User Manual

Green Climate

Green Climate

Climate Controller

Ag/MIS/UmEN-2730-05/19 Rev 1.6

P/N: 116780

Munters

Green Climate

User Manual

Rev 1.6, 11/2023

Product Software: 8.09.01

This manual for use and maintenance is an integral part of the apparatus together with the attached technical documentation.

Munters reserves the right to effect modifications to the apparatus in accordance with technical and legal developments.

Index

1 Introduction

1.1 Disclaimer

Munters reserves the right to make alterations to specifications, quantities, dimensions etc. for production or other reasons, subsequent to publication. The information contained herein has been prepared by qualified experts within Munters. While we believe the information is accurate and complete, we make no warranty or representation for any particular purposes. The information is offered in good faith and with the understanding that any use of the units or accessories in breach of the directions and warnings in this document is at the sole discretion and risk of the user.

1.2 Introduction

Congratulations on your excellent choice of purchasing a Green Climate Controller!

In order to realize the full benefit from this product it is important that it is installed, commissioned and operated correctly. Before installation or using the controller, this manual should be studied carefully. It is also recommended that it is kept safely for future reference. The manual is intended as a reference for installation, commissioning and day-to-day operation of the Munters Controllers.

1.3 Notes

Date of release: July 2019

Munters cannot guarantee to inform users about the changes or to distribute new manuals to them.

2 Introduction to the Green Climate

Munters Green Climate is a climate controller that enables the user to control climate conditions, setting them to the required level inside the climate zone (see zone explanation). **Munters Green Climate** controls up to four climate zones in a single controller.

In each zone, there is the option of controlling various climate systems such as:

- Vents
- Shading & Energy Screens
- Heating
- Misting
- Fan & Pad
- Air Circulation
- CO2
- Crop Protection
- Lights

Strong relationships and priorities are defined between the different control systems to achieve maximum efficiency. Different influences (humidity, radiation, and temperature) can be set to achieve maximum accuracy.

Munters Green Climate has powerful communication capabilities between remote terminal units and other controllers in the network, reducing cable costs and avoiding duplications through receiving information from other controllers.

To maintain the same simplicity and user friendliness, the user interface has been kept as similar as possible to the **Munters Green Field Controller**.

- Climate zones
- User Interface
- User Level Access
- Setup

2.1 Climate zones

Climate zones are independent climate areas (covered and closed) which are used as references for the climate control. Usually climate zones represent one greenhouse but in some cases one greenhouse can be divided into four climate zones.

The reference sensor/s of each specific zone is an attached Green Box/es (Temperature & Humidity).

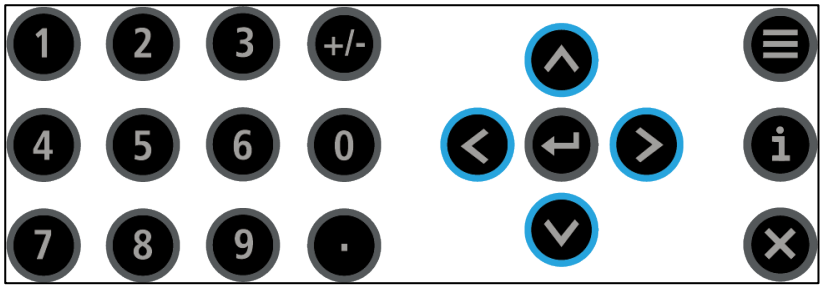
- Define any or all nine climate control systems inside the climate zone/s.
- Define up to four climate zones within the **Munters Green Climate** controller.

The entire viewing structure and navigation throughout the user interface is based on the climate zone/s.

2.2 User Interface

- Keyboard
- Main Menu Screen
- Overview Screen
- Quick Access
- Hot Keys

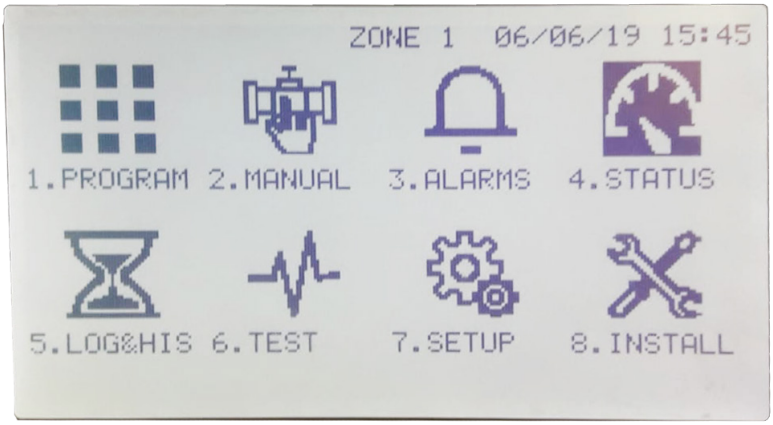
2.2.1 KEYBOARD



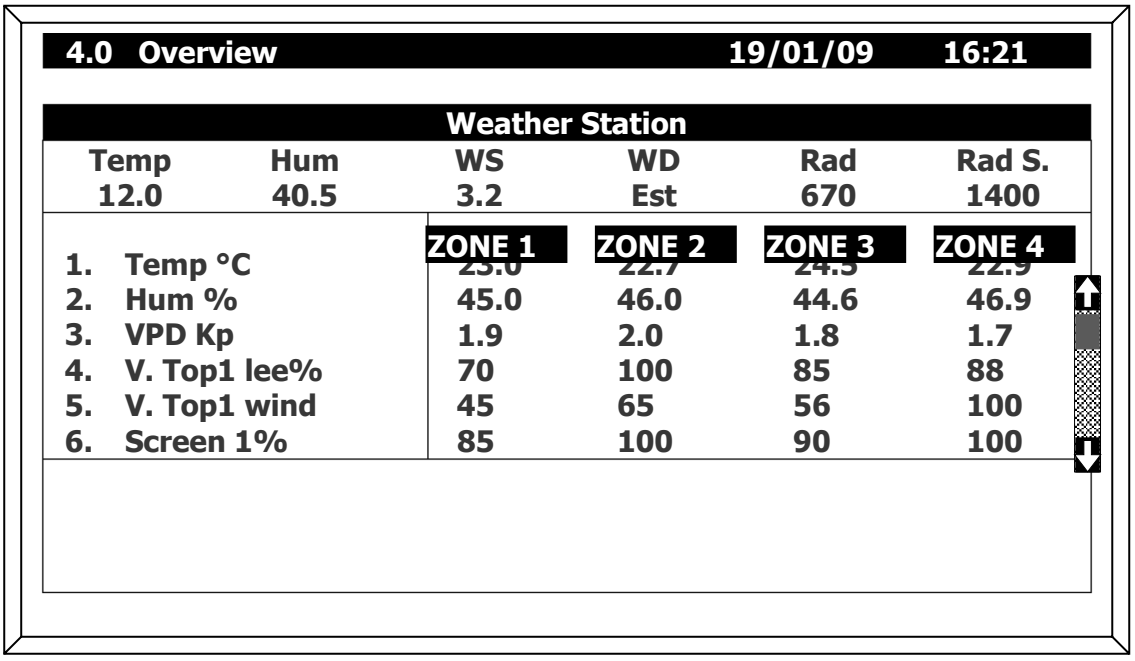
1 2 3 +/- 4 5 6 0 7 8 9 . (Numeric)	• Enter values/quantities • Use as shortcuts to screens
+/-	• Toggle between positive and negative values • Mark check boxes • Use to toggle between quantities and time format in History screens
(Arrows)	• Scroll up, down, left, and right to select menus
(Menu)	• Displays Main Menu • Use as "ESC" and "Back" key
(Zone/Login)	• Opens drop-down menu for selecting Zone #

(Enter)	• Enter menu/submenu/value • Open window • Confirm or change a value • Opens drop-down menu for selecting Zone #
(Delete)	• Erases typing mistake

2.2.2 Main Menu Screen



2.2.3 Overview Screen



*NOTE The following sensor readings will appear on the Overview Screen only if defined in the **Customize Overview** menu 7.13*

1. Temp °C: Average temperature in each zone
2. Hum %: Relative Humidity percentage in each zone
3. VPD Kp: Vapor Pressure Deficit* in each zone
4. V.Top1 wind %
5. V.Top1 lee %
6. V.Top2 wind %
7. V.Top2 lee %
8. V.Top3 wind %
9. V.Top3 lee %
10. V.Top4 wind %
11. V.Top4 lee %
12. V.End wind %

Displays vent position in each zone
0% represents fully closed and 100% is fully opened

13. V.End lee %
14. V.Long wind %
15. V.Long lee %
16. Screen 1 %
17. Screen 2 %

Displays screen position in each zone. Collected screen position is represented by 0% (fully closed) and a spread screen is 100% (fully opened)

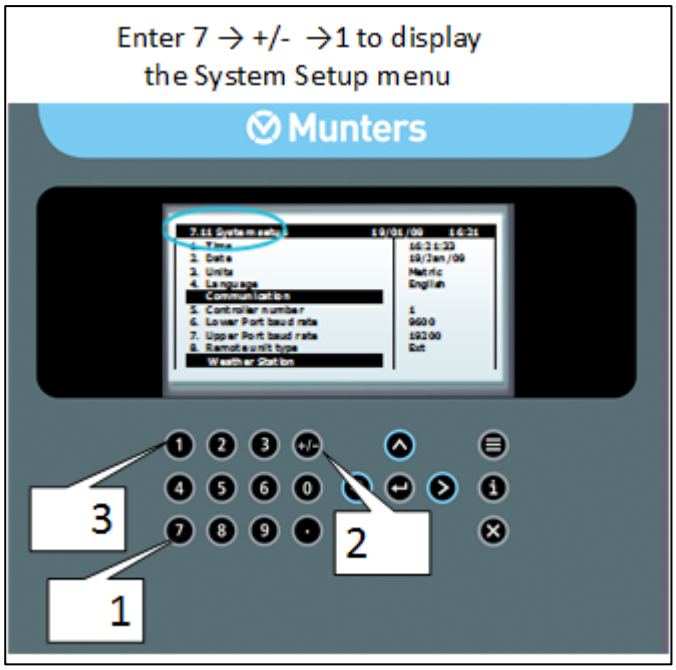
18. HeatNet 1 °C
19. HeatNet 2 °C
20. HeatNet 3 °C
21. HeatNet 4 °C

Displays measured water temperature in the pipes of the heating network in each zone

22. HeatFloat °C
23. Heat On/Off: Displays activity of the ON/OFF Heating system in each zone [ON/OFF]
24. Misting: Displays the total number of active Misting Systems in each zone [0-4]
25. Fan stage: Displays the total number of active fan stages in each zone [0-8]
26. CO2 ppm: Displays the measured C02 concentration level in each zone
27. Crop Protection: Displays whether Crop Protection is enabled/disabled in each zone [Yes/No]
28. Light: Displays the total number of active Light strings in each zone [0-3]
29. Air Circulation: Displays the air circulation status in each zone (on/off)

*NOTE *VPD is the difference (deficit) between the amount of moisture in the air and how much moisture the air can hold when it is saturated. Once air becomes saturated water will condense out to form clouds, dew, or films of water over leaves.*

2.2.4 QUICK ACCESS



Use the Quick Access feature to navigate into any screen by entering in the corresponding numeric keys of the menu (top left of screen) from the Main Menu screen. There is a permanent order in the layout of the screens.
For double digit numbers, use the +/- key for the ten's place and then the corresponding one's place number

2.2.5 HOT KEYS

While in the Overview Screen, enter any one of the following numeric values to view the corresponding screen.

NOTE See Status menus for further explanations

1. Status – Vent (Menu 4.1), page 26
2. Status – Screen (Menu 4.2), page 36
3. Status – Heating (Menu 4.3), page 48
4. Status – Misting (Menu 4.4), page 57
5. Status – Fan & Pad (Menu 4.5), page 64
6. Status – Air Circulation (Menu 4.6), page 74
7. Status – CO2 (Menu 4.7), page 81
8. Status – Crop Protection (Menu 4.8), page 85
9. Status – Light (Menu 4.9), page 91

2.3 User Level Access

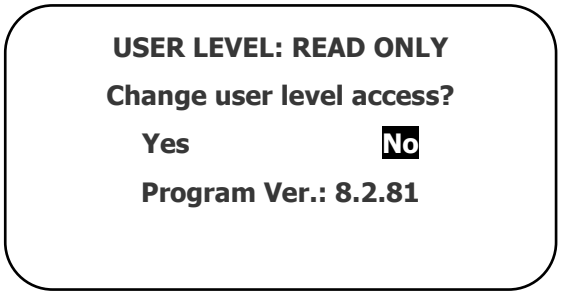
There are three levels of access:

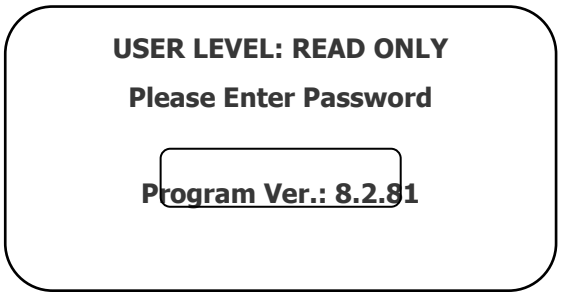
- **Read Only (restricted)**: All the parameters and menus are visible, but cannot be modified

- **User (limited restriction):** Menus 1-7 are fully accessible and can be modified. Menu 8 can be viewed but not edited
- **Technician (unrestricted):** All menus are fully accessible and available for modifications

To change the operation mode:

1. On the Main Menu, press  .
2. Use the arrow keys to select **Yes**.
3. Press  .





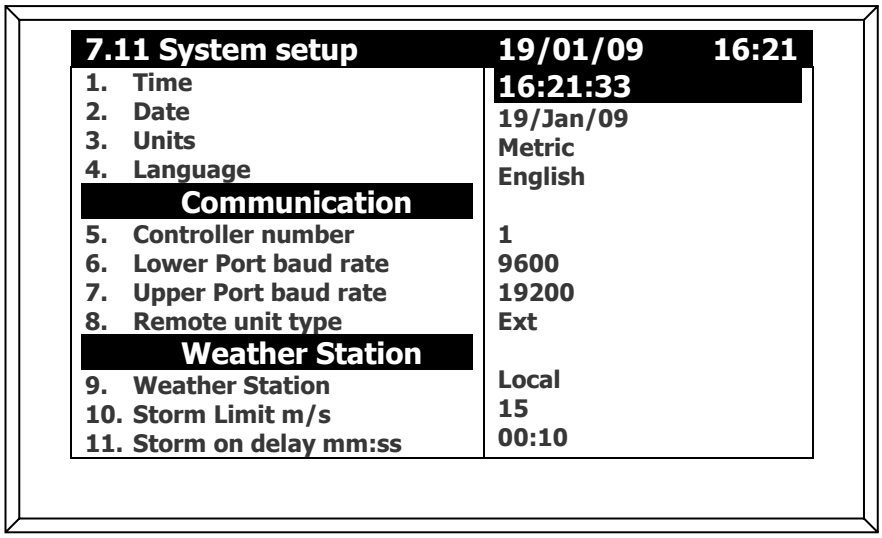
The controller recognizes the operation mode according to the password that is entered:

USER LEVEL	PASSWORD
Read Only	0000
User	9999
Technician	1948

2.4 Setup

- System Setup (Menu 7.11)
- Temperature & Humidity Calibration (Menu 7.10.5)
- Weather Station Calibration (Menu 7.10.6)
- Up/Down Load Data Plug (Menu 7.12)
- Customize Overview (Menu 7.13)
- View Firmware Versions (Menu 7.14)

2.4.1 SYSTEM SETUP (MENU 7.11)

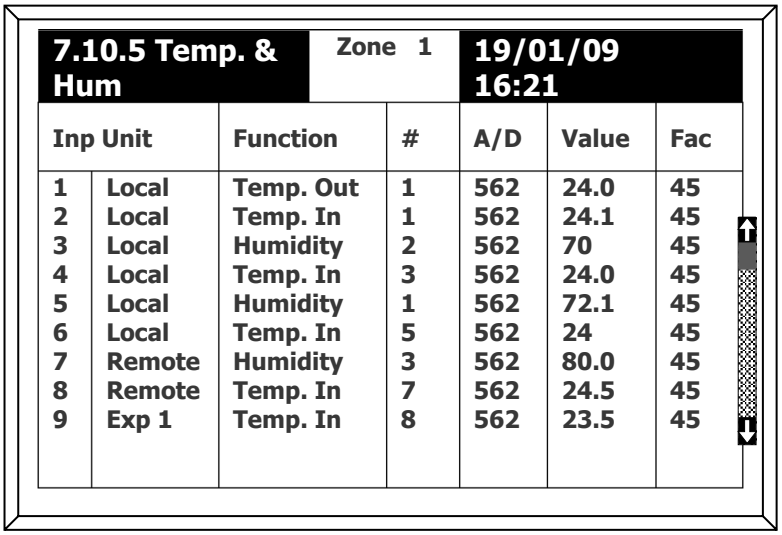


#	Parameter	Explanation	Unit/Range	Default
1.	Time	Enter the current time	hh:mm:ss	
2.	Date	Enter the current date	dd/month/yy	
3.	Units	Select the preferred measuring units for controller calculation	Metric USA	Metric
4.	Language	Select the preferred language for controller display.	English Spanish	English
		Communication		
5.	Controller Number	Define the controller number within the Green Climate network. There can be up to 50 controllers defined within the network.	1 - 50	1
6.	Lower Port Baud Rate	PC communication rate As you increase transmission distance, the number of errors increases. To reduce the error rate, reduce the baud rate.	1200 - 38400	9600
7.	Upper Port Baud Rate	Expansion unit communication rate As you increase transmission distance, the number of errors increases. To reduce the error rate, reduce the baud rate.	1200 - 38400	19200
8.	Remote unit type	Select from the list which type of remote terminal unit is working with the Green Climate.	None Exp RTU Exp&RTU	None

#	Parameter	Explanation	Unit/Range	Default
Weather Station				
9.	Weather Station	Define controller operation as one of the following: • LOCAL: Works only in the current location and is not dependent nor serves as a main controller • SLAVE: Receives weather station data from the MASTER controller defined in the network • MASTER: Is the main controller within the network. Sends weather station data to the connected slave controllers	Local Slave Master	Local
10.	Storm Limit m/s	Define the wind speed (meters/second) which will indicate a Storm event	0-50	15
11.	Storm on delay	Define the duration of time to measure above the Storm Limit value for the controller to recognize it as a Storm event. This is to prevent gusts of wind to be considered as storm events		00:10
12.	Storm off delay	Define the duration of time to measure below the Storm Limit value for the controller to no longer recognize it as a Storm event		01:00
13.	Frost Limit °C	Define the outside temperature which will indicate a Frost event		-10°
14.	Frost on delay	Define the duration of time to measure below the Frost Limit value for the controller to recognize it as a Frost event. This is to prevent momentary drops of temperature to be considered as Frost events		01:00
15.	Frost off delay	Define the duration of time to measure above the Frost Limit value for the controller to no longer recognize it as a Frost event		01:00
16.	Rain event detect	Define the quantity of rain (millimeters) per minute for the controller to recognize a rain event. This parameter is enabled only when a rain collector sensor has been installed.		30
17.	Rain on delay	Define the duration of time to measure a rain indication for the controller to recognize it as a Rain event		01:00

#	Parameter	Explanation	Unit/Range	Default
18.	Rain off delay	Define the duration of time to measure stopped rain for the controller to no longer recognize it as a Rain event		01:00
19.	Snow Limit °C	Define the minimum temperature (°C) to indicate a snow event in addition or instead of a Snow detector		0
20.	Snow on delay	Define the duration of time to measure above the Snow Limit value for the controller to recognize it as a Snow event.		00:00
21.	Snow off delay	Define the duration of time to measure below the Snow Limit value for the controller to no longer recognize it as a Snow event		00:00
Radiation Influence				
22.	Radiation delay	Define the duration of time to measure radiation before the controller performs adjustments for Radiation influence		05:00

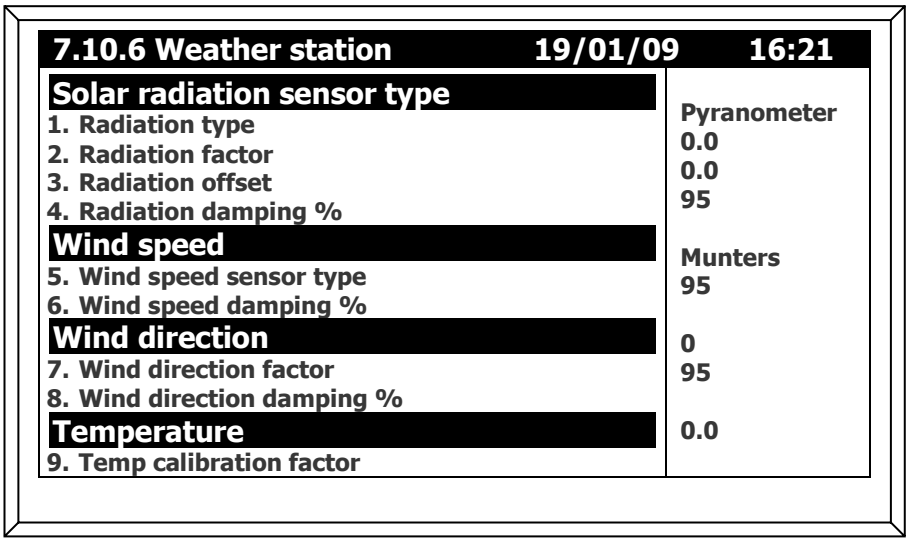
2.4.2 TEMPERATURE & HUMIDITY CALIBRATION (MENU 7.10.5)



- **Input Unit**: Location of the sensor according to the Analog Inputs – System Installation menu (8.1.3)
- **Function**: Sensor type
- **# (Number)**: Every sensor is given a number during installation, in case there are multiple sensors within the same zone
- **A/D**: Analog/Digital reading given by the sensor
- **Value**: Value given by sensor (includes factor offset)

- **Factor (only editable section on screen)**: Difference between the installed sensor and another sensor separate from the system; for example a manual sensor reading. You can edit the value according to the manual sensor.

2.4.3 WEATHER STATION CALIBRATION (MENU 7.10.6)



Solar radiation sensor type

- **Radiation type** – Select the sensor brand (Pyranometer/Davis)
  Settings 2&3 are provided by the supplier on the sensor data sheet. Each sensor has its own specific factor and offset values.
- **Radiation factor** – the value for converting from mV to W/m^2
- **Radiation offset** – the difference between the sensor radiation and the actual radiation
- **Radiation damping** – percentage taken from older reading (remaining percentage taken from the newer reading)

NOTE : When installing a Davis sensor define the parameters as:

  - Radiation factor: 1.67
  - Radiation offset: 0.0
  - Radiation damping %: 95

Wind Speed

- **Wind speed sensor type** – Select the sensor brand (Munters/Davis)
- **Wind speed damping** – percentage taken from older reading (remaining percentage taken from the newer reading)

Wind direction

- **Wind direction factor** – difference between sensor reading to actual wind direction
- **Wind direction damping** – percentage taken from older reading (remaining percentage taken from the newer reading)

Temperature

- **Temp calibration factor –** difference between sensor reading to actual temperature (for example: manual sensor reading)
- **Temp damping –** percentage taken from older reading (remaining percentage taken from the newer reading)

Rain Sensor

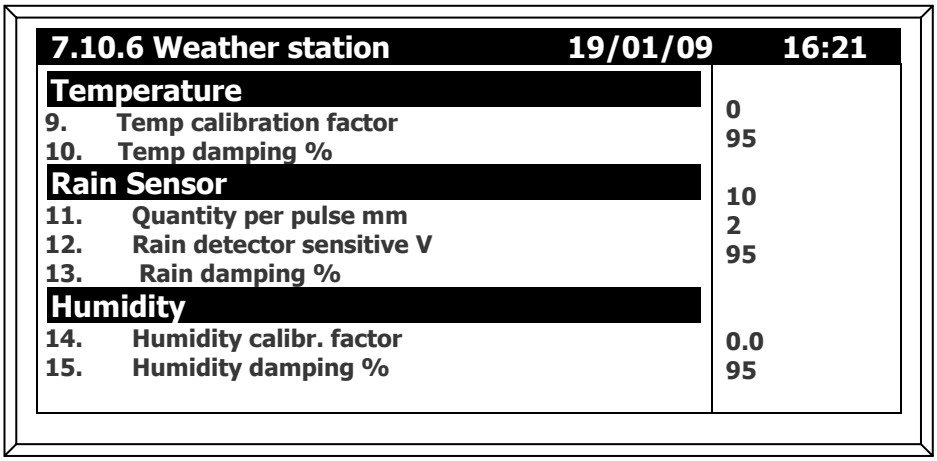
- **Quantity per pulse mm –** the quantity of rain per tipping. A Rain Collection sensor must be installed for this parameter to be valid.
- **Rain detector sensitivity –** set the voltage for rain detection (0-15)

*NOTE Parameter refers to an installed **Rain Detector** used for automatic detection of a start and end of a rain event (Normally Open, closed during rain)*

- **Rain damping –** percentage taken from older reading (remaining percentage taken from the newer reading). A Rain Collection sensor must be installed for this parameter to be valid.

Humidity

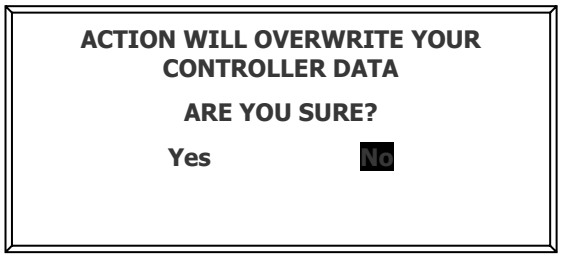
- **Humidity calibration factor –** difference between sensor reading and actual humidity.
- **Humidity damping –** percentage taken from older reading (remaining percentage taken from the newer reading)



2.4.4 UP/DOWN LOAD DATA PLUG (MENU 7.12)

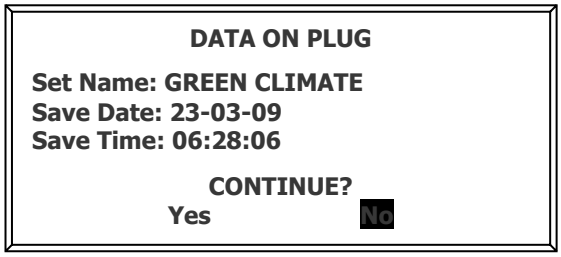
- Read Data from Plug
- Write Data to Plug

2.4.4.1 Read Data from Plug



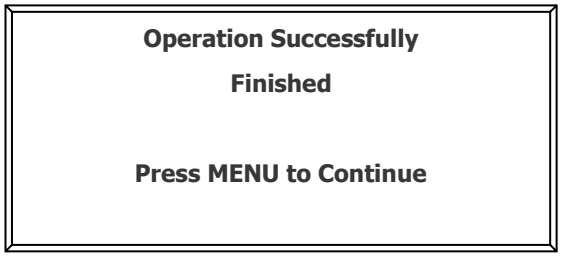
Use the arrow keys to select **Yes**

Press 



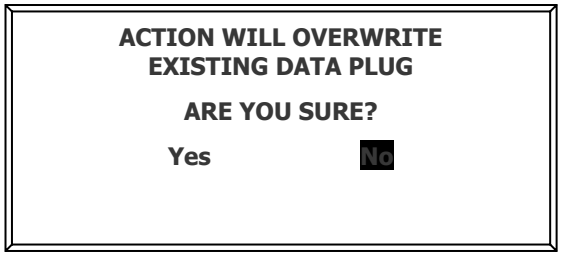
Use the arrow keys to select **Yes**

Press  , and wait for next screen



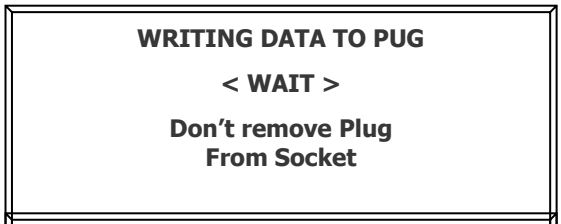
Data has been successfully uploaded to the controller!

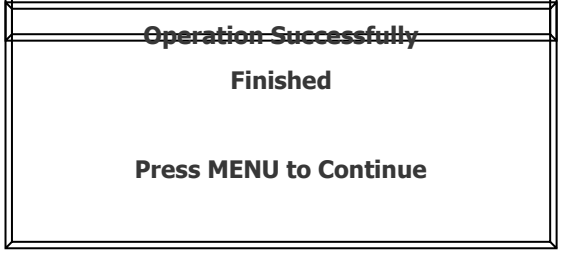
2.4.4.2 Write Data to Plug



Use the arrow keys to select **Yes**

Press  , and wait for next screen





Data has been successfully downloaded to the data plug!

2.4.5 CUSTOMIZE OVERVIEW (MENU 7.13)

Use  and the arrow keys to mark the devices so that their status will appear on the overview screen.

7.13 Overview Cust.	19/01/09	16:21
1. Temp °C		---
2. Hum %		√
3. VPD Kp		√
4. V. Top1 wind %		√
5. V. Top1 lee %		√
6. V. Top2 wind %		---
7. V. Top2 lee %		---
8. V. Top3 wind %		---
9. V. Top3 lee %		---
10. V. Top4 wind %		---
11. V. Top4 lee %		---
12. V. End wind %		√
13. V. End lee %		√

2.4.6 VIEW FIRMWARE VERSIONS (MENU 7.14)

7.14 FM Versions	19/01/09	16:21
Munters – GREEN Climate		
1. Software version		8.2.85
2. Release date		05/Oct/09
3. Expansion box SW version		2.01
4. RTU SW version		1.12
5. Communication version		1.1
6. Boot version		2.1

- **Software version** – Current software version of the controller
- **Release date** – Date the current software version was released
- **Expansion box software version** – Software version of the expansion box
- **Remote unit software version** – Software version of the remote unit
- **Communication version** – Current communication software version
- **Boot version** – Current boot version

3 Vent

- Program – Vent (Menu 1.1)
- Manual – Vent (Menu 2.1)
- Status – Vent (Menu 4.1)
- Log & History – Application History – Vent (Menu 5.2.1)
- Setup – Vent (Menu 7.1)
- Setup – System Calibration – Vents (Menu 7.10.1)

3.1 Program – Vent (Menu 1.1)

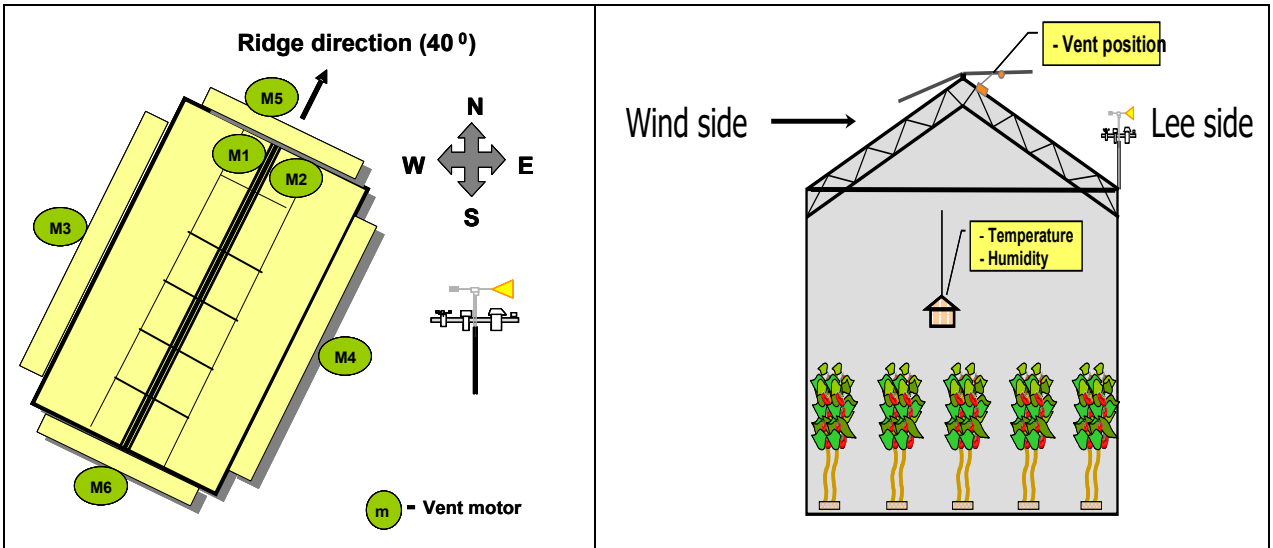
The goal of the Ventilation process is to maintain a fixed temperature in the green house. The Ventilation control manages the vents operation according to the conditions of the greenhouse.

The monitoring and operation is done per control (1-3) and within the control number the controller should operate the vent individually. There are several inputs that influence the calculation position of the vents, such as: inside and outside temperature, humidity, wind speed, wind direction, radiation, and rain.

Emergency cases like rain, storm or frost are monitored continuously and during such events the controller reacts according to the configuration. The vent control should operate in cooperation with other controls like fan & pad, screens, etc.

The vent types (top, side) are divided into vent controls. Each vent control includes lee side and wind side.

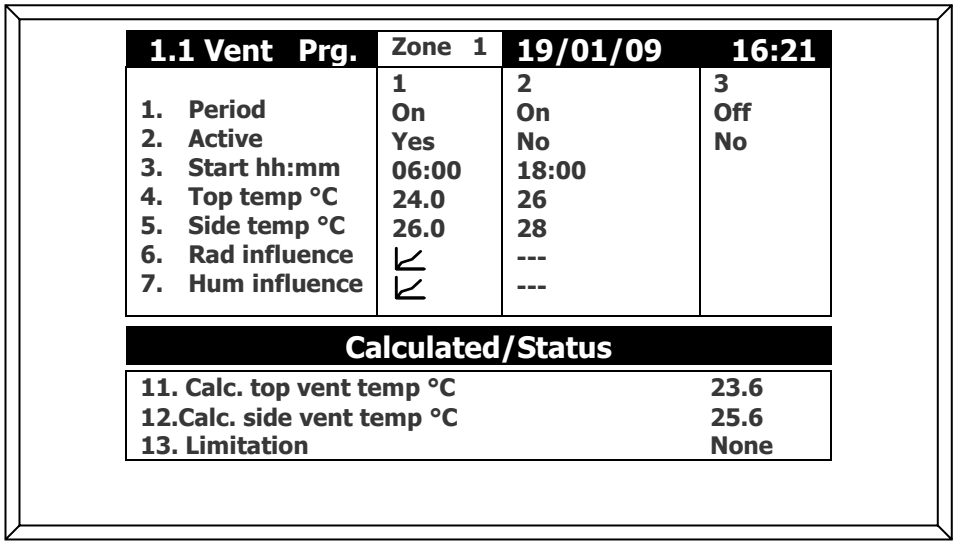
- **Wind side** –The side that the wind enters the greenhouse.
- **Lee side** – The side opposite the direction of the wind.



Example of greenhouse vents position respectively to the north and lee/wind sides

The controller can determine whether each vent is either wind or lee through the vent direction (each vent has its own direction) and wind direction measurements.

CAUTION *IMPORTANT: Verify that the SETUP parameters have been defined and the vents Calibrated!*



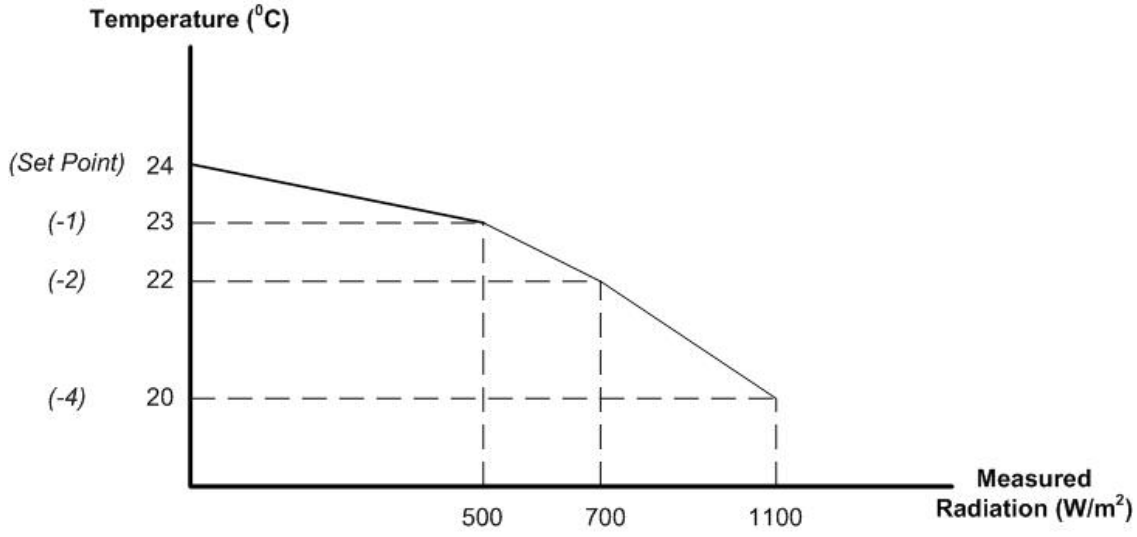
#	Parameter	Explanation	Unit/Range	Default
1.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off	On/Off	Off
2.	Active	Updated by the controller (Read only)	Yes/No	
3.	Start Time	Start Time of the period. The next period START TIME overrides the previous period.	hh:mm	--:--
4.	Top Ventilation Temperature	Define the temperature set point for top ventilation. If the measured temperature is above the set point, the top ventilation begins to open.	-20 ° to +50° C	20
5.	Side Ventilation Temperature	Define the temperature set point for side ventilation. If the measured temperature is above the set point, the side ventilation begins to open.	-20 ° to +50° C	20
6.	Radiation Influence	Define the conversion table that indicates the influence of the radiation level outside on the ventilation temperature. *See Solar Radiation Influence below	0 - 2500 W/m^2 -50° to +50° C	0
7.	Humidity Influence	Define the conversion table that indicates the influence of the humidity level inside on the ventilation temperature. *See Humidity Influence below	0 - 100 % -50° to +50° C	0

#	Parameter	Explanation	Unit/Range	Default
8.	Wind Influence	Define the conversion table that indicates the influence of the wind speed level outside on the ventilation temperature. *See Wind Speed Influence below	0-50 m/sec	0
9.	Cool Down	Define the gradual cooling down time per 1°C (approximately 2F). This is used to avoid fast changes between periods. *For example: Setting this parameter to 15 minutes (00:15) means that it will take one hour for the zone to cool down from 24°C to 20°C (15 minutes per 1°C).	hh:mm	00:15
10.	Heat up	Define the gradual heating time per 1°C (approximately 2F). This is used to avoid fast changes between periods. *For example: Setting this parameter to 15 minutes (00:15) means that it will take one hour for the zone to heat up from 20°C to 24°C (15 minutes per 1°C).	hh:mm	00:15
		Calculated / Status		
11.	Calculated Top Vent Temp.	Calculates the temperature for the opening of the top vent corresponding with the settings defined and taking into consideration the influences.	0 ° to +100° C	
12.	Calculated Side Vent Temp.	Calculates the temperature for the opening of the side vent corresponding with the settings defined and taking into consideration the influences.	0 ° to +100° C	
13.	Vent Limitation	Vent function may be limited due to a higher priority event. Ex: If it is raining, then the vents will proceed to the “RAIN” position, and the Vent Limitation will display Rain.	• Manual • Frost • Storm • Rain • External Input • Crop Protection • Fan&Pad • None	

3.1.1 SOLAR RADIATION INFLUENCE

Solar radiation increases the greenhouse temperature. During higher levels of radiation set the table to negative values to decrease the temperature to a lower set point. This does not mean that the set point changes, simply that the radiation level influences the temperature of the **Calculated vent temperature**.

Radiation Influence the Vent Temperature	
Radiation (w/m²)	Desired Vent temp. (°C)
500	-1.0
700	-2.0
1100	-4.0
0	0.0
0	0.0

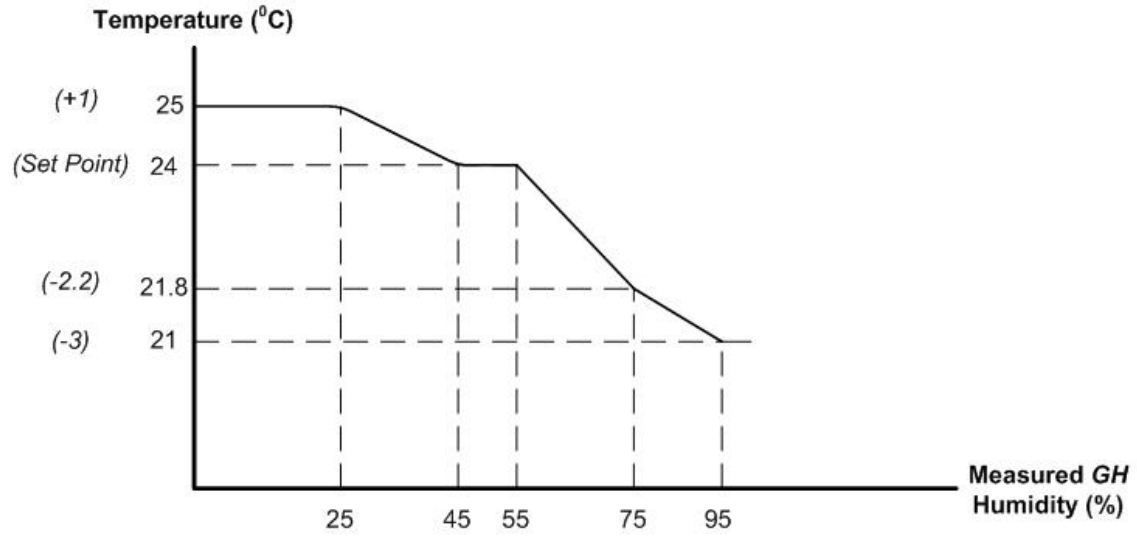


3.1.2 HUMIDITY INFLUENCE

Depending on the crop humidity requirements, a negative value for the temperature decreases the humidity *(humidity release treatment)* while a positive value increases the humidity *(humidification treatment)*.

The following example is for decreasing humidity by opening the vents earlier.

Humidity Influence the Vent Temperature	
Humidity	Desired Vent temp. (°C)
25	1.0
45	0.0
55	0.0
75	-2.2
95	-3.0



3.1.3 WIND SPEED INFLUENCE

Take into consideration the overall climate throughout the season in order for the wind speed influence to accurately control the greenhouse climate.

If the season is summer, for example, then the vents need to be opened more frequently for ventilation. If it is winter, then the vents will need to be closed more to keep the greenhouse at a steady temperature.

SUMMER EXAMPLE:

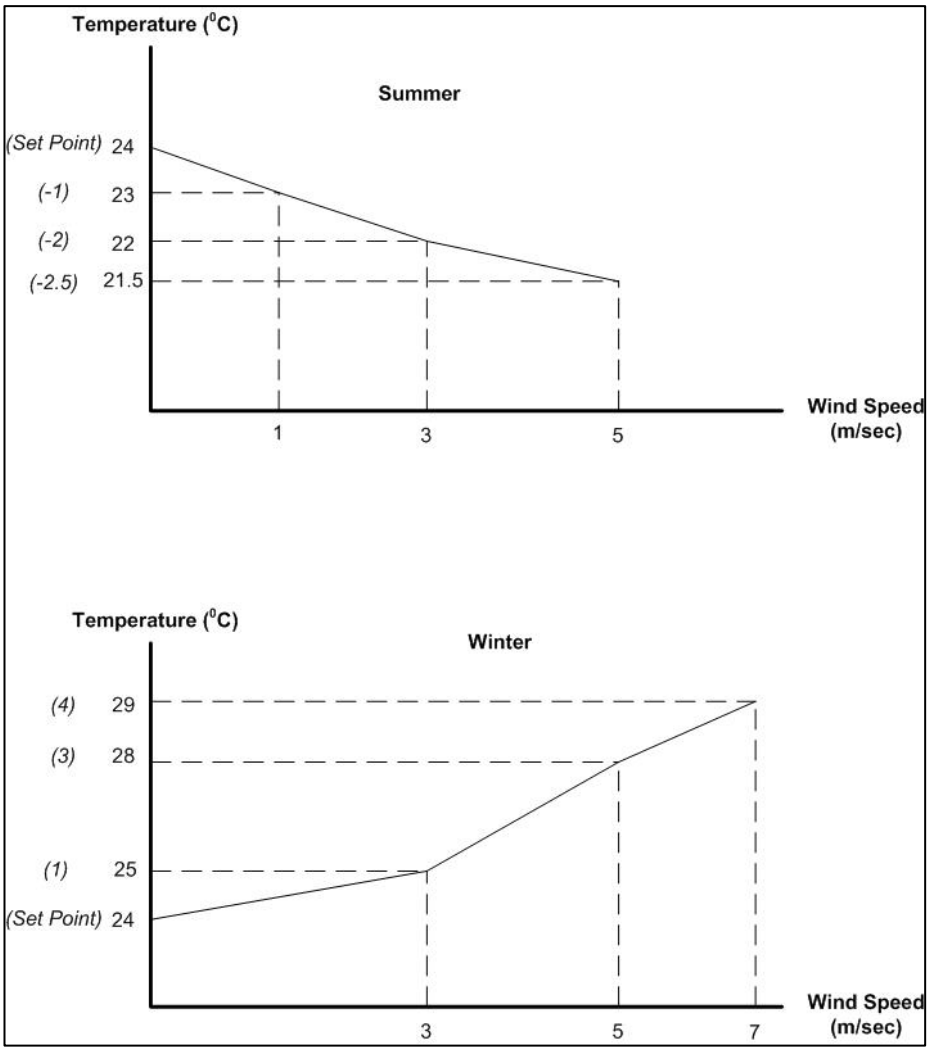
Wind Speed Influence the Vent Temperature

Wind Speed (m/s)	Desired Vent temp. (°C)
5.0	-2.5
3.0	-2.0
1.0	-1.0
0.0	0.0
0.0	0.0

WINTER EXAMPLE:

Wind Speed Influence the Vent Temperature

Wind Speed (m/s)	Desired Vent temp. (°C)
7.0	4.0
5.0	3.0
3.0	1.0
0.0	0.0
0.0	0.0



3.2 Manual – Vent (Menu 2.1)

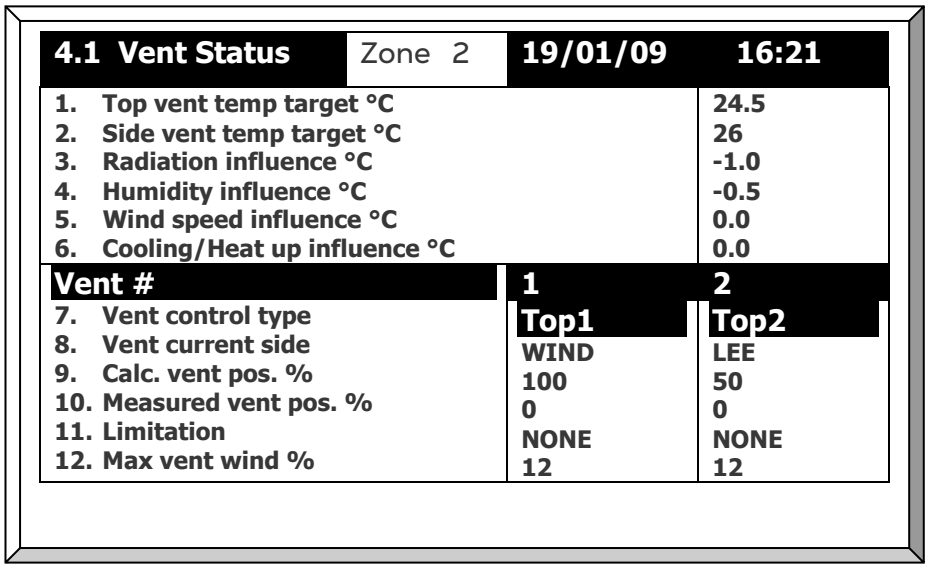
2.1 Vent Manual	Zone 2	19/01/09	16:21
1. Vent #	1	2	3
2. Vent Type	LSide	ESide	Top1
3. Drive Vent	Auto	Open	Fixed
4. Fixed Position %	---	---	---
5. Meas. Position %	23	25	30.5
6. Calc. Position %	20	24	30.5
7. Vent Direction	Wind	Wind	Lee

- **Vent #** - The corresponding vent number as defined in the **System Installation** menu
- **Vent type** - The corresponding vent control type as defined in the **Vent Setup** menu
- **Drive vent** (Press  to display drop-down menu)
    - **Auto** - Operates as defined in the **Vent Program**

- **Open** - Drives vent to be completely open (100%)
- **Close** - Drives vent to be completely closed (0%)
- **Fixed** - Allows for manually defining the desired position of the vent

- **Fixed Position** - Define the vent position when the **Drive vent** option is **FIXED** (0-100%)
- **Measured Position %** - Displays the current position of the vent
- **Calculated Position %** - Displays the target position of the vent
- **Vent direction** - Displays if the vent is on the WIND or LEE side

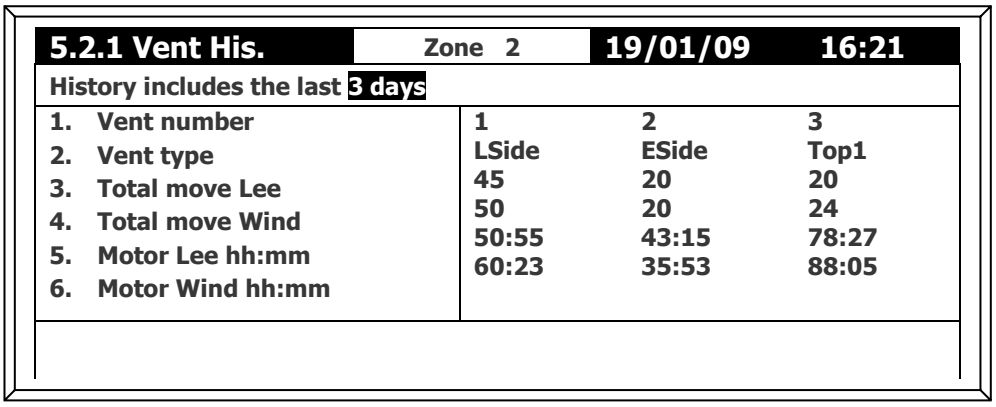
3.3 Status – Vent (Menu 4.1)



- **Top vent temp target** – Desired temperature without influences considered for top vent operation
- **Side vent temp target –** Desired temperature without influences considered for side vent operation
- **Radiation Influence** – Difference in temp caused by the radiation influence on the target temperature
- **Humidity Influence** – Difference in temp caused by the humidity influence on the target temperature
- **Wind Speed Influence** – Difference in temp caused by the wind speed influence on target temperature
- **Cooling down/ Heat up influence** – Displays the temperature change needed to reach the target temperature (during cooling a negative value will be shown and during heating a positive value so to show that the temperature will be increasing)
- **Vent control type** – Displays the vent type as defined in the **Vent Configuration** menu (8.2.1)
- **Vent current side** – Displays the direction of the window correlated to the wind direction outside
- **Calculated vent position** – Displays the target vent position with all influences considered

- **Measured vent position** – Displays the current vent position
- **Limitation** – Displays the limitation event, such as: **Storm Event** or **High Wind Speed**
- **12 – 15.** Values shown are as defined in the **Vent Setup** menu (7.1)

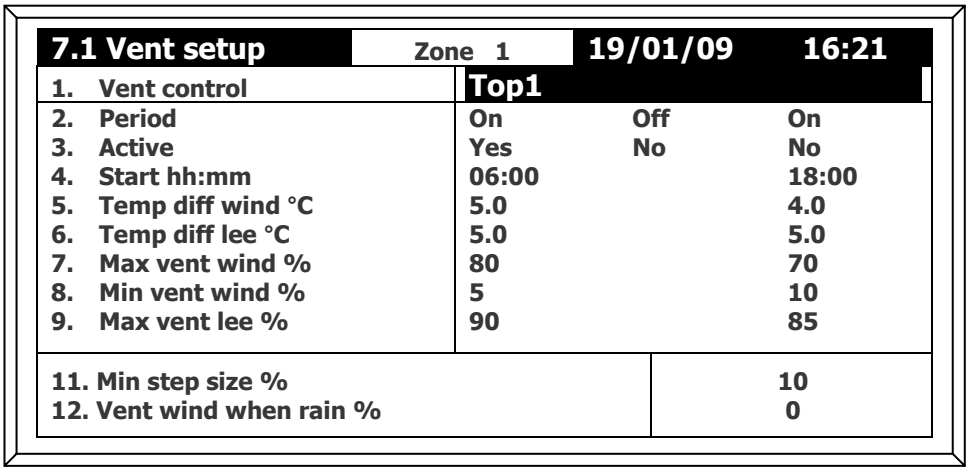
3.4 Log & History – Application History – Vent (Menu 5.2.1)



History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

- Vent # – Vent number as defined in the System Installation – Digital Inputs/Outputs menu *(8.1.1)*
- Vent Type – Vent type as defined in the Vent Program menu *(1.1)*
- Total move Lee – Total amount the vent has moved within the last X day/s
- Total move Wind – Total amount the vent has moved within the last X day/s
- Motor Lee hh:mm – Total time the vent motor operated within the last X day/s
- Motor Wind hh:mm – Total time the vent motor operated within the last X day/s

3.5 Setup – Vent (Menu 7.1)



NOTE During a storm event, there is a 30 second delay before vents change position.

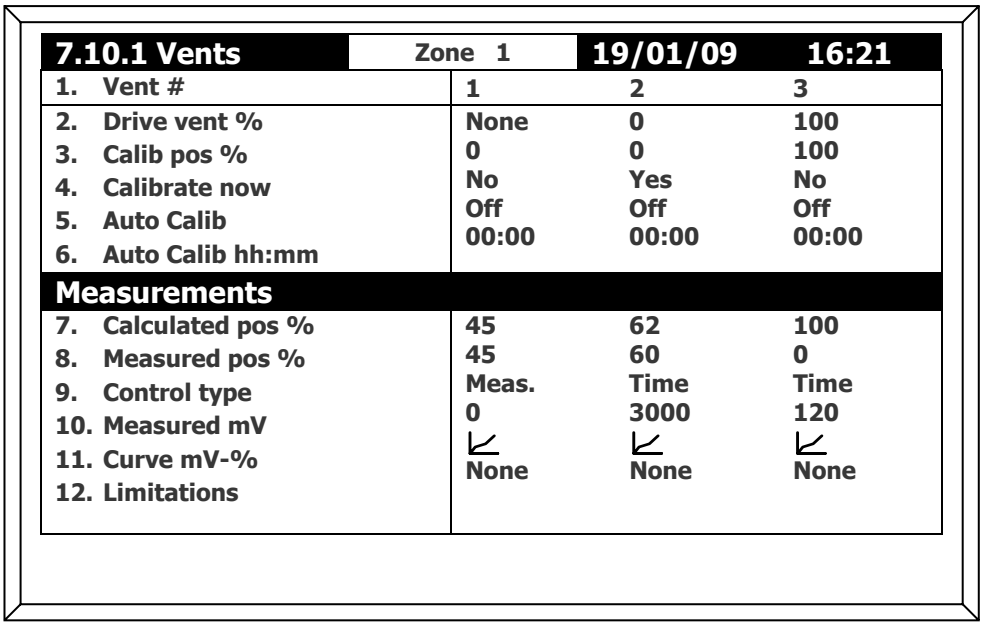
#	Parameter	Explanation	Unit/Range	Default
1.	Vent Control	Select the vent control type desired to be defined	Top 1-4 Long Side End Side	
2.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off	--	No
3.	Active	Updated by the controller (Read only)	Yes/No	
4.	Start Time	Start Time of the period. The next period START TIME overrides the previous period.	hh:mm	--:--
5.	Temp. difference Wind open	Set the temperature difference in degrees from the desired temperature to open to 100% (In Top Side Temp (Vent Program Menu 1.1), define the temperature at which vents fully close.)	Degrees	4°C
6.	Temp. difference Lee open		Degrees	3°C
7.	Max Vent Wind	Set the maximum and minimum positions of the vents allowed during the specific period	0 - 100%	100%
8.	Min Vent Wind		0 - 100%	0%
9.	Max Vent Lee		0 - 100%	100%
10.	Min Vent Lee		0 - 100%	0%
11.	Minimum Step size	Define the minimum percentage for opening/closing the vent from the current position to the calculated. If calculated position percentage is below this percentage, then the vent will not increase/decrease its position.	0 - 100%	10%
12.	Maximum wind when rain	The position of the vent during emergency event – Rain	0 - 100%	0
13.	Maximum lee during rain			
14.	Maximum wind during storm	The position of the vent during emergency event – Storm	0 - 100%	0
15.	Maximum lee when storm			
16.	Use external contact	When set to Yes, vents controlled by this controller move to the position set in Parameter 17.	Yes/No	No
17.	Vent Position During External Contact	When using an external contact: when events occur, the vent position is according to this definition	0 - 100%	0

#	Parameter	Explanation	Unit/Range	Default
18.	Min. Wind for vent influence	Above this speed, vent begins to close by the levels set in the following two parameters.	Km/hour (0 – 99)	18
19.	Maximum Vent lee (Min. Wind)	Maximum vent opening on the lee/wind side when wind speed is above the Min. Wind for Vent Influence.	% (0 – 100)	100
20.	Maximum Vent wind (Min. Wind)		% (0 – 100)	80
21.	Maximum Wind for vent influence	When the wind speed reaches this level, vents close to the levels set in the following two parameters.	Km/hour (1 – 100)	54
22.	Maximum Vent lee (Max. Wind)	Maximum vent opening on the lee/wind side when wind speed is above the Maximum Wind for Vent Influence.	% (0 – 100)	5
23.	Maximum Vent wind (Max. Wind)		% (0 – 100)	0
24.	Vent L/W delay when emrg	There is a delay time when the vent type (lee or wind) changes during emergency events (frost or storm). This parameter defines the time.	Seconds (30 - 180	30

Notes:

- The delay time for non-emergency events cannot be changed.
- To change the wind speed scale to m/sec, go to Set Up › System Calibration › Weather Station › Parameter 7 (Wind Speed Unit).
- If conditions are such that both rain and wind limit the maximum vent opening, Green Climate employs the more restrictive parameter. For example, if Maximum lee when Rain is set to 50% and Maximum Vent lee (Max. Wind) is set to 75%, the vent opens to 50%.
- Status Window (Status – Vent (Menu 4.1), page 26) displays an event If the wind speed is influencing the vent opening,

3.6 Setup – System Calibration – Vents (Menu 7.10.1)



Green Climate supports two calibration methods:

- Vents Manual Calibration
- Vents Automatic Calibration

3.6.1 VENTS MANUAL CALIBRATION

To ensure that vents perform accurately, manually calibrate the system at regular intervals. There are two calibration methods which differ in how the vent movement is measured:

- **TIME**: Calibrate the vent according to the Running Time (time that elapses from fully open to fully closed).
- **MEASURED:** Calibrate the vent according to its position. This calibration method is used when a *Vent Position sensor* is installed.

Table 1: Vents System Calibration Course of Action

TIME	MEASURED
1. Make sure all manual switches of the electrical switch board are set to the AUTO position	1. Make sure all manual switches of the electrical switch board are set to the AUTO position
2. Set the **Drive vent %** → **0%**	2. Set the **Drive vent %** → **0%**
3. Verify visually that the vent is completely closed	3. Verify visually that the vent is completely closed
4. Change **Calibrate now** → **YES**	4. Change **Calibrate now** → **YES**
5. Wait until the **Calibrate now** changes back to **NO**	5. Wait until the **Calibrate now** changes back to **NO**
6. Set the **Drive vent %** → **100%**	6. Set the **Drive vent %** → **100%**

7. Verify visually that the vent is completely opened	7. Verify visually that the vent is completely open
8. Change **Calibrate now** → **YES**	8. Change **Calibrate now** → **YES**
9. Wait until the **Calibrate now** changes back to **NO**	9. Wait until the **Calibrate now** changes back to **NO**
Calibration is complete!	**Calibration is complete!** *Go to 9. Curve mV-% to view readings*

1. **Vent #** – Vent number corresponding with the **Digital Outputs – System Installation** menu

2. **Drive vent %** (Press  to display drop-down menu)

   - None - Operates as defined in the Vent Program
   - 0% - Drives vent to be completely closed (0%)
   - 100% - Drives vent to be completely open (100%)

3. **Calibrate position % -** Define the current position of the vent once the Drive vent % is in the desired position

4. **Calibrate now** (Press  to display drop-down menu) – Select **YES** once the desired position has been achieved, the controller then will record the new measured values (time/mV)

3.6.2 VENTS AUTOMATIC CALIBRATION

Automatic calibration is done at a time specified by the user, once a day. If required, you can reconfigure the Green Climate to recalibrate the same day. Each motor can have a different calibration time.

NOTE Calibration is performed according to a system of priorities. If the motor is engaged in a higher priority action (for example manual operations), calibration does not take place.

To enable calibration:

1. In Auto Calib select:

- **Off**: Disables automatic calibration.
- **Auto:** Enable automatic calibration.
  - If the current position is less than 50%, the vents calibrate to 0%.
  - If the current position is greater than 50%, the vents calibrate to 100%.
- **0%**: The screens calibrate to 0%.
- **100%:** The screens calibrate to100%.

2. In Auto Calib hh:mm, set the time.

Repeat the above procedure for each motor.

NOTE While the unit is calibrating, in Status > Limitations, *calibrate appears. After calibration is completed, the measured vent position returns to its previous position.*

Measurements

- **Calculated position –** Targeted position of the vent
- **Measured position –** Current position of the vent
- **Control type –** Method of which the vent movement is measured (time/measured)
- **Measured mV –** mV read by the potentiometer corresponding with the vent position
- **Curve mV –** Defined position of the vent according to the mV read by potentiometer during calibration
- **Limitations –** Restrictions on calibration process due to higher priority processes

4 Screen

- Program – Screen (Menu 1.2)
- Manual – Screen (Menu 2.2)
- Status – Screen (Menu 4.2)
- Log & History – Application History – Screen (Menu 5.2.2)
- Setup – Screen (Menu 7.2)
- Setup – System Calibration – Screen (Menu 7.10.2)

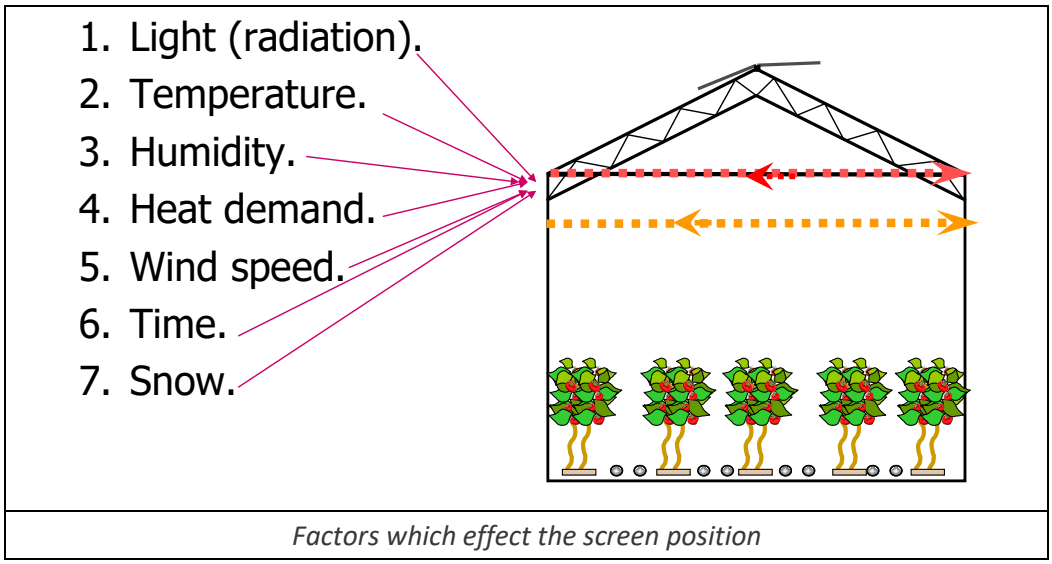
4.1 Program – Screen (Menu 1.2)

The goal of the Screens process is to maintain certain energy in the green house. The Screen control manages the screens operation according to the conditions of the greenhouse. The monitoring and operation is done per zone; the system operates each screen individually, and each day is divided into several periods.

There are different types of screens, such as: energy, shading or black out, each screen type effects the environment of greenhouse differently.

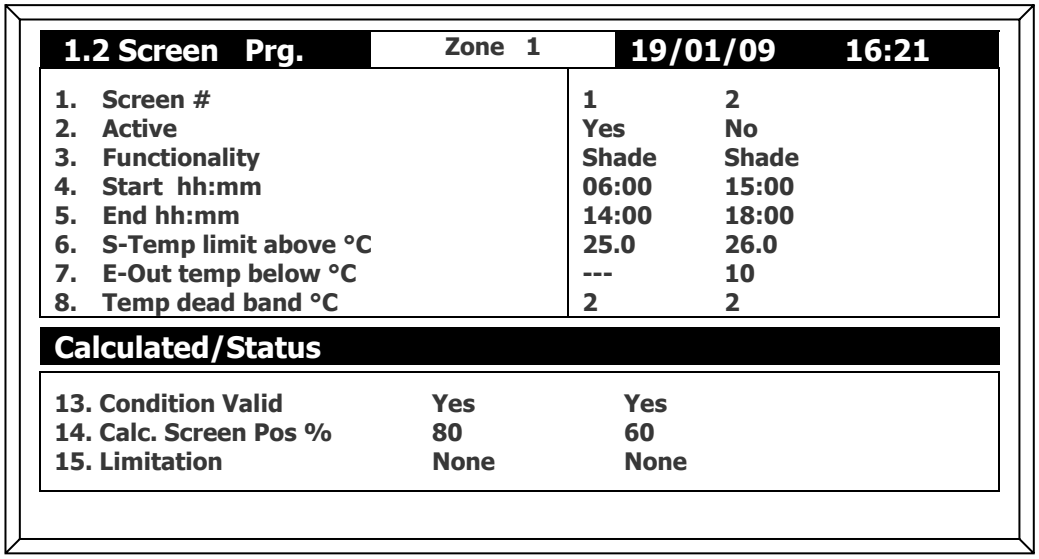
Emergency cases like rain, storm or frost are monitored continuously. In such events, the controller reacts according to the configuration. The screen control should operate in cooperation with other controls like fan & pad, vent, etc.

There may be up to two screens per zone defined in the system.



Factors which effect the screen position

CAUTION *IMPORTANT: Verify that the **SETUP** parameters have been defined and the screens **Calibrated**!*



#	Parameter	Explanation	Unit/Range	Default
1.	Screen #	There are 2 available screens	1-2	
2.	Active	Updated by the controller (Read only)	Yes/No	
3.	Screen Functionality	The screen may be used for shading, energy, or both together	Shading And/or Energy	None
4.	Start Time	Starting time of the period, in case of overlapping periods, the next period overrides the previous period	hh:mm	--:--
5.	End Time	The screens program is active only within the set period	hh:mm	--:--
6.	S- Shading: Inside Temp Set Point above	For Shading screen: Above this set temperature, the screen is spread Cannot set this parameter if Screen Functionality is set to Energy	0° to +50° C	26
7.	E-Energy: Out Temperature set point below	For Energy screen: Below this set temperature and together with other conditions, the screen is spread *If the screen functionality is defined as Energy+Shading and the conditions for both Energy and Shading are true, then the controller will operate according to the settings defined for the higher priority, which is Energy.	0° to +50° C	26

#	Parameter	Explanation	Unit/Range	Default
		Cannot set this parameter if the Screen Functionality is set to Shading		
8.	Temperature dead band	The dead band of the temperature set points	0° to +50° C	1
9.	Radiation limit above	For Shading screen: above this set radiation, the screen is spread	0 - 2500 W/m^2	1000
10.	Radiation limit below	For energy screen: below this set radiation and together with other conditions, the screen is spread	0 - 2500 W/m^2	5
11.	Radiation dead band	The dead band of the radiation set points	0 - 2500 W/m^2	50
12.	Spread when heating is on	Define if the screen will be spread when the *Heating* system is active Relevant ONLY with the Energy Screen	Yes/No	No
Calculated / Status				
13.	Condition Valid	Informs if all defined triggers are met for activation of screen spreading Shading = only 1 trigger needs to be met to activate spread Energy = ALL triggers must be met for activation of spread	Yes/No	
14.	Calculated Screen Pos. %	Displays the screens target position	0 - 100 %	
15.	Screen Limitation	Screen function may be limited due to a higher priority event Ex: If it is snowing, then the screens will proceed to the "SNOW" position, and the Screen Limitation will display Snow	• Storm • Snow • Manual • External Input • Crop Protection • Fan&Pad • Light • NONE	

4.2 Manual – Screen (Menu 2.2)

2.2 Screen manual	Zone 2	19/01/09	16:21
1. Screen #		1	2
2. Screen Type		Shade	Energy
3. Drive Screen		Auto	Spread
4. Fixed Position %		---	---
5. Measured Position %		65	100
6. Calculated Position %		65	45

- **Screen #** - The corresponding screen number as defined in the **System Installation**
- **Screen type** - The corresponding screen control type as defined in the **Screen Setup**
- **Drive screen** (Press  to display drop-down menu)
  - **Auto** - operates as defined by the screen program
  - **Spread** - Drives screen to completely spread (100%)
  - **Collect** - Drives screen to completely collected (0%)
  - **Fixed** - Allows for manually defining the desired position of the screen
- **Fixed Position %** - Define the screen position when the Drive screen option selected is: **FIXED** (0-100%)
- **Measured Position %** - Displays the current position of the screen
- **Calculated Position %** - Displays what is the target position of the screen

4.3 Status – Screen (Menu 4.2)

4.2 Screen Status	Zone 1	19/01/09	16:21
1. Screen #		1	2
2. Active as		Shade	Shade
3. Max Position %		100	90
4. Min Position %		0	0
5. Calc. temp gap %		20	0
6. Calc. humidity gap %		0	30
7. Calc. energy saving %		20	0
8. Calc. rad limit w/m2		0	0
9. Limitation		None	Light
10. Condition valid		No	Yes
11. Calc. screen position		0	30
12. Meas. screen position		0	30

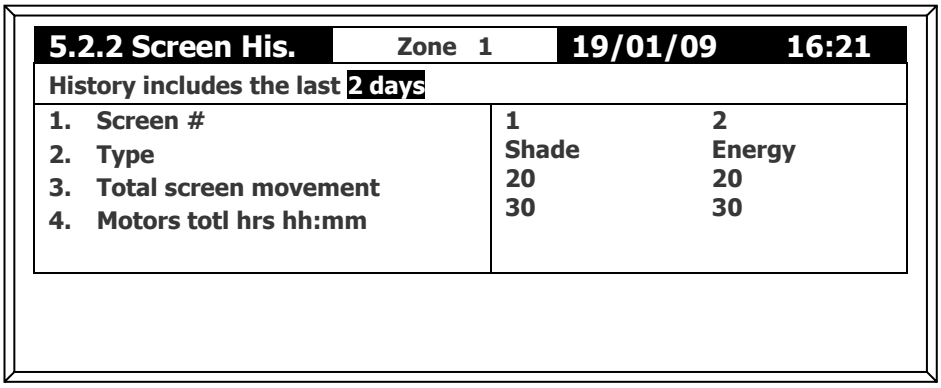
- **Screen #** - Screen number corresponding with the Digital Outputs – System Installation menu
- **Active as** – Represents what is the current screen's function (energy/shading)
- **Max Position %** - Displays the maximum position percent as defined in the Screen Setup menu

- Min Position % - Displays the minimum position percent as defined in the Screen Setup menu
- Calculated temp gap – Displays the percentage of how much the screen should be collected/spread due to the temperature gap
- Calculated humidity gap – Displays the percentage of how much the screen should be collected/spread due to the humidity gap
- Calculated energy saving – Displays the quantity of energy conserved within the green house (in percent)
- Radiation limit – Displays the limit above/below which the screen will spread/collect
- Limitation – Restrictions on calibration due to higher priority processes
- **Condition valid** – Displays if all defined triggers are met for activation of screen spread

*NOTE : **Shading**: Only one trigger needs to be met to activate screen spread*
__Energy__: ALL triggers must be met for activation of screen spread

- **Calculated screen position** – Calculated screen position
- **Measured screen position** – Displays the current screen position

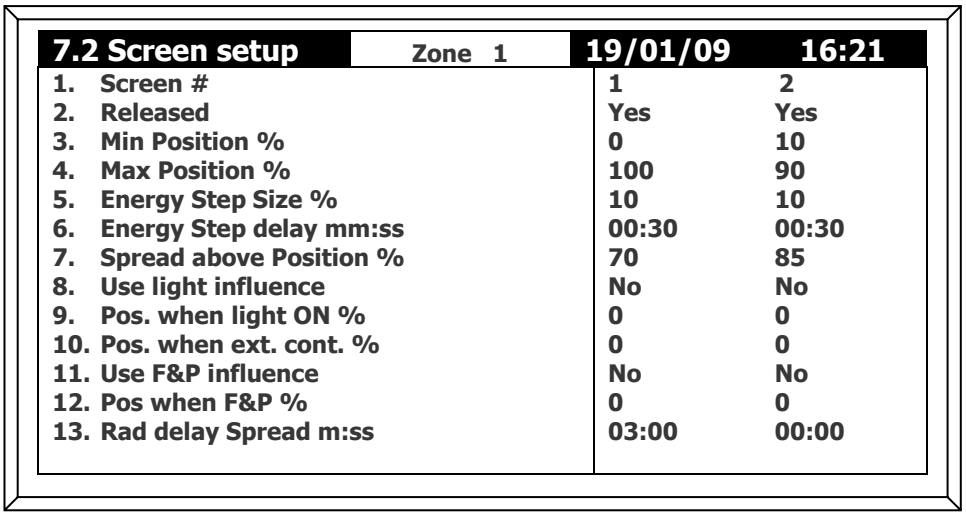
4.4 Log & History – Application History – Screen (Menu 5.2.2)



History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

- **Screen #** – Corresponding screen number with data being displayed below
- **Type** – Screen type as defined in the **Screen Program** menu (**1.2**) *Functionality*
- **Total screen movement** – Total amount the screen has moved within the last **X day/s**
- **Motors total hours** – Total time the motors have operated within the last **X day/s**

4.5 Setup – Screen (Menu 7.2)



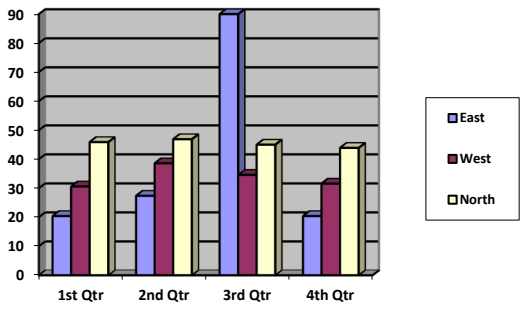
#	Parameter	Explanation	Unit/Range	Default
1.	Screen #	There are two screens available per zone.	--	No
2.	Released	Define YES to allow the screen to be released.	Yes/No	
3.	Screen Minimum Position	The minimum allowed position of the screen	0 - 100%	0
4.	Screen Maximum Position	The maximum allowed position of the screen	0 - 100%	100%
5.	Energy Step Size	The size of the energy screen's step	0 - 100%	100%
6.	Energy Step delay	Delay between screen steps during spreading of the screen	mm:ss	00:00
7.	Spread Above Position	The energy screen will spread to 100% (in one step) once above the value defined in this parameter	0 - 100%	70%
8.	Use Light Influence	The screen spreading can be influenced by existence of light	Yes/No	No
9.	Screen Position when light is ON	Set the screen position percentage when a light event occurs	0 - 100%	0
10.	Screen Position when external contact occurs	If working with an external contact, define the screen position percentage when an event occurs	0 - 100%	0
11.	Use Fan & Pad influence	Select whether the screen spreading will be influenced by a Fan & Pad event	Yes/No	No

#	Parameter	Explanation	Unit/Range	Default
12.	Screen Position during Fan & Pad	Set the screen position percentage when a Fan & Pad event occurs	0 - 100%	0
13.	Radiation delay for spreading	FOR SHADING SCREEN ONLY! Define the time to wait before spreading the screen once a radiation condition is detected. The system will check to see that the condition is still true after the delay, before it begins to spread the screen	mm:ss	00:00
14.	Radiation delay for collecting	FOR SHADING SCREEN ONLY! Define the time to wait before collecting the screen once a radiation condition is detected. The system will check to see that the condition is still true after the delay, before it begins to collect the screen	mm:ss	00:00
15.	Temp gap curve	In cases where the screen is spread to 100%, and the measured temperature/humidity is high, the screen should be opened a little to allow heat to escape from the greenhouse. Define the four-point conversion table that indicates the influence of the temperature/humidity level on the screen position.	0° to +50° C 0 - 100%	0
16.	Humidity gap curve		0° to +50° C 0 - 100%	0

Temp Example:

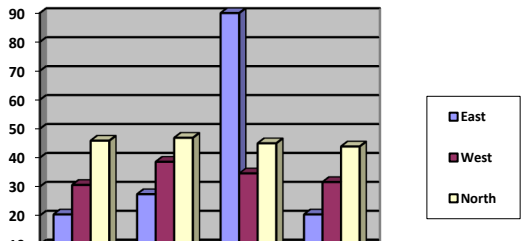
Temp Gap Curve

Temperature	Screen Pos (%)
30	60
27	75
25	95
22	100



Humidity Example:

Humidity Gap Curve	
Humidity (RH)	Screen Pos (%)
92	60
88	75
70	95
65	100



4.6 Setup – System Calibration – Screen (Menu 7.10.2)

7.10.2 Screens	Zone 1	19/01/09 16:21
1. Screen #	1	2
2. Drive screen %	None	0
3. Calib pos %	0	0
4. Calibrate now	No	Yes
5. Auto Calib	Off	Off
6. Auto Calib hh:mm	00:00	00:00
Measurements		
7. Calculated pos %	40	70
8. Measured pos %	40	67
9. Control type	Meas.	Time
10. Measured mV	0	3000
11. Curve mV-%		
12. Limitations	None	None

Green Climate supports two calibration methods:

- System Manual Calibration
- System Automatic Calibration

4.6.1 System Manual Calibration

To maintain accurate screen performance, calibrate the system at regular intervals. There are two different calibration methods, depending on the way the screen movement is measured:

- Time (default screen control)
- Measured (used when a *Screen Position* sensor is installed)

Table 2: Screen System Calibration Course of Action

TIME	MEASURED
1. Make sure all manual switches of the electrical switch board are set to the AUTO position	1. Make sure all manual switches of the electrical switch board are set to the AUTO position
2. Set the **Drive screen %** → **0%**	2. Set the **Drive screen %** → **0%**
3. Verify visually that the screen is completely closed	3. Verify visually that the screen is completely closed
4. Change **Calibrate now** → **YES**	4. Change **Calibrate now** → **YES**
5. Wait until the **Calibrate now** changes back to **NO**	5. Wait until the **Calibrate now** changes back to **NO**
6. Set the **Drive screen %** → **100%**	6. Set the **Drive screen %** → **100%**
7. Verify visually that the screen is completely opened	7. Verify visually that the screen is completely open
8. Change **Calibrate now** → **YES**	8. Change **Calibrate now** → **YES**
9. Wait until the **Calibrate now** changes back to **NO**	9. Wait until the **Calibrate now** changes back to **NO**
Calibration is complete!	**Calibration is complete!** *Go to 9. Curve mV-% to view readings*

4.6.2 SYSTEM AUTOMATIC CALIBRATION

Automatic calibration is done at a time specified by the user, once a day. If required, you can reconfigure the Green Climate to recalibrate the same day. Each motor can have a different calibration time.

NOTE : Calibration is performed according to a system of priorities. If the motor is engaged in a higher priority action (for example manual operations), calibration does not take place.

To enable calibration:

1. In Auto Calib select:
   - **Off**: Disables automatic calibration.
   - Auto: Enable automatic calibration.
     - If the current position is less than 50%, the screen calibrates to 0%.
     - If the current position is greater than 50%, the screen calibrates to 100%.
   - **0%**: The screens calibrate to 0%.
   - **100%:** The screens calibrate to100%.
2. In Auto Calib hh:mm, set the time.

Repeat the above procedure for each motor.

NOTE While the unit is calibrating, in Status › Limitations, calibrate appears. After calibration is completed, the measured vent position returns to its previous position.

- Screen # – Screen number corresponding with the Digital Outputs – System Installation menu

- **Drive Screen %** (Press  to display drop-down menu)
    - **None** - Operates as defined in the **Screens Program**
    - **0%** - Drives screen to be completely collected (0%)
    - **100%** - Drives screen to be completely spread (100%)
- **Calibrate position %** - Define the current position of the screen once the Drive screen % is in the desired position
- **Calibrate now** (Press  to display drop-down menu) – Select **YES** once the desired position has been achieved, the controller then will record the new measured values (time/mV)

Measurements

- **Calculated position** – Targeted position of the screen
- **Measured position** – Current position of the screen
- **Control type** – Method of which the screen movement is measured (time/measured)
- **Measured mV** – Current mV read by the potentiometer corresponding with the screen position
- **Curve mV** – Defined position of the screen according to the mV read by potentiometer during calibration
- **Limitations** – Restrictions on calibration process due to higher priority processes

5 Heating

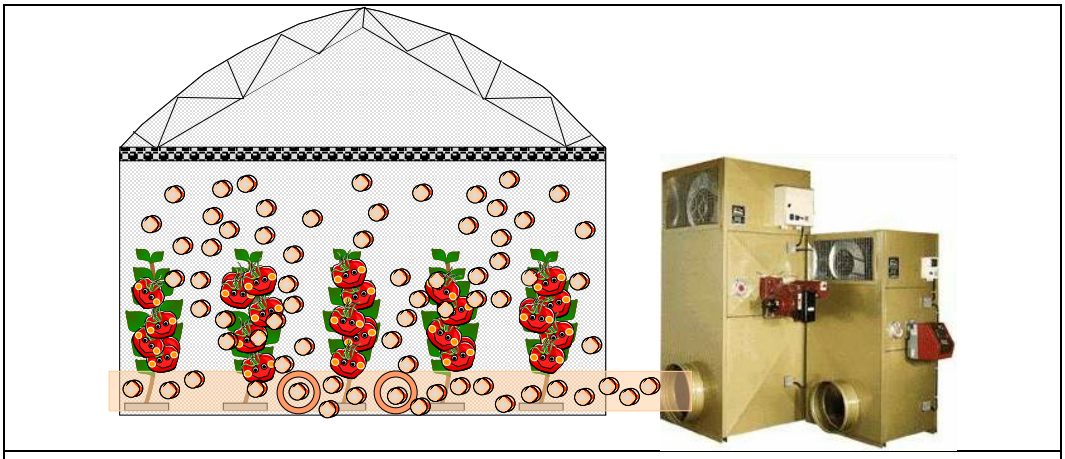
- Program – Heating (Menu 1.3)
- Manual – Heating (Menu 2.3)
- Status – Heating (Menu 4.3)
- Log & History – Application History - Heating (*Menu 5.2.3)*
- Setup – Heating (Menu 7.3)

5.1 Program – Heating (Menu 1.3)

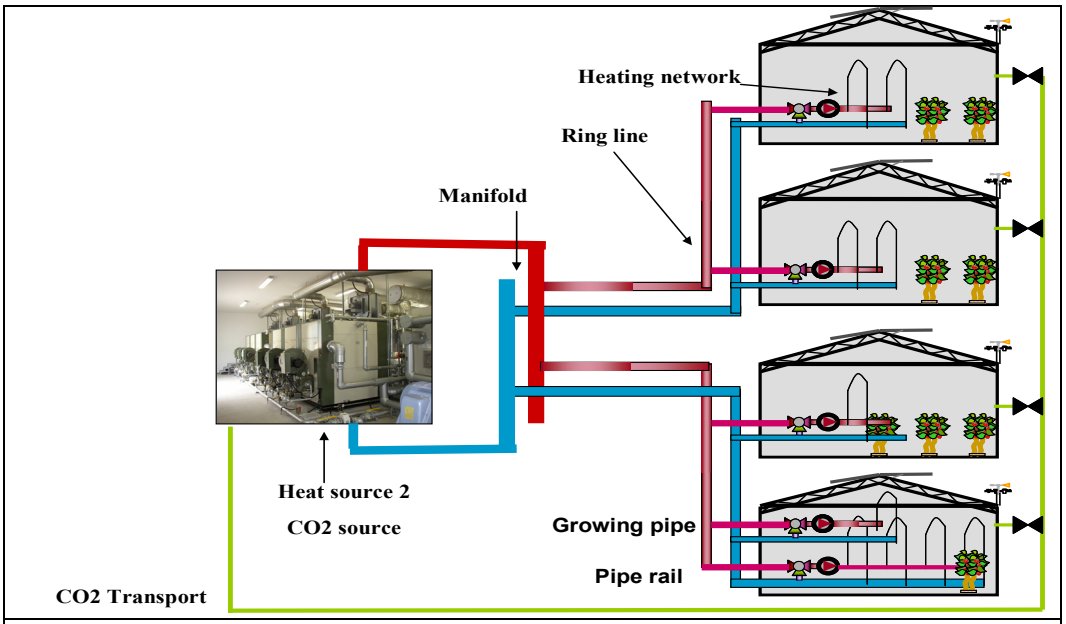
The Heating system controls the desired temperature inside the greenhouse. The desired temperature is achieved by operating two different heating systems:

- ON/OFF Heating
- Water Heating Networks

Defining one boiling system per controller will provide hot water for all the 4 zones.



ON/OFF Heating in Greenhouse



Water Heating in Greenhouse

CAUTION *IMPORTANT: Verify that the SETUP parameters have been defined for heating!*

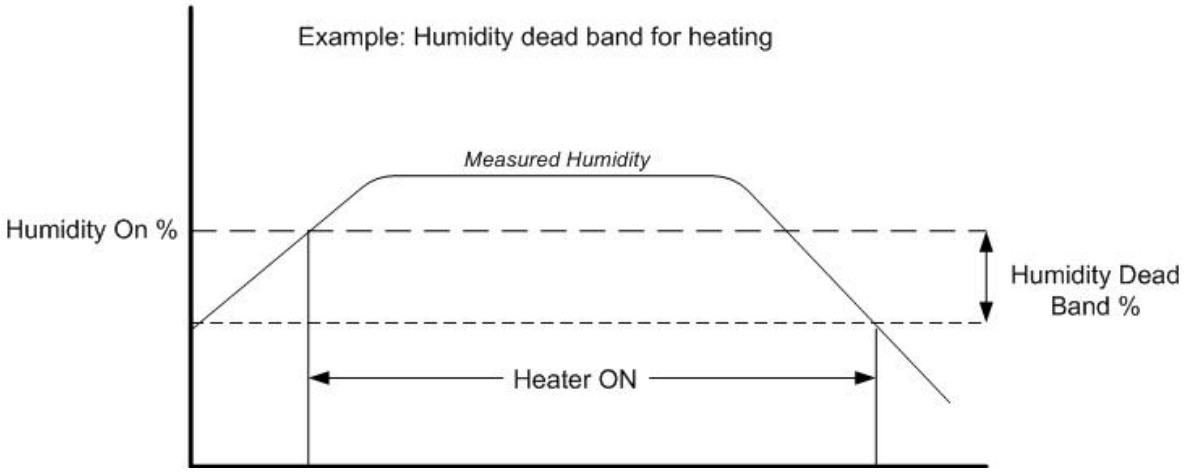
1.3 Heating Prg.	Zone 1	19/01/09	10:21
	1	2	3
1. Period	On	On	Off
2. Active	Yes	No	
3. Start hh:mm	06:00	15:00	
4. Heating temp °C	17.0	22	
5. Rad influence	☑	☑	
6. Out Temp Inf.	☑	☑	
7. Cool time hh:mm	00:15	00:15	
8. Heat time hh:mm	00:15	00:15	

Calculated/Status	
15. GH calculated temp °C	19.0
16. Calc. ON/OFF heat. temp °C	23.5
17. Limitation	None

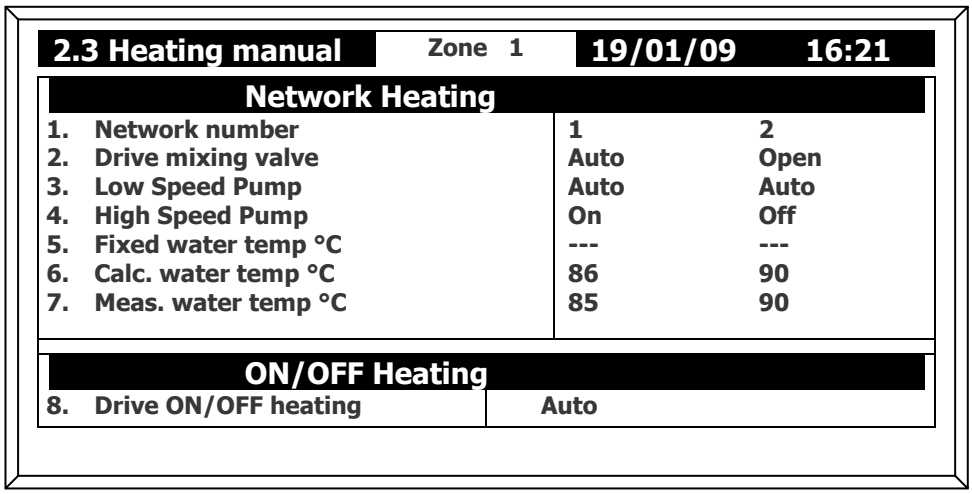
#	Parameter	Explanation	Unit/Range	Default
1.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off.	On/Off	On
2.	Active	Updated by the controller (For indication only)	Yes/No	
3.	Start Time	Start Time of the period. In case of overlapping periods, the next period overrides the previous period.	hh:mm	--:--
4.	Heating Temperature	The desired heating temperature in the specific climate zone.	0° to +50°C	20

#	Parameter	Explanation	Unit/Range	Default
5.	Radiation Influence	A four-point table that defines the conversion of the influence of the outside radiation on the set heating temperature within that zone.	0 - 2500 W/m2 0° to +100° C	--:--
6.	Outside Temperature Influence	A four-point table that defines the conversion of the influence of the outside temperature on the set heating temperature within that zone.	-50° to +50° C	--:--
7.	Cool Down Time	Define the gradual cooling down time per 1°C (approximately 2F). This is used to avoid fast changes between periods.	hh:mm	00:00
8.	Heat Up Time	Define the gradual heating time per 1°C (approximately 2F). This is used to avoid fast changes between periods.	hh:mm	00:00
9.	Use ON/OFF Heating	Option to enable or disable the ON/OFF heater.	Yes/No	Yes
10.	Release for Temperature	NO: The use of the heater is only for CO2 YES: The use of the heater is for both Heating and CO2	Yes/No	Yes
11.	Dead band ON	Dead band in reference to the heating temp (below). When the measured temp in the zone is less than the 'heating temp'-'dead band ON' value, the heater is ON	-50° to +50° C	0.5
12.	Dead band OFF	Dead band in reference to the heating temp (above). When the measured temp in the zone is higher than the 'heating temp'+'dead band OFF' the heater is OFF	-50° to +50° C	0.5
13.	Release for Humidity	Option to use the heater to release the humidity in the zone	Yes/No	Yes
14.	Humidity On %	If the measured humidity is above this set point, the heater will be turned ON *(can be edited only when Release for Humidity is set to "Yes")*	0 - 100%	0
15.	Humidity dead band %	If the measured humidity is below the "'Humidity On %' minus 'Humidity Dead Band %'", the heater turns OFF *(enabled only when Release for Humidity is set to "Yes")* **See graph below* "Example: Humidity dead band for Heating"	0 - 100%	0

#	Parameter	Explanation	Unit/Range	Default
Calculated / Status				
16.	Green House Calculated temperature	Displays the target temperature for the green house with the settings and influences taking into consideration	0° to +100° C	
17.	Calculated ON/OFF Heating temperature	Displays the target temperature for the ON/OFF heating system	0° to +100° C	
18.	Limitation	Heating system may be limited due to a higher priority event. *Ex: If Air Circulation is operating, then the heating system will proceed to the "Air Circulation" position, and the Heating Limitation will display Air Circ.*	1. Manual 2. External input 3. Air Circulation 4. None	



5.2 Manual – Heating (Menu 2.3)



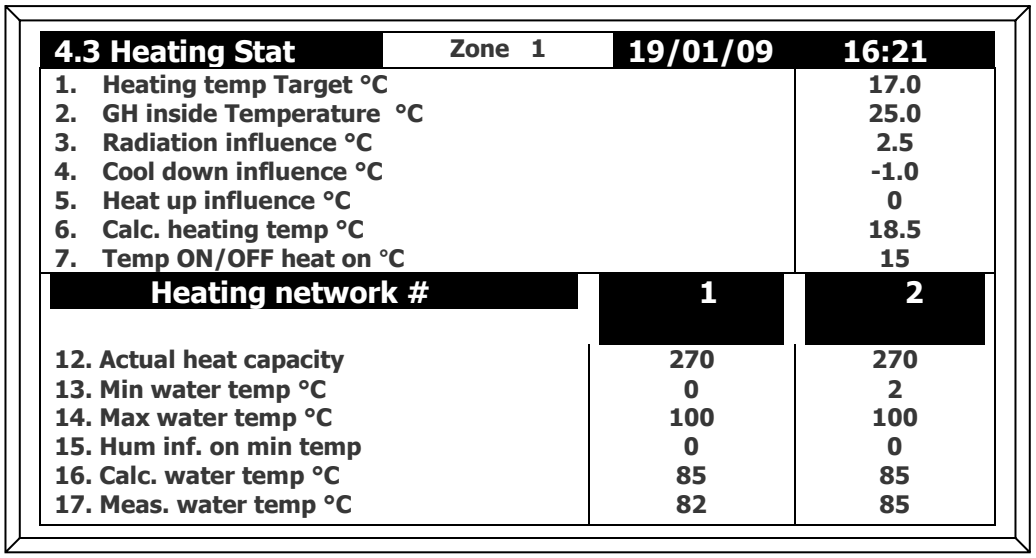
NETWORK HEATING

- **Network number** - The heating network number as defined in **System Installation**
- **Drive mixing valve** (Press  to display drop-down menu)
    - **Auto -** Operates as defined by the heating program
    - **Open** - Drives the mixing valve to completely open (100%)
    - **Closed** - Drives the mixing valve to completely closed (0%)
    - **Fixed** - Allows for manually defining the desired water temperature
- **Low Speed Pump** (Press  to display drop-down menu)
    - **Auto -** Operates as defined by the heating program
    - **On -** Turns low speed pump on (overrides heating program)
    - **Off** - Turns low speed pump off (overrides heating program)
- **High Speed Pump** (Press  to display drop-down menu)
    - **Auto** - operates as defined by the heating program
    - **On -** turns high speed pump on (overrides heating program)
    - **Off -** turns high speed pump off (overrides heating program)
- **Water fixed temp °C** - Define the desired water temperature when the Drive mixing valve option: FIXED is selected (0.0 - 40.0)
- **Water calc temp °C** - Displays the target water temperature
- **Water Meas temp °C** - Displays the current water temperature

ON/OFF HEATING

- **Drive ON/OFF heating** (Press  to display drop-down menu)
    - **Auto -** operates as defined by the heating program
    - **On -** turns on the heating system (**Warning**! Heater remains on until you turn it off!)
    - **Off -** turns off the heating system

5.3 Status – Heating (Menu 4.3)



4.3 Heating Stat	Zone 1	19/01/09	16:21
1. Heating temp Target °C			17.0
2. GH inside Temperature °C			25.0
3. Radiation influence °C			2.5
4. Cool down influence °C			-1.0
5. Heat up influence °C			0
6. Calc. heating temp °C			18.5
7. Temp ON/OFF heat on °C			15
Heating network #		**1**	**2**
12. Actual heat capacity		270	270
13. Min water temp °C		0	2
14. Max water temp °C		100	100
15. Hum inf. on min temp		0	0
16. Calc. water temp °C		85	85
17. Meas. water temp °C		82	85

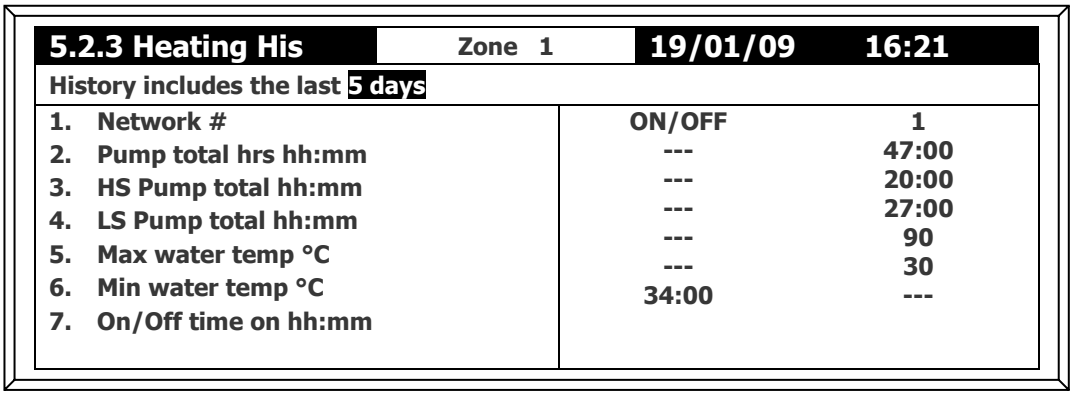
- **Heating temp target** – Desired zone temperature
- **GH inside temperature** – Current greenhouse inside temperature
- **Radiation influence** – Difference in temp caused by the radiation influence on the target temperature
- **Cool down influence** – Displays the temperature change needed to reach the target temperature (will always show a negative value)
- **Heat up influence** – Displays the temperature change needed to reach the target temperature (will always show a positive value)

NOTE The gradual increase/decrease change in temperature for the Cooling and Heating influences are defined by the time required between periods [defined in the ***Heating Program*** *menu (1.3)]*

- **Calculated heating temp** – Target temperature with all influences considered
- **Temp ON/OFF heat on** – Temp at which **ON/OFF Heating** will turn on
- **Temp ON/OFF heat off** – Temp at which **ON/OFF Heating** will turn off
- **Active for temp** – Displays **YES** if the **ON/OFF Heating** is in use for increasing the temperature of the zone
  *ONLY when in menu *1.3* **Heating Program**, parameter *Release for temp* is set to **YES**
- **Active for humidity** – Displays **YES** if the **ON/OFF Heating** is in use for decreasing the humidity of the zone
  *ONLY when in menu *1.3* **Heating Program**, parameter *Release for hum.* is set to **YES**
- **Active for CO2** – Displays **YES** if CO_2 is active
  *ONLY when in menu *7.3.1* **Heating ON/OFF Setup,** parameter *Release for CO2* is set to **YES**
- **ON/OFF Heating limitation** – Shows if there is a higher priority event restricting the **ON/OFF Heating** from operating

- **Actual heat capacity –** Displays the heat kW transferred to the zone from each network
- **Calculated Min water temp –** Displays the minimum temperature for the water with the humidity influence considered
- **Max water temp –** Displays the maximum temperature for the water as defined in *7.3.1* **Heating ON/OFF Setup**
- **Humidity influence on min temp –** Displays the maximum heating network temperature difference from the set minimum water temperature to the calculated (calculated – taken from the *Humidity influence* parameter **SETUP – Heating Network** *menu 7.3.2*)
- **Calculated water temp –** Displays the target water temperature with all influences considered
- **Measured water temp –** Displays the current water temperature

5.4 Log & History – Application History - Heating (*Menu 5.2.3)*



History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

- **Network # -** Heating network or number corresponding with data displayed below

NOTE Data displayed from 2-6 is relevant for Water Heating Network only

- **Pump total hrs hh:mm –** Accumulated pumps operation time over the last X day/s
- **HS Pump total hh:mm -** Accumulated high speed pump operation time over the last X day/s
- **LS Pump total hh:mm -** Accumulated low speed pump operation time over the last X day/s
- **Max water temp °C –** The highest temperature that was measured within the last X day/s
- **Min water temp °C -** The lowest temperature that was measured within the last X day/s

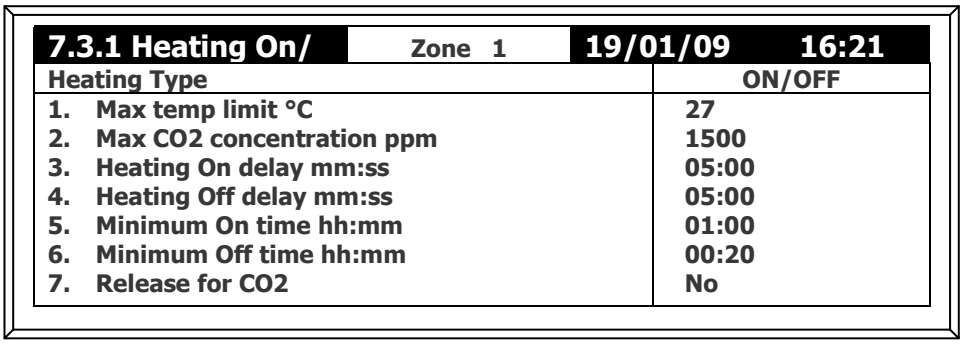
NOTE Data displayed for 7 is relevant for ON/OFF Heating only

- **On/Off time on hh:mm** – Accumulated ON/OFF heating time over the last X day/s

5.5 Setup – Heating (Menu 7.3)

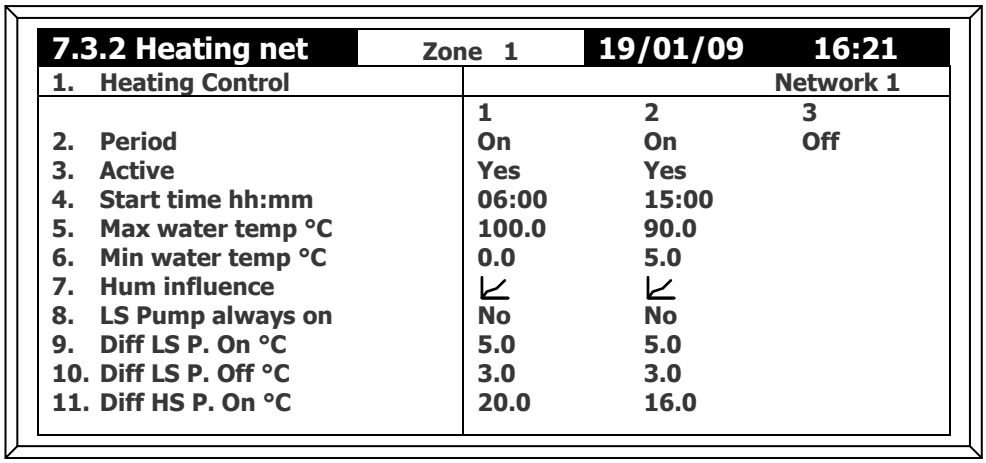
- Heating ON/OFF (Menu 7.3.1)
- Heating Network (Menu 7.3.2)

5.5.1 HEATING ON/OFF (MENU 7.3.1)



#	Parameter	Explanation	Unit/Range	Default
1.	Maximum temp limit	Define the greenhouse temperature at which the On/Off heating does not operate	0 - 40° C	25
2.	Maximum CO2 concentration	Define the CO2 concentration at which the On/Off heating does not operate. This parameter is enabled only if it the On/Off heating system is the CO2 supplier which enriches the greenhouse with heating and CO2 (same value as in the CO2 application setup).	0 - 5000 ppm	1500
3.	Heating On delay	Define the time delay for the system to verify that the heater ON trigger is true before turning the heater ON	mm:ss	00:00
4.	Heating Off delay	Define the time for the system to verify that the heater OFF trigger is true before turning the heater OFF	mm:ss	00:00
5.	Minimum On time	Define the minimum time duration for the heater to be ON	hh:mm	00:00
6.	Minimum Off time	Define the minimum time duration for the heater to be OFF	hh:mm	00:00
7.	Release for CO_2	Select YES to permit CO_2 to control the ON/OFF Heating when the CO_2 is set to Passive mode	Yes/No	No

5.5.2 HEATING NETWORK (MENU 7.3.2)



NOTE To view this screen, go to Installation › System Installation › Digital Outputs *and define one relay as Mix V. Open and one relay as Mix V. Close.*

#	Parameter	Explanation	Unit/Range	Default
1.	Heating Control	Select the network from the drop-down list to define its setup within the zone.	Network 1-4 Floating Network	
2.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off.	ON/OFF	
3.	Active	Updated by the controller (Read only)	Yes/No	
4.	Start time	Start Time of the period. In case of overlapping periods, the next period overrides the previous period.	hh:mm	--:--
5.	Maximum Water Temperature	The maximum allowed water temperature in the specified heating network. Even if the calculated temperature is higher than the set maximum water temperature, it will be restricted by this parameter.	0° to +150° C	50
6.	Minimum Water Temperature	The minimum allowed water temperature in the specified heating network. Even if the calculated temperature is lower than the set minimum water temperature, it will be restricted by this parameter.	0° to +150° C	0

#	Parameter	Explanation	Unit/Range	Default
7.	Influence of Relative Humidity on the Minimum Water Temperature	A four-point table which defines the influence of the measured humidity in the greenhouse on the minimum pipe temperature. For example: If the humidity is high, then increase the minimum temperature of the water to decrease the humidity in the greenhouse.	0-100% Vs. -100° to +100° C	0-0
8.	Low Speed Pump Always On	Option to force the circulation pump to operate throughout the entire period.	Yes/No	No
9.	Temp Difference for Low Speed Pump On	Low Speed Pump is turned ON if the difference between the calculated water heating network temperature and the greenhouse temperature is higher than this set point.	0° to +150° C	5
10.	Temp Difference for Low Speed Pump Off	Low Speed Pump is turned OFF if the difference between the calculated water heating network temperature and the greenhouse temperature is lower than this set point.	0° to +150° C	3
11.	Temp Difference High Speed Pump On	High Speed Pump is turned ON if the difference between the calculated water heating network temperature and the greenhouse temperature is higher than this set point.	0° to +150° C	20
12.	Temp Difference High Speed Pump Off	High Speed Pump is turned OFF if the difference between the calculated water heating network temperature and the greenhouse temperature is lower than this set point.	0° to +150° C	1
13.	Off Delay	Delay before switching off the heat circulation pump.	mm:ss	05:00
14.	Use External Contact	Option to use external contact	Yes/No	
15.	Water Temp with External Contact	If Yes is selected in parameter 14, then the system ignores the calculated water temperature and regards to this value as the target water temperature.	0° to +120° C	0

#	Parameter	Explanation	Unit/Range	Default
16.	Boiler: Humidity Release	This parameter enables activating the boiler when a humidity release takes place. Boiler activation takes place if 1) this parameter is enabled 2) according to the zone and the network 3) if the Influence of Relative Humidity on the Minimum Water Temperature (item 7 in this menu) is defined.	No/Yes	No
17.	Lagging °C	Define the offset per network for the calculated water temperature. For example, if *Network 1* is defined as Lagging = 0 and *Network 2* is defined as Lagging = -15° C when the calculated water temperature is 70° C, then *Network 1* will operate until 70° C while *Network 2* will operate until 55° C.		

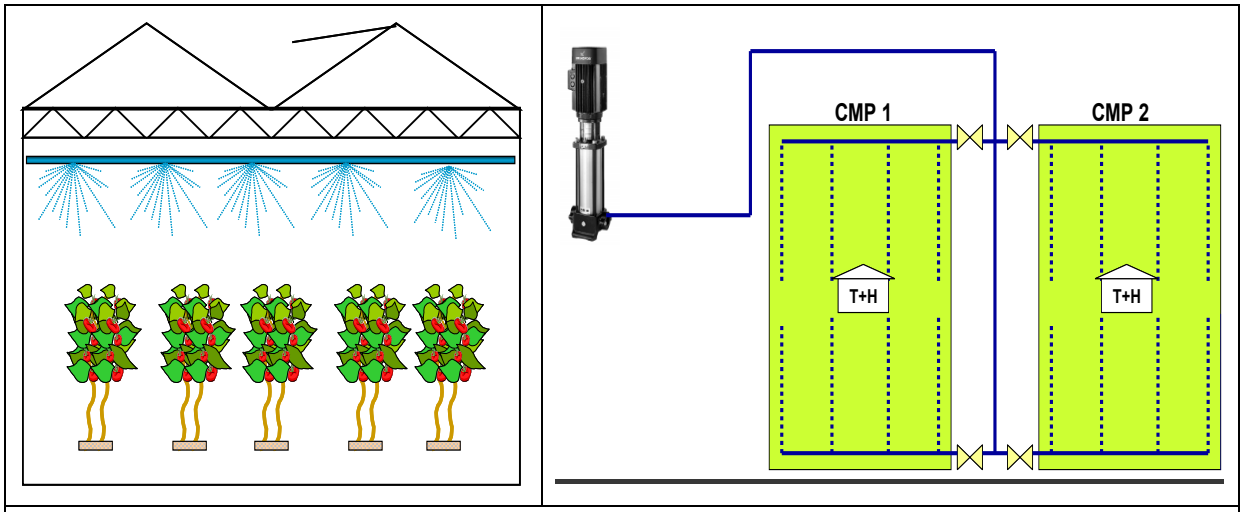
6 Misting

- Program – Misting (Menu 7.4)
- Manual – Misting (Menu 2.4)
- Status – Misting (Menu 4.4)
- Log & History – Application History – Misting (Menu 5.2.4)
- Setup – Misting (Menu 7.4)

6.1 Program – Misting (Menu 7.4)

The Misting process in the Greenhouse should provide the ability to increase the Humidity or VPD* (vapor pressure deficit) and cool down the greenhouse zone temperature. The Misting program controls the misting valves by pulse base and pause time, with automatic adjustment according to desired value.

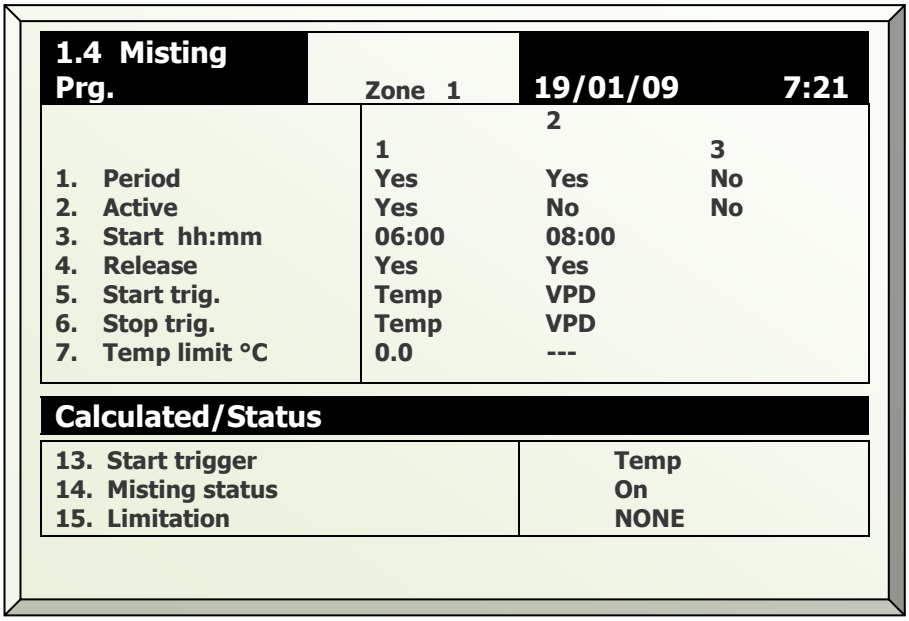
Define one misting pump per zone, or one misting pump for all the four zones, and it is possible to divide up to 6 periods.



Misting in Greenhouse

*NOTE *VPD is the difference (deficit) between the amount of moisture in the air and how much moisture the air can hold when it is saturated. Once air becomes saturated water will condense out to form clouds, dew, or films of water over leaves.*

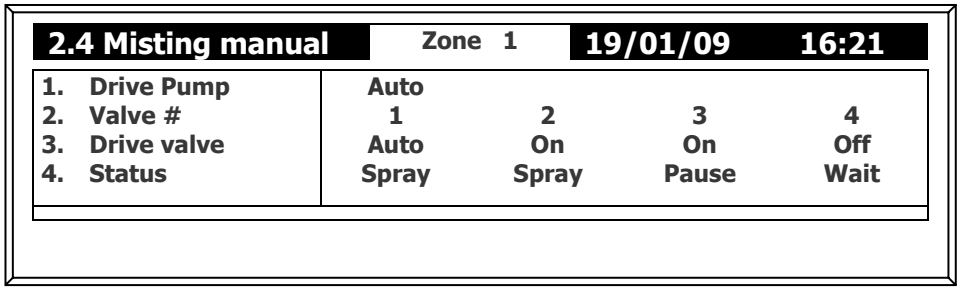
CAUTION *IMPORTANT: Verify that the **SETUP** parameters have been defined for Misting!*



#	Parameter	Explanation	Unit/Range	Default
1.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off.	No/Yes	No
2.	Active	Updated by the controller (For indication only)	Yes/No	
3.	Start Time	Start Time of the period. In case of overlapping periods, the next period overrides the previous period.	hh:mm	--:--
4.	Release Misting	Yes – misting valve opens for misting event. No – misting valve does not open and the misting process will not start.	Yes/No	Yes
5.	Start Misting trigger	Select a START trigger from the list. After the period starts, the system will check the trigger and determine if to open the misting valves and start the misting process. None – the misting process does not start	• Temp • Humidity • VPD • None	None
6.	Stop Misting trigger	Select trigger from the list. After misting program is in process, the system will check the stop trigger, and determine if to stop the misting process completely until a Start trigger is recognized. NONE - misting stops according to dead band limit of the start trigger	• Temp • Humidity • VPD • None	None
7.	Temp limit		°C	0.0

#	Parameter	Explanation	Unit/Range	Default
8.	Temp dead band	If 'Temp' is selected as the Start/Stop trigger, then above this set point, the misting program will start and below the dead band, the misting will stop.	°C	0.0
9.	Hum limit	If 'Hum' is selected as the Start trigger, then below this set point, the misting program will start and above the dead band, the misting will stop. If 'Hum' is selected as the Stop trigger, then above this set point, the misting program will start and below the dead band, the misting will stop.	0 - 100%	0
10.	Hum dead band		0 - 100%	0
11.	VPD limit	If 'VPD' is selected as the Start trigger, then above this set point, the misting program will start and below the dead band, the misting will stop. If 'VPD' is selected as the Stop trigger, then below this set point, the misting program starts and above the dead band, the misting stops.	kPa	0.0
12.	VPD dead band		kPa	0.0
		Calculated / Status		
13.	Start trigger	Displays the trigger that will activate the misting system.	• VPD • Humidity • Temperature • None	
14.	Misting system status	Current status of the misting system.	On/Off	
15.	Limitation	Misting system may be limited due to a higher priority event. Ex: If the Crop Protection system is activated, then the misting system will be inactive and the Limitations will display Crop Pro.	• Manual • External input • Crop Protection • None	

6.2 Manual – Misting (Menu 2.4)



- **Drive Pump** (Press  to display drop-down menu)
  - **Auto** – operates according to misting program
  - On – turns pump on (Warning: Misting continues until you turn it off!)
  - **Off** – turns pump off
- **Valve #** – Valve number as defined in the System Installation menu
- **Drive Valve** (Press  to display drop-down menu)
  - **Auto** – Operates according to the misting program
  - **On** – Drives valve to open
  - **Off** – Drives valve to closed
- **Status** – Displays the current status of the valve
  - VALVE OPEN → SPRAY
  - VALVE CLOSED → **OFF**

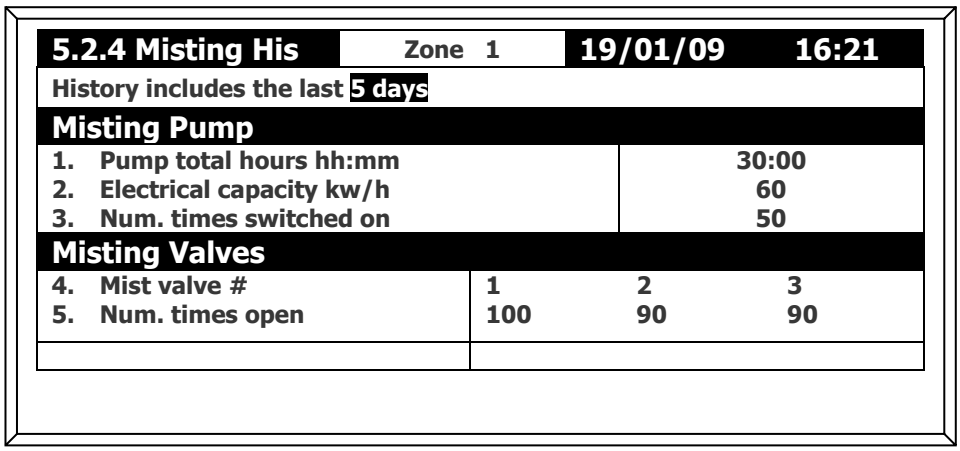
6.3 Status – Misting (Menu 4.4)

4.4 Misting Stat	**Zone 1**	**19/01/09**	**16:21**
1. Misting system status	**Off**		
2. Actual start trigger	**VPD**		
3. Actual stop trigger	**None**		
4. Pump status	**Rest**		
5. Max valves allowed	**5**		
6. Limitations	**None**		
Misting Valve			
7. Valve #	**1**	**2**	**3**
8. Calc spray	**0:00:05**	**0:00:05**	**0:00:05**
9. Calc pause	**0:06:00**	**0:06:00**	**0:06:00**
10. Calc cycl	**0:06:05**	**0:06:05**	**0:06:05**
11. Pause			
12. V. Status	**Spray**	**Spray**	**Wait**

- **Misting system status** – Displays if the Misting system is **ON** or **OFF**
- **Actual start trigger** – Displays the current start trigger if any
- **Actual stop trigger** – Displays the current stop trigger if any
- **Pump status** – Displays the current condition of the pump (Rest/On/Off)
- **Max valves allowed** – Maximum number of valves allowed to operate simultaneously defined in menu *8.2.4* **Misting Configuration**
- **Limitation** – Displays a restriction on the Misting system due to a higher priority event
- **Valve #** – Misting Valve number as defined in the **System Installation – Digital Inputs** menu *(8.1.1)*
- **Calculated spray** – Displays the calculated spray processes **duration**
- **Calculated pause** – Displays the calculated pause between sprays

- **Calculated cycle** – Displays the calculated cycle duration
- **Pause** – Displays the run time of the current Pause
- **V. status** – Displays the current status of each individual valve

6.4 Log & History – Application History – Misting (Menu 5.2.4)



5.2.4 Misting His	Zone 1	19/01/09	16:21
History includes the last 5 days			
Misting Pump			
1. Pump total hours hh:mm		30:00	
2. Electrical capacity kw/h		60	
3. Num. times switched on		50	
Misting Valves			
4. Mist valve #	1	2	3
5. Num. times open	100	90	90

History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

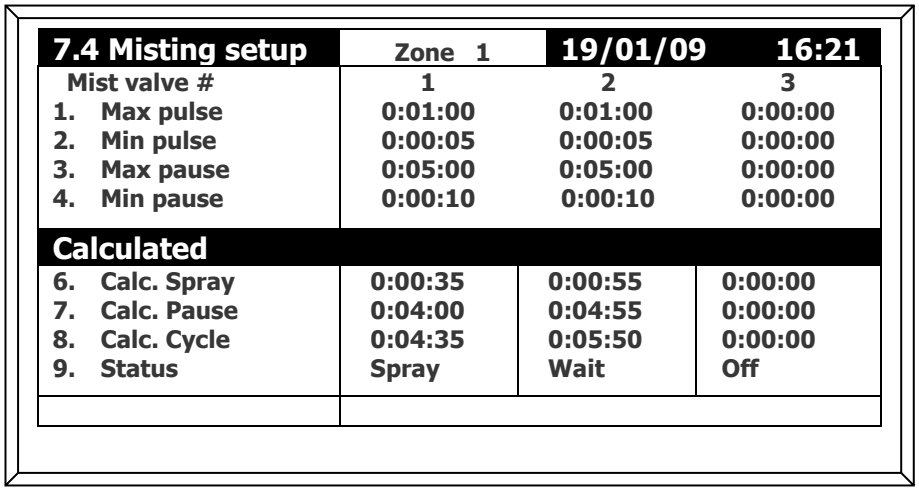
Misting Pump

- **Pump total hours** – Total time pump operated during the last X day/s
- **Electrical capacity** – Total electrical power reached within the last X day/s
- **Number of times switched on** – Number of times the pump switched on during the last X day/s

Misting Valves

- **Mist Valve #** - The valve number as defined in the system installation
- **Number of times opened** – Number of times the valve opened during the last X day/s

6.5 Setup – Misting (Menu 7.4)



7.4 Misting setup	Zone 1	19/01/09	16:21
Mist valve #	1	2	3
1. Max pulse	0:01:00	0:01:00	0:00:00
2. Min pulse	0:00:05	0:00:05	0:00:00
3. Max pause	0:05:00	0:05:00	0:00:00
4. Min pause	0:00:10	0:00:10	0:00:00
Calculated			
6. Calc. Spray	0:00:35	0:00:55	0:00:00
7. Calc. Pause	0:04:00	0:04:55	0:00:00
8. Calc. Cycle	0:04:35	0:05:50	0:00:00
9. Status	Spray	Wait	Off

#	Parameter	Explanation	Unit/Range	Default
Mist valve number		There are up to eight misting valves available for setup; each valve is defined separately	1-8	
1.	Max Pulse	The maximum and minimum time that the misting valve may be opened.	h:mm:ss	00:00
2.	Min Pulse		h:mm:ss	00:00
3.	Max Pause	The maximum and the minimum pause time, between pulses.	h:mm:ss	00:00
4.	Min Pause		h:mm:ss	00:00
5.	Calculated Spray	Values displayed are according to the set point that starts the misting process and the measured value inside the greenhouse. The value varies between the minimum and the maximum values of the ON/OFF time, which are defined in the Misting Program.	h:mm:ss	00:00
6.	Calculated Pause		h:mm:ss	00:00
7.	Calculated Cycle	Cycle duration, beginning from when the valves are turned on and off, and until they start running again. Ex: If there is one misting valve, then the calculated cycle time is the Spray time + the pause time.	h:mm:ss	00:00
8.	Status	The current state of each valve.		

7 Fan & Pad

- Program – Fan & Pad (Menu 1.5)
- Manual – Fan & Pad (Menu 2.5)
- Status – Fan & Pad (Menu 4.5)
- Log & History – Application History – Fan & Pad (Menu 5.2.5)
- Setup – Fan & Pad (Menu 7.5)
- Setup – System Calibration – Fan & Pad Inlet (Menu 7.10.3)

7.1 Program – Fan & Pad (Menu 1.5)

The Fan & Pad process in the Greenhouse enables cooling the interior environment and maintaining a fixed humidity and temperature inside the greenhouse. The grower can define up to eight fan stages per each zone.

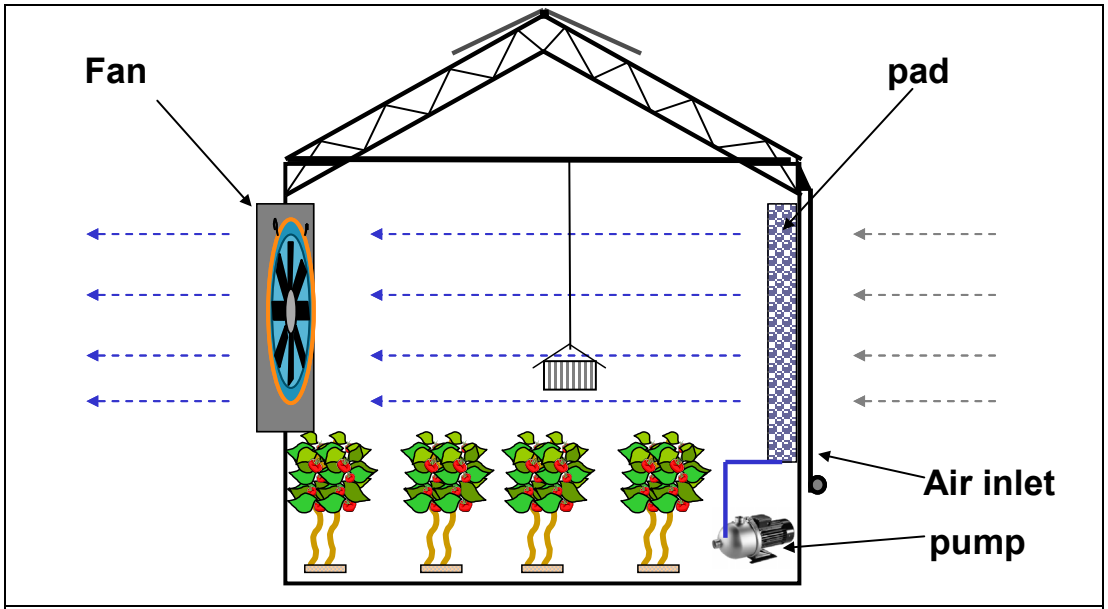
The Fan & Pad operates under several conditions and activates the devices according to the user setup.

The system is composed of the following:

- **Fan stages** – up to 8 per zone
- **Air inlet** – 1 per zone
- **Pad Pump** – 1 per zone

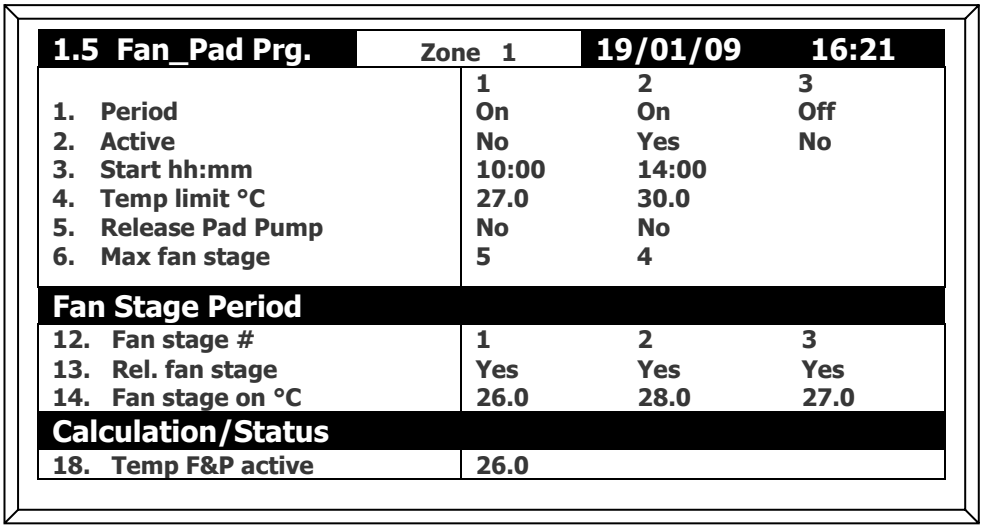
NOTE The Fan stages may be used also for the humidity release process.

NOTE For fans to operate, at least one air inlet or curtain/vent must be open.



Fan & Pad in Greenhouse

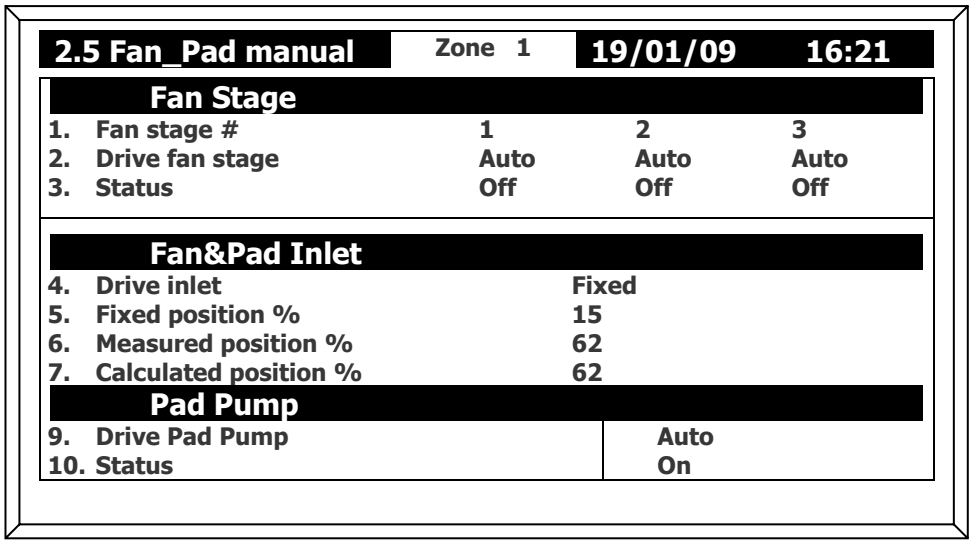
CAUTION *IMPORTANT: Verify that the **SETUP** parameters have been defined and the Fan&Pad Inlet **Calibrated**!*



#	Parameter	Explanation	Unit/Range	Default
1.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off.	1-6	
2.	Active	Updated by the controller (Read only)	Yes/No	Yes
3.	Start Time	Start Time for the period. The End Time is signified by the Start Time of the following period.	hh:mm	--:--
4.	Temperature limit °C	If the temperature inside the greenhouse is higher than the Temp limit, then the Fan&Pad will activate.	° C	26.0
5.	Release pad pump	Decide whether to use the pad pump within the specified period. Release = Yes ➔ use pad pump	Yes/No	Yes
6.	Max fan stage	The maximum number of fan stages that can be operating per period.	1-8	8
7.	Release for Humidity	Option to release the fan stage for humidity treatment. There are 3 modes of operation – Timer, Triggers or Timer&Triggers	• None • Timer • Trigger • Timer&Trigger	None
8.	Difference Between Inside and Outside Humidity	The system checks the difference between the inside humidity and outside. If the difference is higher	-100% to +100%	100

#	Parameter	Explanation	Unit/Range	Default
		than the set point, the humidity release process begins. This parameter exists only when Trigger or Trigger+Timer mode are selected.		
9.	Minimum Outside Temperature for Humidity Release	Fan operation stops when the outside temperature is below this set point. This line exists only when Release for Hum is set to Yes.	0° to +50° C	28.0
10.	Timer Off time	The OFF/ON time of the fan stage for humidity release. Parameter exists only if Timer or Trigger+Timer mode are selected.	mm:ss	00:00
11.	Timer On time		mm:ss	00:00
Fan Stage **(settings should be considered for operating each period)**				
12.	**Fan stage #**	There are up to eight fan stages per zone available	1-8	
13.	**Release Fan Stage**	Option to permit the fan stage	Yes/No	Yes
14.	**Fan Stage temp On**	The temperature set points to start/stop the fan stage when Fan&Pad is activated.	0° to +50° C	26.0
15.	**Fan Stage temp Off**		0° to +50° C	24.0
16.	**Humidity limit**	Humidity release process starts when the humidity is above this set point. *These two parameters are displayed only when* ***Release for hum*** *is set to one of the 3 modes.*	0-100 %	90
17.	**Humidity dead band**		0-20 %	10
Calculation / Status				
18.	**Temp F&P active**	Displays the temperature that will activate the Fan&Pad	0° to +50° C	
19.	**No. of fans active**	Displays the number of fans that are currently active.	0-8	
20.	**Pad pump active**	Status of pad pump activity	Yes/No	

7.2 Manual – Fan & Pad (Menu 2.5)



Fan Stage

- **Fan stage #** – fan device number as defined in the System Installation menu
- **Drive fan stage** (Press ↵ to display drop-down menu)
  - **Auto** – operates according to Fan&Pad program
  - **On** – turns fan on
  - **Off** – turns fan off
- **Status** - displays the current status of fan

Fan & Pad Inlet

- **Drive air inlet** (Press ↵ to display drop-down menu)
  - **Auto** – operates as defined by the Fan&Pad program
  - **Open** – Drives air inlet to completely open (100%)
  - **Close** – Drives air inlet to completely closed (0%)
  - **Fixed** – Allows for manually defining the desired position of the air inlet
- **Fixed position %** – define the desired position for the Fan&Pad air inlet
- **Measured position %** – displays the current position of the air inlet
- **Calc. Position %** – displays what the position of the air inlet should be
- **Air inlet direction** – displays the direction of the air inlet according to the wind direction (lee or wind)

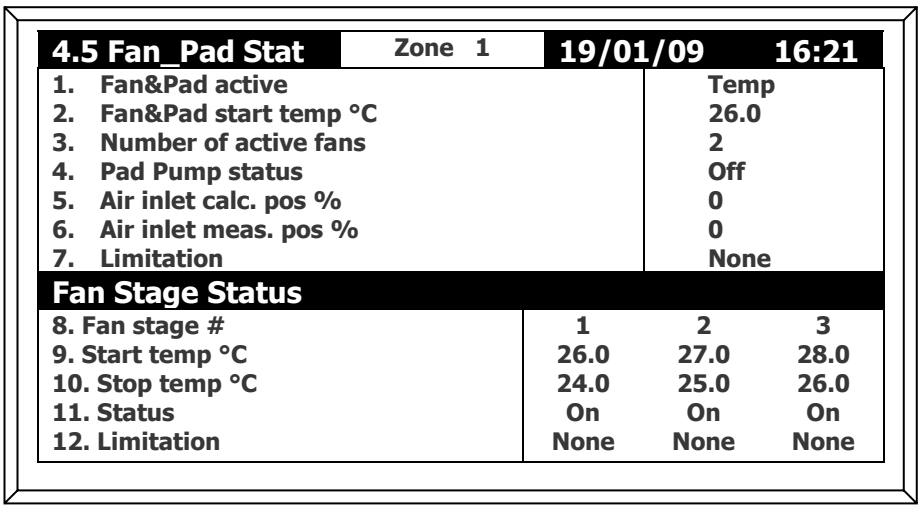
Pad Pump

- **Drive Pad pump** (Press ↵ to display drop-down menu)
  - **Auto** – operates according to Fan&Pad program

- On – turns pump on
- Off – turns pump off

- **Status** – Displays the current status of the pump

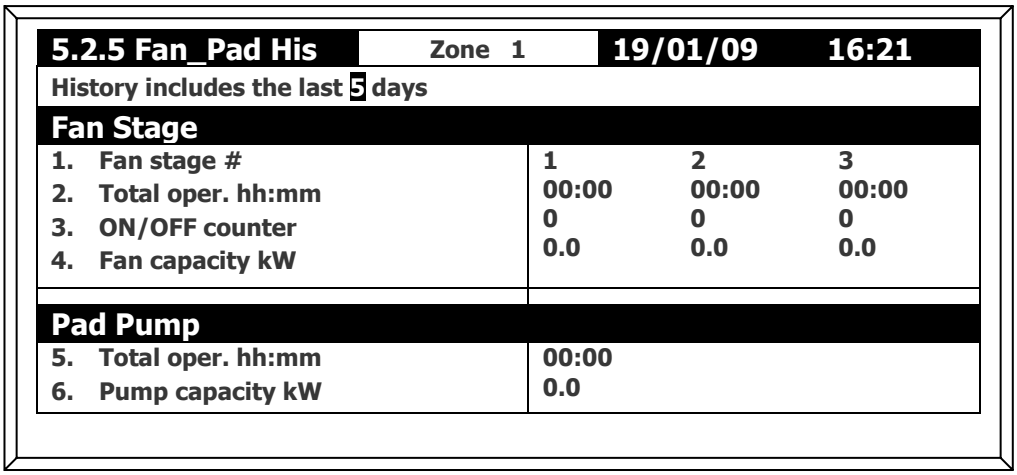
7.3 Status – Fan & Pad (Menu 4.5)



4.5 Fan_Pad Stat	Zone 1	19/01/09	16:21
1. Fan&Pad active		Temp	
2. Fan&Pad start temp °C		26.0	
3. Number of active fans		2	
4. Pad Pump status		Off	
5. Air inlet calc. pos %		0	
6. Air inlet meas. pos %		0	
7. Limitation		None	
Fan Stage Status			
8. Fan stage #	1	2	3
9. Start temp °C	26.0	27.0	28.0
10. Stop temp °C	24.0	25.0	26.0
11. Status	On	On	On
12. Limitation	None	None	None

- **Fan & Pad active** – Displays if the Fan & Pad is currently operating
- **Fan & Pad start temp** – Temperature at which the Fan & Pad process begins
- **Number of active fans** – Displays how many fans are currently active
- **Pad Pump status** – Displays the current activity of the pad pump
- **Air inlet calculated position** – Displays the position the air inlet should be with all influences considered
- **Air inlet measured position** – Displays the position the air inlet should be with all influences considered
- **Limitation** – Displays if there is a restriction on the Fan & Pad process due to a higher priority event
- **Fan stage #** – Fan stage number according to **Fan & Pad Program** menu *(1.5)*
- **Start temp** – Temperature at which the fan stage starts operating
- **Stop temp** – Temperature at which the fan stage stops operating
- **Status** – Fan stage status
- **Limitation** – Displays if there is a restriction on the Fan Stage due to a higher priority event

7.4 Log & History – Application History – Fan & Pad (Menu 5.2.5)



5.2.5 Fan_Pad His	Zone 1	19/01/09	16:21
History includes the last 5 days			
Fan Stage			
1. Fan stage #	1	2	3
2. Total oper. hh:mm	00:00	00:00	00:00
3. ON/OFF counter	0	0	0
4. Fan capacity kW	0.0	0.0	0.0
Pad Pump			
5. Total oper. hh:mm	00:00		
6. Pump capacity kW	0.0		

History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

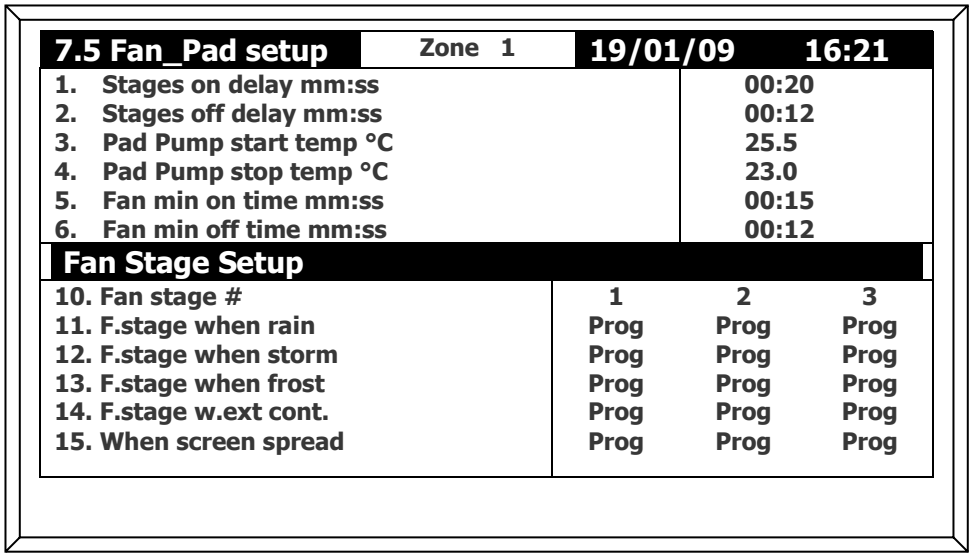
Fan Stage

- **Fan stage #** – Corresponding fan stage number with data being displayed below
- **Total operation time** – Total time the fan stage has operated within the last X day/s
- **ON/OFF counter** – Total number of times the fan stage switched from On and Off within the last X day/s
- **Fan capacity kW** – Total electrical power reached within the last X day/s

Pad Pump

- **Total operation time** – Total time the pad pump operated within the last X day/s
- **Pump capacity kW** – Total electrical power reached within the last X day/s

7.5 Setup – Fan & Pad (Menu 7.5)

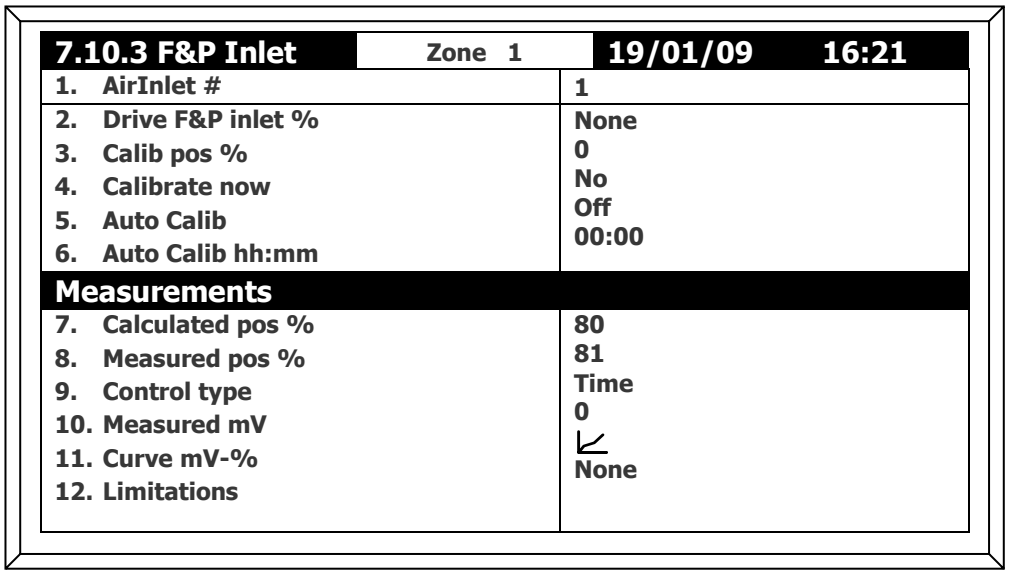


7.5 Fan_Pad setup	Zone 1	19/01/09	16:21
1. Stages on delay mm:ss		00:20	
2. Stages off delay mm:ss		00:12	
3. Pad Pump start temp °C		25.5	
4. Pad Pump stop temp °C		23.0	
5. Fan min on time mm:ss		00:15	
6. Fan min off time mm:ss		00:12	
Fan Stage Setup			
10. Fan stage #	1	2	3
11. F.stage when rain	Prog	Prog	Prog
12. F.stage when storm	Prog	Prog	Prog
13. F.stage when frost	Prog	Prog	Prog
14. F.stage w.ext cont.	Prog	Prog	Prog
15. When screen spread	Prog	Prog	Prog

#	Parameter	Explanation	Unit/Range	Default
1.	Stage on delay	If there are two or more fan stages that need to turn on/off at the same time, then define a delay between each fan stage to turn on/off so that they do not turn on/off at once.	mm:ss	00:20
2.	Stage off delay		mm:ss	00:12
3.	Pad pump start temp	The pad pump may start and stop according to the temperature inside the greenhouse (even if the fan stage is not working).	°C	25.5
4.	Pad pump stop temp		°C	23.0
5.	Fan min on time	Each fan stage works according to the defined minimum on time and the minimum off time.	mm:ss	00:00
6.	Fan min off time		mm:ss	00:00
7.	Air inlet temp curve	The air inlet should be opened when the fan stages are active. The curve defines a four-point table for Position (%) in relation to the temp	% - °C	-
8.	Temperature difference pump off	If the difference between the temperatures inside the greenhouse to the temperature outside is more than the set point, the pad pump will turn off. Example: Temp diff pump-off is set to 9°C. If the outside temp is 20°C and the inside temp is 30°C, then the pad pump will turn off.	°C	10
9.	Humidity limit pad pump off	If the humidity inside the greenhouse is higher than this value, then the controller will turn off the pad pump.	%	90
Fan Stage Setup				
10.	Fan stage when rain	During special events such as: rain, storm, frost, external condition and spread screen, each fan stage can be set to react differently. Set whether the fan should:	• Off • On • Prog	Prog
11.	Fan stage when storm			
12.	Fan stage when frost			

#	Parameter	Explanation	Unit/Range	Default
13.	Fan stage with external condition	• Off – Fan is OFF during event • On – Fan is ON during event Prog – Fan continues working according to what is defined in the Fan&Pad Program		
14.	Fan stage when screen is spread			

7.6 Setup – System Calibration – Fan & Pad Inlet (Menu 7.10.3)



Green Climate supports two calibration methods:

- Manual Calibration
- Automatic Calibration

7.6.1 MANUAL CALIBRATION

At regular intervals, calibrate the air inlets to maintain accurate performance. There are two different calibration methods depending on the way the air inlet movement is measured:

- Time (air inlet curtain is controlled by the running time)
- Measured (performed when *Air Inlet Position* sensor is installed)

Table 3: Fan and Pad Inlet Calibration Course of Action

TIME	MEASURED
1. Make sure all manual switches of the electrical switch board are set to the AUTO position	1. Make sure all manual switches of the electrical switch board are set to the AUTO position
2. Set the **Drive vent % → 0%**	2. Set the **Drive vent % → 0%**
3. Verify visually that the vent is completely closed	3. Verify visually that the vent is completely closed
4. Change **Calibrate now → YES**	4. Change **Calibrate now → YES**
5. Wait until the **Calibrate now** changes back to **NO**	5. Wait until the **Calibrate now** changes back to **NO**
6. Set the **Drive vent % → 100%**	6. Set the **Drive vent % → 100%**
7. Verify visually that the vent is completely opened	7. Verify visually that the vent is completely open
8. Change **Calibrate now → YES**	8. Change **Calibrate now → YES**
9. Wait until the **Calibrate now** changes back to **NO**	9. Wait until the **Calibrate now** changes back to **NO**
Calibration is complete!	**Calibration is complete!** *Go to 9. Curve mV-% to view readings*

1. Air Inlet # – Air Inlet number corresponding with the Digital Outputs – System Installation menu

2. **Drive F&P inlet %** (Press  to display drop-down menu)

- **None** - Operates as defined in the **Fan&Pad Program**
- **0%** - Drives air inlet to be completely closed (0%)
- **100%** - Drives air inlet to be completely open (100%)

3. **Calibrate position %** - Define the current position of the inlet once the Drive F&P inlet % is in the desired position

4. **Calibrate now** (Press  to display drop-down menu) – Select **YES** once the desired position has been achieved, the controller then will record the new measured values (time/mV)

7.6.2 AUTOMATIC CALIBRATION

Automatic calibration is done at a time specified by the user, once a day. If required, you can reconfigure the Green Climate to recalibrate the same day. Each motor can have a different calibration time.

NOTE : Calibration is performed according to a system of priorities. If the motor is engaged in a higher priority action (for example manual operations), calibration does not take place.

To enable calibration:

1. In Auto Calib select:

- **Off**: Disables automatic calibration.
- **Auto:** Enable automatic calibration.
    - If the current position is less than 50%, the air inlet calibrates to 0%.
    - If the current position is greater than 50%, the air inlet calibrates to 100%.
- **0%**: The screens calibrate to 0%.
- **100%:** The screens calibrate to100%.

2. In **Auto Calib hh:mm**, set the time.

NOTE While the unit is calibrating, in Status > Limitations, *calibrate appears. After calibration is completed, the measured vent position returns to its previous position.*

Measurements

- **Calculated position –** Targeted position of the inlet
- **Measured position –** Current position of the inlet
- **Control type –** Method of which the inlet movement is measured (time/measured)
- **Measured mV –** Current mV read by the potentiometer corresponding with the inlet position
- **Curve mV –** Defined position of the inlet according to the mV read by potentiometer during calibration

NOTE : DO NOT EDIT MANUALLY

- **Limitations –** Restrictions on calibration process due to higher priority processes

8 Air Circulation

- Program – Air Circulation (Menu 1.6)
- Manual – Air Circulation (Menu 2.6)
- Status – Air Circulation (Menu 4.6)
- Log & History – Application History – Air Circulation (Menu 5.2.6)
- Setup – Air Circulation (Menu 7.6)

8.1 Program – Air Circulation (Menu 1.6)

Air Circulation in the greenhouse:

- Prevents differences of temperature/humidity inside a zone
- Removes humidity from the foliage of plants – bring a fresh supply of CO_2 to the leaves
- Prevents disease

The Air Circulation in the Greenhouse is managed per zone, and sometimes operates corresponding to other controls such as:

- Fan&Pad
- Crop Protection
- Screen
- ON/OFF Heating

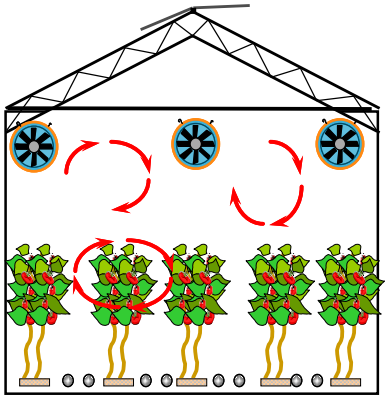
Possible triggers for the Air Circulation are:

- Temperature
- Humidity
- Temp Difference
- Humidity Difference
- Heating

Air circulation contribution

Homogeny Air conditions

1. Prevent temperature differences.
2. Prevent humidity differences.
3. Evacuate humidity from the leaves.
4. Thermo dynamic advantages (improving the heating efficiency).



Air Circulation in Greenhouse

CAUTION *IMPORTANT: Verify that the SETUP parameters have been defined for air circulation!*

1.6 Air circ. Prg.	Zone 1	19/01/09 16:21	
		1	2
1. Period		Yes	Off
2. Active		No	No
3. Start time hh:mm		06:00	
4. End time hh:mm		10:00	
5. Valid conditions no.		1	
6. Temp limit °C		↑ 25.0	
7. Temp dead band °C		3.0	
8. Hum. Limit %		↑ 70	
Calculation/Status			
14. Air circulation status		No	
15. Limitation		None	

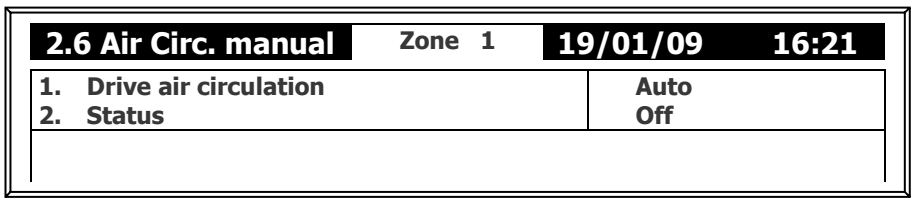
#	Parameter	Explanation	Unit/Range	Default
	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off.	On/Off	On
	Active	Updated by the controller **(For indication only)**	Yes/No	
	Start Time	Start Time of the period. In case of overlapping, the next period's Start Time overrides the previous period.	hh:mm	06:00
	End Time	The air circulation program is active only within the set period.	hh:mm	10:00

#	Parameter	Explanation	Unit/Range	Default
	Valid Condition number	The number of conditions that are required to be true for the air circulation to operate. Possible conditions: Temp, Humidity, Temp difference, and/or Humidity difference	1-4	1
	Temp Limit	Define the temperature set point and the direction above/below to start air circulation. Press  to edit, then use +/- button to adjust arrow direction, press  and use the number keypad to define the limit, press  again to exit the parameter.	0° to +50° C	25.0
	Temp Dead band	Define the temp dead band for ceasing operation of the air circulation system.	0° to +50° C	3.0
	Humidity limit	Define the Humidity set point and the direction above/below to start air circulation Press  to edit, then use +/- button to adjust arrow direction, press  and use the number keypad to define the limit, press  again to exit the parameter.	0 - 100%	70
	Humidity dead band	Humidity Dead band for air circulation system operation.	0 - 100%	5

#	Parameter	Explanation	Unit/Range	Default
	Temp diff limit	Define the temperature difference between two or more Green Boxes and the direction above/below to start air circulation Press  to edit, then use +/- button to adjust arrow direction, press  and use the number keypad to define the limit, press  again to exit the parameter.	0 - 50° C	3.0
	Temp diff dead band	Temperature difference dead band for air circulation system operation.	0 - 50° C	1.0
	Humidity diff limit	Define the Humidity difference between two or more Green Boxes and the direction above/below to start air circulation Press  to edit, then use +/- button to adjust arrow direction, press  and use the number keypad to define the limit, press  again to exit the parameter.	0 - 100%	20
	Humidity diff dead band	Humidity difference dead band for air circulation system operation	0 - 100%	4
		Calculation/Status		
	Air Circulation Status	Status of the air circulation		

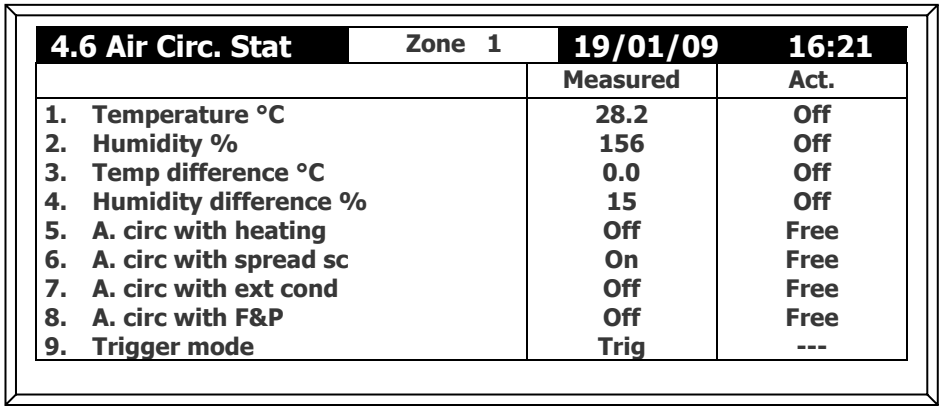
#	Parameter	Explanation	Unit/Range	Default
	Air Circulation Limitation	Displays any limitation to the air circulation		

8.2 Manual – Air Circulation (Menu 2.6)



- **Drive air circulation** (Press  to display drop-down menu)
  - **Auto** - operates as defined by the air circulation program
  - **On** - turns on the air circulation system
  - **Off** - turns off the air circulation system
- **Status** – Displays the current status of the air circulation system

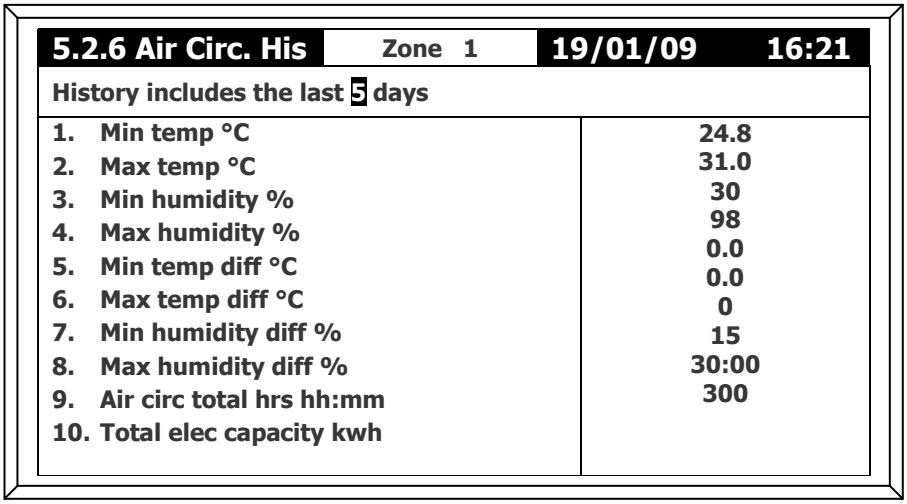
8.3 Status – Air Circulation (Menu 4.6)



#	Parameter	Current	Actual
1.	Temperature	Current measured temperature	Displays the actual validity of the condition
2.	Humidity	Current measured Humidity	
3.	Temp difference	Current measured difference between the highest and lowest temperature sensors	
4.	Humidity difference	Current measured difference between the highest and lowest humidity sensors	
5.	Air circulation with heating	Displays if heating is ON or OFF	Displays what has been defined in the Air

#	Parameter	Current	Actual
6.	Air circulation with spread screen	Displays if screen is spread or collected	Circulation – Setup menu *(7.6)*
7.	Air circulation with external condition	Displays if the external condition is ON or OFF	
8.	Air circulation with Fan&Pad	Displays if Fan&Pad is ON or OFF	
9.	Trigger mode	Displays what has been defined as the trigger in the Air Circulation – Setup menu *(7.6)*	---

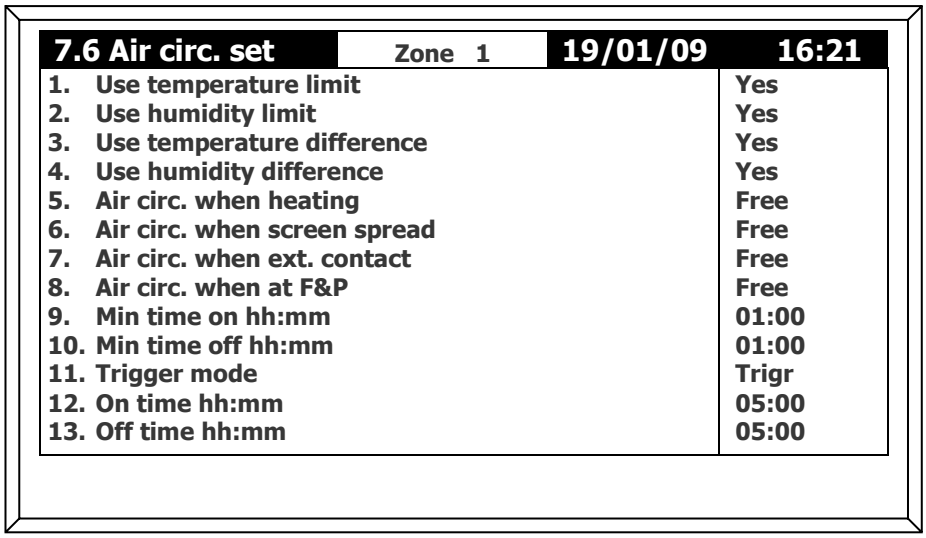
8.4 Log & History – Application History – Air Circulation (Menu 5.2.6)



History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

- **Min/Max temperature** – Displays the min/max temperatures reached within the last **X day/s**
- **Min/Max humidity** – Displays the min/max humidity reached within the last **X day/s Min/Max temperature difference** – Displays the min/max temperature differences reached within the last **X day/s**
- **Min/Max humidity difference** – Displays the min/max humidity differences reached within the last **X day/s**
- **Air circulation total hours** – Total time the air circulation system operated within the last **X day/s**
- **Total electric capacity** – Total amount of electrical power within the last **X day/s**

8.5 Setup – Air Circulation (Menu 7.6)



#	Parameter	Explanation	Unit/Range	Default
1.	Use Temperature Limit	Define whether or not conditions should be valid.	No/Yes	No
2.	Use Humidity limit			
3.	Use Temp Diff limit			
4.	Use Humidity Diff limit			
5.	Air Circulation when heat is on	Define whether the Air circulation will be influenced directly by heating, screen location-above 1%, external contact, and/or Fan & Pad.	Prog/On/Off	No
6.	Air Circulation when screen is spread			
7.	Air Circulation when external contact			
8.	Air Circulation when F&P is on			
9.	Minimum Time On	The air circulation system will work according to the on/off limitations defined here.	hh:ss	00:00
10.	Minimum Time Off			
11.	Trigger Mode	Define if the air circulation will operate according to one of three options: Timer, Trigger, or Timer+Trigger Parameters 12 and 13 exist only when the Trigger Mode selected is 'Timer' or 'Timer+Trigger.'	Timer/Trigger / Timer&Trigger	No
12.	On Time		mm:ss	00:00
13.	Off Time		mm:ss	00:00

9 CO2

- Program – CO2 (Menu 1.7)
- Manual – CO2 (Menu 2.7)
- Status – CO2 (Menu 4.7)
- Log & History – Application History – CO2 (Menu 5.2.7)
- Setup – CO2 (Menu 7.7)
- Setup – System Calibration – CO2 (Menu 7.10.4)

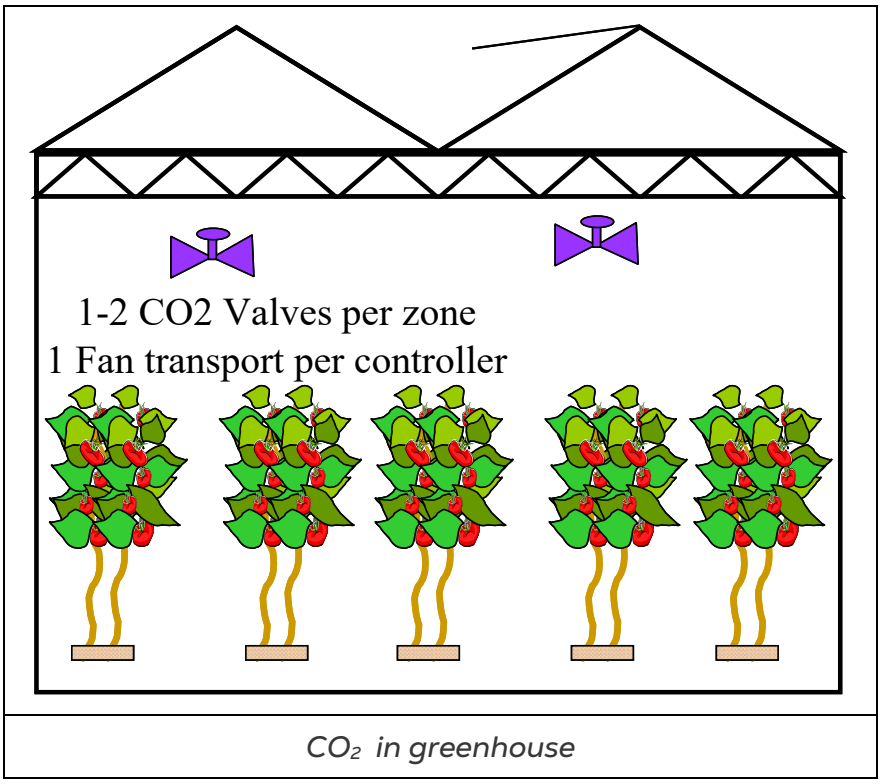
9.1 Program – CO2 (Menu 1.7)

The CO_2 Process should maintain a certain level of CO_2 inside the greenhouse. The CO_2 program controls up to two CO_2 valves per zone and one CO_2 Fan transport per controller.

The operation of the CO_2 is dependent on the greenhouse temperature, the solar radiation and vent positions.

There are three CO_2 processes that can be defined:

- **Active Mode:** In this mode, the system activates the CO_2 process permanently, according to the limitations that are defined by the user.
- **Passive Mode:** In this mode, the system activates the CO_2 process during the period time according to the limitations that are defined by the user, but, only when the **Heating** in the greenhouse is ON. Meaning, the CO_2 process starts only when one of the heating processes is active.
- **Liquid Mode:** In this mode, the system activates the CO_2 enrichment process, according to the limitations that are defined by the user.



CO_2 in greenhouse

CAUTION *IMPORTANT: Verify that the **SETUP** parameters have been defined and the CO_2 Sensor/s **calibrated!***

1.7 CO2 Program	**Zone 1**	**19/01/09**	**16:21**
	1	**2**	**3**
1. Period	**On**	**On**	**Off**
2. Active	**No**	**Yes**	
3. CO2 mode	**Pass.**	**Act.**	
4. Start hh:mm	**05:30**	**14:00**	
5. End hh:mm	**11:45**	**16:00**	
6. CO2 concent. Ppm	**700**	**950**	
7. Dead band off ppm	**50**	**50**	

Calculated/Status	
11. CO2 Status	**On**
12. Calc. CO2 concentration ppm	**750**
13. Limitation	**None**

#	Parameter	Explanation	Unit/Range	Default
1.	Period	It is possible to divide the day up to 6 periods. You can decide if the period is On/Off.	ON/OFF	ON
2.	Active	Updated by the controller (For indication only)	Yes/No	Yes

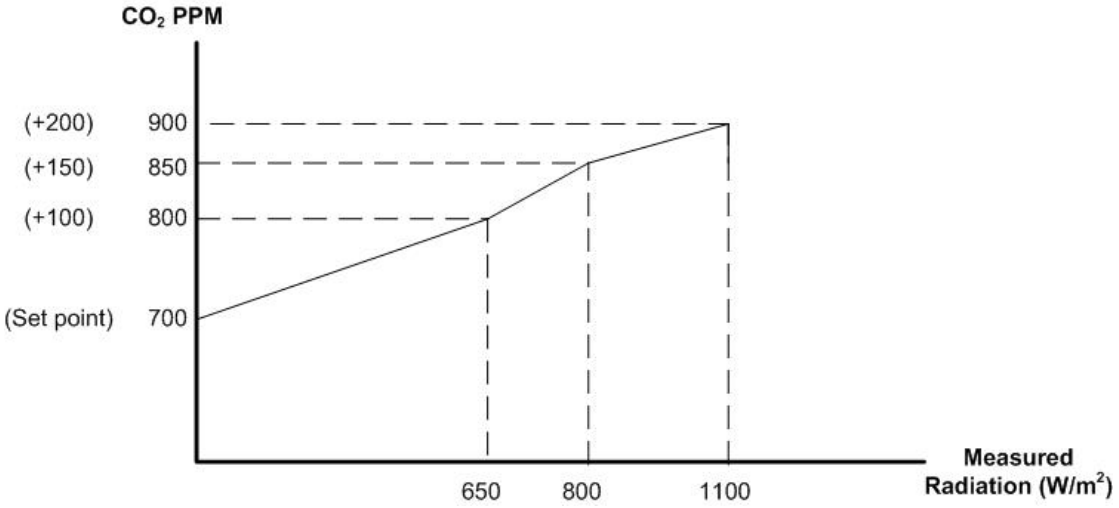
#	Parameter	Explanation	Unit/Range	Default
3.	CO_2 Mode	• Passive – Only when heating source is already working for heating then the CO_2 operation will take place, but if heating is not working then the CO_2 will remain off. • Active – In all cases of CO_2 demand it will activate the CO_2 transport and valves • Liquid – The system opens the valve of a tank containing liquid CO_2 for CO_2 enrichment	• Passive • Active • Liquid	Act.
4.	Start Time	Start/Stop Time of the period.	hh:mm	--:--
5.	End Time			
6.	CO_2 concentration	The desired level of CO_2 in the Zone.	ppm	0
7.	Dead band OFF	The controller stops the CO_2 process when it is above the desired concentration plus the Dead band OFF parameter.	ppm	100
8.	Dead band ON	The controller starts the CO_2 process when it is below the desired concentration minus the Dead band ON.	ppm	100
9.	Radiation influence	Four-point table that describes the influence of the radiation level on the desired CO_2 in the greenhouse (Increases the desired CO_2 concentration) *See additional explanation below		
10.	Vent Influence	Four-point table that describes the influence of the vent position on the desired CO_2 in the greenhouse (Decreases the desired CO_2 concentration) The system considers the maximum opened vents in the Zone *See additional explanation below		

Radiation Influence Example:

To optimize the photosynthesis process, increase the CO_2 concentration during high solar radiation.

Rad Influence the desired CO_2 Concentration	
Radiation	CO_2 Influence
1100	200
800	150
650	100
0	0

NOTE The target CO_2 concentration increases/decreases according to the table values.



Vent Influence Example:

Vent Influence the desired CO_2 Concentration	
Vent Pos	Des CO2 (ppm)
80	200
60	120
20	80
0	0

Define how much to decrease the CO_2 concentration according to the vent position (the higher the vent position percentage, the higher the CO_2 influence should be decreased). The table works according to the vent that the controller found to be the most opened within the zone. The example shows that when the controller finds the vent with the highest opened position within the zone to be 50% then the CO_2 concentration should be decreased by 50 ppm from the target concentration.

9.2 Manual – CO2 (Menu 2.7)

2.7 CO2 manual	Zone 1	19/01/09	16:21
1. Drive CO2		Auto	
2. Status		Off	

- **Drive CO_2** (Press  to display drop-down menu)
  - **Auto** - Operates as defined by the CO_2 program
  - **On** - Turns CO_2 ON (overrides CO_2 program)
  - **Off** - Turns CO_2 OFF (overrides CO_2 program)
- **Status** – Notifies of the current CO_2 state (ON or OFF)

9.3 Status – CO2 (Menu 4.7)

4.7 CO2 Status	Zone 1	19/01/09	16:21
1. CO2 mode			Pass.
2. CO2 status			On
3. Radiation influence ppm			200
4. Vent influence ppm			-100
5. Calc. CO2 concent. ppm			900
6. Meas. CO2 concent. ppm			1000
7. Limitations			None

- **CO2 mode** – Displays the current mode of the CO_2 as defined in the **CO2 Program** menu *(1.7)*
- **CO2 status** – Current activity of CO_2
- **Radiation influence** – Current influence on the CO_2 concentration due to radiation *Defined in **CO2 Program** menu *(1.7)*
- **Vent influence** – Current influence on the CO_2 concentration due to vent position *Defined in **CO2 Program** menu *(1.7)*
- **Calculated CO2 concentration** – Displays the target CO_2 concentration with all influences considered
- **Measured CO2 concentration** – Current CO_2 concentration
- **Limitations** – Displays if there is a restriction on the CO_2 process due to a higher priority event

9.4 Log & History – Application History – CO2 (Menu 5.2.7)

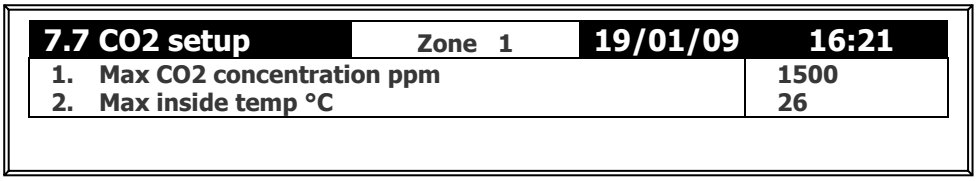
5.2.7 CO2 His.	Zone 1	19/01/09	16:21
History includes the last 2 days			
1. CO2 total hours hh:mm			5:05
2. Maximum level ppm			1200
3. Average level during opr ppm			800

History includes the last X day/s – Define the number of days until current date to display history data (1 day – 7 days)

- **CO_2 total hours** – Duration of time that the CO_2 operated within the last **X day/s**

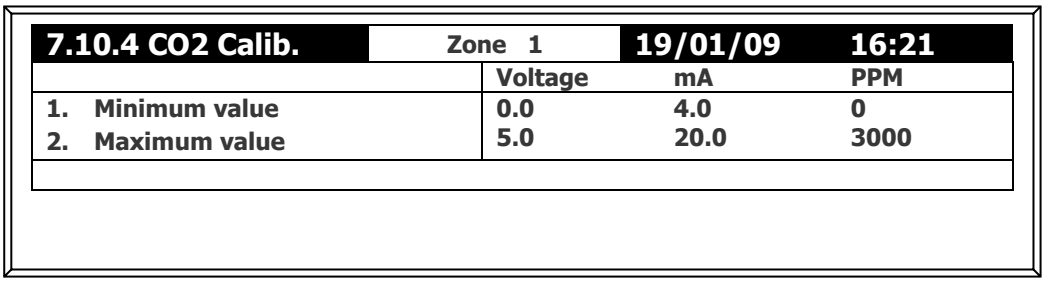
- **Maximum level ppm** – Displays the maximum level of CO_2 concentration reached within the last **X day/s**
- **Average level during operation ppm** – Displays the average level of CO_2 while active within the last **X day/s**

9.5 Setup – CO2 (Menu 7.7)



#	Parameter	Explanation	Unit/Range	Default
1.	Maximum CO_2 concentration	The maximum allowed CO_2 concentration per zone. When the concentration is above this limit, the CO_2 dosing stops.	0 - 2500 ppm	1000
2.	Maximum inside temperature	The maximum temperature allowed per zone. When the temperature is above this limit, the CO_2 dosing stops.	° C	35

9.6 Setup – System Calibration – CO2 (Menu 7.10.4)



Use this table to calibrate the CO_2 sensor in the greenhouse (voltage or current sensors).

10 Crop Protection

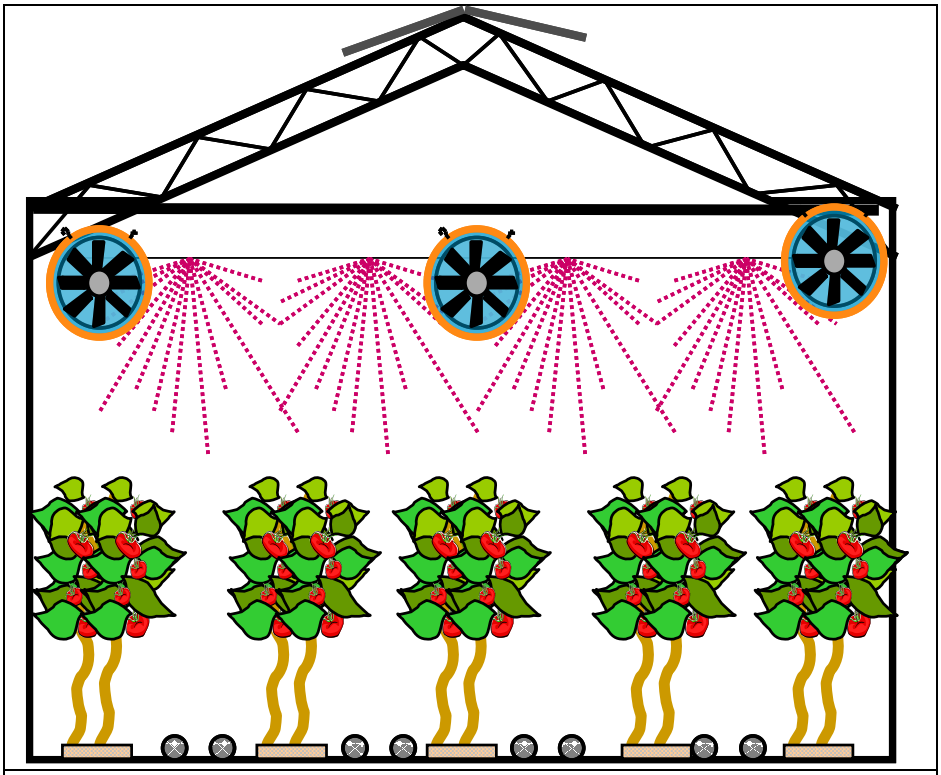
- Program – Crop Protection (Menu 1.8)
- Manual – Crop Protection (Menu 2.8)
- Status – Crop Protection (Menu 4.8)
- Log & History – Application History – Crop Protection (Menu 5.2.8)
- Setup – Crop Protection (Menu 7.8)

10.1 Program – Crop Protection (Menu 1.8)

The Crop Protection process in the green house does not operate on a regular basis, the grower determines when it will activate.

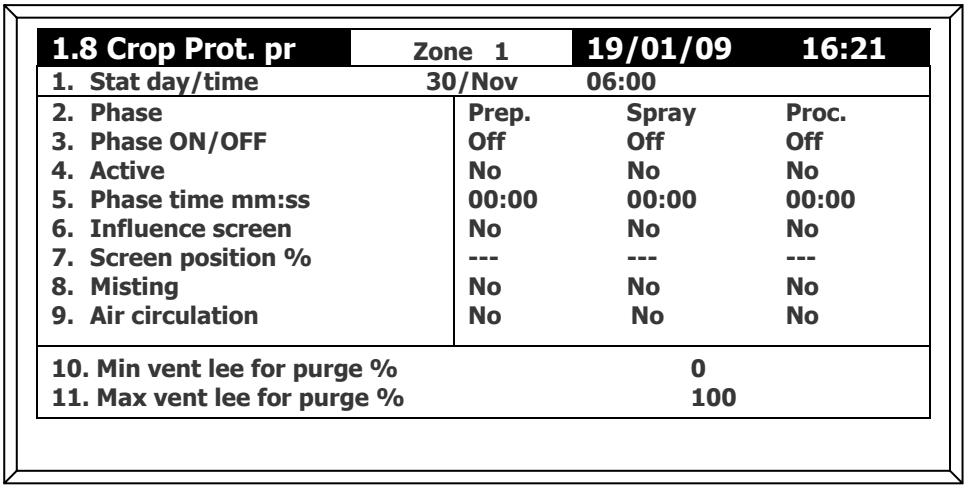
The Crop protection program provides four steps. The user can enable/disable one or more of the following steps:

- Preparation – The vents will close completely
- Spray – Crop Protection treatment is dispersed among the plants
- Process – Time allowed for the treatment to sink into the plants
- Purge – The vents are opened to clear the atmosphere in the green house



Crop Protection in GH

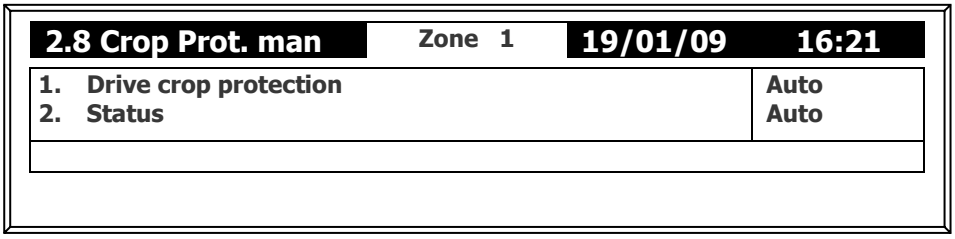
*NOTE **IMPORTANT:** Verify that the **SETUP** parameters have been defined for **crop protection!***



#	Parameter	Explanation	Unit/Range	Default
1.	Start Day/Time	Define the specific date and time for the crop protection process.	dd/mon hh:mm	
2.	Phase	There are four phases to crop protection and each is programmed separately. *This line serves as a title of the column	Preparation Spray Protection Purge	Off
3.	Phase ON/OFF	Define if to enable or disable the phase.	On/Off	
4.	Active	Updated by the controller (For indication only)		
5.	Phase time	Set the run time per phase.	mm:ss	--:--
6.	Influence Screen	Define activity of SCREENS during Crop Protection: Free –according to Screen program Yes –according to the Crop Protection - *Screen Position %* parameter	Free/Yes	No
7.	Screen Position	If YES is selected in the *Influence Screen* parameter, then the *Screen Positioning* parameter becomes available. Define the exact position of the screen during crop protection.	0 - 100%	0
8.	Misting	Define activity of MISTING during Crop Protection: Free – according to Misting program No – disables Misting during Crop Protection	Free/No	No
9.	Air Circulation	• Define activity of AIR CIRCULATION during Crop Protection: • Free – according to Air Circulation program	Free/Yes/No	No

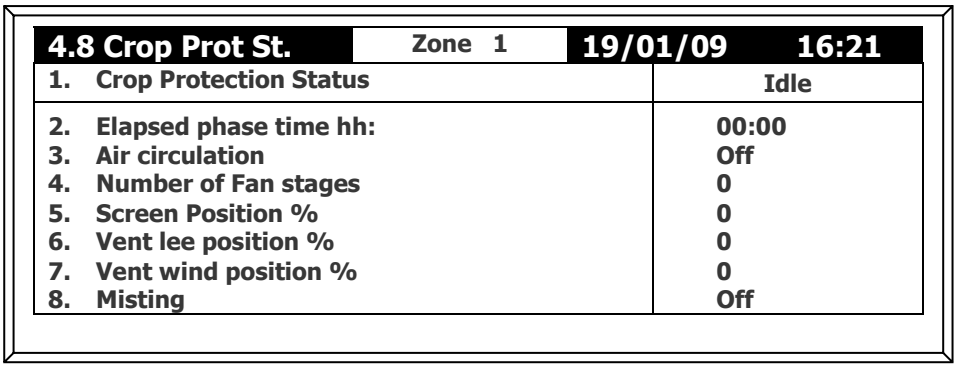
#	Parameter	Explanation	Unit/Range	Default
		• Yes – turns Air Circulation ON during Crop Protection No – disables Air Circulation during Crop Protection		
10.	Maximum vent LEE	• For Purge phase only, the user can define the position of the vents. • The Crop Protection program takes control of the vent minimum and maximum positions.	0 - 100%	100%
11.	Minimum vent LEE			0
12.	Maximum vent WIND			100%
13.	Minimum vent WIND			0

10.2 Manual – Crop Protection (Menu 2.8)



- **Drive crop protection** (Press  to display drop-down menu)
  - Auto - Operates as defined by the crop protection program
  - On - Turns crop protection ON
  - Off – Turns crop protection OFF
- **Status** - Displays the current activity of Crop Protection

10.3 Status – Crop Protection (Menu 4.8)



- **Crop Protection Status** - Display the current activity of Crop Protection
- **Elapsed phase time** – Displays the amount of time the current phase has operated

- **Air circulation** – Shows the current activity of the Air Circulation
- **Number of Fan stages** – Displays the number of operating Fan Stages
- **Screen Position** – Displays the current position (in percentage) of the screen
- **Vent lee position** – Displays the current position (in percentage) of the lee Vent
- **Vent wind position** – Displays the current position (in percentage) of the wind Vent
- **Misting** – Shows the current activity of Misting

10.4 Log & History – Application History – Crop Protection (Menu 5.2.8)

5.2.8 Crop Prot.	Zone 1	19/01/09 16:21
1. Crop Prot date&time 2. Cycle time hh:mm		00/Jan/00 00:00 00:00
3. Crop Prot date&time 4. Cycle time hh:mm		00/Jan/00 00:00 00:00
5. Crop Prot date&time 6. Cycle time hh:mm		00/Jan/00 00:00 00:00
7. Crop Prot date&time 8. Cycle time hh:mm		00/Jan/00 00:00 00:00

The Crop Protection Application History displays the last four times Crop Protection operated with the corresponding date and time as well as how long the entire crop protection cycle lasted.

10.5 Setup – Crop Protection (Menu 7.8)

7.8 Crop Prot. Set	Zone 1	19/01/09 16:21	
Start day/time		30/Nov 6:00	
1. Phase	Prep.	Spray	Proc.
2. Active	No	No	No
3. Use fan stage	Yes	No	No
4. F&P inlet pos %	10		
5. Use fan stage 1	Yes		
6. Use fan stage 2	No		
7. Use fan stage 3	No		
8. Use fan stage 4	No		
9. Use fan stage 5	No		
10. Use fan stage 6	No		
11. Use fan stage 7	Yes		

#	Parameter	Explanation	Unit/Range	Default
	Start day/time	Displays the specified date and time (defined in the Crop Protection Program) for operation of the Crop Protection. *Cannot be edited		
1.	Phase	There are 4 phases – Prepare, Spray, Process, and Purge. *This line serves as a title of the column		
2.	Active	Updated by the controller (For indication only)	Yes/No	
3.	Use Fan stage	Select if to use fan stages along with the crop protection. • Free – according to Fan&Pad program • Yes – allows activation per fan stage 1-8 • No – disables fan stages during crop protection	Free/Yes/No	No
4.	F&P inlet position %	The minimum position of the air inlet, to operate the fan stage/s.	0 - 100%	0
5-12	Use fan stage (1-8)	Select if to enable the fan stage (1-8) in this phase	Yes/No	

11Light

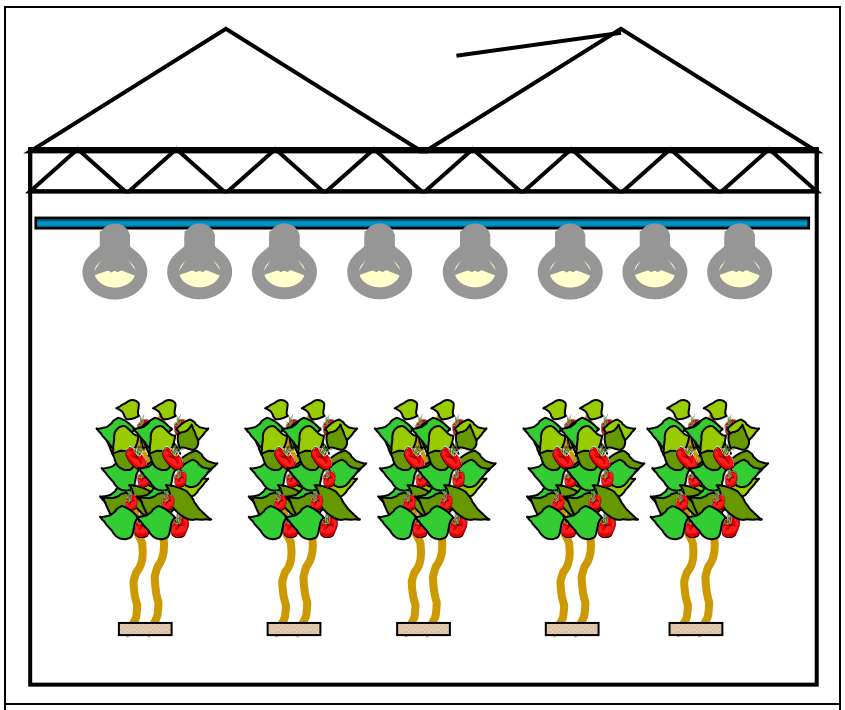
- Program – Light (Menu 1.9)
- Manual – Light (Menu 2.9)
- Status – Light (Menu 4.9)
- Log & History – Application History - Light (Menu 5.2.9)
- Setup – Light (Menu 7.9)

11.1 Program – Light (Menu 1.9)

The Lighting devices in the greenhouse provide the ability to supply the crop with the specific quantity of light required. The Light control in the greenhouse manages the HID lamp operation and each zone may include up to four light strings. There are two types of lighting control methods:

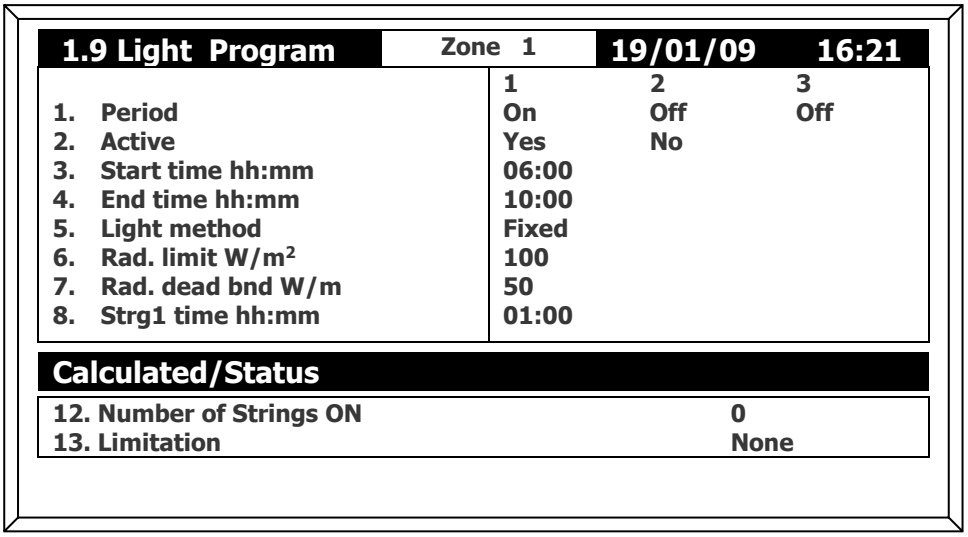
- Cyclic
- Fixed

The grower can define four light strings per zone, the strings may work all together (Fix) or operate one by one (Cyclic).



Lighting in Greenhouse

CAUTION Light! *IMPORTANT: Verify that the **SETUP** parameters have been defined for*



#	Parameter	Explanation	Unit/Range	Default
1.	Period	It is possible to divide the day up to 6 periods. The User may decide if the period is active	On/Off	Off
2.	Active	Updated by the controller **(For indication only)**	Yes/No	
3.	Start Time	Start Time of the period. In case of overlapping periods, the next period overrides the previous period.	hh:mm	06:00
4.	End Time	The Light program is active only within the set period.	hh:mm	10:00
5.	Light Method	The User can select to work on Fixed, or Cyclic method • **Fixed** – turns light strings on and off according to limitations of outside radiation and maximum strings which are allowed to be turned on per zone (according to configuration). Each string can be turned on and off **one time per period.** • **Cyclic** – turns light strings on and off according to the limitation of the outside radiation. There is no limitation to the number of times that lighting can turn on or off. The string's operating time is defined in the setting in parameters *8-11:* **Light String 1-4.** *Both methods can work with or without rotation.	Fixed / Cyclic /	Fixed

#	Parameter	Explanation	Unit/Range	Default
		• String: ○ When set to Rotation Mode, the controller operates the strings according to each string's working time. The string having the shortest operating time runs first and the string with the longest operating time runs last. ○ When set to No Rotation, strings run from String 1 › String 4. • Notes: ○ The controller turns on the 1st string, continues to turn on the next, according to the maximum number of strings allowed. The user defines the delay time between strings. ○ When a string begins to operate, the controller: ▪ Increases the Active String Controller ▪ Increase the String Working Hours counter ▪ Calculates the radiation sum per string.		
6.	Radiation Limit	The lighting will turn on below this value of radiation	W/m^2	100
7.	Radiation Dead band	The lighting will turn off when radiation reaches the **Radiation Limit + Radiation Dead band**	W/m^2	50
8.	Light String 1	If operating according to the Cyclic method, the lights operate with each relevant string according to the setup time defined here	hh:mm	01:00
9.	Light String 2			
10.	Light String 3			
11.	Light String 4			

11.2 Manual – Light (Menu 2.9)

2.9 Light manual	Zone 1	19/01/09	16:21
Light string #	1	2	3
1. Drive string	Auto	Auto	Auto
2. Status	Off	Off	Off

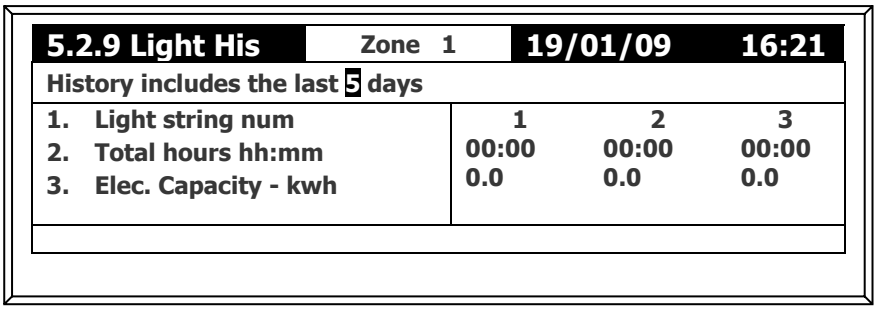
- **Light string #** - Up to four light strings
- **Drive string** (Press  to display drop-down menu)
- **Auto** - Operates as defined by the light program
- **On** - Turns light string ON (overrides light program)
- **Off** - Turns light string OFF (overrides light program)
- **Status** – Displays the current activity of light string

11.3 Status – Light (Menu 4.9)

4.9 Light Status	Zone 1	19/01/09	16:21
1. String #		1	2
2. Light mode		Fixed	Fixed
3. String ON time hh:mm		00:00	00:00
4. String time elapsed		00:00	00:00
5. Rad sum inside J/m^2		0	0
6. Light capacity KW		0	0

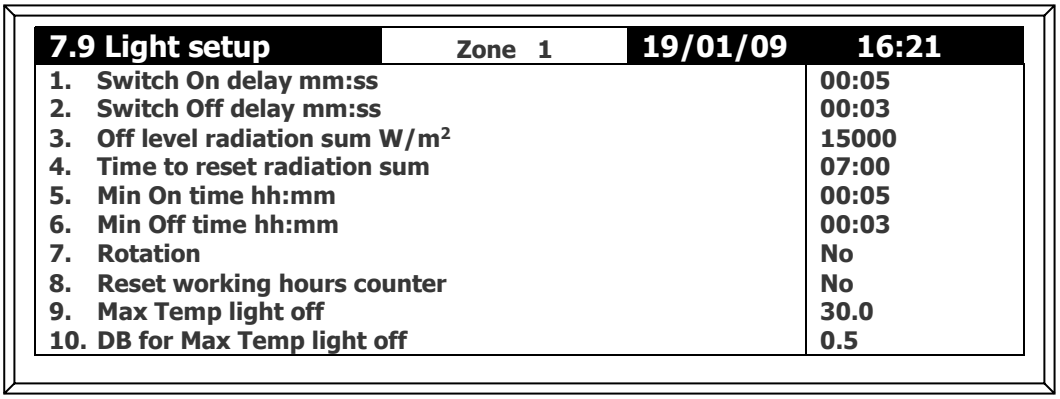
- String # – String number as defined in System Installation – Digital Inputs menu *(8.1.1)*
- **Light mode** – Method of which the string was defined in **Light Program** menu *(1.9)*
- **String ON time** – Displays the time for the string to be on as defined in **Light Program** menu *(1.9)*
- **String time elapsed** – Displays the string's **ON** run time (hh:mm)
- **Radiation Sum inside** – Displays the total radiation measured per string
- **Light capacity** – Displays the current electrical power of each light string

11.4 Log & History – Application History - Light (Menu 5.2.9)



- **History includes the last X day/s** – Define the number of days until current date to display history data (1 day – 7 days)
- **Light string number** – Corresponding light string number with data being displayed
- **Total hours** – Total hours:minutes that the light string worked within the last X day/s
- **Electrical capacity** – Total electrical power reached within the last X day/s

11.5 Setup – Light (Menu 7.9)



#	Parameter	Explanation	Unit/Range	Default
1.	Switch On Delay	When the controller needs to turn on/off more than one string, the system waits the time defined in this parameter to delay between the switches.	mm:ss	00:00
2.	Switch Off Delay			
3.	Off Level Radiation Sum	Total accumulated radiation from midnight that will result in turning off the lights.	0 - 15000 W/m^2	15000
4.	Time to reset Radiation Sum	The counter for the radiation sum should be reset once a day. Define at what time of the day the reset should occur.	hh:mm	00:00
5.	Minimum On time		hh:mm	00:00

#	Parameter	Explanation	Unit/Range	Default
6.	Minimum Off time	The minimum time the string can be on/off.		
7.	String rotation	Yes – operates the light string according to the Light Program and working hours counter No – operates in successive order	Yes/No	No
8.	Reset working hours counter	Option to reset the working hours counter. This is a onetime event.	Yes/No	No
9.	Max Temp light off	Define the temperature at which the lights go off.		30.0
10.	DB for Max Temp light off	Define the differential below the Max Temp light off parameter at which lights go back on.		0.5

12 Alarm

- Reset Alarm (Menu 3.1)
- View Alarm History (Menu 3.2)
- Alarm Definitions

12.1 Reset Alarm (Menu 3.1)

3.1 Reset Alarm	Zone 1	19/01/09 16:21			
1. Reset Now?					No
2. Period of automatic reset					1 hr
Active Alarms					
No.	**Z**	**Event**	**#**	**Date**	**Time**

- Reset Now? (Press  to display drop-down menu)
  - **No** – Alarms are not reset
  - **Current Zone** – Zone that is currently shown at top of screen is reset
  - **All Zones** – Alarms in all four zones are reset
- Period of automatic reset (Press  to display drop-down menu)
  - 1, 2, 4, or 24: After the selected delay, the controller resets alarms

12.2 View Alarm History (Menu 3.2)

Displays alarms that have been logged into the controller with the date and time it occurred.

3.2 View Alarm His. 19/01/09 16:21					
No.	**Z**	**Event**	**#**	**Date**	**Time**
1	1	Temp. Too High	1	11/Nov	16:05
2	2	Temp. Too High	1	10/Nov	16:00
3	3	Hum. Too Low	1	10/Nov	14:25
4					
5					
6					
7					

12.3 Alarm Definitions

3.3.1 Proc. Alarm ZONE 1 **19/01/09 16:21**

#	Name	Limit	Delay	Out	Action
1	Temp defect	0.0	01:00	SMS	Ignore
2	Hum defect	0.0	01:00	SMS	Ignore
3	CO2 defect	0.0	01:00	SMS	Ignore
4	High temp	35.0	01:00	SMS	---
5	Low temp	15.0	01:00	SMS	---
6	High hum	95.0	01:00	SMS	---
7	Low hum	35.0	01:00	SMS	---
8	High CO2	1000	01:00	SMS	---
9	Low CO2	100.0	01:00	SMS	---
10	Temp>T.vent	0.0	01:00	SMS	---
11	Temp<T.heat	0.0	01:00	SMS	---

All alarms appear and are recorded by zone. This feature provides detailed data to the user, enabling simpler monitoring and maintenance.

- **#** - Each alarm has its own unique number (for technical support).
- **Name** – Alarm name
- **Limit** – Define the value for the controller to consider the deviation an alarm
- **Delay** – Define the time (mm:ss) for the controller to wait before taking action and logging an alarm
- **Out** (Log) – The controller logs the alarms in the **Log & History – System Log** *menu 5.5*
- **Action** – Define what the controller should do in case the alarm occurs
    - Ignore –controller will not take any action and does not display or log the alarm
    - Stop –controller displays and logs alarm, but stops processes relevant to the issue
    - Continue – controller displays and logs alarm, and continues running processes relevant to the issue

The following alarm definition menus follow the same format as the above menu

- Communication Alarms
- Weather Station Alarms
- Vent Alarms
- Screen Alarms
- Heating Alarms
- F&P Alarms

13 Test

- Test Relay
- Test Analog Inputs
- Test Digital Inputs
- View Hardware Checklist

13.1 Test Relay

In this menu, the relays that have been defined under the **System Installation – Digital Outputs** (Menu 8.1.1) can be tested manually. The "manual" action turns the relay on. After a period of five minutes the relay will turn off if left idle.

13.2 Test Analog Inputs

Displays analog inputs as defined in the **System Installation – Analog Inputs** (Menu 8.1.3).

13.3 Test Digital Inputs

Displays digital inputs as defined in the **System Installation – Digital Inputs** (Menu 8.1.2).

13.4 View Hardware Checklist

HW CHECKLIST

DESCRIPTION	LOC.	EXP1	EXP2	EXP3
Analog Input	2	1	1	1
Digital Input	1	1	1	1
Relay Card	6	8	6	5
Exp. Box Version	--	1.0	1.0	1.0
Qty. Climate RTU	4	3	3	3

COM	Relay 57-64	Relay 56-49	A. In No. 2	A. In No. 1	D. In No. 1	CPU

Relay 1-8	Relay 9-16	Relay 17-24	Relay 25-32	Relay 33-40	P.S.

14 Log & History

- Climate Zone
- Application History
- User Event Log (Menu 5.3)
- Action Log (Menu 5.4)
- System Log (Menu 5.5)

14.1 Climate Zone

- History (Menu 5.1.1)
- Settings

14.1.1 HISTORY (MENU 5.1.1)

5.1.1 Climate Hist	Zone 1	19/01/09	16:21

#	Date & Time	T. Avg	T. Sn1	T. Sn2
1	18/01/09 23:00	17.0	17.0	17.0
2	18/01/09 22:00	18.0	18.1	18.0
3	18/01/09 21:00	18.5	18.6	18.4
4	18/01/09 20:00	19.0	19.0	18.9
5	18/01/09 19:00	19.0	19.0	19.0
6	18/01/09 18:00	20.0	20.1	20.0
7	18/01/09 17:00	21.0	21.0	21.0

NOTE Must define the SETTINGS menu before being able to view the HISTORY!

Displays all data collected by sensors that are defined in the **SETTINGS** *(Menu 5.1.2)*, according to the *History resolution interval* defined.

14.1.2 SETTINGS

5.1.2. Sensors Set	ZONE 1	19/01/09	16:21

1. History resolution interval	5 min
2. Average Temperature	√
3. Temperature Sensor 1	√
4. Temperature Sensor 2	√
5. Temperature Sensor 3	√
6. Temperature Sensor 4	√
7. Water Temp. Network 1	√
8. Water Temp. Network 2	---
9. Water Temp. Network 3	---
10. Water Temp. Network 4	---
11. Water T.Ret. Manifold	√
12. Water T. Supl. Manifold	√

Define in the **History resolution interval** how often the controller will record the sensor readings. Checkmark the sensors desired for the controller to record in the **Climate Zone – History**

14.2 Application History

#	Application	Refer to page
1	Vent	27
2	Screen	37
3	Heating	49
4	Misting	58
5	Fan&Pad	65
6	Air Circulation	75
7	CO2	81
8	Crop Protection	86
9	Light	92

14.3 User Event Log (Menu 5.3)

Displays all changes made to the controller by the user. Changes are noted by zone.

14.4 Action Log (Menu 5.4)

Displays all controller device operations.

14.5 System Log (Menu 5.5)

Displays all system events (software, firmware, cold starts, data plug).

15 Warranty

Warranty and technical assistance

Munters products are designed and built to provide reliable and satisfactory performance but cannot be guaranteed free of faults; although they are reliable products they can develop unforeseenable defects and the user must take this into account and arrange adequate emergency or alarm systems if failure to operate could cause damage to the articles for which the Munters plant was required: if this is not done, the user is fully responsible for the damage which they could suffer.

Munters extends this limited warranty to the first purchaser and guarantees its products to be free from defects originating in manufacture or materials for one year from the date of delivery, provided that suitable transport, storage, installation and maintenance terms are complied with. The warranty does not apply if the products have been repaired without express authorisation from Munters, or repaired in such a way that, in Munters' judgement, their performance and reliability have been impaired, or incorrectly installed, or subjected to improper use. The user accepts total responsibility for incorrect use of the products.

The warranty on products from outside suppliers fitted to Green Climate, (for example antennas, power supplies, cables, etc.) is limited to the conditions stated by the supplier: all claims must be made in writing within eight days of the discovery of the defect and within 12 months of the delivery of the defective product. Munters has thirty days from the date of receipt in which to take action, and has the right to examine the product at the customer's premises or at its own plant (carriage cost to be borne by the customer).

Munters at its sole discretion has the option of replacing or repairing, free of charge, products which it considers defective, and will arrange for their despatch back to the customer carriage paid. In the case of faulty parts of small commercial value which are widely available (such as bolts, etc.) for urgent despatch, where the cost of carriage would exceed the value of the parts, Munters may authorise the customer exclusively to purchase the replacement parts locally; Munters will reimburse the value of the product at its cost price.

Munters will not be liable for costs incurred in demounting the defective part, or the time required to travel to site and the associated travel costs. No agent, employee or dealer is authorised to give any further guarantees or to accept any other liability on Munters' behalf in connection with other Munters products, except in writing with the signature of one of the Company's Managers.

WARNING: In the interests of improving the quality of its products and services, Munters reserves the right at any time and without prior notice to alter the specifications in this manual.

The liability of the manufacturer Munters ceases in the event of:

- dismantling the safety devices;

- use of unauthorised materials;
- inadequate maintenance;
- use of non-original spare parts and accessories.

Barring specific contractual terms, the following are directly at the user's expense:

- preparing installation sites;
- providing an electricity supply (including the protective equipotential bonding (PE) conductor, in accordance with CEI EN 60204-1, paragraph 8.2), for correctly connecting the equipment to the mains electricity supply;
- providing ancillary services appropriate to the requirements of the plant on the basis of the information supplied with regard to installation;
- tools and consumables required for fitting and installation;
- lubricants necessary for commissioning and maintenance.

It is mandatory to purchase and use only original spare parts or those recommended by the manufacturer.

Dismantling and assembly must be performed by qualified technicians and according to the manufacturer's instructions.

The use of non-original spare parts or incorrect assembly exonerates the manufacturer from all liability.

Requests for technical assistance and spare parts can be made directly to the nearest Munters office.

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