failure, overpressure or under-pressure on a boiler, generator status or monitoring equipment that produces a contact closure or opening. Any detector can be configured to trigger the computer's alarm. If you configure a detector as a source of alarms, the computer will activate its buzzer and alarm relay whenever the detector is not in its normal state.

Address Screen

This screen sets the network address, when multiple computers are in use and when the interface software is in use. This screen sets the network address. To reach the screen:
- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the <<<Configuration Menu>>>
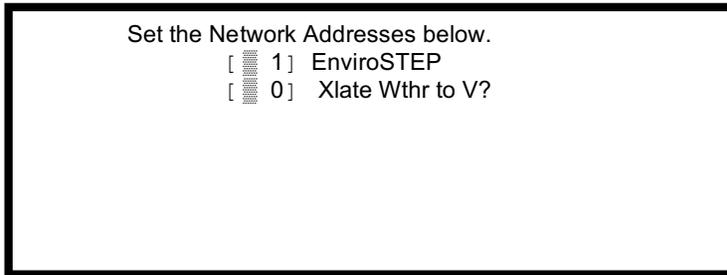- Press **5** then **GO** to reach Address screen

Sample Address Screen:

```
          Set the Network Addresses below.
              [    1]  EnviroSTEP
              [    0]   Xlate Wthr to V?
```

Reading the Address Screen

Enviro STEP	Indicates the network address for the computer. If you use a personal computer and Wadsworth Control Systems STEPsaver to communicate with your EnviroSTEP, and you have more than one EnviroSTEP or microSTEP/SA, each must have a network address assigned according to the following rules: ▪ Each EnviroSTEP or microSTEP must have a unique network address between 1 and 254. Network addresses must begin at 1 and increase sequentially with no gaps. The numbers do not necessarily correspond with the zone numbers. ▪ A PC automatically uses address 255.
Xlate Wthr to V?	In addition to controlling a greenhouse, the EnviroSTEP can serve as a transducer to convert its weather data to variable voltages for the use of a building control system like those made by Johnson Controls or Honeywell. On a university or office campus, weather data from the greenhouse controller may be of interest to such a building control system and its users, and the EnviroSTEP provides cost effective means of providing this data where required. The EnviroSTEP must be special-ordered from Wadsworth Control Systems for this feature to work correctly. If using this feature set this field to 1, if not, set it to 0.

Changing the Address Screen

Sample Address Screen:

```
Set the Network Addresses below.
       [  1]  EnviroSTEP
       [  0]   Xlate Wthr to V?
```

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **5** then **GO** to reach Address screen
- Enter # ↓ for EnviroSTEP.   Numbers must be sequential, starting with 1.
     This example 1, meaning this is the first (or only) EnviroSTEP connected to a personal computer using STEPsaver.
- Enter # ↓ for **Xlate Wthr to V?**
     This example uses 0, the standard setting, which should not be changed without consulting Wadsworth Control Systems Technical Support at 1-800-821-5829.
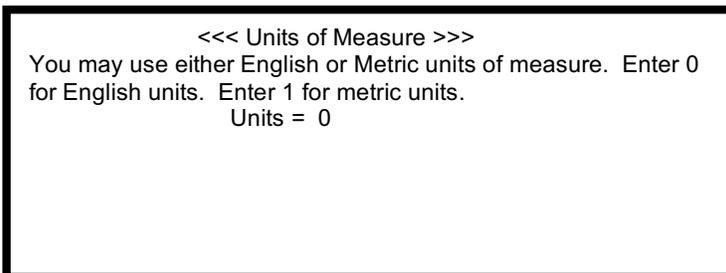- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Var. Voltage

This menu item is reserved for future releases of the EnviroSTEP program. As of this printing of the manual, no settings here affect the operation of the controller.

Units Screen

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Screen>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **7** then **GO** to reach **<<<Units of Measure>>>**
- Enter 1 or 0 ↓ to indicate type of units. 0 = English (Fahrenheit), 1 = Metric (Celsius)
     This example uses 1 meaning metric units. The default is English (Fahrenheit).
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

Sample Units Screen:

```
            <<< Units of Measure >>>
You may use either English or Metric units of measure.  Enter 0
for English units.  Enter 1 for metric units.
                 Units =  0
```

If you enter your settings with one system of units, and later change this setting to use the other system of units, the computer will not automatically convert the settings to the new system. You must re-enter the settings.

Changing the Reverse LCD

This screen sets the preferred mode of display. The default is a light background with dark characters. There is an option to have a dark background with light characters. There is no Reverse LCD screen; instead, simply entering this menu choice and pressing **GO** makes the change. To change the display mode:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **8** then **GO** to change the LCD screen
- Press **8** then **GO** to change it back
- Press **GO** to keep the screen display setting and to return to the <<<Configuration Menu>>> or press **GO** repeatedly to return to the **<<<Main Menu>>>**

Changing the Weather Station

This screen turns the Weather Station On/Off. There is no Weather screen. Simply entering the menu choice and pressing **GO** makes the change. To change the setting:

- Press **GO** repeatedly until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the **<<<Configuration Menu>>>**
- Press **9** then **GO** to change the Weather setting On/Off
- Press **9** then **GO** to change it back
- Press **GO** to keep the setting and to return to the <<<Configuration Menu>>> or press **GO** repeatedly to return to the **<<<Main Menu>>>**

When Weather is toggled "On", this EnviroSTEP will translate the readings on its first three detector channels into wind direction, and monitor for wind speed. It will update this information each second on its weather report screen. In addition, once a minute, it will broadcast a complete weather report to all other computers connected to the RS-485 network. For this reason, **only one** EnviroSTEP should have Weather toggled "On" in any greenhouse.

When Weather is toggled "Off," the EnviroSTEP will use detector channels as configured by you, and will get its weather data (if any) once a minute from another computer on the RS-485 network.

Installing a Weather Station to One EnviroSTEP

These procedures should be used if you did not originally order your EnviroSTEP with a Weather Station.

> **Remove power to the EnviroSTEP before performing the installation! An easy way to do this is to remove the primary fuse.**

- When adding a Weather Station to an existing EnviroSTEP, the first step is to connect the wires from the Weather Station to the EnviroSTEP on the green terminal blocks **J-2**, **J-3** and **J-4** (see the wiring instructions section in this manual).
- Remove the wires for the original outdoor temperature sensor (white and black wires on **J-3** points **8** and **9** on the faceplate of the EnviroSTEP computer). The new Weather Station has its own outdoor temperature sensor (red with yellow stripe and red with black stripe).
- Remove the 8 screws from around the outside edge of the EnviroSTEP faceplate.
- Lift the faceplate out and set aside.
- On the EnviroSTEP main circuit board find the row of jumpers labeled **J-6**, located near the lower left hand corner of the circuit board, approximately 2 3/8" from the bottom edge and 1 ½" from the left edge. If you have trouble finding J-6, look at the green terminal block **J-4** on point 5. The J-6 row of jumpers is ½" right of P-6 point 5.
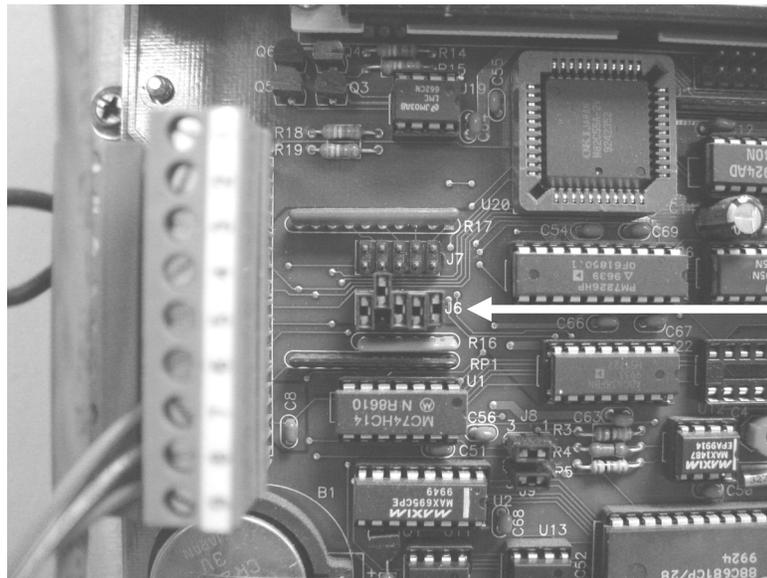
J6 Jumper

- There are 5 small black jumpers on the J-6 row, remove the second jumper from the left-hand side. Note: This jumper must be removed to accommodate the light sensor in the Weather Station.
- Verify the ribbon cable from the keypad to the EnviroSTEP logic board is connected, if OK then replace the EnviroSTEP faceplate.
- Re-connect the power.
- Activate Weather Station (see previous page).

On the EnviroSTEP computer, complete the following steps:

- Press **GO** until you reach the **<<<Main Menu>>>**
- Press **7** then **GO** to reach the **<<<Setting Menu>>>**
- Press **7** then **GO** to reach the <<<Configuration Menu>>>
- Press **2** for *Sensors* then press **GO**. Sensor channels 5 and 6 must be spare for the new Weather Station, channel 4 will remain as configured (Zone 99 Temp).

```
----------------------Sensor Configuration------------------------
      Channel: 5
      Activate: 1 (0=No, 1=Yes)
   Sensor Code: 2   (0=T, 1=RH, 2=Sun, 8=Tpro)
       Method:  0  (See Manual, Usually 0)
         Cstm: 0   (See Manual, Usually 0)
     Smoothing: 0  (0-9 for Least to Most)
   For Weather: 1   (0=Normal, 1=Weather)
```

- Press **1** then ↓ to turn sensor on or off.
- Press **2** then ↓ to choose Sun in this example.
- Press **0** then ↓ to set Method.
- Press **0** then ↓ to set Cstm.
- Press **0** then ↓ to Smoothing option.
- Press **1** then **GO** to choose Weather. In this example, it is set to 1 to meaning it is a Sun sensor attached to the Weather Station.
- When done the sensor channel assignment screen should show channels 4, 5 and 6 as follows.

Channel	Zone	Senses
4	99	Temp
5	99	Sun
6	99	RH

- If this is what is displayed, then press the **GO** key until you see the **<<<Configuration Menu>>>**
- Enter **9** then **GO** to toggle the *Weather* On.
- Press **GO** repeatedly to return to the **<<<Main Menu>>>**

For more information on smoothing, custom and Method, see the section **Reading the Sensor Configuration Screen (Screen 2)** under Configuration\Setting Menu.

Installing a Weather Station to Multiple EnviroSTEPs

Only the EnviroSTEP directly connected to the Weather Station will have the Weather turned ON. The remaining EnviroSTEPs will get the Weather data through the communication port on J-**2 points 3 and 4.** If several EnviroSTEPs are connected from the communications port then go the EnviroSTEP computers that are not directly connected to the Weather Station and perform the following procedures.

- Remove the existing outdoor temperature sensor located on J-**3 points 8 and 9.**
- Press the **GO** key until you see the **<<<Main Menu>>>**
- Enter **7** and **GO** to reach the **<<<Setting Menu>>>**
- Enter **7** then **GO** to reach the <<<Configuration Menu>>>
- Enter **2** and **GO** for the Sensors screen.
- At the Sensors screen, press **4** then **GO.** Enter a **0** for the all sections in the sensor screen and press the **GO** key repeatedly until you see the **<<<Main Menu>>>**
- Repeat this process for all EnviroSTEPs and MicroSTEPs

To check the Weather Station, press the **GO** key repeatedly until you see the **<<<Main Menu>>>**. Press **3** for Weather then press the **GO** key. You should see weather information like the example below.

Sample Weather Station Data:

```
              Current Weather
        Temp              70F
        RH                56%RH
        Sun               27mW      27mW  Avg.
        WSpd  (Wind Speed)   7MPH
        Wdir              NE
        Rain              No

     Accumulated Sun =         0W-H/sq-m
```

Installing Communication Wire and USB box for PC Access

Instructions for installing the USB box are packaged with your computer software when ordered. The USB box allows you to connect your PC to your EnviroSTEP/MicroSTEP controllers(s) using STEPsaver.

The package when mailed includes a CD with the Windows version of STEPsaver, (1) serial USB cable, (1) USB box with wiring attached and STEPsaver manual.

Single Controller Environment

If you only have one MicroSTEP or EnviroSTEP, follow the procedures below:
- Determine if the wiring provided is long enough to reach from the controller to the PC you wish to connect.
- The communication cable has a green and white wire. On the EnviroSTEP, connect the Green wire to position 3 and the White wire to position # 4 on the green terminal block labeled **J2** (You do not need to open the face plate of the EnviroSTEP to complete this step).
- Connect the green and white communication wires to the corresponding wires on the USB box.
- Do not attach the USB box to the PC until after the STEPsaver software has been installed.

Example of Terminal Block J2:

Terminal Block J2
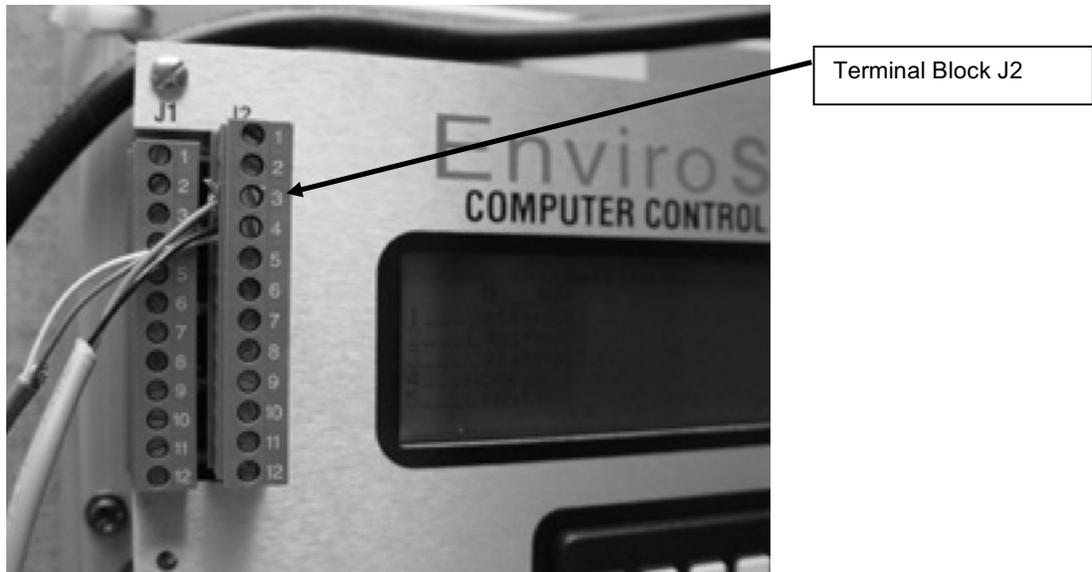
Multiple Controller Environment

If you have multiple controllers in your greenhouse, use the following procedures:
- Determine which controller is the 'main' controller of the group. This will be the controller with the network address of "1". To determine this, you can view the network address by choosing option 5, **Address**, from the <<<Configuration Menu>>>.

> **If you have multiple controllers, the network address of the first controller should start with "1" and continue with 2, 3, etc. If you have multiple controllers, any controller with a network address of "0" will not communicate properly with the other controllers and will cause the PC software not to connect.**

- The communication cable attached to the USB box has a green and white wire. On the EnviroSTEP, connect the Green wire to position # 3 and the White wire to position # 4 on the green terminal box labeled **J2** on the controller with the network address of "1".

If you are connecting a microSTEP to the 'main' controller, find terminal block marked "3". It is numbered 1 through 8. Connect the green wire to position # 7 and the white wire to position # 8. It can be connected to either the top or bottom screw of the corresponding number.

Add additional controllers to the network by daisy chaining them to the first or 'main' controller. The green wire connects to position # 3 of J2 on each EnviroSTEP or position # 7 of terminal block "3" on each microSTEP.
The white wire connects to position # 4 of J2 on each EnviroSTEP or position # 8 of terminal block '"3" on each microSTEP.

Example of Terminal Block "3" on microSTEP:
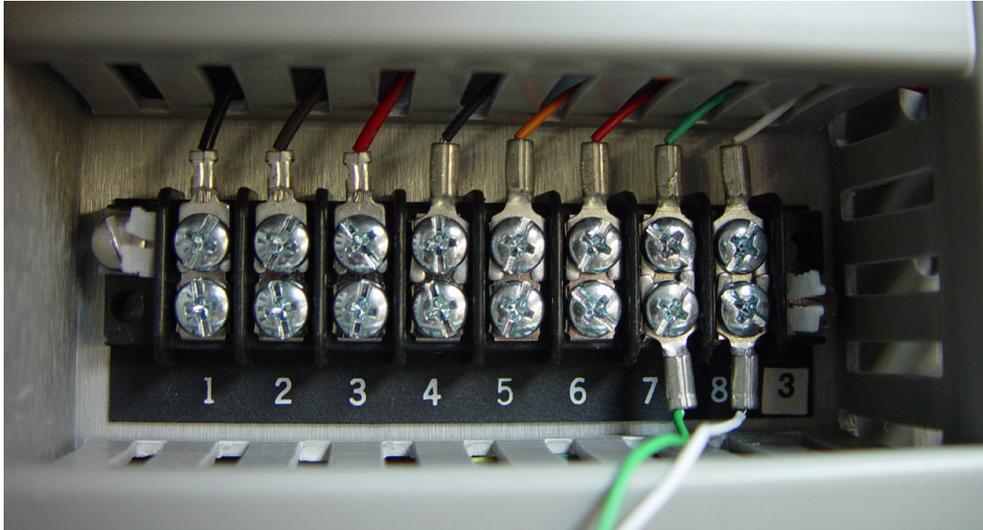
Installing a New Program Chip

There may be times when you will need to install a new program chip into your EnviroSTEP for upgrades to your system due to custom programs for your environment or to have your EnviroSTEP connect to a PC for the Wadsworth Windows software program, the STEPsaver.

To install new chip:

- Disconnect power to your EnviroSTEP by removing the primary fuse on the control panel.
- Remove the 8 screws from around the outside edge of the EnviroSTEP faceplate.
- Lift the faceplate out and set aside.
- Find and locate the old program chip below the LCD screen. Use the diagram below for assistance. The chip will have a sticker with verbiage such as E-step V32, or E-step V28, etc.

Location of program chip:
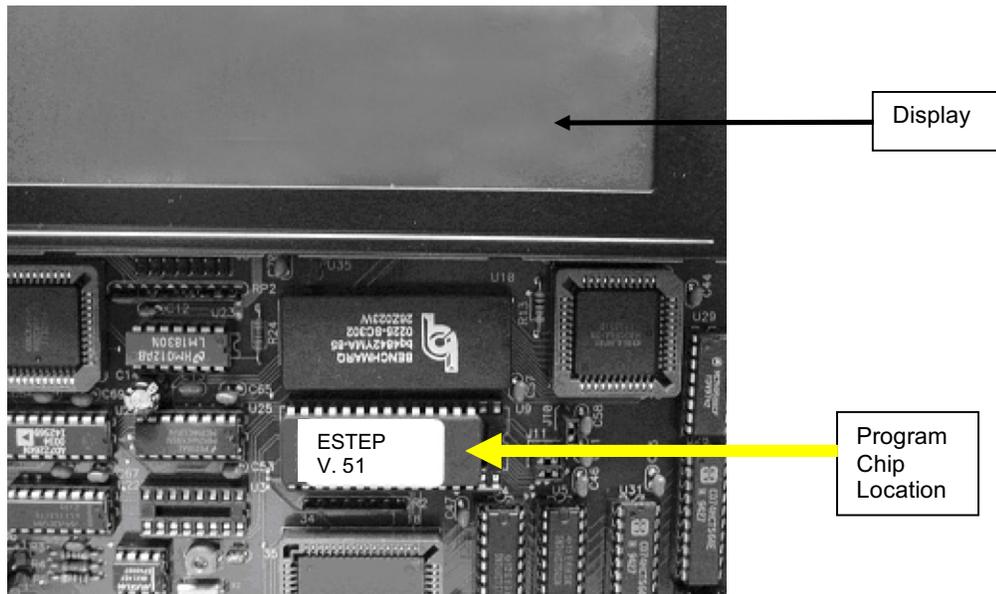
- Use a small screwdriver for leverage to gently pry up the chip. Be careful not to bend the metal prongs as you remove it.
- Insert new chip into the same slot. Be sure to place the chip all the way to the left of the available slots. There should be two available slots to the right of the chip (top and bottom) when installed properly. Refer to the diagram above.
- Replace the metal faceplate and secure with the 8 screws.
- Replace the fuse.

Many of the systems in a greenhouse come together at the computer control. Therefore, it is the one of the first places users look when a problem occurs. Remember there is a chain of connections and relationships between the equipment and the computer. Motors, switches, wiring and subsidiary controls are integrated and the connections must be examined. Most EnviroSTEP problems have simple solutions. You can often solve them yourself. The checklist below will help you find and fix some of the more common problems.

Optional Equipment

Alarm Manager

Enhance your EnviroSTEP control by adding an Alarm Manager.

Keep your plants safe with our easy-to use Alarm Manager. It is remarkably persistent: it will keep dialing and dialing until someone responds to your customized alarm..

Benefits:
- Protects your crop by notifying you of dangerous extreme weather conditions and power outages.
- Continues calling up to four phone numbers until alarm is acknowledged.

Features:
- Create a call list to contact in an emergency .
- No need to install a second phone line.
- Assign a 'normal-state' for each input.
- Determine a time delay for each input.
- Custom message that indicates the location or the alarm, e.g.: 'north house cold'.
- Monitors dry contact inputs.
- Power Alarm contacts you if the system's power is cut off.
- Rechargeable backup battery, in case power outages occur.
- Connects to your EnviroSTEP relay override or contactor panel.
- Plug-in wall transformer, splitter and phone extension cable included.

Contact us tech@wadsworthcontrols.com or 1.800.821.5829 to order or to learn more about this valuable system.

Weather Station

Enhance your EnviroSTEP control by adding a Weather Station. This system increases the power of your integrated controls. By using additional sensors, your control can make anticipatory decisions for optimum control. The Weather Station protects your greenhouse by overriding normal operations to close vents or retract curtain systems when high winds, cold weather, rain or snow might cause damage to your crop or your greenhouse. It also enhances the controls ability to make decisions, allowing even better control of your environment.

Features:
- Weather instruments measure wind speed and direction, precipitation, humidity, temperature, light intensity and accumulated light.
- Mounted on a ground or gable mast.
- Includes 100' of cable.

Protection:
- Closes windward vents in high winds
- Allows leeward vents to stay open.
- Vents are protected from cold temperature and precipitation.
- Outdoor curtains can be retracted in high winds or if there is precipitation.
- Indoor curtains uncover and gutter heaters can be turned on to protect the structure from snow damage.

Optimum Performance:
- Enables watering based on light intensity
- Allows curtains to cover for shading
- Boilers can fire based on outdoor temperature and sunlight intensity

Part # M-4825

Contact us info@wadsworthcontrols.com or 1.800.821.5829 to order or to learn more about this valuable system.

STEPsaver Software

Add the convenience of your PC to the power of your environmental control. STEPsaver provides a single view of all greenhouse zones. This software allows you to monitor and make changes from your PC, a Smartphone or an Internet connection. STEPsaver provides advanced data logging and analysis tools to help you manage your crop.

If you have multiple greenhouses with EnviroSTEP and VersiSTEP controls you can link all of them to the same PC for a centralized view of your greenhouses.
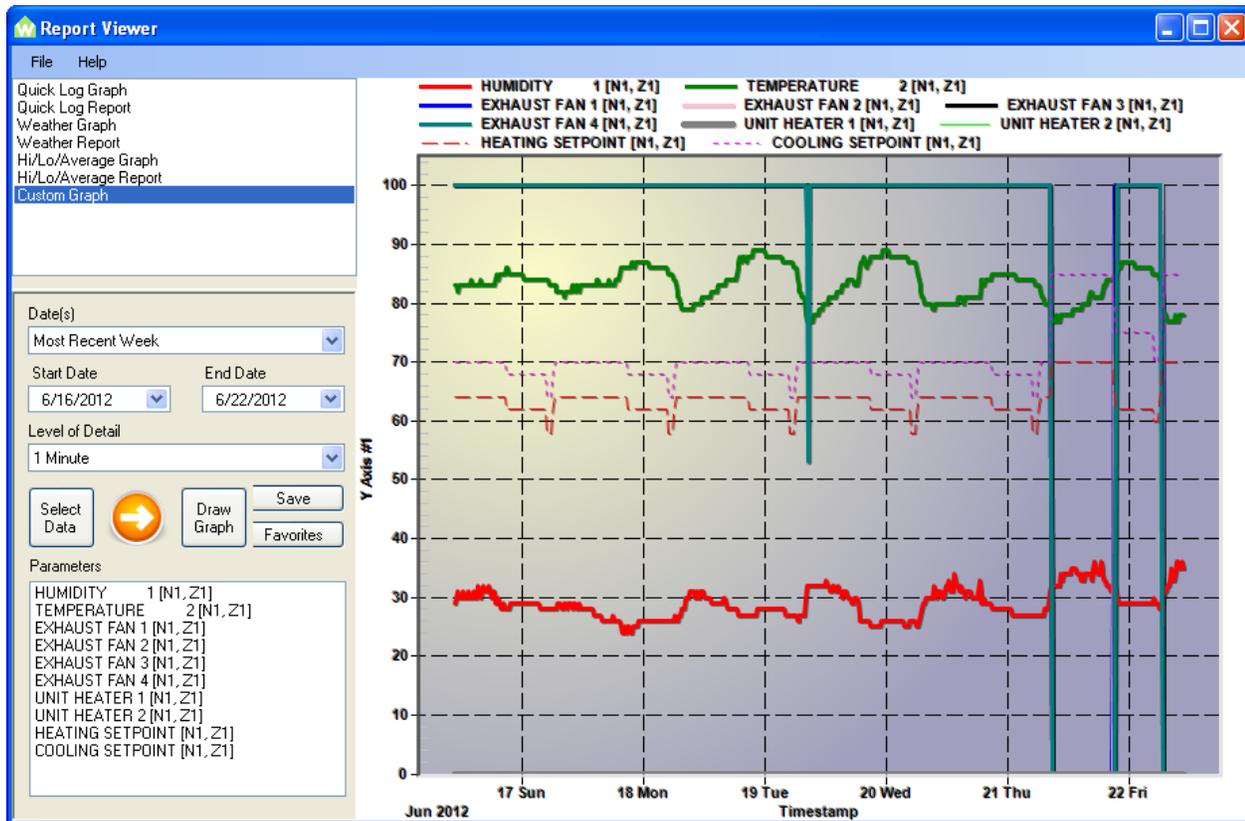
STEPsaver as a Productivity Tool
■ View conditions for the entire greenhouse range at a glance. For greenhouses with many zones or acres, STEPsaver is a step saver
■ All features accessible with point and-click menus and buttons
■ Allows you to see and change the settings for any controller in any zone
■ Not limited to a single PC. No extra charge for sites with a Local Area Network
■ Oversee the greenhouse climate, no matter where you are
■ STEPsaver Imaging takes a snapshot of all settings so you can replicate previous success
■ Instructional DVD included

STEPsaver as an Analysis Tool
■ STEPsaver expands the graphing power of your Wadsworth STEP control
■ Analyze temperature with equipment use
■ Compare data between zones
■ Filter data to pinpoint every data entry, or broaden your view to a few points that represent hours or a whole day. Spot long-term trends by hiding detail
■ Create custom views of your data that combine sensor readings, equipment use and weather
■ Dynamic, quick, and easily done with a few mouse clicks

STEPsaver as Your Watchdog

- STEPsaver constantly monitors your Wadsworth STEP controls for alarm reports
- Pop-up window on your desktop PC alerts you to trouble
- With your permission, STEPsaver reports to e-mail, or it will text your cell phone or PDA
- Makes an ideal complement to your Alarm Manager or other alarm monitoring system

STEPsaver as a Management Tool

- Transfer and store data from your greenhouse control
- Use STEPsaver's built-in reporting tools to summarize stored data. Know how many hours your fans or heaters ran. Confirm
that systems ran as you expected. Learn the average temperature and humidity for day, night and DIF
- Manage access to settings with user names and passwords
- Access STEPsaver over the internet, with user name and password protection

System Requirements

- Version 3.3.0 and higher – Windows 10(32-bit and 64-bit), Windows 8 (32-bit and 64-bit), Windows 7 (32-bit and 64-bit)
- STEPsaver works with: EnviroSTEP and VersiSTEP

Troubleshooting

Computer Issues

Problem	Solution
The computer display looks normal, but no pilot lights are on and the manual override switches don't seem to work	The secondary fuse is blown. Replace it with a type 3AG 2 Amp slow-blow fuse.
The whole computer seems to be dead.	The circuit breaker that powers the computer may be tripped. The computers primary fuse may be blown. Check the circuit breaker. Replace the computer's primary fuse with a type 3AG 1 Amp slow-blow fuse.
Computer Locks Up	If a user enters information on the keypad too quickly, the system can lock up. To correct this, you must power the EnviroSTEP down and restart. You can do this by removing the Primary Fuse and then re-connecting the fuse.

Heating Equipment

Problem	Solution
Fan or heater will not shut off.	Possible setting error. From the **<<<Main Menu>>>**, press **7** for settings then **GO.** Choose **2** for Equipment and press **GO**. Find the heater or fan on the list of equipment, enter the line number to the left of its name, then press **GO**. If the first two settings (*TEMP ON/OFF*) are the same, (often 0/0) the heater will not shut off. Typical correct settings are -1/0 or -2/-1.
Fan or heater will not shut off.	Possible electronic failure. Check for an automatic mode hardware failure. From the **<<<Main Menu>>>**, press **8** and **GO** to reach the diagnostics menu. Press **9** and **GO** for the Hammer test to check a switch. Enter the number of the switch and press **GO**. Enter 1000 for "MS?" and press **GO**. If the pilot light for the switch clicks slowly on and off, the hardware is good. If not, call Tech Support at 1-800-482-7943 to arrange for repairs. Press **GO** repeatedly to return to the **<<<Main Menu>>>**

WARNING: This installation requires working with electrical circuits. If you do not have experience working with electrical circuits, please contact a licensed electrician to do this installation.

Cooling Equipment/Vent Machines

Problem	Solution
Vent will not open	Manual override switches may not be set to automatic. All the manual override switches must be set correctly before the computer can open a vent. Set both Auto/Off/On switches on the EnviroSTEP unit all the way left in the Auto position. At the vent control box, flip the Man-Off-Auto switch all the way up in the Auto position. Refer to the troubleshooting section in the VC-100A and VC-2000 manual for additional tips.
Vent will not open	Possible Limits setting error, wind related vent limits. At the EnviroSTEP, press the GO key until you see the <<<Main Menu>>>. Press 7 then GO to view the <<<Setting Menu>>>. Press 5 for "Limits" then GO. Incorrect wind protection settings can keep the vents closed. Be sure that Vent-Limit/Gale% is 0, Vent-Limit/Max% is 100, that neither Wind-Speed/Min nor Wind-Speed/Max is zero, and that Wind-Speed/Min is at least 1 less than Wind-Speed/Max. Refer to the Limit Settings section of this manual for an example of correct settings. These values must follow the example if the greenhouse has no Weather Station. All four rows must be filled out even if no Weather Station is connected.
Vent will not open	Possible Limits setting error, outdoor temperature related limits. At the EnviroSTEP, press the GO key until you see the <<<Main Menu>>>. From the <<<Main Menu>>> press 3 for Weather and GO. Note the measured readings for the current outdoor temperature. Return to the <<<Main Menu>>> by pressing the GO key. Press 7 then GO to view the <<<Setting Menu>>>. Press 5 for Limits then GO. There are two screens for limits. The first screen sets the vent position during a windstorm. Press the GO key again to get to the second limits screen. The first setting "Max Roof / Side vent % during rain" sets the vent position during a rainstorm. These settings are typically "10/25", if precipitation is sensed the roof vents will close to 10% and side vents will close to 25%. The next line "Cold Lockout" sets the outside temperature where the vents are restricted. If the outside temperature (as displayed in the weather screen) is less than the "Cold Lockout" setting the vents will not open. The next line "Cold Lockout Ends" sets the outside temperature where there is no restriction of the vents due to cold outside temperatures. A typical setting for "Cold Lockout" is 10º F. A typical setting for "Cold Lockout Ends" is 20º F. Be sure that "Cold Lockout" is set at least 1 degree below "Cold Lockout Ends". **"Cold Lockout Ends" must be a larger number than "Cold Lockout"**
Vent will not open	Possible problem with outdoor temperature sensor If the reported outside temperature (as displayed in the weather screen) is inaccurate then test the outside temperature sensor with the following procedure. From the **<<<Main Menu>>>** press **7** for the **<<<Setting Menu>>>** then **GO. P**ress **3** for **Calibration** then press **GO**. The outside temperature sensor will be assigned as zone 99, typically programmed on sensor channel 4. Press **4** to see the calibration screen. There are three lines for the calibration screen, *"Factory Reading, Old Calibrated Reading and New Calibrated Reading".* If the temperature displayed on the first line, *"Factory Reading"* reports a temperature of **277.5** then one of the following has occurred.

	▪ The sensor has not been connected (typical in a new installation). Check to see if there are any wires on **J-3 points 8 and 9.** ▪ There is an open sensor condition (defective sensor or open sensor wire). Replace the sensor (part number M-4823) to correct the problem. If the temperature displayed on the *"Factory Reading"* shows a negative temperature then the sensor may be wired incorrectly. Reverse the wires on **J-2 points 8 & 9** and check the weather report for a correct temperature reading. If neither condition exists then simply recalibrate the temperature sensor by entering the correct outdoor temperature at the *"New Calibrated Reading".* **NOTE:** If you do not see any sensors assigned to Zone 99 there may be several EnviroSTEPs sharing weather information from one Weather Station. Make sure that all the EnviroSTEPs are connected together (daisy chained) on **J-2 points 3 and 4** (see section on installing multiple computers to a Weather Station)
Vent will not open	Weather sensor may be misconfigured. From the **<<<Main Menu>>>** press **3** then **GO** to check the Weather. Too cold a reading can keep then vents closed. Verify that the outdoor temperature reading is accurate. A reading of 0º suggests the computer is not configured to read the outdoor temperature. A reading of 22ºF or -120ºC suggests the computer is configured to read the outdoor temperature, but that the sensor is missing, has failed, or has a broken wire. Readings of about -83ºF or 50ºC suggest the sensor is wired backward.
Vent will not open	Possible problem with vent. At the vent control, flip the "Man-Off-Auto" switch to the "Man" position. Flip "Open-Close" switch to the "Open" position. If the vent will not open it could be a faulty open limit mercury switch or faulty open torque limit switch. Refer to the instruction manual for the vent for troubleshooting help.
Vent works "Manually" not "Automatically"	**The most common cause is that all associated switches are not in the "Automatic" position. If the EnviroSTEP computer is trying to send a signal to a vent system and the switches are not in the "Auto" mode the signal cannot be completed. If all the switches are in the "Auto" position and the vent does not respond then see below for more troubleshooting suggestions.** At the vent controller set the "On-Off-Auto" switch to the Auto position. At the EnviroSTEP set the "Vent Open" switch to the "On" position, and the "Vent Close" switch to the "Off" position. The vent should begin to open, if it does not open, check the wiring between the open and close relays in the EnviroSTEP and terminal block #2 at the vent controller. Set the "Vent Close" switch to the "On" position and the "Vent Open" switch to the "Off" position. The vent should close, if it doesn't check the wiring between the open and close relays in the EnviroSTEP and terminal block #2 at the vent controller. If the vent functions properly with the switch test then look for additional tips in this section.
Vent will not open, or does not open as far as it should, or its position does not match the value shown on the Equipment report on the **<<<Main Menu>>>**	Check the vents equipment settings. Make sure the STROKE setting is not 0. If the STROKE setting is 180, it is possible the actual stroke time of the vent has never been set. To set it, time how many seconds it takes to move from full open to full close, this is the stroke time. Make sure the RELAY setting is correct: this setting is the number of seconds from when the vent switch is set to open or close, to the time the vent motor switches on. All Wadsworth vent machines are factory preset for a **Relay** time of (6) seconds.
Vent position does not match the value shown on the	From the **<<<Main Menu>>>** press **7** then **GO** to reach the **<<<Setting Menu>>>.** Press **2** then **GO** to reach the Equipment menu. Choose the vent. Change the

| Equipment report on the **<<<Main Menu>>>** | FUMIGATE setting from 0 to 1. The computer will recalibrate the vent position to 0%, or closed, and reopen the vent if necessary. |

Cooling Equipment/Exhaust Fans

Problem	Solution
Exhaust fan will not turn on	If it is a new installation try turning the switch that controls the exhaust fan to the "On" position. If the exhaust fan does not turn on, check the wiring. If it is a two-speed exhaust fan, test both speeds - first turn on the *"Low Speed"* switch to, leave the *"Low Speed"* switch on and turn on the *"High Speed"* . If that tests OK then continue to the next step. The exhaust fan may be restricted due to the *"Minimum Vent Position"* setting in the *"Equipment"* settings screen. From the **<<<Main Menu>>>** press **7** then **GO** in the **<<<Setting Menu>>>** press **2** then **GO** for **Equipment.** Locate the exhaust fan on the equipment list and enter the number to the left of the equipment description then **GO** (Note the equipment list does not correspond to the switch numbers). An exhaust fan can also be listed as a *"Cooling"* stage. Check the setting for *"Min % Vent"*. If the *"Min % Vent"* is a non-zero number the exhaust fan will not start until the vent has opened to the *"Min % Vent"* position. If you do not want the exhaust fan to wait unit the vent reaches the *"Min % Vent"* position change the*"Min % Vent"* to 0. Check the *"Temp On/Off"* settings, from the **<<<Main Menu>>>** press **7** then **GO**, from the **<<<Setting Menu>>>** press **2** and **GO** for the **Equipment** menu. Offsets from the *"Cooling Setpoint"* typical settings would be "2/0", 3/1 or something similar. A setting of 2/0 with a cooling setpoint of 70º F would turn the fan on at 72º F and off at 70º. **Temperature settings of 0/0 will not work.** Note: It is common for someone to enter On/Off temperatures of 72/70 (The actual desired temperatures that the grower wants to operate the equipment). Based on a cooling setpoint of 70º F these settings would turn the equipment on at 142º F and off at 140º F. Check the *"Day/Night Frost Lockout"* settings. The factory settings are 0/0, which turns off the frost lockout feature. If other settings are shown then the exhaust fan will not come on until the outdoor temperature is above the entered settings. Example: If the *"Day/Night Frost Lockout" is* set at 32/40 then the exhaust fans are locked out at 32º F during day mode and locked out at 40º F during night mode. Verify that the computer can sense outdoor temperature, and that the outdoor temperature is higher than the frost lockout setting.
Fan or heater will not shut off.	From the **<<<Main Menu>>>** press **7** then **GO** to view the **<<<Setting Menu>>>**. Press **2** then **GO** for Equipment, and choose the fan or heater. Make sure that the TEMP ON/OFF settings are not 0/0 and that there is at least one degree of difference between the two.
Fan or heater will not shut off.	Check for an automatic mode hardware failure. From the **<<<Main Menu>>>**, press **8** and **GO** to reach the diagnostics menu. Choose **9** and **GO** for the Hammer test to check a switch. Enter the number of the switch and press **GO**. Enter 1000 for "MS?" and press **GO**. If the pilot light for the switch clicks slowly on and off, the hardware is good. If not, call Technical Support at 1-800-482-7943 to arrange for repairs. Press **GO** repeatedly to return to the **<<<Main Menu>>>**
Shade or HID Lights cycle too often.	From the **<<<Main Menu>>>** press **7** then **GO** to reach the **<<<Setting Menu>>>**. Choose Limits. On the second screen of Limits, change Light Intensity Averaging Factor to 9.

Sensors and Sensor Readings

Problem	Solution
Sensor will not stay calibrated	Sensor failure. Order a replacement from Wadsworth. In the aspirator for the zone, carefully remove the wire from position 5 of the 8-point terminal block. This will make the reading from that aspirator rise to 278ºF/136ºC. Verify that the hot reading comes from the expected zone and correct wiring if it does not.
Sensor reads very high, 278ºF/136ºC or more.	Indicates a loose or broken wire or a damaged sensor.
Sensor reads very low, -100ºF/-50ºC or less.	Indicates a shorted sensor cable or a damaged sensor.
Outdoor temperature sensor	If the outdoor temperature sensor fails, the vents will automatically lock out. To override this until a new sensor can be installed, drop the cold lock out to 21ºF.

Access Code

Problem	Solution
Computer asks for an access code, but I didn't set one.	Another user may have entered an access code without your knowledge. An electrical storm may have interrupted correct operation of your computer. From the **<<<Main Menu>>>**, press **8** then **GO** to enable diagnostics. Choose item 2, "Clear access" from the diagnostics menu and press **GO** twice. You should now be able to access your settings.

Time & Date Settings

Problem	Solution
Time of day reading is incorrect, or time of sunrise/sunset is incorrect.	From the **<<<Main Menu>>>** press **7** for Settings, then press **GO**. From the **<<<Setting Menu>>>**, press **6** for **Time and Date**, and then press **GO**. Enter the correct month, day of month, year, hour, minute and second on the settings screen. Set Daylight Saving Time to **1** if it is between the first Sunday in April and the last Sunday in October, or to **0** otherwise. Correct your time zone setting if necessary. Correct your latitude and longitude settings as necessary. These coordinates are recorded on the set-up worksheets provided with your EnviroSTEP.

Weather Station

Problem	Solution
Wind speed is always 0 and wind direction is always N (north)	The computer must be equipped with a Weather Station to read wind speed and direction. If there is a Weather Station installed and wired to this computer, go to the **<<<Main Menu>>>** press **7** then **GO** for the **<<<Setting Menu>>>**. Press **7** then **GO** to reach the <<<Configuration Menu>>>. Press **9** then **GO** for Weather On/Off and be sure it is shown as [On]. To change it from [Off] to [On], press 9 (Weather On/Off) and **GO**.
Problem	**Solution**
Wind speed is always 0 and wind direction does not change.	If there is a Weather Station installed and wired to this computer, test the sensor by connecting one end of a wire (you can use a paper clip) to J-3 point 2 (DC ground) and pulse the other end of the wire to J-3 point 7 as quickly as possible. You should see a reading in the weather screen in mph.

Configuration Worksheet

Time Zone_____Longitude_____Latitude_____

Sensor Assignments

Channel	Zone	Code	Description
1			
2			
3			
4			
5			
6			
7			

Sensor Codes

0 = Temperature	1 = Humidity	2 = Light Level
6 = CO_2	7 = Potentiometer	8 = Soil/Pipe Probe
9 = Custom Sensor		

Switch Assignments

Switch	Zone	Code	Description	On/Off Temperature
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Configuration Worksheet
Equipment Codes

NOTE: Use these codes when filling out the switch assignment worksheet. The worksheet is for you to use when configuring the switches under the <<<Configuration Menu>>>.

Code #	Description	Equipment Type
0	Roof Vent	Cooling
1	Side Vent	Cooling
2	Pad Vent	Cooling
3	Tube Blower	Cooling
4	Fan	Cooling
5	Low Fan	Cooling
6	High Fan	Cooling
7	Pad Pump	Cooling
8	Louver (A)	Cooling
9	Hot Water Pump	Heating
10	Mixing Valve	Heating
11	Unit Heaters	Heating
12	Heat Valve	Heating
13	Root-Zone Heating	Heating
14	Jet Fan	Cooling
15	C02	CO_2
16	Curtain System	Light
17	Irrigation Valve	Irrigation
18	HID Lights	Light
19	HAF Fans	Cooling
20	Fog (Second On / Minutes Off)	Cooling/RH
22	Boiler	Heating
23	Gutter Line	Heating
24	Mixing Valve	Heating
25	Transport Line (Ringline)	Heating
26	Monitor	Misc.
27	Shutter	Cooling
28	Cyclic Lighting	Light
29	Slave Switch	Irrigation
30	Vent (VC-500)	Cooling
31	Louver (13)	Cooling
32	Unit Heater Fan	Heating
33	Proportional Valve	Heating
36	Cooling	Cooling
37	Proportional Hot Water Valve	Heating
38	Mist	Misc.
39	Shade (Open/Close)	Misc.
40	Fog (Seconds On / Seconds Off)	Misc.
41	Photoperiod	Misc.
42	Ringline (On with '25')	Heating
43	Pressure Fan	Heating
44	Boiler, Low Volume	Heating
45	Boiler Pump	Heating
46	Variable Voltage Output	Not Implemented

Detector Assignments

Channel	Code	Description
1		
2		
3		
4		
5	**-**	**Wind Speed Only (Automatically Detected)**
6	**-**	**Rain Detector Only (Automatically Detected)**

9 = Misc/Other   10 = Flame Failure 11 = Low Water   13 = Generator

Note: When a weather station is connected, channels 1 thru 4 will automatically detect the wind direction. As you can see, channel 5 is for wind speed only and channel 6 is for a rain detector only. With a weather station connected, there are no free detector inputs that can be used for any other purpose.

'WHY' Codes
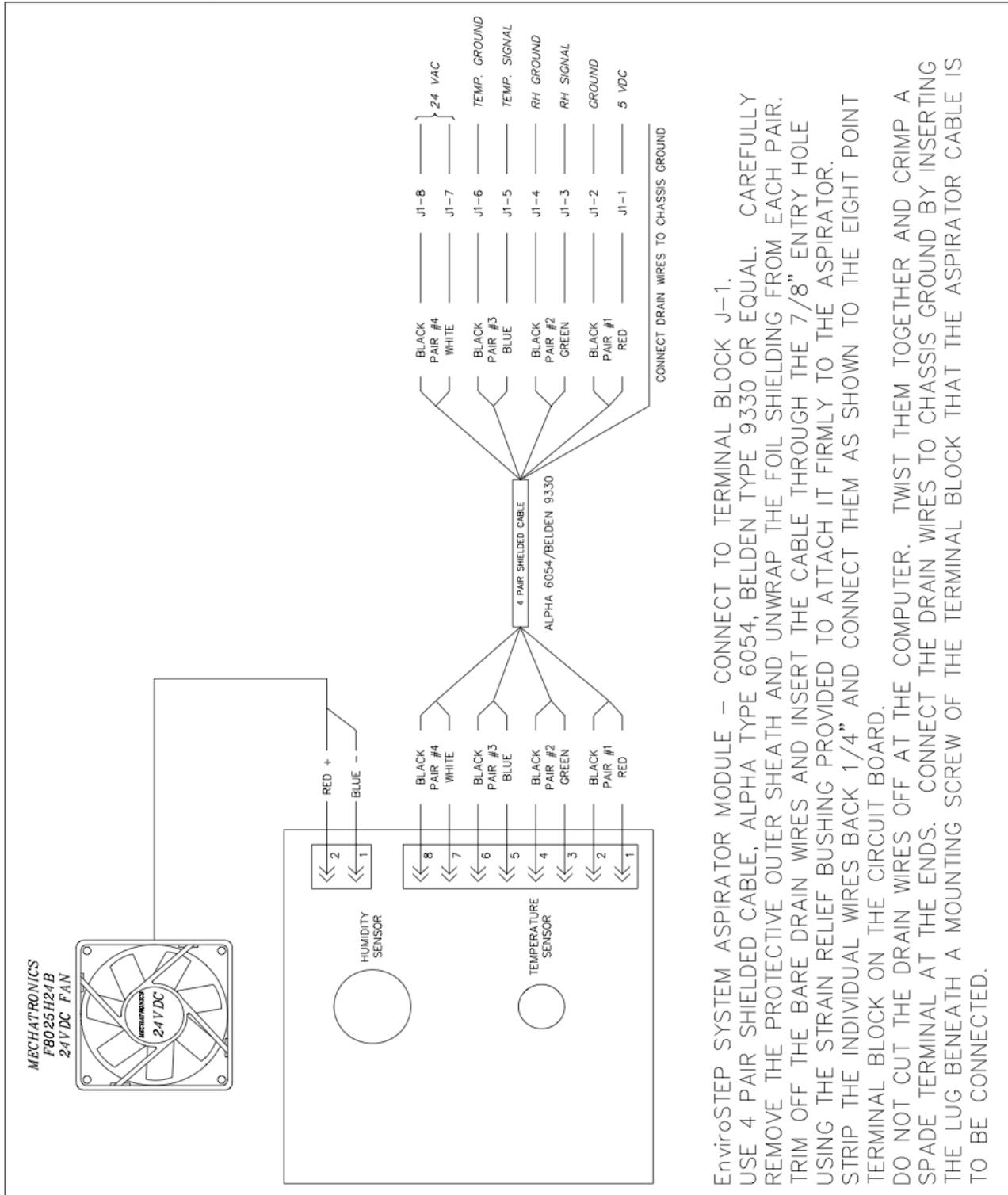
Why Codes

"Why" Codes appear on the Equipment report, item 1 on the Main Menu.

[!] Cycle Timer   [L] Light
[B] Boosting   [N] In Night Mode
[C] CO2 Concentration   [R] Rain Limit
[D] Dry Limit   [S] Snow
[E] Defaulted   [T] Temperature
[F] Follows a Fan   [V] Vent Position
[H] Humidity   [W] Weather Lockout

Wiring Diagrams

Figure 1, Aspirated Temperature and Humidity Sensor Wiring

EnviroSTEP SYSTEM ASPIRATOR MODULE — CONNECT TO TERMINAL BLOCK J-1. USE 4 PAIR SHIELDED CABLE, ALPHA TYPE 6054, BELDEN TYPE 9330 OR EQUAL. CAREFULLY REMOVE THE PROTECTIVE OUTER SHEATH AND UNWRAP THE FOIL SHIELDING FROM EACH PAIR. TRIM OFF THE BARE DRAIN WIRES AND INSERT THE CABLE THROUGH THE 7/8" ENTRY HOLE USING THE STRAIN RELIEF BUSHING PROVIDED TO ATTACH IT FIRMLY TO THE ASPIRATOR. STRIP THE INDIVIDUAL WIRES BACK 1/4" AND CONNECT THEM AS SHOWN TO THE EIGHT POINT TERMINAL BLOCK ON THE CIRCUIT BOARD. DO NOT CUT THE DRAIN WIRES OFF AT THE COMPUTER. TWIST THEM TOGETHER AND CRIMP A SPADE TERMINAL AT THE ENDS. CONNECT THE DRAIN WIRES TO CHASSIS GROUND BY INSERTING THE LUG BENEATH A MOUNTING SCREW OF THE TERMINAL BLOCK THAT THE ASPIRATOR CABLE IS TO BE CONNECTED.

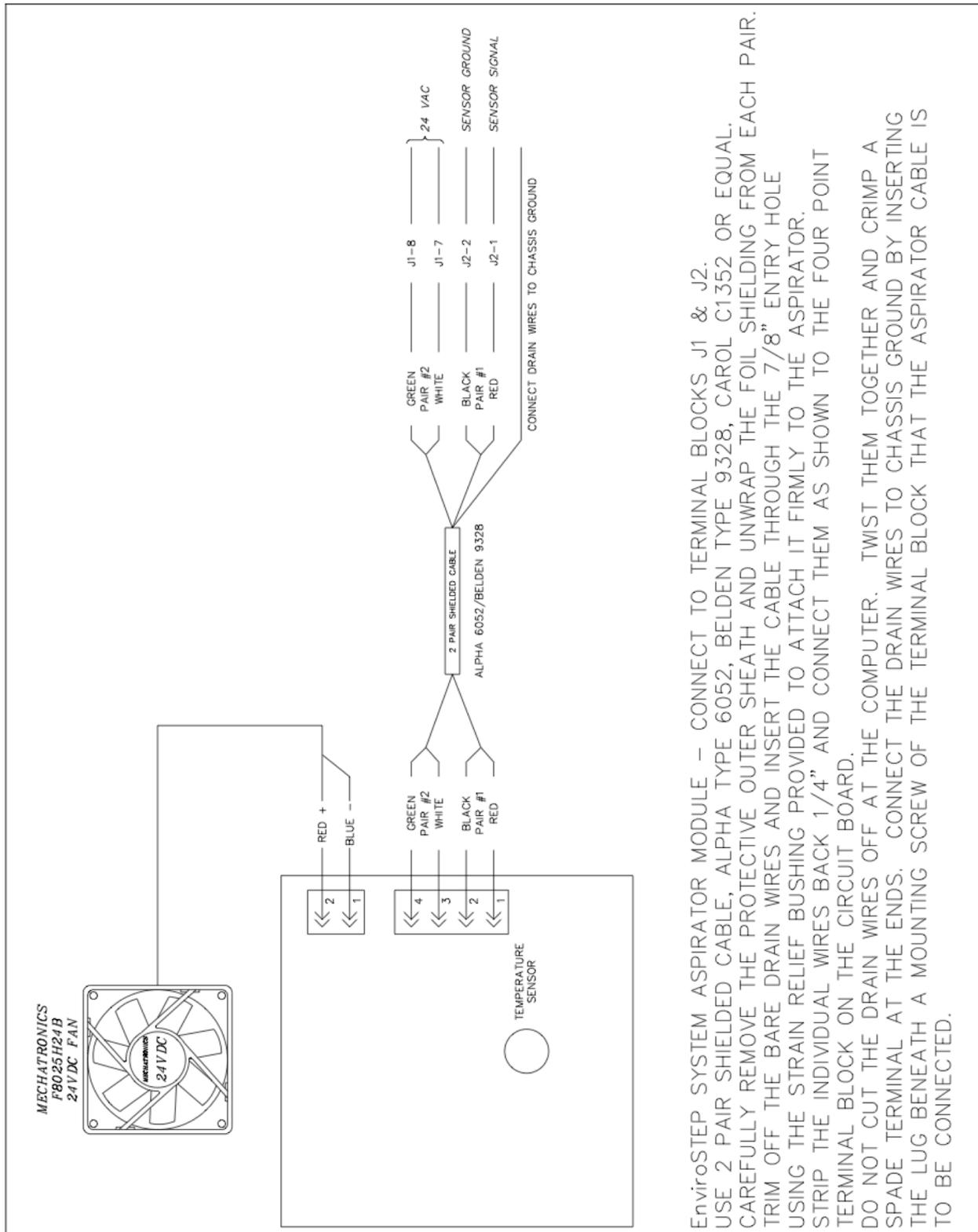# Figure 2, Aspirated Temperature Only Sensor Wiring
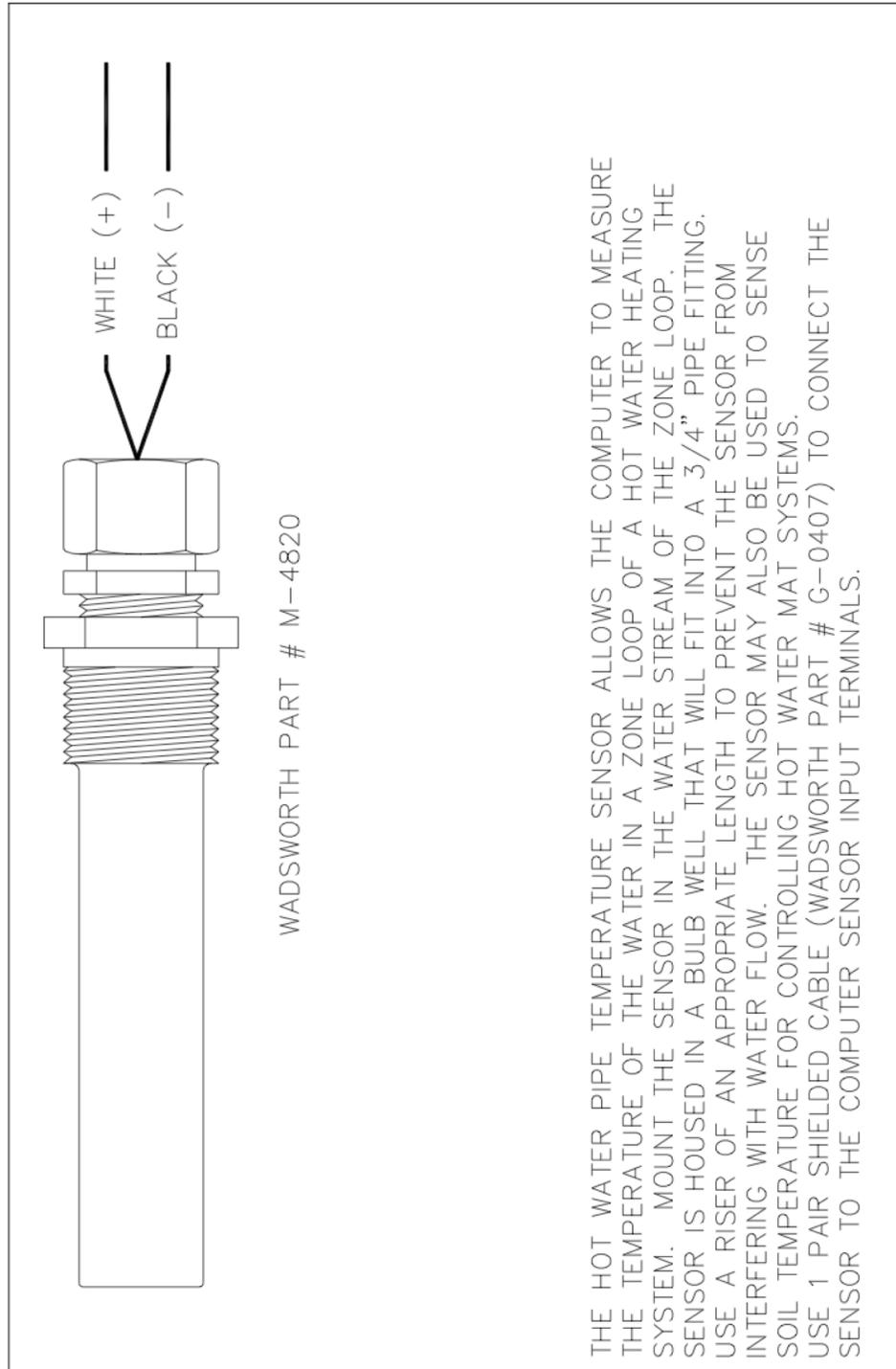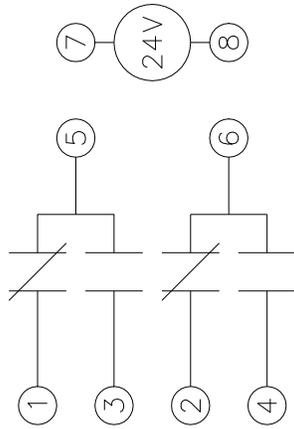
Figure 3, Hot Water Pipe Temperature Sensor Diagram

WHITE (+)

BLACK (−)

WADSWORTH PART # M−4820

THE HOT WATER PIPE TEMPERATURE SENSOR ALLOWS THE COMPUTER TO MEASURE THE TEMPERATURE OF THE WATER IN A ZONE LOOP OF A HOT WATER HEATING SYSTEM. MOUNT THE SENSOR IN THE WATER STREAM OF THE ZONE LOOP. THE SENSOR IS HOUSED IN A BULB WELL THAT WILL FIT INTO A 3/4" PIPE FITTING. USE A RISER OF AN APPROPRIATE LENGTH TO PREVENT THE SENSOR FROM INTERFERING WITH WATER FLOW. THE SENSOR MAY ALSO BE USED TO SENSE SOIL TEMPERATURE FOR CONTROLLING HOT WATER MAT SYSTEMS. USE 1 PAIR SHIELDED CABLE (WADSWORTH PART # G−0407) TO CONNECT THE SENSOR TO THE COMPUTER SENSOR INPUT TERMINALS.

Figure 3, Control Relay and Socket Diagram
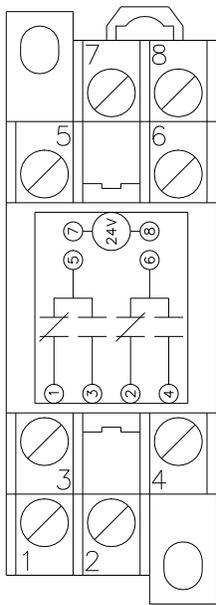
1 NORMALLY CLOSED
3 NORMALLY OPEN
5 COMMON CONTACT
7 RELAY COIL

2 NORMALLY CLOSED
4 NORMALLY OPEN
6 COMMON CONTACT
8 RELAY COIL

DPDT RELAY 24 VAC – WADSWORTH PART #E-0327
DPDT RELAY SOCKET – WADSWORTH PART #E-0402

THE EnviroSTEP COMPUTER CONTROLS THE GREENHOUSE EQUIPMENT USING A MAGNETIC SWITCHING DEVICE CALLED A RELAY. THE COMPUTER CONTAINS 12 DPDT RELAYS RATED FOR A MAXIMUM OF 10 AMPS RESISTIVE LOAD. THESE RELAYS EACH CONTAIN TWO SEPARATE SWITCHING CONTACTS FOR FLEXIBILITY IN WIRING DIFFERENT TYPES OF EQUIPMENT TO THE SAME OUTPUT. THESE RELAYS ARE INTENDED TO OPERATE SMALL LOADS DIRECTLY AND TO PILOT MAGNETIC STARTERS THAT OPERATE MOTOR LOADS. THE RELAYS ARE NOT INTENDED TO OPERATE LARGE MOTOR LOADS. SWITCHING LARGE LOADS THROUGH THE RELAY WILL SHORTEN ITS SERVICE LIFE. IN THE EVENT THAT A RELAY SHOULD WEAR OUT SIMPLY UNPLUG IT FROM ITS SOCKET AND REPLACE IT WITH A NEW ONE. THE RELAY SOCKET MAY ALSO BE EASILY REPLACED IF IT IS NECESSARY.

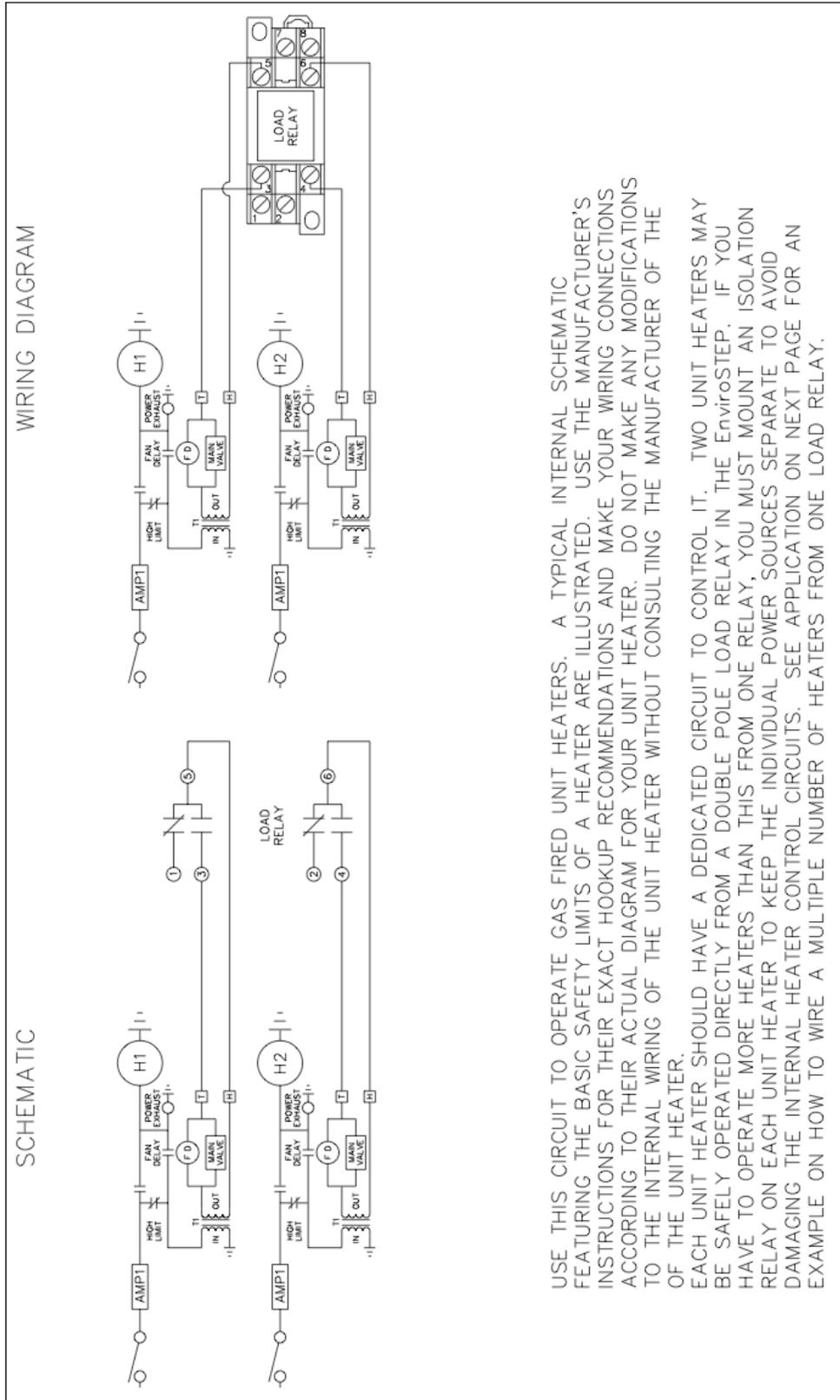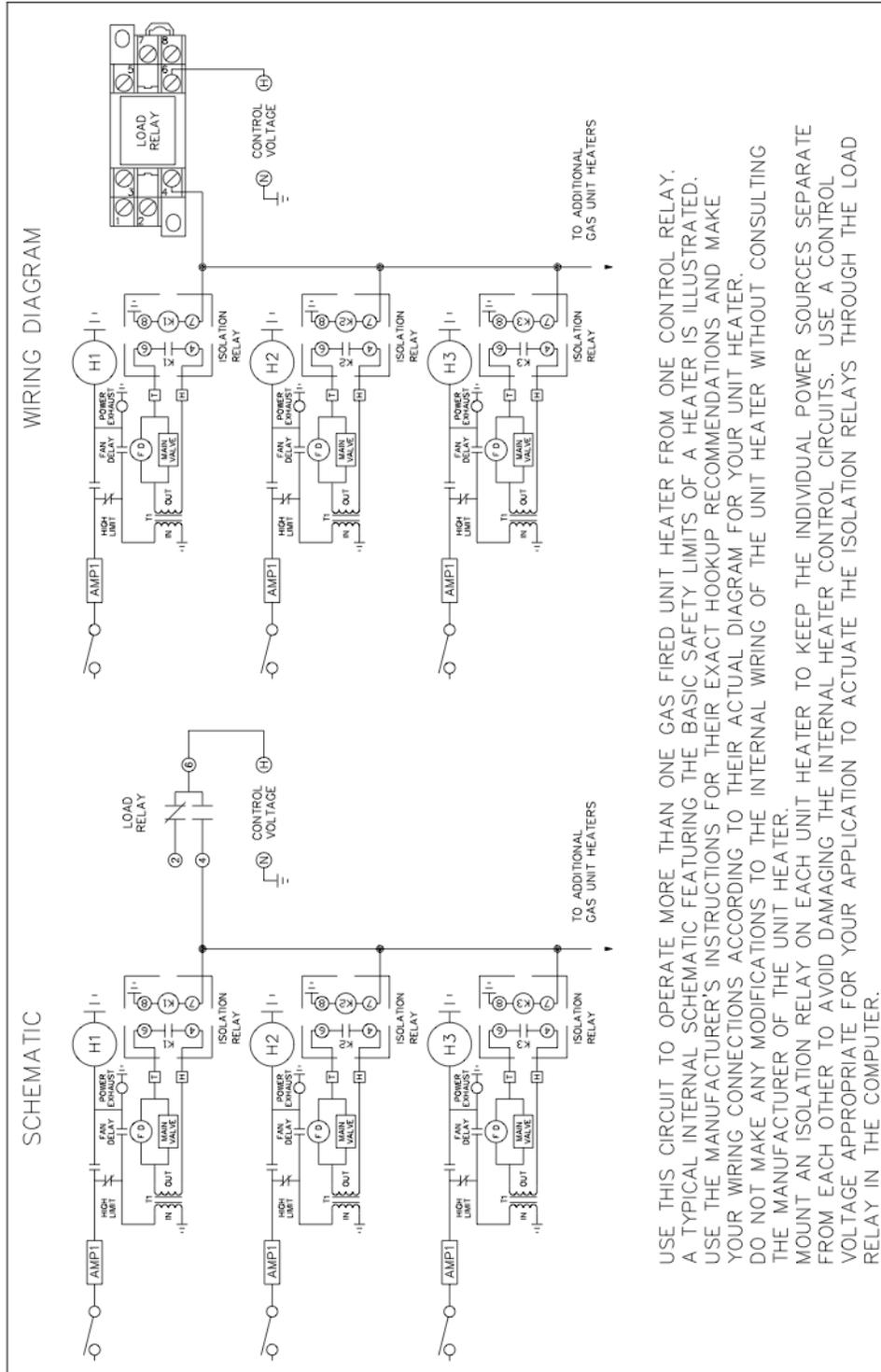# Figure 5a, Control Wiring for 1 or 2 Gas Fired Unit Heaters

USE THIS CIRCUIT TO OPERATE GAS FIRED UNIT HEATERS. A TYPICAL INTERNAL SCHEMATIC FEATURING THE BASIC SAFETY LIMITS OF A HEATER ARE ILLUSTRATED. USE THE MANUFACTURER'S INSTRUCTIONS FOR THEIR EXACT HOOKUP RECOMMENDATIONS AND MAKE YOUR WIRING CONNECTIONS ACCORDING TO THEIR ACTUAL DIAGRAM FOR YOUR UNIT HEATER. DO NOT MAKE ANY MODIFICATIONS TO THE INTERNAL WIRING OF THE UNIT HEATER WITHOUT CONSULTING THE MANUFACTURER OF THE UNIT HEATER.

EACH UNIT HEATER SHOULD HAVE A DEDICATED CIRCUIT TO CONTROL IT. TWO UNIT HEATERS MAY BE SAFELY OPERATED DIRECTLY FROM A DOUBLE POLE LOAD RELAY IN THE EnviroSTEP. IF YOU HAVE TO OPERATE MORE HEATERS THAN THIS FROM ONE RELAY, YOU MUST MOUNT AN ISOLATION RELAY ON EACH UNIT HEATER TO KEEP THE INDIVIDUAL POWER SOURCES SEPARATE TO AVOID DAMAGING THE INTERNAL HEATER CONTROL CIRCUITS. SEE APPLICATION ON NEXT PAGE FOR AN EXAMPLE ON HOW TO WIRE A MULTIPLE NUMBER OF HEATERS FROM ONE LOAD RELAY.

Figure 5b, Control Wiring for Multiple Gas Fired Unit Heaters

Figure 6, Control Wiring for Open/Close Valve Actuator

WIRING DIAGRAM

SCHEMATIC

USE THIS CIRCUIT TO OPERATE A MOTORIZED VALVE IN THE TWO POSITION MODE. A BARBER COLMAN TYPE MP-485 ACTUATOR IS ILLUSTRATED. OTHER MANUFACTURER TYPES ARE EQUALLY SUITABLE. EACH VALVE ACTUATOR SHOULD HAVE A DEDICATED CIRCUIT TO CONTROL IT. IF MORE THAN ONE ACTUATOR MUST BE OPERATED FROM A SINGLE LOAD RELAY CONTACT, ISOLATION RELAYS MUST BE USED TO KEEP EACH ACTUATOR SEPARATE FROM THE OTHER. LONG DISTANCES BETWEEN THE VALVE ACTUATOR AND THE CONTROL RELAY MAY ALSO AFFECT THE OPERATION OF THE ACTUATOR.
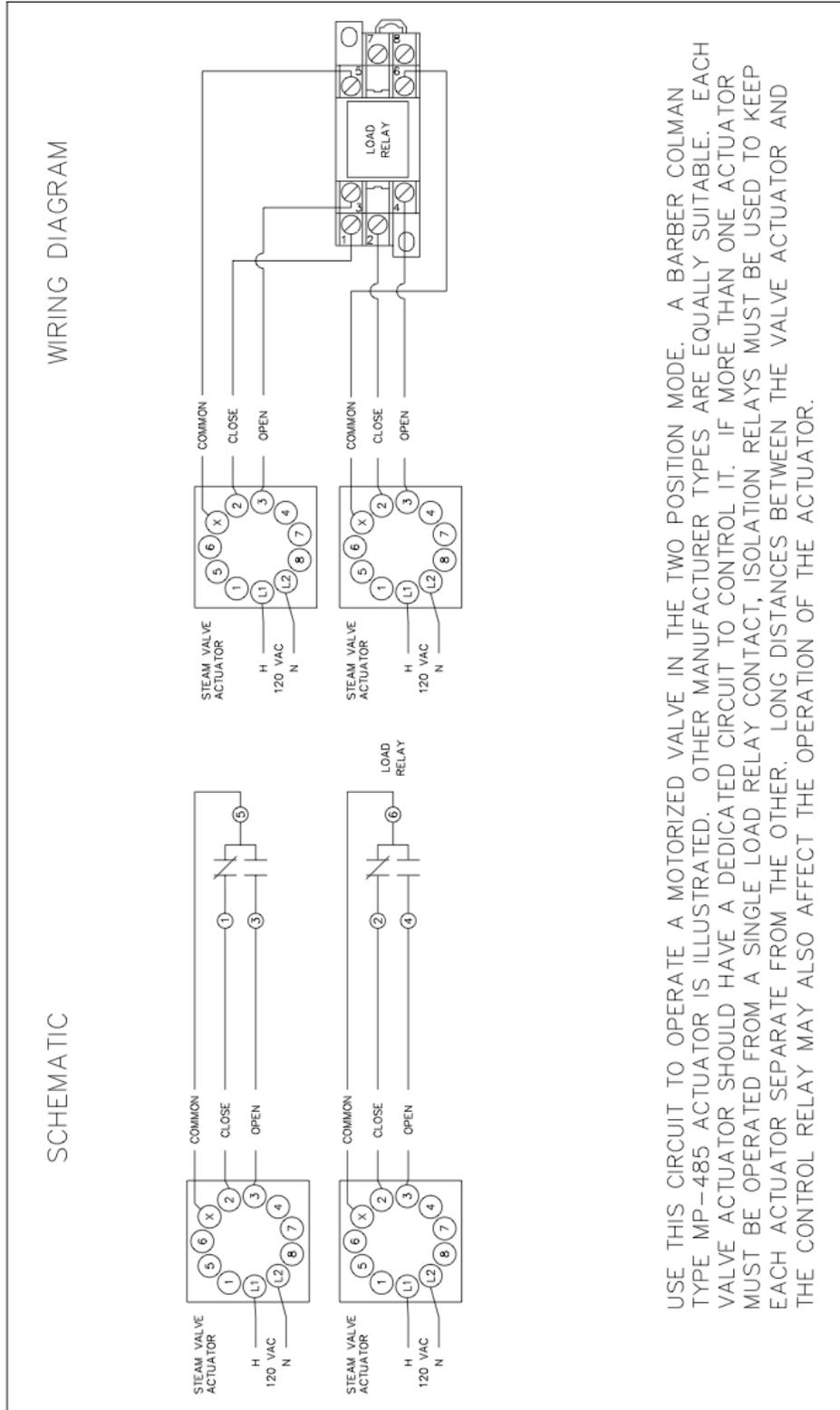
Figure 7, Control Wiring for Modulating Valve Actuator
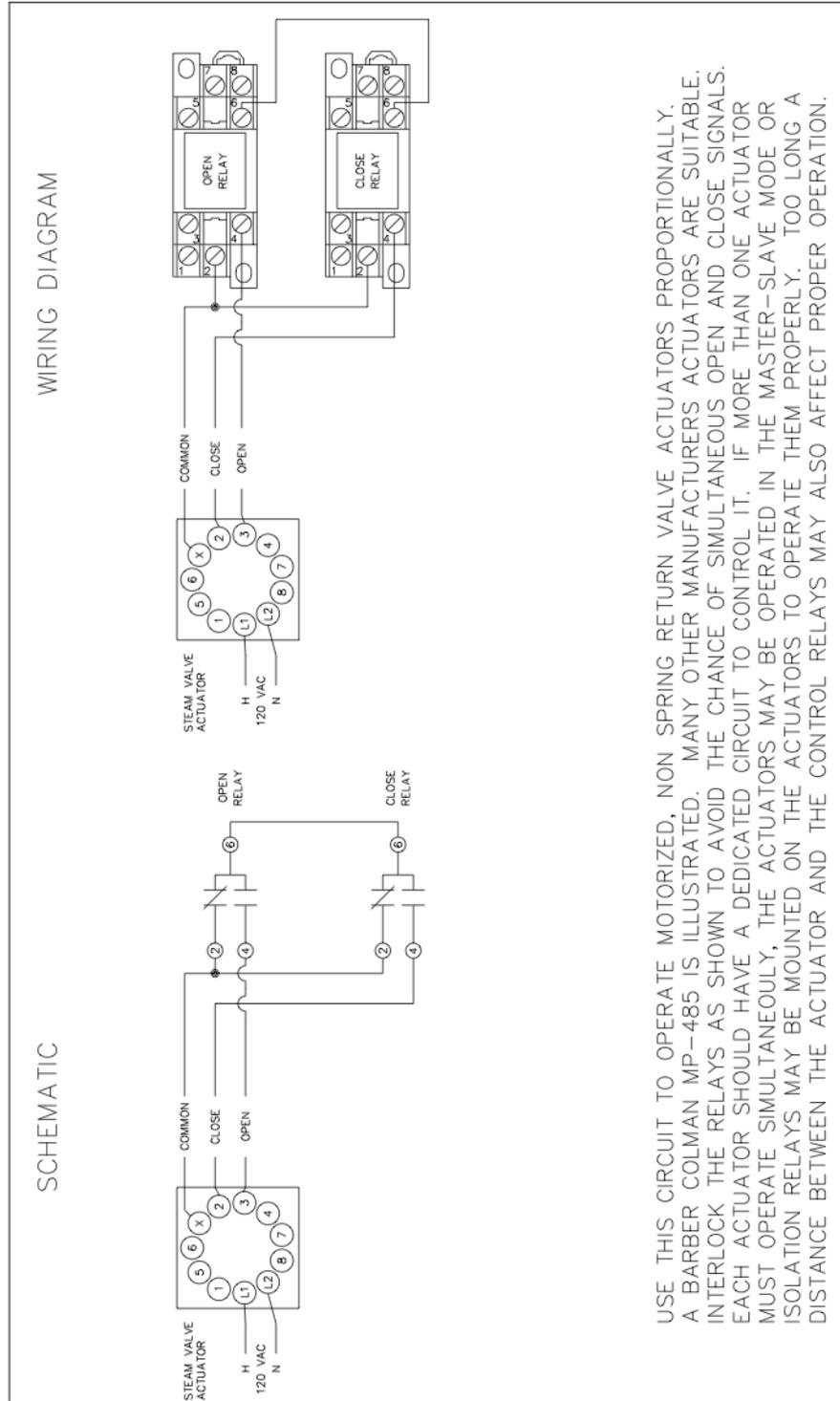
Figure 8, Control Wiring for 2-Speed Exhaust Fan

Figure 9, Control Wiring for Modulating Vent

WIRING DIAGRAM

OPEN RELAY

CLOSE RELAY

TB-2
4 COMMON
3 OPEN
1 CLOSE

ROOF/SIDE VENT CONTROL CIRCUIT

SCHEMATIC

OPEN RELAY

CLOSE RELAY

TB-2
4 COMMON
3 OPEN
1 CLOSE

ROOF/SIDE VENT CONTROL CIRCUIT

USE THIS CIRCUIT TO OPERATE VENT CONTROL SYSTEMS THAT PROVIDE THEIR OWN LOW VOLTAGE POWER INTERNALLY. THE VC-200 AND THE VC-2000/LST ARE EXAMPLES OF THIS TYPE. INTERLOCK THE RELAYS AS SHOWN TO AVOID THE CHANCE OF SENDING SIMULTANEOUS OPEN AND CLOSE SIGNALS. IF MORE THAN ONE VENT CONTROL SYSTEM IS TO BE OPERATED BY THESE RELAYS, THEY SHOULD BE WIRED IN THE MASTER-SLAVE MODE OR ISOLATION RELAYS MAY BE REQUIRED TO KEEP THE INDIVIDUAL POWER SOURCES SEPARATE TO AVOID DAMAGING THE VENT CONTROL CIRCUITS.
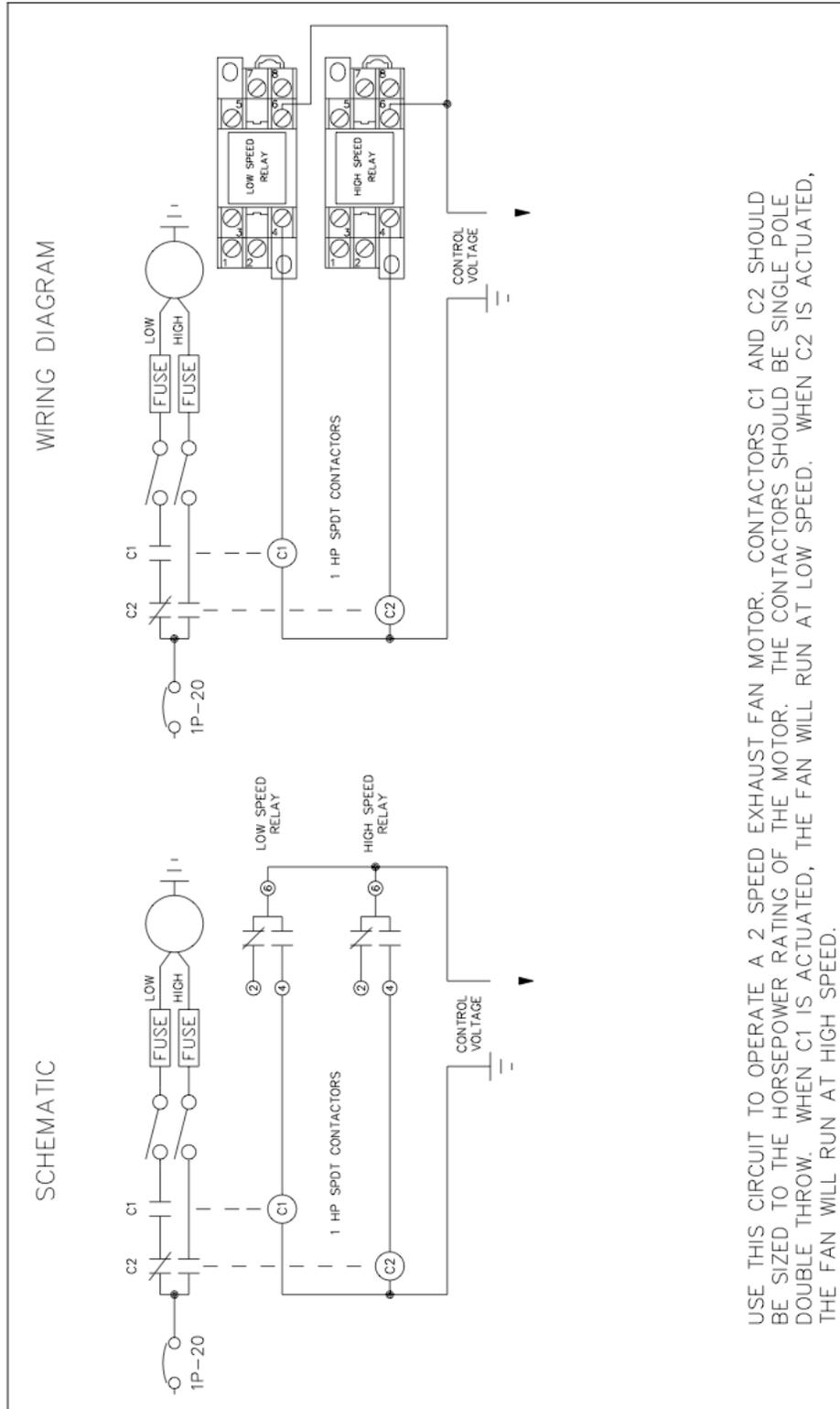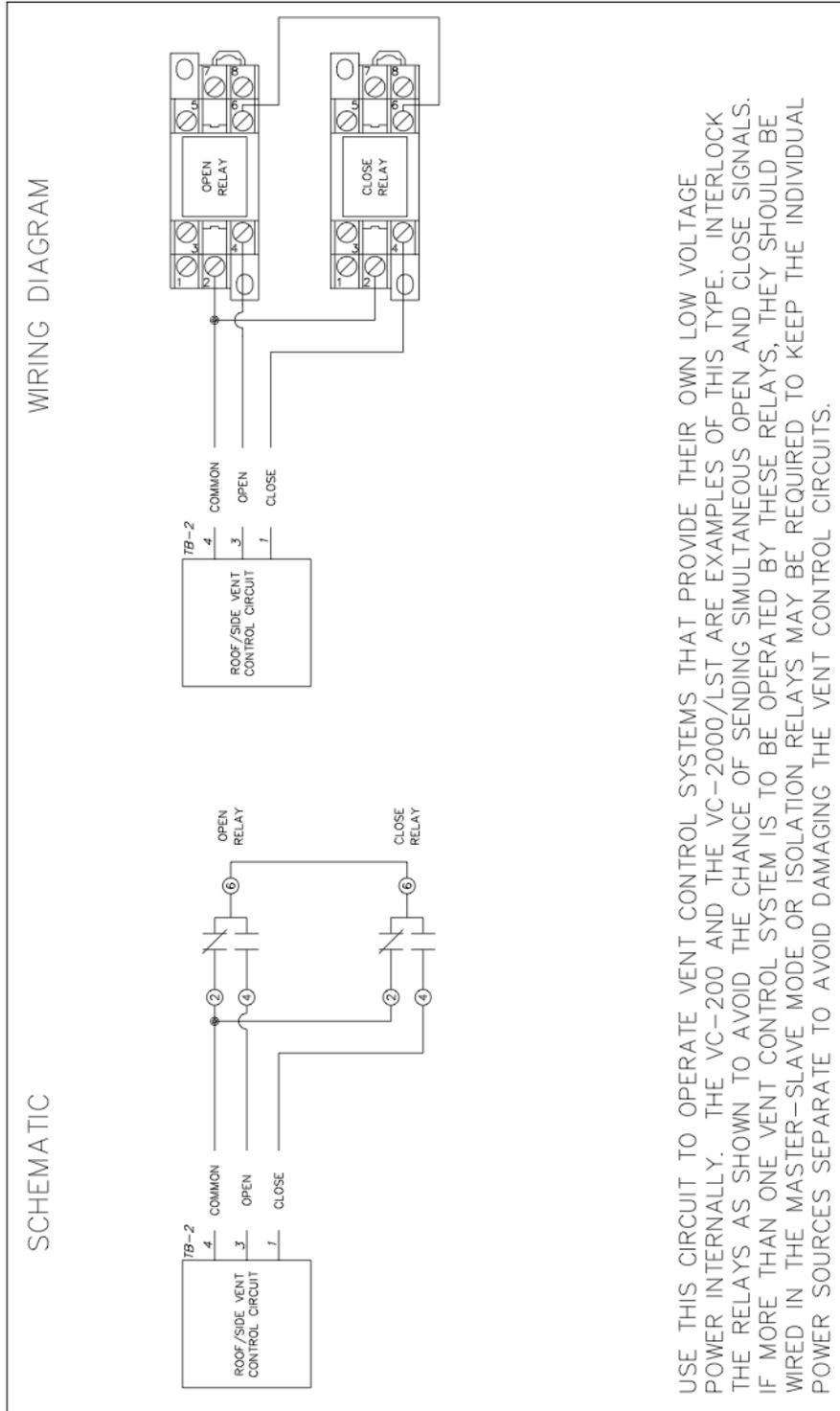
Figure 10, Control Wiring for Modulating Vent with Followers (Slaves)
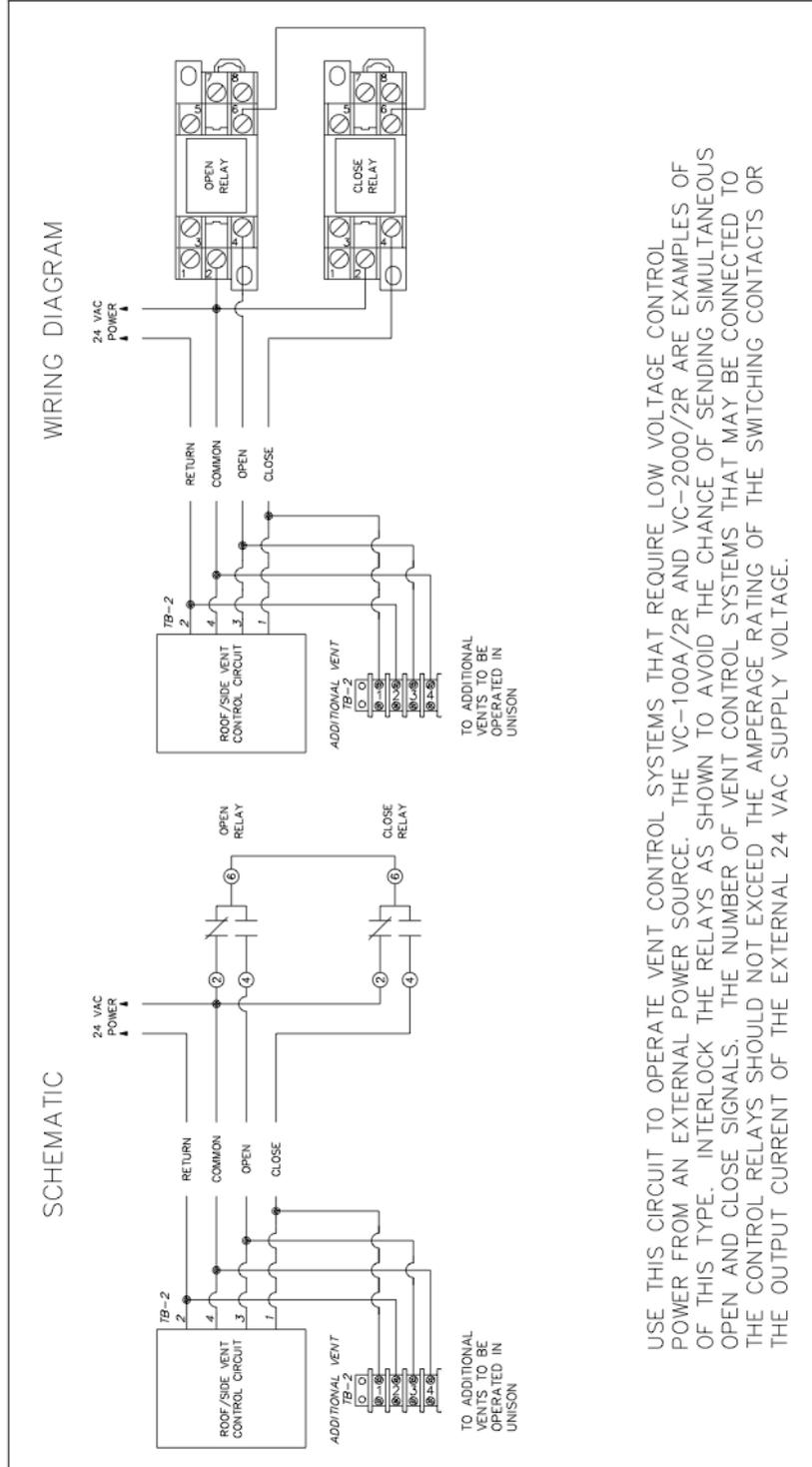
Figure 11, Control Wiring for pre-1985 VC-200 Vent

SPECIAL MODIFICATION OF VC-200 VENT CONTROL SYSTEM TO ACCEPT COMPUTER INTERFACE CONTROL

INSTALL A DPDT SWITCH ON THE VC-201 CONTROL CABINET. CLIP THE RED/BLK AND BLUE/BLK WIRES FROM THE CIRCUIT BOARD AND ATTACH TO SWITCH LUGS. ATTACH WIRES TO CENTER LUGS OF SWITCH AND CONNECT TO TERMINALS 20 AND 22 ON THE CIRCUIT BOARD. CONNECT THE THREE WIRES FROM THE COMPUTER CONTROL RELAYS TO THE SWITCH AND TO THE LOWER CONTACT TERMINAL OF THE THERMAL OVERLOAD RELAY. WHEN THE SWITCH IS PLACED IN THE COMPUTER POSITION, THE COMPUTER SYSTEM HAS CONTROL OF THE VC-200 VENT SYSTEM. WHEN THE SWITCH IS PLACED IN THE OVERRIDE POSITION, THE VC-200 MAY BE OPERATED FROM THE MANUAL CONTROL STATION OR PROPORTIONAL THERMOSTAT.
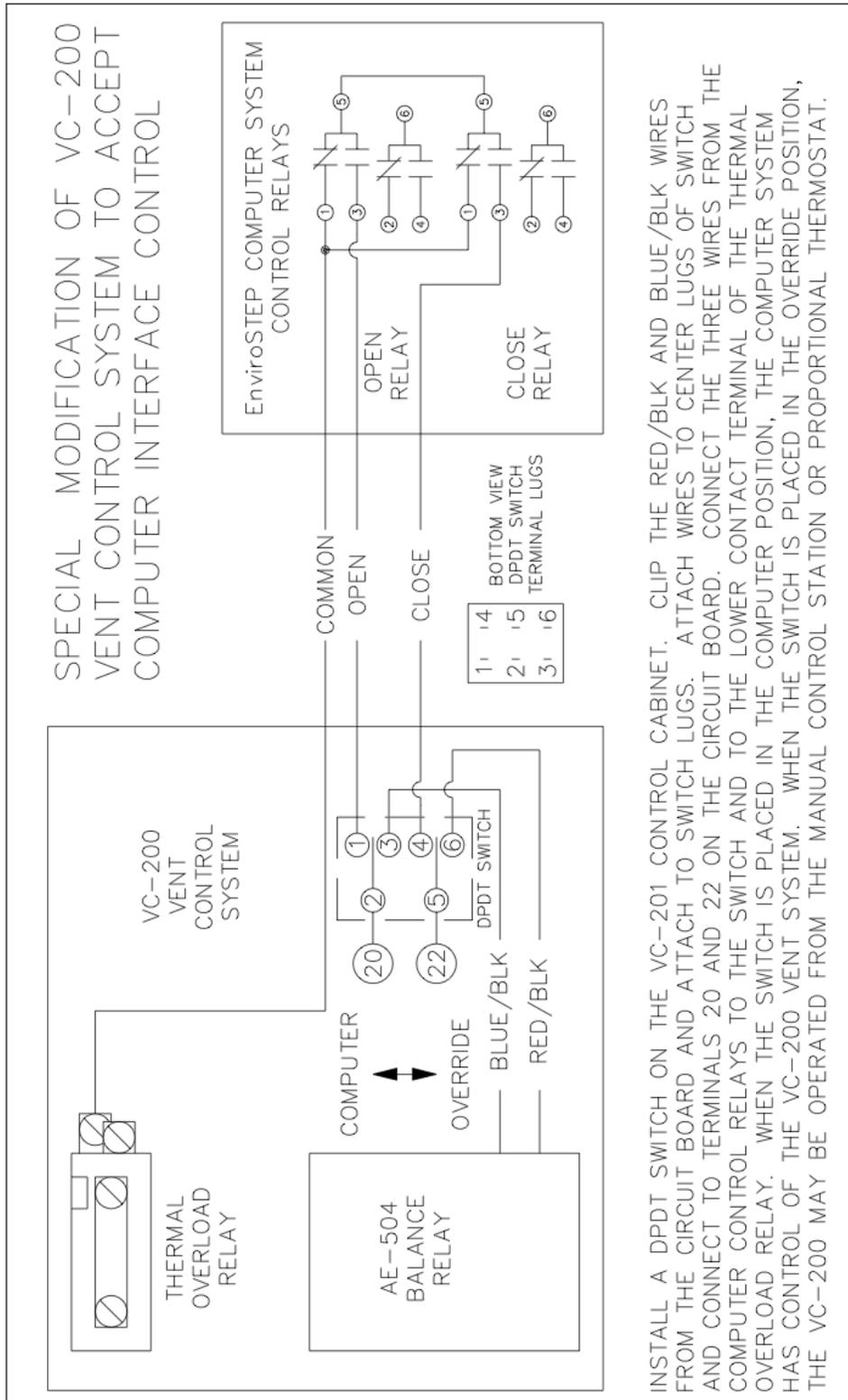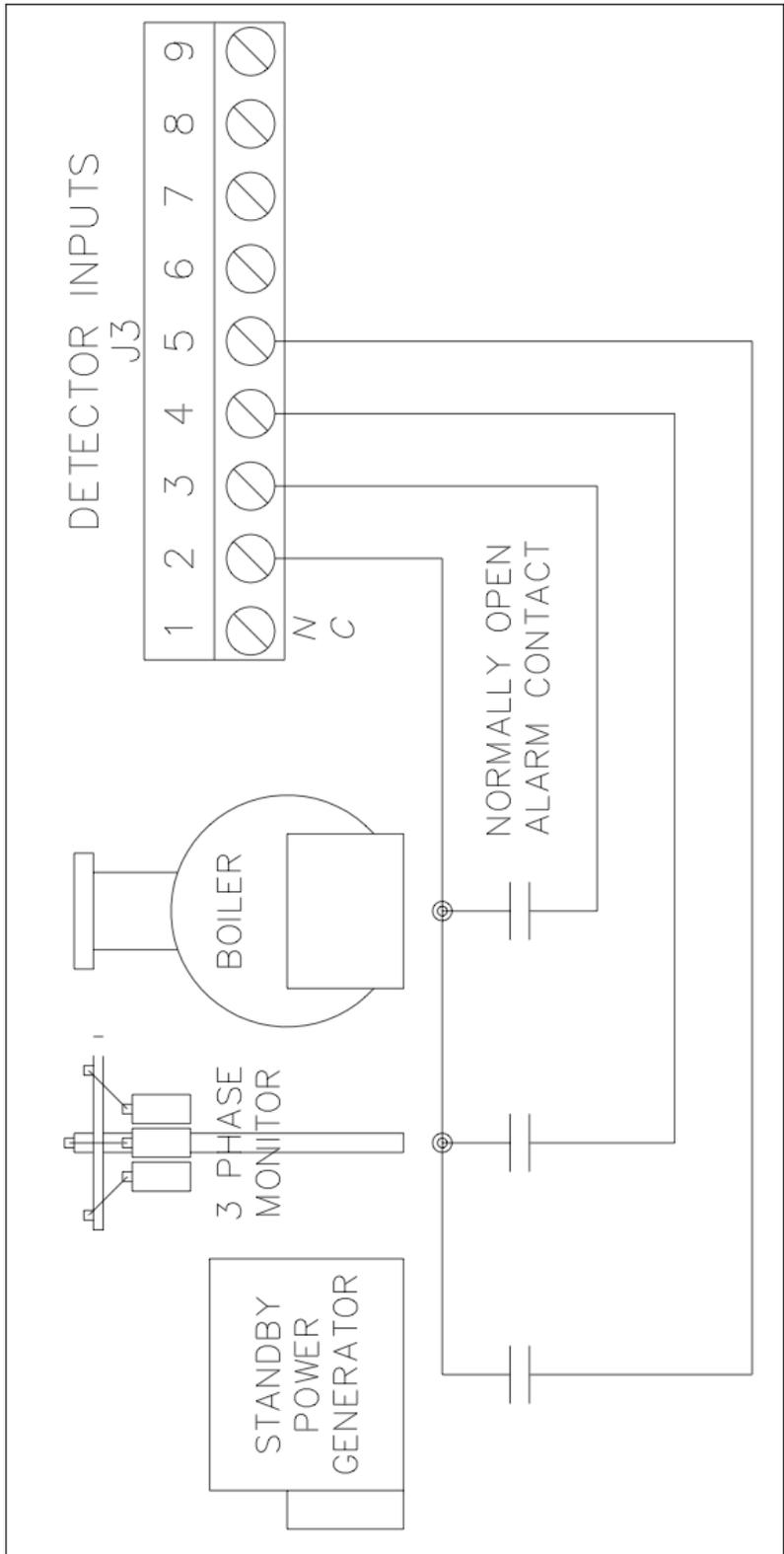
Figure 12, Control Wiring for Shade/Energy Curtain

Figure 13, Sample Detector Input Wiring

Figure 14, EnviroSTEP Weather Station Wiring Diagram

Figure 15, Weather Station Liquid Level Board Installation
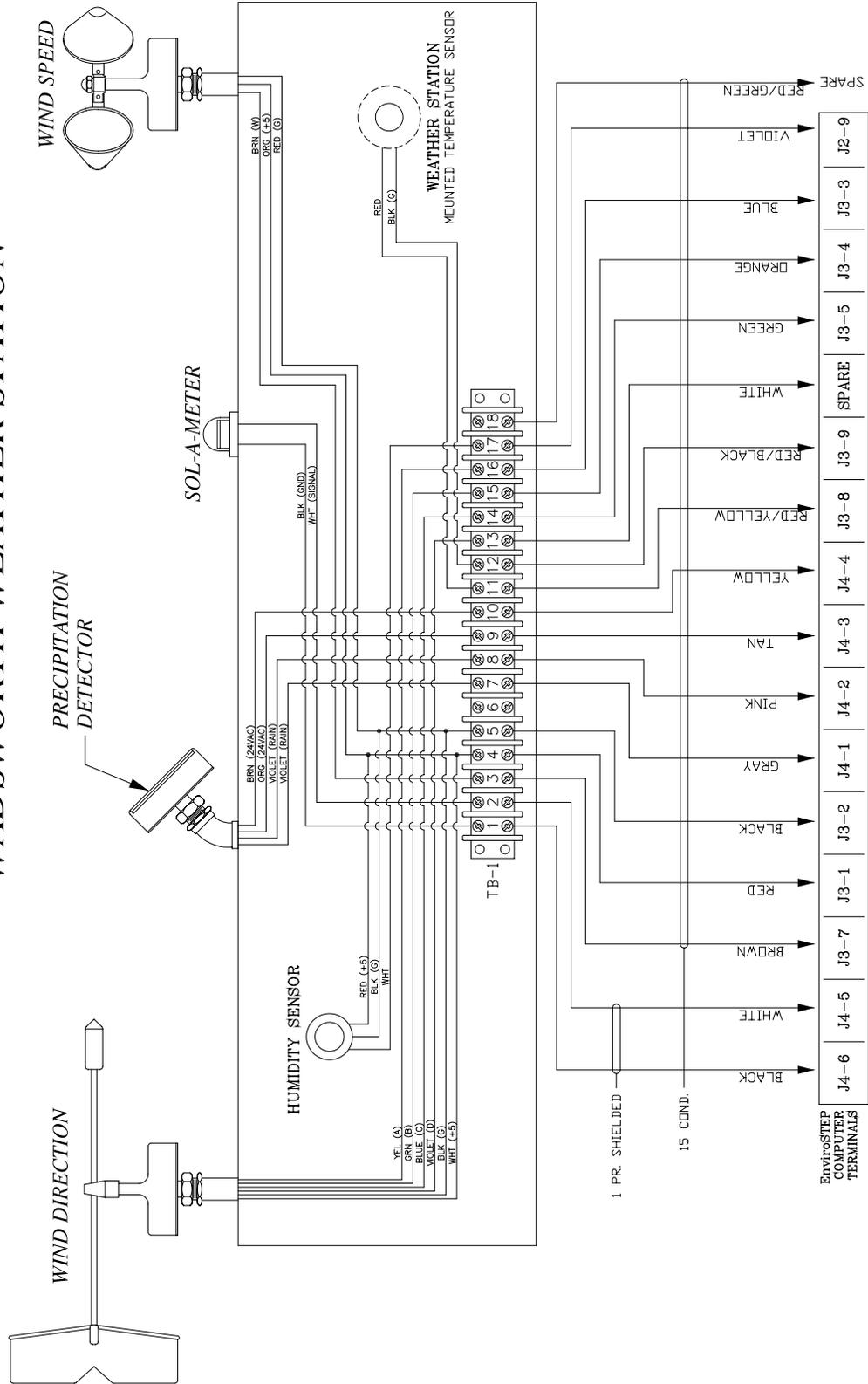
Figure 16, EnviroSTEP Weather Station Gable Mount Installation Diagram

Figure 17, EnviroSTEP Weather Station Ground Wiring Diagram
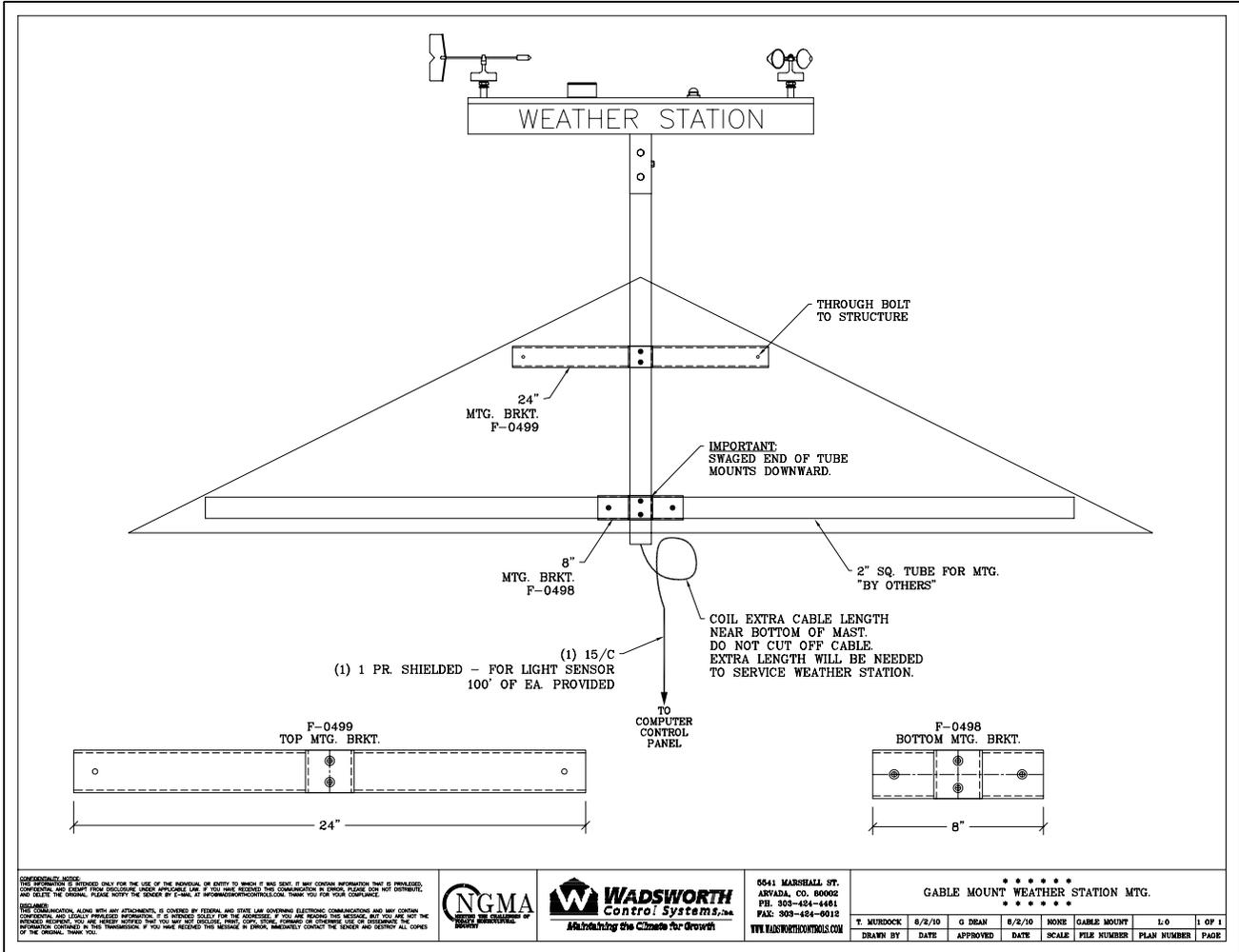
Glossary

Accum	"Accumulated" - the sum of a period's light quanta. Expressed as W-H/sq-cm (Watt-hours per square centimeter)
Ballast Delay	Indicates how many minutes the HID lights must remain off after they are turned off for any reason. Many ballasts require an idle time before they can be restarted.
CO_2	Carbon Dioxide concentration in PPM as sensed by optional sensing equipment.
Cold Lockout	Temperature when the vents lock closed due to cold weather outside the greenhouse.
Cold Lockout Ends	Defines temperature when vent restrictions end.
Cycle Timer	An internal timer, similar in operation to a 24-hour mechanical cycle timer.
Delay	Indicates any programmed time delay for the equipment. Some contactors interfaces have time-delay relays to allow equipment to stop prior to reversing.
Due-to	The column heading shows the measurement that causes the setpoint change (light, CO2, accumulated light).
Equipment Code	Displays the code for the piece of equipment. Codes are listed on the printed Configuration worksheet as well as in the equipment settings section
Fire	A setting to tell the computer yes or no to have a piece of equipment respond to a fire-alarm input.
Gale-%	Gale % – Sets the vent position when the wind speed is greater than or equal to the max wind speed setting.
Generator	A setting to tell the computer yes or no to have a piece of equipment operate when the system is on generator power.
HI	On Setpoint adjustments Indicates high end of range when adjustment will take effect.
Idle	You can set the minutes to **delay** between movements of a vent or other device. This limits wear-and-tear and over shoot.
KW-H	The unit-of-measure label for Accum light based changes
Light	Solar radiation - counted in mW/sq-cm. Measured real-time and accumulated totals. Can be averaged.
Light Intensity Averaging Factor	Controls the amount of averaging applied to the sun reading as used by curtains and HID lights. Higher settings smooth out the reading more than lower settings.
LO	On setpoint adjustment screens - Indicates low end of range when adjustment will take effect.
Lockout	Equipment can be selectively shut off, "locked out" based upon certain outside environmental cues such as Temperature, wind speed, etc.
mW-cm2	Milliwatts per square centimeter. A unit of solar radiation roughly 1/1000 of a foot-candle. The unit of measure label for light intensity based changes.
PPM	The unit of measure label for CO2 concentration based changes.
VPD	Plant Stress Index. Anticipates the amount of accumulated water stress a plant is experiencing. Only appears on older EnviroSTEPs we now use VPD.
Ramp	The system offers ramping between periods for gradual change in settings from one period to the next. For example: temperature from day setpoint to night setpoint.
RH	Relative Humidity as a setpoint, or as a reading from the sensors.
Set Point	Either a Heating or Cooling target point within the Day, Night, or DIFF periods

Start	Push the "Start" menu to initialize the system, or to bypass ramp times to make setpoints become immediately active.
Stroke	The time it takes, in seconds, for a piece of equipment to cycle 100%. e.g. a roof vent may take 56 seconds to open.
Sun On	Indicates when lights come on based on the level of sunlight intensity
Sun Off	Determines when the lights should turn off based on the sunlight intensity.
Time Type:	"Fixed time" (0) is by the clock, e.g. 02:00 or 14:00, "Relative Time" (1) relates to sunrise and sunset. So many minutes before or after.
Vapor Pressure Deficit VPD	Anticipates the amount of accumulated water stress a plant is experiencing.
Vent-Limit Max %	Max% Sets the maximum allowed vent opening when the wind speed is at or below the minimum wind speed setting.
Why	Indicates why the equipment is in its current stage (On/Off). See list of abbreviations in Manual. e.g. "T" = Temperature
Wind-Speed gale	Max – Sets the maximum wind speed at which it is safe to have the vent open at all.
Wind-Speed Min	Min – Sets the minimum wind speed at which damage to the vents may occur. Below this speed, the computer assumes it is safe to open the vent to the setting under Vent–Limit-Max% as needed.

Contact Information

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> 303-424-4461
>
> For emergency, Technical Support:
> 720-879-3936 or 1-800-821-5829

Manuals:
> There is a small fee for additional printed copies of the manual. However, you are welcome to download additional copies free of charge by visiting our website. Note a password is required. You will need to complete a quick form to gain access to the manuals on our website.
> https://wadsworthcontrols.com/manual-request/

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CONTINGENCIES: Wadsworth shall not be responsible for any failure to perform due to causes beyond its control. These causes shall include, but not be restricted to, fire, storm, flood, earthquake, explosion, accident, acts of the public enemy, war, rebellion, insurrection, sabotage, delays in transportation, inability to secure raw materials or machinery for the manufacturer of its devices, acts of GOD, acts of Federal Government, or any agency thereof, acts of any state or local government, or agency thereof, judicial action, and strikes.

WARNING!

COMPUTERIZED STEP CONTROL SYSTEMS ALLOW FOR INPUT FROM A FIRE ALARM SENSOR. DEPENDING ON THE SETTINGS, THE SYSTEM MAY THEN OPERATE EQUIPMENT IN A SPECIFIC MANNER UNLESS THE EQUIPMENT SWITCH IS PLACED IN THE MANUAL POSITION. IF THE SWITCH IS PLACED IN THE MANUAL POSITION, THE SYSTEM WILL NOT CONTROL THE EQUIPMENT.

COMPUTERIZED STEP CONTROL EQUIPMENT MAY ALSO MALFUNCTION OR NOT OPERATE PROPERLY IF DAMAGED BY FIRE OR OTHER CIRCUMSTANCES OUTSIDE THE CONTROL OF THE MANUFACTURER. THE SYSTEM IS NOT DESIGNED TO BE USED AS A FIRE SUPPRESANT OR CONTROL MECHANISM.