User Manual

Green
Field DC

Green Field DC

Climate Controller

Munters

Green Field DC

User Manual

Rev 1.1, 06/2024

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

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 Field DC!

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: June 2020

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

2 General

2.1 Keyboard

- Numeric– To enter values, quantities. Act as shortcuts to selections.
- +/– Key: Toggles between positive and negative values and marks check boxes option selection. In a History screen, use to toggle between quantities and time format.
- Arrows: Scroll up, down, left, and right to select menus.

- ![menu icon] : To main menu, also acts as "ESC" and "Back" keys.

- ![enter icon] : Enter menu, submenu, value, open window, confirm a value or change.

- ![info icon] : Access help screens and graphs.

- ![erase icon] : Erases typing mistake.

2.2 Hot Screens

Press MENU from Main Menu to see Read-Only overview running processes. Press MENU again to return to Main Menu

Nine Hot Screens/Keys:

0 Hot Key: Icon of active actions/processes

1: Main Screen/System Status

2: Irrigation Process

3: Irrigation Program Status

4: Water, EC/pH, Dosing

5: Filter Flushing Status

6: Temperature & Humidity measurement

7: Weather Station measurement

8: System Pressure

2.3 Main Menu Icons

Conduct manual irrigation process, filter flush, system pause

Set alarm threshold, and reset

Programs: irrigation regimen, dosing recipe, filter flushing, entire program

Data log- irrigation log, water meter, and system event log

1.Program	2.Manual	3.Alarm	4.History
5.Test	6.Setup	7.Config	8.Install

Manually test field devices (valves, pumps…), sensor values (EC, pH, temp, hum…)

For professional technical use only

System set-up, time/date, sensors calibration, unit measurements

For professional technical use only

2.4 Introduction

To set an irrigation program-regiment/strategy: the grower must select necessary valves and set Run Time and Dosing program. May define 1 or more programs for 1 or more valves.

Irrigation Programs

Valve Run time Programs

Dosing Programs

Irrigation Triggers
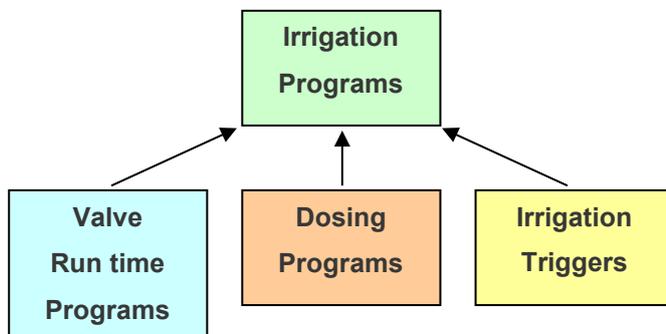
Run Time Programs–

- Based on Time or Quantity
- Set water *before* and *after* dosing process (fertilizer injection)

Dosing Programs (fertilization)

- Up to 8 dosing channels per program
- Dosing method per channel (Time, Quantity, EC/pH)

Irrigation Timing based on External Conditions

- Start/ Stop up to 2 Dry Contacts
- Start/End time for irrigation period
- Trigger Type

2.5 Operation Mode

There are three levels of operation:

- **Read Only (restricted):** All the parameters and menus are visible but cannot be modified.
- **User (partially restricted):** Menus 1-6 are fully accessible and can be modified. Menus 7 and 8 can be viewed but not modified.
- **Technician (unrestricted):** All menus are fully accessible (no restrictions).

To change the operation mode, press the **Mode** key
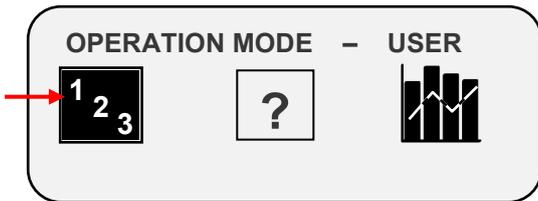
Press **ENTER** when the "**Mode**" icon is selected
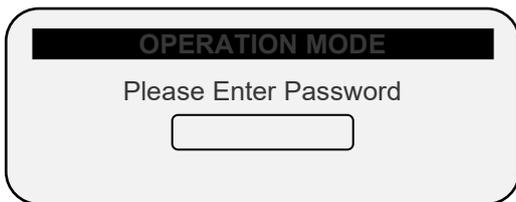
The controller recognizes the operation mode according to the password that is entered:

MODE	PASSWORD
Read Only	0000
User	9785 or 0101

If an incorrect password is entered, then this screen will appear:
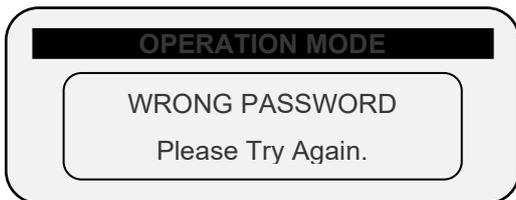
The Operation mode can be configured to automatically return to the "Read-Only" mode after a certain amount of time.

*NOTE Refer to the SYSTEM SETUP section in the **Installation Manual.***

SYSTEM SETUP		
HISTORY		
History Resolution	▶	1 HOUR
WEATHER STATION		
Controller Function	▶	LOCAL
OPERATION MODE		
Automatic return to RO mode	▶	NO
Return period to RO mode	▶	00:10
COMMUNICATION		
Controller Number	▶	1
Lower Port – Protocol	▶	GREEN NET
Lower Port – BaudRate	▶	9600
Upper Port – Protocol	▶	NONE
Upper Port – BaudRate	▶	9600

- In order to perform a **cold start** or **firmware upgrade**, the controller must be in the "**Technician**" mode.

- If there is a power failure, the controller will power up with the last mode that used.

3 Program

- Run Time Program
- Dosing Program
- Irrigation Based on Time
- Irrigation Based on External Condition (Field)
- Irrigation Based on Radiation Sum (Greenhouses)
- Irrigation Based on VPD Sum (Field)
- Agitator
- Selector
- Filter Flushing
- Cooling
- Misting
- Water Heating

3.1 Run Time Program

For every irrigation program, define a Run Time recipe.

1. Program

2. Water Run Time

- Based on Time/Qty
- Water Before and After Dosing Process

3.1.1 BASED ON TIME/QTY

Qty.

WATER RUN TIME PROGRAM				
#	Method	Water	Before	After
1	QTY.	10.000	0.000	0.000
2	QTY.	25.000	0.000	0.000
3	QTY.	0.000	0.000	0.000
4	QTY.	QTY.	0.000	0.000
5	QTY.	TIME	0.000	0.000
6	QTY.	0.000	0.000	0.000
7	QTY.	0.000	0.000	0.000
8	QTY.	0.000	0.000	0.000
9	QTY.	0.000	0.000	0.000
10	QTY.	0.000	0.000	0.000
11	QTY.	0.000	0.000	0.000

➡️ Define
Time

WATER RUN TIME PROGRAM				
#	Method	Water	Before	After
1	TIME	00:15:00	00:00:00	00:00:00
2	QTY.	25.000	0.000	0.000
3	QTY.	0.000	0.000	0.000
4	QTY.	0.000	0.000	0.000
5	QTY.	0.000	0.000	0.000
6	QTY.	0.000	0.000	0.000
7	QTY.	0.000	0.000	0.000
8	QTY.	0.000	0.000	0.000
9	QTY.	0.000	0.000	0.000
10	QTY.	0.000	0.000	0.000
11	QTY.	0.000	0.000	0.000

Define value for "before" and "after" time program

3.1.2 WATER BEFORE AND AFTER DOSING PROCESS

WATER RUN TIME PROGRAM				
#	Method	Water	Before	After
1	TIME	00:15:00	00:02:00	00:01:00
2	QTY.	25.000	5.000	5.000
3	QTY.	0.000	0.000	0.000
4	QTY.	0.000	0.000	0.000
5	QTY.	0.000	0.000	0.000
6	QTY.	0.000	0.000	0.000
7	QTY.	0.000	0.000	0.000
8	QTY.	0.000	0.000	0.000
9	QTY.	0.000	0.000	0.000
10	QTY.	0.000	0.000	0.000
11	QTY.	0.000	0.000	0.000

Water   Water + dosing   Water

2 min   12 min   1 min
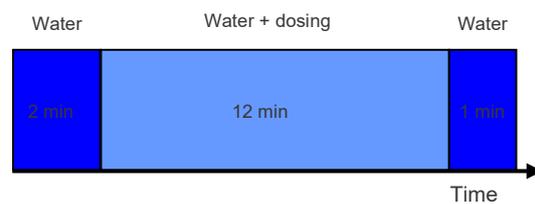
Time

NOTE Define total Time/Qty. Before and after deducted from total Time/Qty.

3.2 Dosing Program

For every irrigation program, define a Dosing recipe.
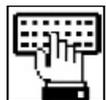
1. Program

3. Dosing

- Dosing Channel Definition
- Proportional Qty.
- Proportional Time
- Time
- Quantity
- Common Dosing Program for Open Fields (example)
- Controlled EC/pH based on P.Qty. (example)
- EC Pre-Control (example)

3.2.1 DOSING CHANNEL DEFINITION

NOTE Channel mode pre-configured by technician.

Channel   Define dosing method for specific channels (USA: Qty. = gallon)

3.2.2 PROPORTIONAL QTY.

NOTE 1/1000, Litre/m³, gallon/1000 gallons

```
              DOSING PROGRAM
  Program:     1

     INJECTION PER DOSING CHANNEL
  1          2          3          ---
  EC         EC         ACID       ---
  5.00       5.00       5.00       ---
  EC Dosing Method    P.QTY
  PH Dosing Method    P.QTY
```

5 liters (gallon) of fertilizer for every M³ (1000 gallon) of water
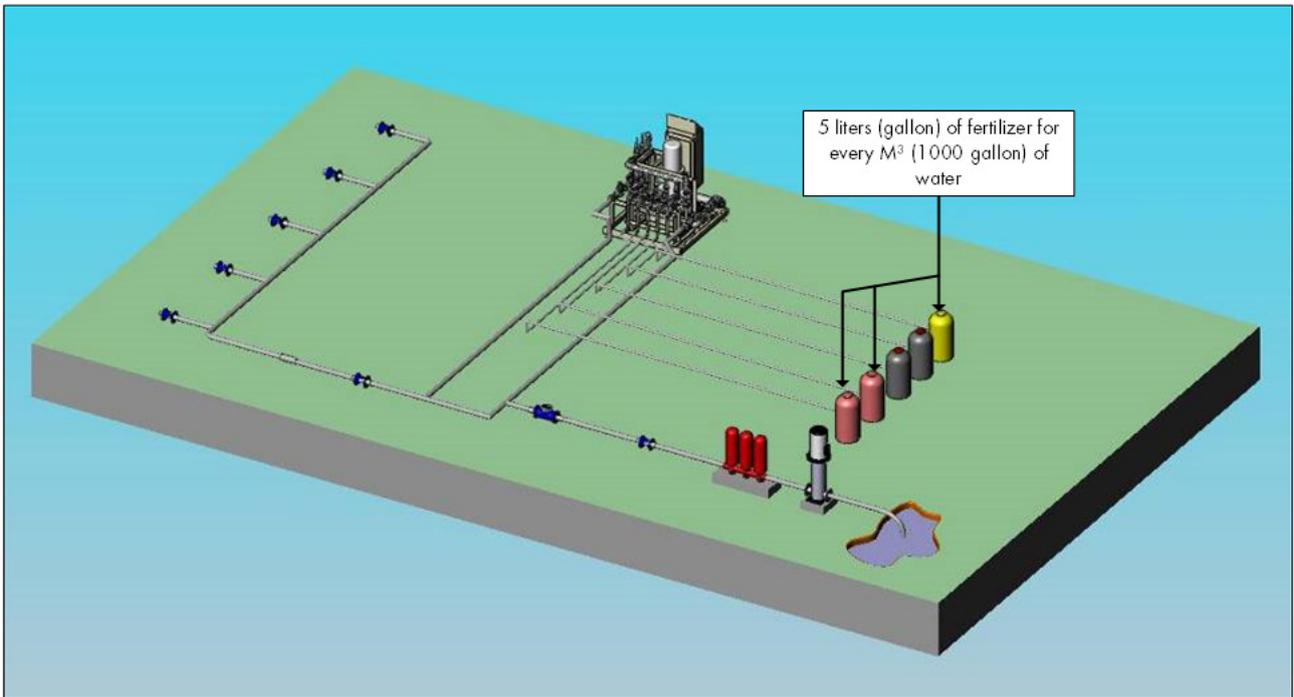
3.2.3 PROPORTIONAL TIME

P. Time

```
              DOSING PROGRAM
  Program:     1

     INJECTION PER DOSING CHANNEL
  1          2          3        P. QTY
  EC         EC         ACID     P. TIME
  00:00      00:00      0.00     TIME
  EC Dosing Method    P.TIME
  PH Dosing Method    P.QTY
```

Define minimum dose for each channel

DOSING PROGRAM			
Program: 1			
INJECTION PER DOSING CHANNEL			
1	2	3	---
EC	EC	ACID	---
00:10	00:10	00:05	---
EC Dosing Method		P.TIME	
PH Dosing Method		P.TIME	

Ex: Ch 1= P1+P2+P3…+Pn= 10 min.

Irrigation

P1 P2 P3 P4 P5 P6
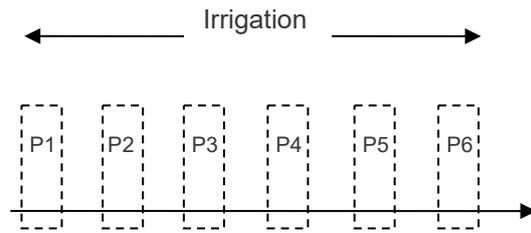
Time in pulses for Channel 1 or 2

NOTE Proportional Time= Take desired dosing time and spread out dose over irrigation program in open/close pulses per channel.

3.2.4 TIME

Time

DOSING PROGRAM			
Program: 1			
INJECTION PER DOSING CHANNEL			
	P. QTY	3	--
	P. TIME	ACID	-
00:	TIME	00:05	--
			-

Define in 1 bulk: Open for a set time straight through, i.e. not spread out over a defined program.

DOSING PROGRAM			
Program: 1			
INJECTION PER DOSING CHANNEL			
1	2	3	---
EC	EC	ACID	---
00:15	00:10	00:05	---
EC Dosing Method		TIME	
PH Dosing Method		TIME	

Irrigation

5 min

Ex: Ch 3= P1= 5 min. (1 pulse)
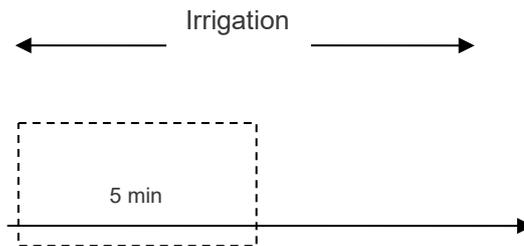
Time in bulk Channel 3

3.2.5 QUANTITY

NOTE Example shows liters, in USA use gallons.

Qty

DOSING PROGRAM			
Program: 1			
INJECTION PER DOSING CHANNEL			
1	2	3	---
EC	EC	ACID	---
4.00	5.00	2.00	---
EC Dosing Method		QTY.	
PH Dosing Method		QTY.	

- **Option A**: In Bulk (similar to Time above).

Irrigation
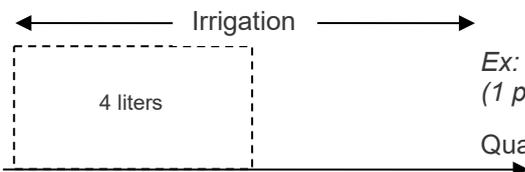
4 liters

Ex: Ch 1= P1= 4liters. (1 pulse)

Quantity in bulk Channel 1

- **Option B**: Spread Out (According to dosing configuration done by technician).

Irrigation

P1 P2 P3 P4 P5 P6

Ex: Ch 1= P1+P2+P3...+Pn= 4 litres.

Quantity in pulses

SELECT → Main Menu → [7.Config] → 7. Dosing Configuration

Define according to Bulk or Spread
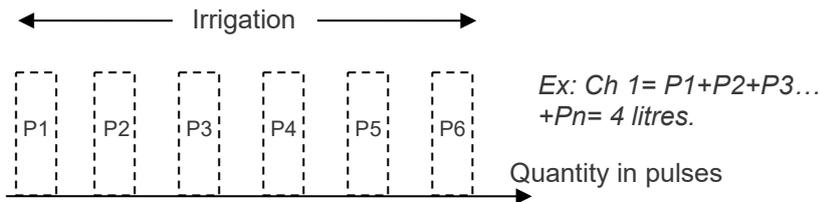
DOSING CONFIGURATION

EC Alarms ▶	NO
pH Alarms ▶	NO
Minimum On Time (sec)	1.0
Minimum Off Time (sec)	1.0
EC Coarse Tuning (0-10)	5
EC Fine Tuning (0-10)	5
pH Coarse Tuning (0-10)	5
pH Fine Tuning (0-10)	BULK
Control Cycle (sec)	SPREAD
EC/pH Averaging (0-Low, 20-High)	3
Dosing Boost. Off Delay (mm:ss)	00:10
Dosing by QTY. Method ▶	BULK

Back in Dosing Program menu, define Injection per Dosing Channel.

DOSING PROGRAM

Program: 1

INJECTION PER DOSING CHANNEL

1	2	3	---
EC	EC	ACID	---
4.00	5.00	2.00	---
EC Dosing Method	QTY.		
PH Dosing Method	QTY.		

3.2.6 COMMON DOSING PROGRAM FOR OPEN FIELDS (EXAMPLE)

DOSING PROGRAM

Program: 1

INJECTION PER DOSING CHANNEL

1	2	3	---
PASSIV	PASSIV	ACID	---
2.00	5.00	3.00	---
Target PH	5.50		
Passive Dosing Method	QTY.		
PH Dosing Method	P.QTY		

Fertilization (EC) amounts are fixed, no matter how much water goes through (channels 1 &2: Passive) pH is controlled at 5.50

Irrigation

Ch.2   P1   P2   P3   P4

Ch.1   P1 P2 P3 P4 P5 P6
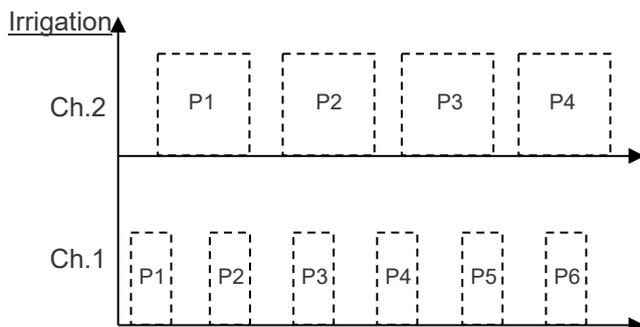
Ch. 1⇨ Spread Qty. = 2 liters
Ch. 2⇨ Spread Qty. = 5 liters

**Channel 3 (Acid channel): Pulse width fluctuates according to controller calculations depending on pH levels to keep it on target.

Irrigation
pH Dosing
by P. Qty.

P1   P2   P3

3 liter ⇨ 1m³
pH Target = 5.5
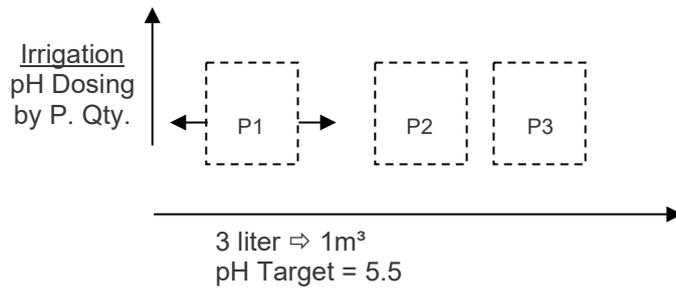
3.2.7 CONTROLLED EC/PH BASED ON P.QTY. (EXAMPLE)

Example A–

DOSING PROGRAM		
Program: 1		
INJECTION PER DOSING CHANNEL		
1	**2**	**3**
EC	EC	ACID
5.00	5.00	5.00
Target EC		1.50
Target PH		5.50
EC Dosing Method		P.QTY
PH Dosing Method		P.QTY

Example B

DOSING PROGRAM			
Program: 1			
INJECTION PER DOSING CHANNEL			
1	**2**	**3**	---
EC	EC	ACID	---
2.00	5.00	3.00	---
Target EC		1.50	
Target PH		5.50	
EC Dosing Method		P.QTY	
PH Dosing Method		P.QTY	

Define dosing program: Nutrient amount and desired EC/pH levels
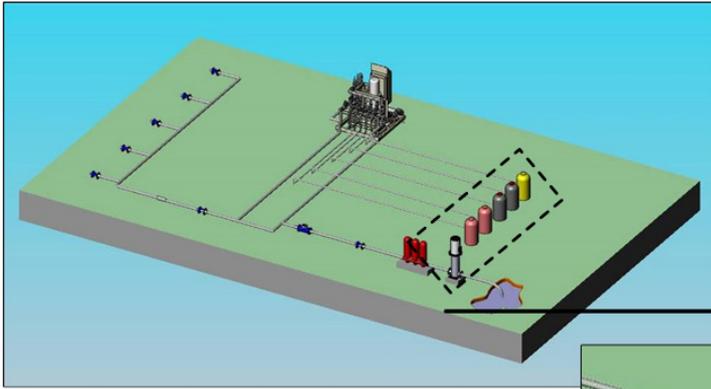
Controlled EC/pH Target
1.5 EC
5.5 pH

Ex.A
5 liters
(gallons)

Ex. B
3 liters
(gallons)

5 liters
(gallons)

5 liters
(gallons)

5 liters
(gallons)

2 liters
(gallons)
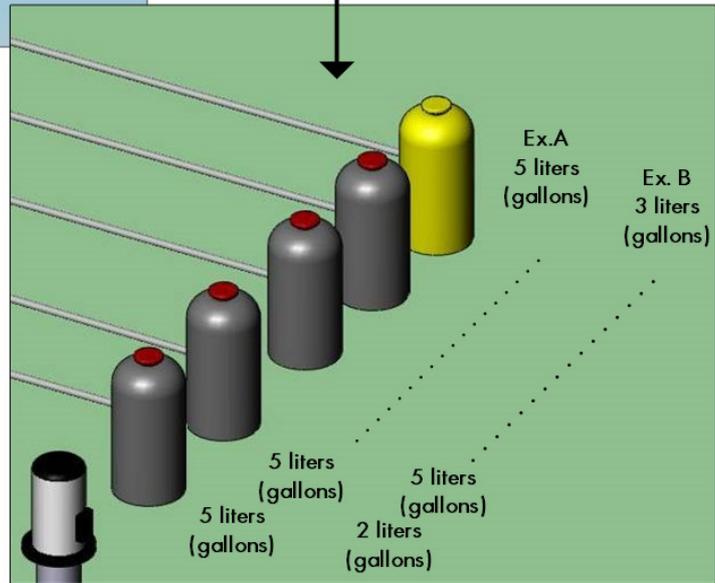
3.2.8 EC PRE-CONTROL (EXAMPLE)

NOTE Must be previously defined by technician

For hydraulic pre-control systems in greenhouses: When collecting excess water from drains, grower can set EC target before water goes through irrigation system. Discrepancies

EC Pre-Control ON
*Only if this was pre-defined by technician during installation.

DOSING PROGRAM			
Program: 1		EC Pre-Control: OFF	
INJECTION PER DOSING CHANNEL			
1	2	3	---
EC	EC	ACID	---
2.00	5.00	3.00	OFF
Target EC		1.50	ON
Target PH		5.50	
EC Dosing Method		P.QTY	
PH Dosing Method		P.QTY	

DOSING PROGRAM			
Program: 1		EC Pre-Control: ON	
INJECTION PER DOSING CHANNEL			
1	2	3	---
EC	EC	ACID	---
2.00	5.00	3.00	---
Target EC		1.50	
Target PH		5.50	
Target EC Pre-Control		-----	
EC Dosing Method		P.QTY	
PH Dosing Method		P.QTY	

Define pre-controlled EC target

DOSING PROGRAM			
Program: 1		EC Pre-Control: ON	
INJECTION PER DOSING CHANNEL			
1	2	3	---
EC	EC	ACID	---
2.00	5.00	3.00	---
Target EC		1.50	
Target PH		5.50	
Target EC Pre-Control		0.80	
EC Dosing Method		P.QTY	
PH Dosing Method		P.QTY	

Fresh Water

3-Way Valve

EC Sensor- Target 0.8

GreenJet Inlet

GreenJet

GreenJet Outlet

Drain Water
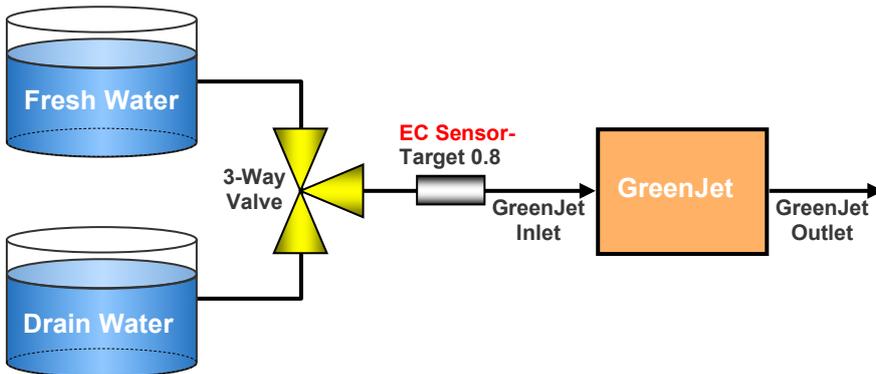
3.3 Irrigation Based on Time

SELECT

1. Program

➡ 1. Irrigation ➡ Select program ⬎

- Example 1: Single Valve
- Example 2: Group Valve
- Example 3: Group Valves and Individual Valve
- Example 4: Excess Radiation
- Example 5: Excess Rain
- Example 6: Days of Week

3.3.1 EXAMPLE 1: SINGLE VALVE

IRRIGATION PROGRAM			
Program: 4	Priority: --	Const.	0%
Start Time	08:00		
Clock Start	2		
Min. Time	01:00		
Valve #	001		
Run Time #	1		
Dosing Prog	1		
Day: 01/01	1		
Dose/Water	D		

Valve

V2

V1

Cycle 1   Cycle 2

8:00   9:00   10:00
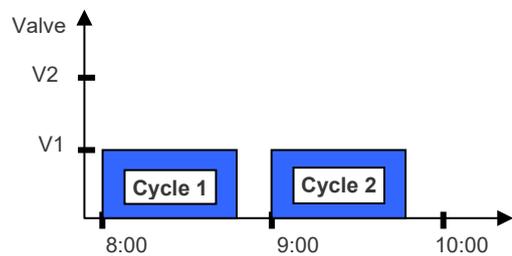
Irrigation program for one valve

NOTE Min. Time= Delay between cycles from start time to start time
Clock Start= Number of cycles

Valve 1: runs 2 cycles, 1 hour between start times on Run Time &
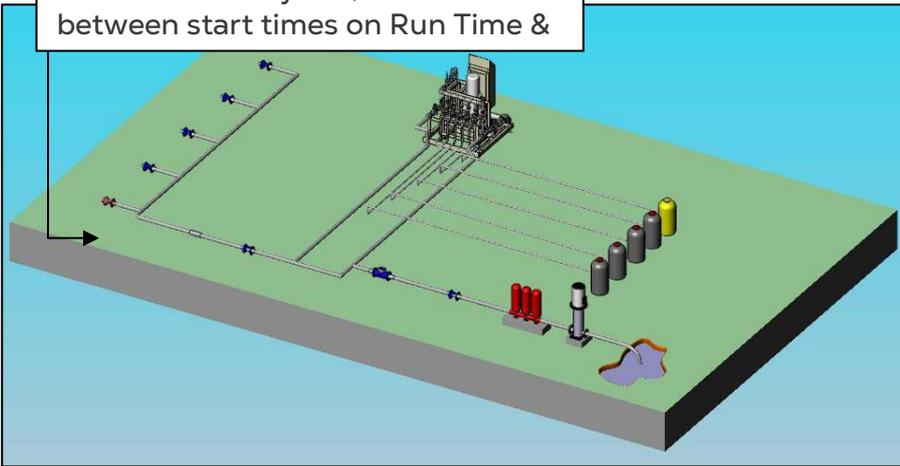
3.3.2 EXAMPLE 2: GROUP VALVE

DATE : 19-Apr-07		TIME : 16:12:32	
IRRIGATION PROGRAM			
Program: 4	Priority: --	Const. 0%	
Start Time	08:00		
Clock Start	2		
Min. Time	01:00		
Valve #	001+002		
Run Time #	1 1		
Dosing Prog	1 1		
Day: 01/01			
Dose/Water			

Irrigation program for a group of two valves
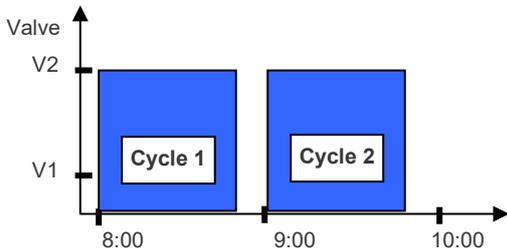
Valve 1 & 2– run 2 cycles, 1 hour between start times on Run Time &
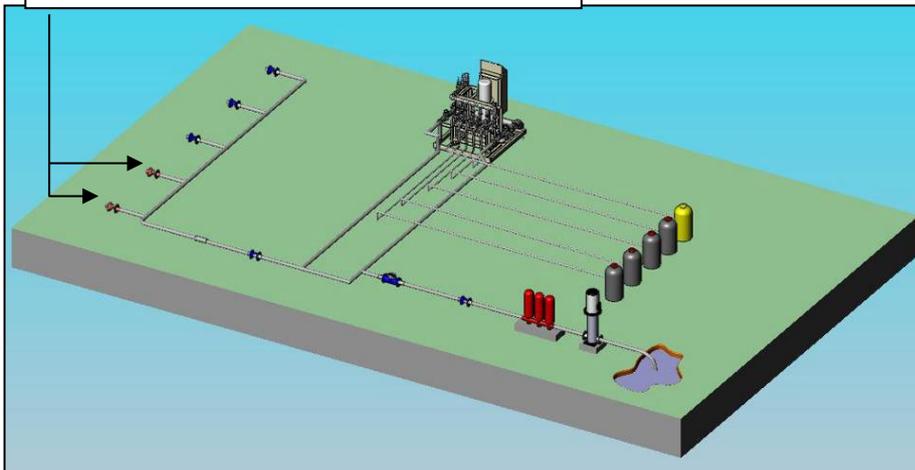
NOTE Min. Time= Delay between cycles from start to start   Clock Start= Number of cycles

3.3.3 EXAMPLE 3: GROUP VALVES AND INDIVIDUAL VALVE

DATE : 19-Apr-07	TIME : 16:12:32		
IRRIGATION PROGRAM			
Program: 4	Priority:	Const. 0%	
Start Time	08:00 10:30 12:30		
Clock Start	2 2 2		
Min. Time	01:00 00:30 1:00		
Valve #	001+002 003		
Run Time #	1 1 2		
Dosing Prog	1 1 2		
Day: 01/01	1 2 3		
Dose/Water	DWD		

Irrigation program for a group and individual valve

C1= cycle 1
C2= cycle 2
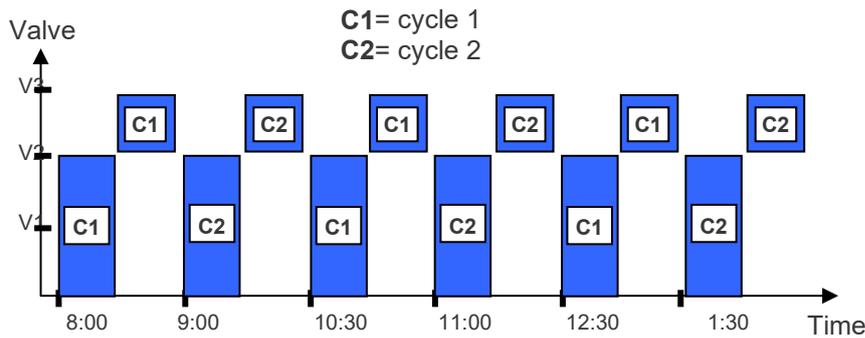
Valve 1 & 2– runs 6 cycles simultaneously on Run Time & Dosing Program 1, valve 3 runs after valves 1& 2 on Run time & Dosing Program 2,
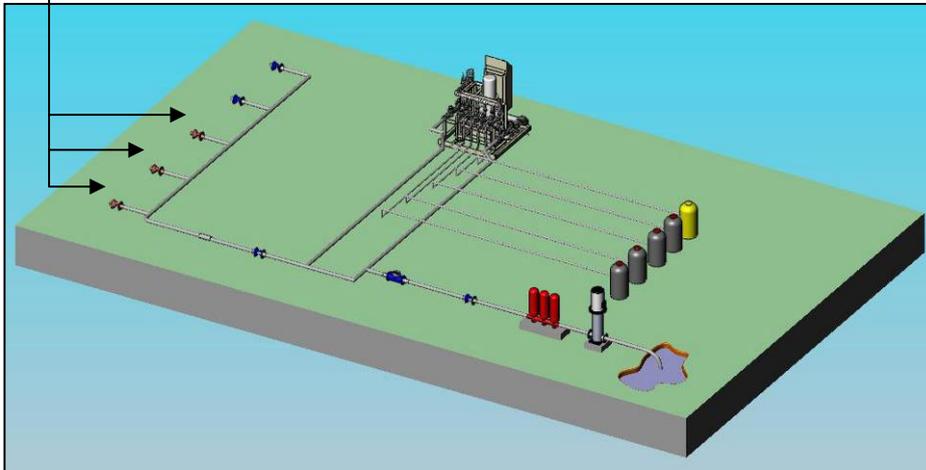
NOTE Different/interchangeable delays (multiple start time) dividing the day into periods

NOTE Min. Time= Delay between cycles from start to start
     Clock Start= Number of cycles in every period (start time)

Depending on weather conditions, increase/decrease amount of water emitted from valves without changing the program.

3.3.4 EXAMPLE 4: EXCESS RADIATION

DATE : 19-Apr-07	TIME : 16:12:32	
IRRIGATION PROGRAM		
Program: 4	Priority:-	Daily 20%
Start Time	08:00 10:30	
Clock Start	2 2	
Min. Time	01:00 00:30	
Valve #	001+002 003	
Run Time #	1 1 2	
Dosing Prog	1 2	
Day: 01/01	1 2 3	
Dose/Water	D W-	

If there's a lot of radiation, you want to irrigate more, +20%
(Regular 10min. runtime⇨12 min.)

NOTE   Daily = Current day only. Regular program will resume the following day.

3.3.5 EXAMPLE 5: EXCESS RAIN

DATE : 19-Apr-07	TIME : 16:12:32	
IRRIGATION PROGRAM		
Program: 4	Priority:--	Const. - 10%
Start Time	08:00 10:30	
Clock Start	2 2	
Min. Time	01:00 00:30	
Valve #	001+002 003	
Run Time #	1 1 2	
Dosing Prog	1 1 2	
Day: 01/01	1	
Dose/Water	D	

If there is bad weather, want to irrigate less, –10% (Regular 10min. runtime⇨9 min.)

NOTE Const.= Constant running of program on daily basis. May increase/decrease amount of water in this mode according to weather conditions.

3.3.6 EXAMPLE 6: DAYS OF WEEK

Select water/dosing program by days of week

DATE : 19-Apr-07	TIME : 16:12:32						
IRRIGATION PROGRAM							
Program: 4	Priority: --		Daily20%				
Start Time	08:00 10:30						
Clock Start	2 2						
Min. Time	01:00 00:30						
Valve #	001+002 003						
Run Time #	1 1 2						
Dosing Prog	1 1 2						
Day: 01/01	1	2	3	4	5	6	7
Dose/Water	D	D	D	D	D	D	D

Select program by days of week

S	M	T	W	TH	F	ST
X		X		X		X

OR

Choose cycle of days

<table>
<thead>
<tr><th colspan="2">DATE : 19-Apr-07</th><th>TIME :
16:12:32</th><th></th></tr>
<tr><th colspan="4">IRRIGATION PROGRAM</th></tr>
</thead>
<tbody>
<tr><td>Program: 4</td><td>Priority: --</td><td></td><td>Daily
20%</td></tr>
<tr><td>Start Time</td><td>08:00</td><td>10:30</td><td rowspan="2">Dose
Water</td></tr>
<tr><td>Clock Start</td><td>2</td><td>2</td></tr>
<tr><td>Min. Time</td><td>01:00</td><td>00:30</td><td></td></tr>
<tr><td>Valve #</td><td colspan="2">001+002 003</td><td></td></tr>
<tr><td>Run Time #</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>Dosing
Prog</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>Day: 01/01</td><td>1</td><td>2</td><td></td></tr>
<tr><td>Dose/Water</td><td>D</td><td>W-</td><td></td></tr>
</tbody>
</table>

<table>
<thead>
<tr><th colspan="4">DATE : 19-Apr-07   TIME : 16:12:32</th></tr>
<tr><th colspan="4">IRRIGATION PROGRAM</th></tr>
</thead>
<tbody>
<tr><td>Program: 4</td><td>Priority: --</td><td colspan="2">Daily 20%</td></tr>
<tr><td>Start Time</td><td>08:00</td><td>10:30 12:30</td><td>--:-</td></tr>
<tr><td>Clock Start</td><td>2</td><td>22 --</td><td></td></tr>
<tr><td>Min. Time</td><td>01:00</td><td>00:3001:00</td><td></td></tr>
<tr><td>Valve #</td><td colspan="2">001+002 003</td><td></td></tr>
<tr><td>Run Time #</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>Dosing Prog</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>Day: 01/01</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Dose/Water</td><td>D</td><td>W</td><td>-</td></tr>
</tbody>
</table>

D = Dosing + Water
W = Just Water
 - = Nothing

S	M	T	W	TH	F	ST
D	W	-	D	W	-	D

3.4   Irrigation Based on External Condition (Field)

To operate irrigation by peripheral equipment (i.e., filling a water tank according to level float switch)

SELECT

1. Program → 4. Ext. Condition → Set start/end time

EXTERNAL CONDITION PROGRAM

#	From hh:mm	To hh:mm	Start Dry Cont.
1	07:00	18:00	Dry Con 1
2	--:--	--:--	<NONE>
3	--:--	--:--	<NONE>
4	--:--	--:--	<NONE>
5	--:--	--:--	<NONE>
6	--:--	--:--	<NONE>
7	--:--	--:--	<NONE>
8	--:--	--:--	<NONE>
9	--:--	--:--	<NONE>
10	--:--	--:--	<NONE>

Select trigger type

EXTERNAL CONDITION PROGRAM

#	Start Dry Cont.	Trigger Type	Stop Dry Cont.
1	Dry Con 1	One Shot	Dry Con 2
2	<NONE>	One Shot	<NONE>
3	<NONE>	One Shot	<NONE>
4	<NONE>	One Shot	<NONE>
5	<NONE>	One Shot	<NONE>
6	<NONE>	One Shot	<NONE>
7	<NONE>	One Shot	<NONE>
8	<NONE>	One Shot	<NONE>
9	<NONE>	One Shot	<NONE>
10	<NONE>	One Shot	<NONE>

One Shot
Multi Shot
Only If On

Trigger Type: One Shot

Condition Input — On / Off
☐ = 6 sec

Irrigation Program — On / Off
Run Time | Run Time

Trigger Type: Multi Shot

Condition Input — On / Off

Irrigation Program — On / Off
Run Time | Run Time | Run Time | Run Time

Trigger Type: Only if ON

Condition Input — On / Off

Irrigation Program — On / Off
Run Time | Run Time

Trigger Type: Stop Dry Con.

Start Condition Input — On / Off

Stop Condition Input — On / Off

Irrigation Program — On / Off
Run Time | Run Time

→ Select dry contact (pre-defined by technician) to start/stop condition and set limit

EXTERNAL CONDITION PROGRAM

#	Start Dry Cont.	Trigger Type	Stop Dry Cont.
1	Dry Con 1	One Shot	Dry Con 2
2	<NONE>	One Shot	<NONE>
3	<NONE>	One Shot	<NONE>
4	<NONE>	One Shot	<NONE>
5	<NONE>	One Shot	<NONE>
6	<NONE>	One Shot	<NONE>
7	<NONE>	One Shot	<NONE>
8	<NONE>	One Shot	<NONE>
9	<NONE>	One Shot	<NONE>
10	<NONE>	One Shot	<NONE>

SELECT

1. Program

1. Irrigation

DATE : 1-May-07 TIME : 10:12:09			
IRRIGATION PROGRAM			
Program: 2	Priority: --	Cond. 1	
Start Time	08:00		
Clock Start	--		
Con. Starts	ON		
Min. Time	--:--		
Max. Time	--:--		
Valve #	004		
Run Time #	2		
Dosing Prog	2		

Start/Stop Irrigation by Dry

Start Condition Input — On / Off
Stop Condition Input — On / Off
Irrigation Program — On / Off — Run Time
8:00
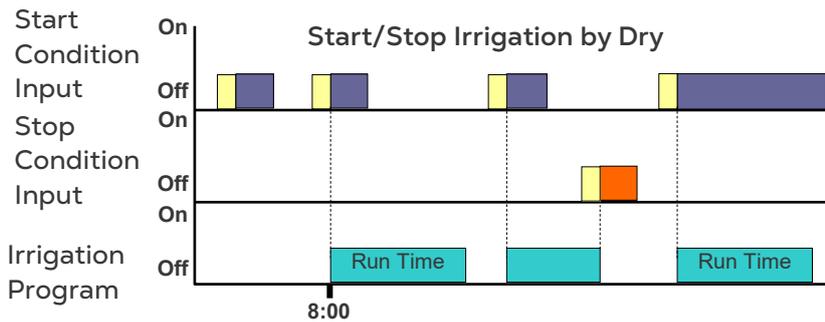
Example of tank filling:
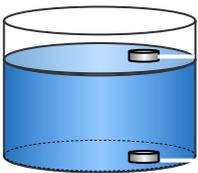
Dry contact 2
Dry contact 1

Water Tank with Floats

Start Condition — On / Off
Stop Condition — On / Off
Irrigation Program — On / Off
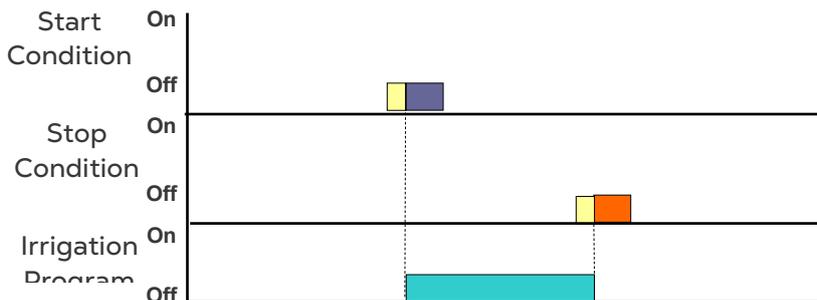
Trigger Type: Stop Dry Con.

3.5 Irrigation Based on Radiation Sum (Greenhouses)

Set trigger-based radiation sum limit Joul/cm²=Energy.

1. Program → 1. Irrigation →

DATE : 1-May-07	TIME :	10:12:09		
IRRIGATION PROGRAM				
Program: 1	Priority:	--		Rad Sum
Start Time	07:00	08:00	10:00	16:00
Clock Start	1	--	--	1
Rad Sum Li.	----	300	150	Const.
Min. Time	--:--	00:30	00:20	Daily
Max. Time	--:--	--:--	--:--	Cond.
Valve #	001			**Rad Sum**
Run Time #	1			
Dosing Prog	1			

→ Set start/end time
Rad. Sum limit
Set min./max. resting time
Select program

DATE : 1-May-07	TIME :	10:12:09		
IRRIGATION PROGRAM				
Program: 1	Priority:	--		Rad Sum
Start Time	07:00	08:00	10:00	16:00
Clock Start	1	--	--	--
Rad Sum Li.	----	300	150	----
Min. Time	--:--	00:30	00:20	--:--
Max. Time	--:--	01:00	01:00	--:--
Valve #		001		
Run Time #	1			
Dosing Prog	1			

NOTE Start Time= When to begin measuring radiation levels to implement irrigation program. Min. rest time most important so as to not irrigate too often when radiation levels fluctuate. In this example, 8:00-10:00 irrigation should occur at most every 30 min. when radiation hits 300joules/cm².Max. rest time here indicates that irrigation must occur at least every hour if there is less radiation.

Rad. Sum limit 300 Rad. Sum limit 150

● Irrigation by clock start at 7:00
● Irrigation by radiation sum
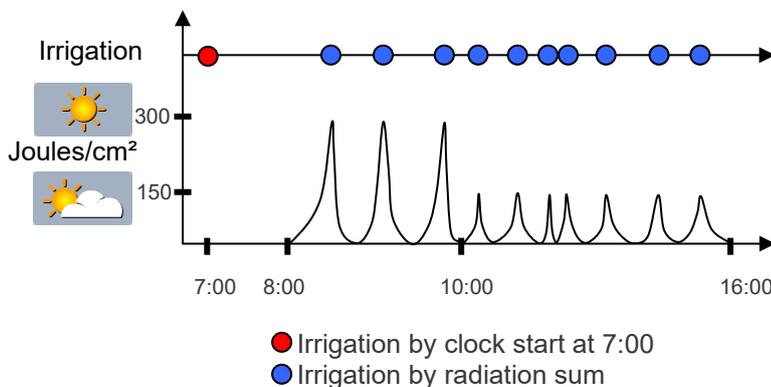
3.6 Irrigation Based on VPD Sum (Field)

Set trigger based VPD sum limit kPa•min. The VPD behavior throughout the daytime is similar to the behavior of ET, therefore using the VPD Sum will allow for irrigation as if ET calculations were being used.

1. Irrigation

1. Program

DATE : 1-May-07 TIME : 10:12:09				
IRRIGATION PROGRAM				
Program: 1	Priority: --		VPD Su	
Start Time	07:00	08:00	10:00	16:
Clock Start	1	--	--	1
Rad Sum Li.	----	300	150	----
Min. Time	--:--	00:30	00:20	--:--
Max. Time	--:--	--:--	--:--	--:--
Valve #		001		
Run Time #	1			
Dosing Prog	1			

(Daily Cond. / Rad Sum / VPD Sum)

Set period Start time
VPD Sum limit
Set min./max. resting time
Select program

DATE : 1-May-07 TIME : 10:12:09				
IRRIGATION PROGRAM				
Program: 1	Priority: --		VPD Sum	
Start Time	07:00	08:00	10:00	16:00
Clock Start	1	--	--	--
VPD Sum Li.	----	300	150	----
Min. Time	--:--	00:30	00:20	--:--
Max. Time	--:--	01:00	01:00	--:--
Valve #	001			
Run Time #	1			
Dosing Prog	1			
For Next Screen Press The DOWN Arrow				

- Irrigation based on VPD Sum is available for operation only during the VPD time frame. Refer to the **6.1 SETUP – TIME & DATE** for defining the start and end time for VPD Sum.
- **Start Time:** define the time of day in which the irrigation based on VPD Sum should begin for the period (next period overrides the previous)
- **Clock Start:** define the number of cycles per **Start Time** (period)
- **VPD Sum Limit:** define the VPD Sum trigger for irrigation to begin

NOTE NOTE: after irrigation, the VPD Sum counter will reset. In cases where the limit was achieved but the minimum time between irrigation was not, the counter continues summing until irrigation and will re-calculate after the irrigation in this manner:

- *VPD SUM counter = VPD SUM counter – VPD SUM LIMIT*
- **Minimum Time:** define the minimum amount of time between cycles
- **Maximum Time:** define the maximum amount of time without an irrigation cycle
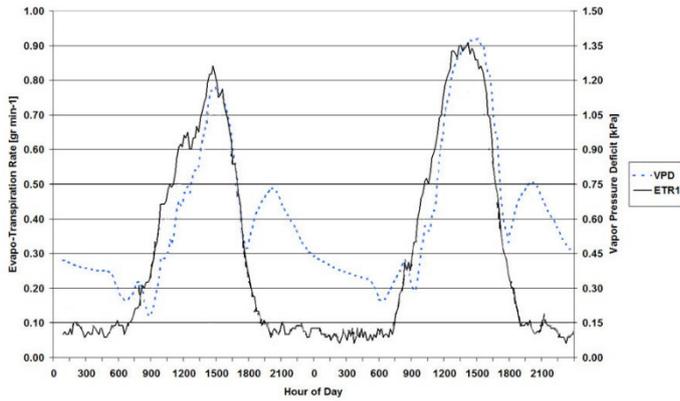
EXAMPLE ONLY!

*NOTE **IMPORTANT**: Each Climate zone has different VPD values. It is critical for the grower to learn the VPD values of their specific area to properly use the Irrigation Program based on the VPD Sum.*

3.7 Agitator

To operate fertilizer tanks with mixing devices:

    → 5. Agitator

AGITATOR		
	On mm:ss	Off mm:ss
Dosing Active	--:--	--:--
Dosing Not Active	--:--	--:--
Operation Mode	Parallel	

Define On/Off time during dosing and when system is idle
 Select Parallel to operate +1 Agitator simultaneously.
 Select Serial if not enough power to operate +1 agitator at a time.

AGITATOR		
	On mm:ss	Off mm:ss
Dosing Active	01:00	05:00
Dosing Not Active	05:00	60:00
Operation Mode	Parallel	

Parallel
Serial

OR

AGITATOR		
	On mm:ss	Off mm:ss
Dosing Active	01:00	05:00
Dosing Not Active	05:00	60:00
Operation Mode	Parallel	

AGITATOR		
	On mm:ss	Off mm:ss
Dosing Active	01:00	05:00
Dosing Not Active	05:00	60:00
Operation Mode	Serial	

3.8 Selector

+1 fertilizer tank (with different fertilizers) attached to a single dosing channel

1. Program

Dos. Chan. 1 / Dos. Chan. 2
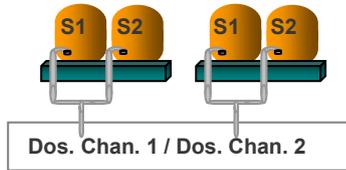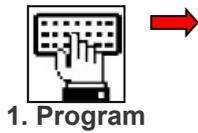
SELECTOR		
Dosing Prog.	**S1**	**S2**
1	✓	▪
2	▪	✓
3	▪	▪
4	▪	▪
5	▪	▪
6	▪	▪
7	▪	▪
8	▪	▪
9	▪	▪
10	▪	▪

3.9 Filter Flushing

Program filter flushing during irrigation process
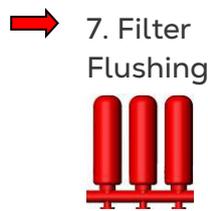
1. Program → **7. Filter Flushing**

FILTER FLUSHING PROGRAM	
Time Between Flushing (hh:mm)	02:00
Flushing Time (mm:ss)	00:10
Delay Between Filters (mm:ss)	00:05
Delta Pressure (Digital)	YES
Delta Pressure Valve (bar)	0.5
Delay Delta Pressure (mm:ss)	00:06
Delta Pressure Reiteration	3
Dwell Time Main (mm:ss)	00:10

NOTE Filter flush process can start only after main water line is full. Default set at 1 min., see menu 3.3.

ALARM DEFINITION	
Water Fill Up (min)	
Water Leak (m3)	
Water Leak Period (hh:mm)	
Identify Leak-Subtr. Meter? ▶	
Dosing Channel Leak Delay(s)	
Dosing Channel Leak (Pulse)	
Dosing Flow Difference (%)	
Missing Pulses For No Flow	
Stop System Cons.Flow Alarms	
# of Irrig. Without Drainage	
Low Pressure Alarm (bar)	
No. Of Short Circ. To Pause	

NOTE See graph on next page for further information.

Item	Description
Time Between Flushing	Time between flushes accumulated during set irrigation time (one filter flush a time).
Flush Time	Flush time per filter.
Delay Between Filters	Set delay between flushes to build up pressure.
Delta Pressure	Set flush by pressure sensor. Pressure at filter inlet/outlet, if there is a significant difference, a filter may be blocked.

Item	Description
Delta Pressure Value (sensor)	If there is a differential, (DP signal or Analog DP value), a flush is needed.
Delta Pressure Delay	Set delay to verify if there is a definite blockage.
Delta Pressure Reiteration	Set to give signal after XX flushes. If Delta Pressure still indicates a blockage, an alarm will be raised.
Dwell Time Main	Open main filter valve before flush to balance pressure for a reliable flushing process.

FILTER FLUSHING PROGRAM

Time Between Flushing (hh:mm)	02:00
Flushing Time (mm:ss)	00:10
Delay Between Filters (mm:ss)	00:05
Delta Pressure (Digital)	YES
Delta Pressure Valve (bar)	0.5
Delay Delta Pressure (mm:ss)	00:06
Delta Pressure Reiteration	3
Dwell Time Main (mm:ss)	00:10

Start Time

1 hr Irrigation   Delay   1 hr Irrigation

8:00   9:00   10:00   11:00   3:00

After 2 hours of water flowing through filters, flush every filter for 10 seconds.

Trigger

Flush Process

Trigger

Flush Time/Delay Between Filters

Flush 1   Flush 2   Flush 3

5 sec. Delay   10 sec.   5 sec. Delay   10 sec.

10 seconds of flushing with 5 second delay between flushes/filters.

Dwell Time Main

10 sec. Dwell Time   Flush 1...
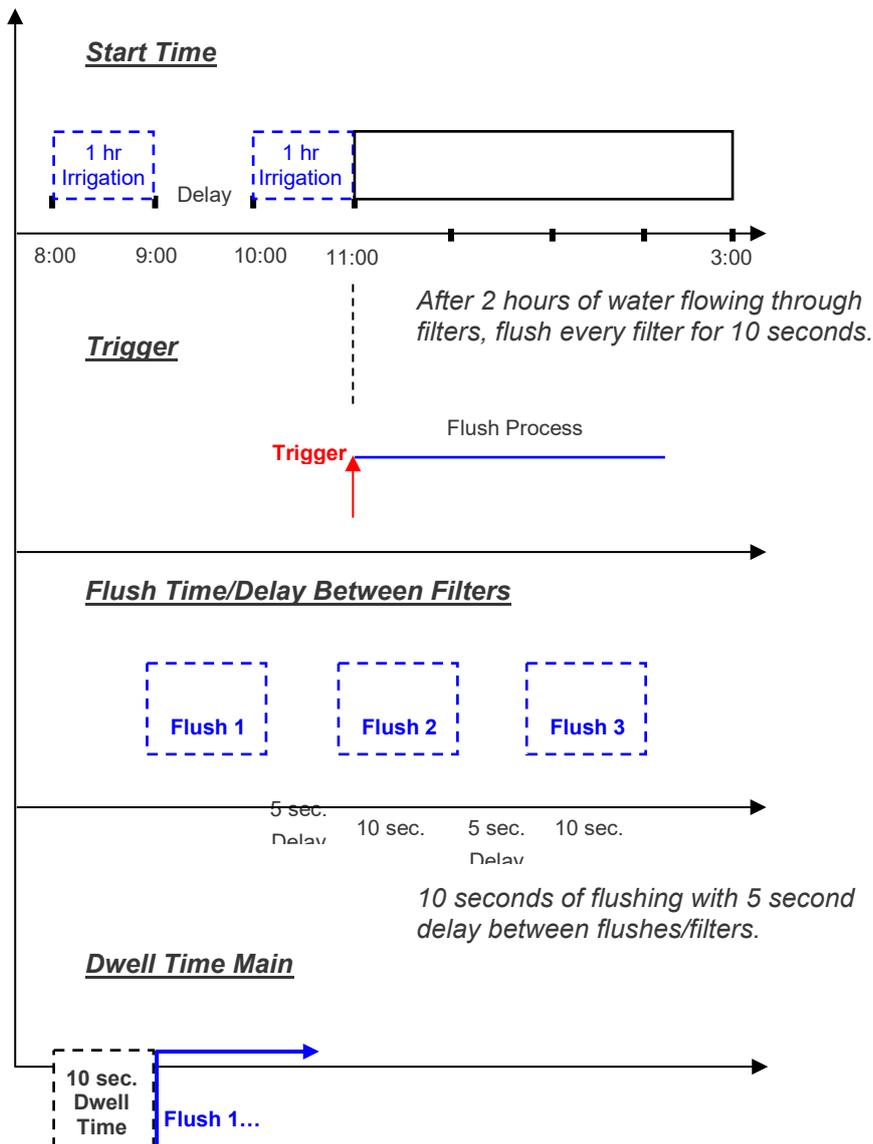
Delta Pressure Reiteration
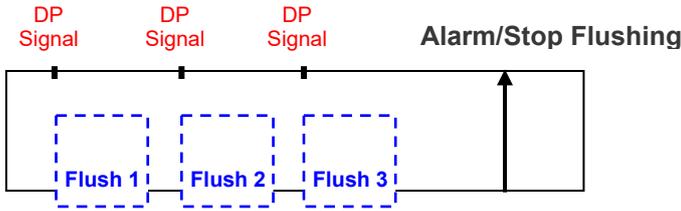
After 3 flushes, if Delta Pressure shows a blockage, system will raise an alarm.

3.10 Cooling

Set cooling program for cooling/humidification process in greenhouses. This program will operate according to temperature, humidity or time (to reduce temp, increase hum.).

SELECT ➡ **1. Program** ➡ 8. Cooling ➡ Set On/Off time and select sensors

Temp. Sens. 1
Hum. Sens. 1

COOLING/HUMIDIFICATION PROGRAM			
Program: 1		**Status: Cooling**	
	Below RH	**On**	**Off**
1	80	00:00:10	00:00:10
2	---	--:--:--	--:--:--
Cool#	1 2 - - - - - - - -		
Temp. Sens.: 1		**Hum. Sens.: 1 -**	

OR

+1 of each sensor: uses average of both

COOLING/HUMIDIFICATION PROGRAM			
Program: 1		**Status: Cooling**	
	Below RH	**On**	**Off**
1	80	00:00:10	00:00:10
2	---	--:--:--	--:--:--
Cool#	1 2 - - - - - - - -		
Temp. Sens.: 1 2		**Hum. Sens.: 1 2**	

Dynamic cooling: 2 temp. threshold, same Hum.

COOLING/HUMIDIFICATION PROGRAM			
Program: 1		**Status: Cooling**	
	From	**To**	**Above t°**
1	08:00	16:00	25.0
2	08:00	16:00	35.0
Cool#	1 2 - - - - - - - -		
Temp. Sens.: 1 2		**Hum. Sens.: 1 2**	

➡

COOLING/HUMIDIFICATION PROGRAM			
Program: 1		**Status: Cooling**	
	To	**Above t°**	**Below RH**
1	16:00	25.0	80
2	16:00	35.0	80
Cool#	1 2 - - - - - - - -		
Temp. Sens.: 1 2		**Hum. Sens.: 1 2**	

COOLING/HUMIDIFICATION PROGRAM			
Program: 1		**Status: Cooling**	
	Below RH	**On**	**Off**
1	80	00:00:10	00:00:10
2	80	00:00:10	00:00:05
Cool#	1 2 - - - - - - -		
Temp. Sens.: 1 --		**Hum. Sens.: 1 --**	

On time is set.
Off time can be controlled according to temp.
High temp.= less off time
Low temp.= more off time
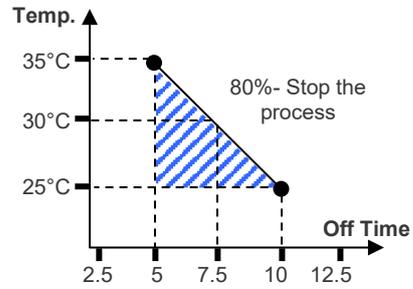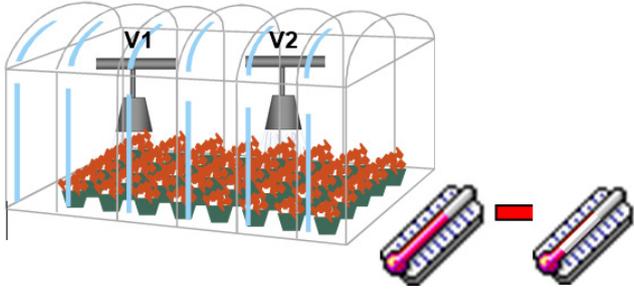
3.11 Misting

General program using a timer.

 SELECT   **1. Program**   ➡ 9. Misting

MISTING PROGRAM					
#	**No.**	**Start hh:mm**	**End hh:mm**	**On hh:mm:ss**	**Off hh:mm:ss**
1	1	08:00	16:00	00:00:10	00:00:05
2	--	--:--	--:--	--:--:--	--:--:--
3	--	--:--	--:--	--:--:--	--:--:--
4	--	--:--	--:--	--:--:--	--:--:--
5	--	--:--	--:--	--:--:--	--:--:--
6	--	--:--	--:--	--:--:--	--:--:--
7	--	--:--	--:--	--:--:--	--:--:--
8	--	--:--	--:--	--:--:--	--:--:--
9	--	--:--	--:--	--:--:--	--:--:--
10	--	--:--	--:--	--:--:--	--:--:--

➡ Define Start/End time
Define misting On/Off time

3.12 Water Heating

Heat water in cold areas/seasons.

 SELECT   **1. Program**   ➡️   10. Water Heating

WATER HEATING	
From Time	08:00
To Time	16:00
Water Temperature	20.0
Difference	2.0
Temp. Sensor #1	1
Temp. Sensor #2	2

➡️   Define Start/End time
Define Water Temp. ± Difference (dead band) to stop
Define sensors

ON↑ /OFF↓

16 18 20 22 24   °C

Temperature
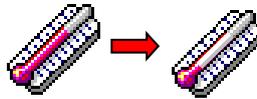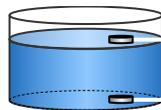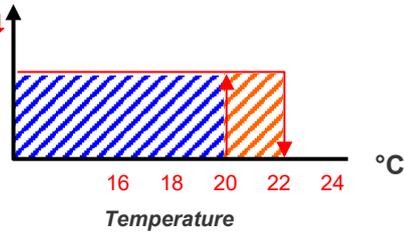
Cold
Hot

4 Manual

- System Pause
- Start/Stop Program
- Start/Stop Valve
- Manual Filter Flush

4.1 System Pause

Manually pause system during an irrigation program (EC/pH calibration, fix pipes...).

SELECT

2. Manual

1. Irrigation pause

IRRIGATION PAUSE		
Pause Irrigation?	NO	YES
	YES	

IRRIGATION PAUSE

Menu

To resume, reverse steps above and select NO.

ACTIVE IRRIGATION			
	SET	ACTUAL	LEFT
CYCLE	0	0	0
WATER	00:15:00	00:01:00	00:14:01
FLOW	100.000	0.000	
EC	1.5	4.5	
Ph	5.5	3.3	

STATUS	ACTIVE
PROGRAM: PAUSE	■
15:38:16	IRRIGATION
VALVE: 125-Apr-07	☐ DOSING
3 MESSAGES	☐ FILTER
(2) EC Low Valve #1	☐
	COOLING
	■ ALARM

4.2 Start/Stop Program

Manually start/stop a program.
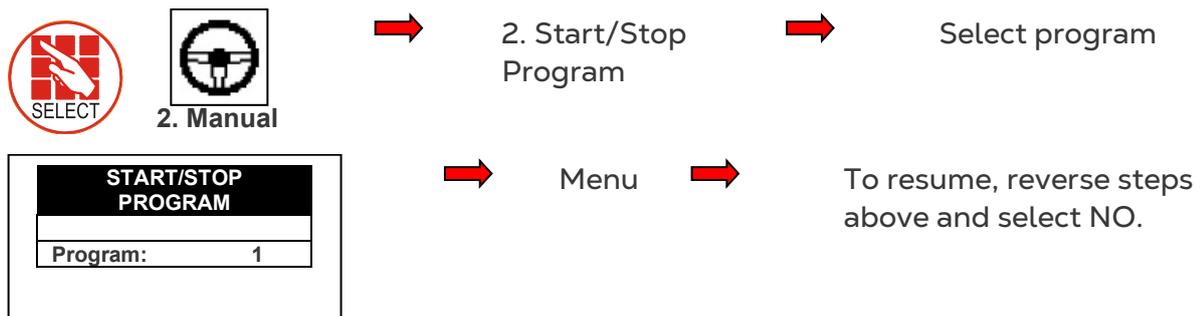
SELECT

2. Manual

2. Start/Stop Program

Select program

START/STOP PROGRAM
Program: 1

Menu

To resume, reverse steps above and select NO.

DATE : 1-May-07 TIME : 10:12:09				
IRRIGATION PROGRAM				
Program: 1	Priority: --		Rad Sum	
Start Time	07:00	08:00	10:00	13:00
Clock Start	1	--	--	--
Rad Sum Li.	----	300	150	300
Min. Time	--:--	00:30	00:20	00:30
Max. Time	--:--	01:00	01:00	01:00
Valve #	001			
Run Time #	1			
Dosing Prog	1			

4.3 Start/Stop Valve

Manually start/stop a valve

SELECT → (2. Manual) → 3. Start/Stop Valve → Select Valve and corresponding Run Time/Dosing program

START/STOP VALVE	
Valve	2
Run Time #	1
Dosing Program	1

→ Menu → Yes

To resume, reverse steps above and select NO.

START/STOP VALVE	
Valve	1
Run Time #	1
Dosing Program	1

Run Time Program (1)

WATER RUN TIME PROGRAM				
#	Method	Water	Before	After
1	TIME	00:10:00	00:00:00	00:00:00
2	QTY.	0.000	0.000	0.000
3	QTY.	0.000	0.000	0.000
4	QTY.	0.000	0.000	0.000
5	QTY.	0.000	0.000	0.000
6	QTY.	0.000	0.000	0.000
7	QTY.	0.000	0.000	0.000
8	QTY.	0.000	0.000	0.000
9	QTY.	0.000	0.000	0.000
10	QTY.	0.000	0.000	0.000
11	QTY.	0.000	0.000	0.000

Dosing Program (1)

DOSING PROGRAM				
Program: 1				
INJECTION PER DOSING CHANNEL				
1	2	3	4	5
EC	EC	EC	EC	ACID
5.00	5.00	5.00	5.00	3.00
Target EC			1.60	
Target PH			5.50	
EC Dosing Method			P.QTY	
PH Dosing Method			P.QTY	

4.4 Manual Filter Flush

Manual filter flush only when system is irrigating

SELECT → (steering wheel icon) 2. Manual → 4. Filter Flush → Select filters (usually all)

MANUAL FILTER FLUSHING

Which Filter	<None>

<None>
All Filters
Filter 01
Filter 02

→

MANUAL FILTER FLUSHING

Which Filter to Flush?	All Filters

→ Yes → Menu → Hot Screen 5 to view flushing status

FILTER FLUSHING STATUS

Item	
Flush Status	ON
Time To Nest Flush	--:--:--
Delta Pressure (Digital)	OFF
Flushing Filter No.	1
Remaining Filters Qty.	1
Flush Time	00:07
Current Delta Pressure	----
Main Filter Delay	00:00:00

NOTE "All Filters" means all filter's but 1 at a time. No more than 1 filter may be flushed at a time.

NOTE Filter flush process can start only after main water line is full. Default is 1min. as shown in picture below (See menu 3.3

ALARM DEFINITION

Water Fill Up (min)	1
Water Leak (m3)	1.000
Water Leak Period (hh:mm)	00:30
Identify Leak-Subtr. Meter? ▶	NO
Dosing Channel Leak Delay(s)	3
Dosing Channel Leak (Pulse)	10
Dosing Flow Difference (%)	25
Missing Pulses For No Flow	10
Stop System Cons.Flow Alarms	--
# of Irrig. Without Drainage	3
Low Pressure Alarm (bar)	2.5
No. Of Short Circ. To Pause	3

5 Alarm

- Reset
- Alarm History
- Alarm Definition
- Alarm Setting
- EC/pH Alarm Definition
- EC/pH Alarm Setting
- Radio System Alarm Definition
- Radio System Alarm View
- SMS Subscription

5.1   Reset

Reset alarm (in case of high flow, low flow, water leak, fertilizer leak...)

SELECT ➡ **3. Alarm** ➡ 1. Alarm Reset ➡ Option A: Reset manually

ALARM RESET			
Reset Now? ▶		No	
Period Of Automatic Reset ▶		24 h	
Complete Irrig. On Reset? ▶		YES	
ACTIVE ALARMS			
No.	Message	Date	Time
1	High Flow Valve #1	25/Apr	15:49

➡

ALARM RESET			
Reset Now? ▶		No	
Period Of Automatic Reset ▶		NO	
Complete Irrig. On Reset? ▶		YES	
ACTIVE ALARMS			
No.	Message	Date	Time
1	High Flow Valve #1	25/Apr	15:49

➡ Yes

Option B: Automatic reset to check itself every so often as desired:

- ⇨ Select how often system should reset itself.

➡

ALARM RESET			
Reset Now? ▶		No	24 h
Period Of Automatic Reset ▶		24 h	12 h
Complete Irrig. On Reset? ▶		YES	6 h
ACTIVE ALARMS			4 h
No.	Message	Date	Time / 3 h

➡️ "Complete Irrig. On Reset?" Select Yes or No

ALARM RESET		
Reset Now? ▶		No
Period Of Automatic Reset ▶		24 h
Complete Irrig. On Reset? ▶		YES

ACTIVE ALARMS			
No.	Message	Date	Time

5.2 Alarm History

View alarm history (Read-Only)

SELECT → **3. Alarm** ➡️ 2. History

ALARM HISTORY			
No.	Message	Date	Time
112	EC Low Valve # 1	25/Apr	13:43
113	EC Low Valve # 1	25/Apr	13:44
114	High Flow Valve # 4	25/Apr	14:26
115	Emergency pH Low	25/Apr	14:44
116	Emergency EC High	25/Apr	15:46
117	High Flow Valve # 1	25/Apr	15:49
118	High Flow Valve # 1	25/Apr	15:52
119	High Flow Valve # 4	25/Apr	15:53
120	High Flow Valve # 1	25/Apr	15:54
121	High Flow Valve # 1	25/Apr	15:55

NOTE Logs up to 250 alarms

5.3 Alarm Definition

Define system thresholds.
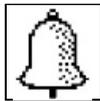
SELECT **3. Alarm** ➡️ 3. Alarm Definition

➡️ Define trigger: deviation from target pressure, flow.

ALARM DEFINITION	
Water Fill Up (min)	1
Water Leak (m3)	1.000
Water Leak Period (hh:mm)	00:30
Identify Leak-Subtr. Meter? ▶	NO
Dosing Channel Leak Delay(s)	3
Dosing Channel Leak (Pulse)	10
Dosing Flow Difference (%)	25
Missing Pulses For No Flow	10
Stop System Cons.Flow Alarms	--
# of Irrig. Without Drainage	3
Low Pressure Alarm (bar)	2.5
No. Of Short Circ. To Pause	3

➡️

ALARM DEFINITION	
Dosing Channel Leak Delay(s)	3
Dosing Channel Leak (Pulse)	10
Dosing Flow Difference (%)	25
Missing Pulses For No Flow	10
Stop System Cons. Flow Alarms	3
# of Irrig. Without Drainage	3
Low Pressure Alarm (bar)	2.5
No. Of Shor Cir. To Pause	3
Short Output Level (60-350)	300
Short O. Level EXP1 (60-350)	300
Short O. Level EXP2 (60-350)	300
Short O. Level EXP3 (60-350)	300

Item	Description
Water Fill Up (min)	Time of filling the main irrigation line. In that time, the system will ignore high flow alarm and won't implement a filter flushing process.

Item	Description
Water Leak (m3 or Gal)	Quantity of water leaking while the system is in idle.
Water Leak Period (hh:mm)	Time frame to measure the water leak quantity. Example: 1m^3 was leaking in less than 30min.
Identify Leak–Subtr. Meter?	This setting relevant only when working in "Water source" method. User can ignore or identify a water leak.
Dosing Channel Leak Delay (s)	Delay between switching off a dosing channel and generating dosing leak alarm.
Dosing Channel Leak (Pulse)	Number of pulses (by dosing meter) during the delay above to generate an alarm. Example; 10 pulses in 3 seconds will generate alarm.
Dosing Flow Difference (%)	Difference between calculated and measured dosing channel flow. Example: Dosing Channel 1 defined by technician as 100liter/hour, but if the system measured less than 75liter/hour or more than 125liter/hour, an alarm will be generated.

ALARM DEFINITION	
Water Fill Up (min)	1
Water Leak (m3)	1.000
Water Leak Period (hh:mm)	00:30
Identify Leak-Subtr. Meter? ▶	NO
Dosing Channel Leak Delay(s)	3
Dosing Channel Leak (Pulse)	10
Dosing Flow Difference (%)	25
Missing Pulses For No Flow	10
Stop System Cons.Flow Alarms	--
# of Irrig. Without Drainage	3
Low Pressure Alarm (bar)	2.5
No. Of Short Circ. To Pause	3

ALARM DEFINITION	
Dosing Channel Leak Delay(s)	3
Dosing Channel Leak (Pulse)	10
Dosing Flow Difference (%)	25
Missing Pulses For No Flow	10
Stop System Cons. Flow Alarms	3
# of Irrig. Without Drainage	3
Low Pressure Alarm (bar)	2.5
No. Of Shor Cir. To Pause	3
Short Output Level (60-350)	300
Short O. Level EXP1 (60-350)	300
Short O. Level EXP2 (60-350)	300
Short O. Level EXP3 (60-350)	300

Item	Description
Missing Pulses For No Flow	Number of missing pulses before the system will generate a No Flow alarm. The system calculates the expected time between pulses of water meter and if a certain time elapsed without receiving the desired number of pulses, then generate an alarm.
Stop System Consecutive Flow Alarms	Number of consecutive flow alarms of the same type (high flow, low flow etc') but different valves before the system is stopped. Example: High flow at valve 1 –›High flow at valve 2–›High flow at valve 3 = 3 consecutive High flow, then system stops.
# of Irrigations Without Drainage	Number of irrigations given without measuring drainage, above which an alarm will be generated. Common reasons: Irrigation quantity is too small so there is not enough drain or drain measurement malfunction because of technical problem.
Low Pressure Alarm (bar/psi)	Minimum system pressure before generate an alarm.

Item	Description
Num. Of Short Circ. To Pause	Number of short circuit (in field device) alarms measured before the system is paused.
Short Output Level (60–350)	Define the A/D threshold value to be considered as a short circuit (For technician use only).
Short O. Level EXT1 (60 – 350)	Define the A/D threshold value to be considered as a short circuit for Extension box no. 1 (For technician use only)
Short O. Level EXT2 (60 – 350)	Define the A/D threshold value to be considered as a short circuit for Extension box no. 2 (For technician use only)
Short O. Level EXT3 (60 – 350)	Define the A/D threshold value to be considered as a short circuit for Extension box no. 3 (For technician use only)

5.4 Alarm Setting

Set alarms and define action in event of an alarm.

3. Alarm → 4. Alarm Setting

ALARM SETTING				
Description	Irr.	Dose	Delay mm:ss	Alarm Active
High Flow	CONT.	STOP	01:00	NO
Low Flow	STOP	STOP	01:00	YES
No Flow	STOP	STOP	----	YES
D. Ch. Leak	STOP	STOP	30:00	YES
D. Ch. Fault	STOP	STOP	01:00	YES
Ext. Pause	PAUSE	IRRIG.	00:30	YES
D. Boos.Prot.	CONT.	STOP	01:00	YES
Low Pressure	STOP	STOP	01:00	YES
R.U. Error	STOP	STOP	01:00	YES
R.U. Comm F.	STOP	STOP	01:00	YES

- Define alarm action: automatically stop or continue.
- Delay before generating alarm.
- Alarm output activation: YES/NO (siren, light).

5.5 EC/pH Alarm Definition

Define EC/pH threshold.

3. Alarm → 5. EC/pH Alarm Definition

EC/pH ALARM DEFINITION	
Delta EC Low	0.5
Delta EC High	0.5
Delta pH Low	0.5
Delta pH High	0.5
Delta EC-Pre Control Low	0.5
Delta EC-Pre Control High	0.5
Emergency EC High (1 Min.Dly)	5.0
Emergency pH Low (1 Min.Dly)	2.0

- Delta Low: Maximum differences below EC, pH and EC Pre-Control targets.
- Delta High: Maximum difference above EC, pH and EC Pre-Control targets.
- Emergency: Critical values of High EC and Low pH that stop the system after 1min.

5.6 EC/pH Alarm Setting

Set EC/pH alarm and define action in event of an EC/pH alarm.

6. EC/pH Alarm Setting

3. Alarm

EC/pH ALARM SETTING				
Description	Irr.	Dose	Delay mm:ss	Alarm Active
EC High/Fail	STOP	STOP	01:00	YES
EC Low	STOP	STOP	01:00	YES
pH High	STOP	STOP	01:00	YES
pH Low/Fail	STOP	STOP	01:00	YES
EC-P. Hi/Fail	STOP	STOP	01:00	YES
EC-Pre. Low	STOP	STOP	01:00	YES
E. Tank Fresh	STOP	STOP	01:00	YES
E. Tank Drain	STOP	STOP	01:00	YES
EC Sen. Dif.	STOP	STOP	01:00	YES
pH Sen Dif.	STOP	STOP	01:00	YES

- Define EC/pH alarm action: automatically stop or continue.
- Delay before generating alarm.
- Alarm output activation: YES/NO (siren, light).

5.7 Radio System Alarm Definition

IMPORTANT: For Radio System to work properly, MUST define in the 6.2 SYSTEM SETUP menu – *Remote Unit type* parameter SN/RF Net.

Define Radio Systems alarm activity and notification.

7. Radio Sys Alarm Definition

3. Alarm

RADIO SYS. ALARM DEFINITION			
Alarm Type	Delay mm:ss	Active	Inform
RTU			
Vbatt failure	00:00	YES	YES
Vbatt low	00:00	NO	YES
Vbatt warn	00:00	NO	YES
Cap failure	00:00	NO	YES
Card failure	00:00	NO	YES
I/O Open	00:00	NO	YES
I/O Shor	00:00	NO	YES
HOST			
Over current	00:00	NO	YES

- The **ACTIVE** column defines whether the alarm is used in making decision regarding the irrigation program (YES / NO)
- The **INFORM** column defines whether the system will notify the user of the alarm occurrence (YES / NO)

5.8 Radio System Alarm View

View the current alarm status of the Radio System.
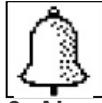
| | | | 8. Radio Sys Alarm View |

RADIO SYS. Alarm view				
Unit	S/N	Comm	Vin state	Card
HOST	0128	OK	-	-
BASE	0117	FAIL	-	-
RTU	0236	OK	-	3.1
RTU	0115.3.4	-	OK	
RTU	0513.4.1	-	FAIL	
RTU	0198	-	WARN	
RTU	0555.3.1	-	LOW	
RTU	----	-	-	
RTU	----	-	-	
RTU	----	-	-	

The **S/N** column is the number of the unit. When an *Open Circuit or Short Circuit* alarm is detected, the system in addition will also present the card number and the input/output number that is problematic.

For Example: **RTU –   0555.3.1**

UNIT #   CARD #   INPUT/OUTPUT #

Exiting and re-entering refreshes the alarm status screen.

5.9 SMS Subscription

Define which alarms to send for each subscriber. Subscribers need to be defined in the 6.11 EDIT SMS PHONEBOOK menu.

| | | | 7. SMS Subscription |

SMS SUBSCRIPTION		
ALARM/GROUP	ADAM	JAKE
*HARDWARE	PRIORITY	YES
*SYSTEM VALVE#	PRIORITY	YES
*HYDRAULICVALVE#	PRIORITY	YES
*DOSING VALVE#	PRIORITY	YES
HIGH FLOW VALVE#	YES	NO
LOW FLOW VAVLE#	YES	NO
WATER LEAK	YES	NO
LOW PRES PRESSOS	YES	NO
DELTA PRESSURE	NO	NO
SYS LOW PRESSURE	YES	YES

Define which subscriber will receive an SMS if there is an active alarm within the listed alarms or group of alarms according to:

NO	Do not send SMS for this alarm
YES	Send SMS for this alarm according to the "Send period" parameter defined in the SMS SETUP menu
PRIORITY	Send SMS for this alarm as soon as it appears (ignores time constraint of the "Send Period")

*Refer to the **SETUP** section (Menu 10.8) in the **Installation manual** for more information on the SMS feature.

6 History

- System History
- Irrigation Log
- Rad. Sum & Drain Log
- Uncompleted Irrigation
- Uncompleted Programs
- Daily Irrigation
- Irrigation Accumulation
- AUX Meter Accumulation
- Accumulation Reset
- Filters
- Cooling
- Sensor Log
- Event Log
- System Log

6.1   System History

Read-Only screens of system's history (measurements, settings, processes, events, graphs…)

SENSORS LOG				
Date	Time	Avg. Hum.	- EC-	- pH-
25/Apr	16:00	----	3.0	4.1
25/Apr	15:00	----	1.4	4.8
25/Apr	14:00	----	1.1	5.4
22/Apr	16:00	----	1.0	5.1
22/Apr	16:00	----	1.0	5.1
22/Apr	15:00	----	1.0	5.1
22/Apr	15:00	----	1.0	5.1
22/Apr	14:00	----	1.0	5.1
22/Apr	14:00	----	1.0	5.1
22/Apr	13:00	----	1.0	5.1
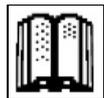
SELECT → 4. History → 11. Sensor Log →

→ | **SENSORS LOG**

Date	Time	Avg. Hum.	- EC-	- pH-
25/Apr	16:00	----	3.0	4.1
25/Apr	15:00	----	1.4	4.8
25/Apr				5.4
22/Apr				5.1
22/Apr				5.1
22/Apr				5.1
22/Apr				5.1
22/Apr	14:00	----	1.0	5.1
22/Apr	14:00	----	1.0	5.1
22/Apr	13:00	----	1.0	5.1

→ Select sensors using +/– key: (no more than 3 per graph)

GRAPH SELECT

Option	Yes/No
Avg. Temp	·
Avg. Hum.	·
-EC-	√
-pH-	√

→ SELECT   Menu
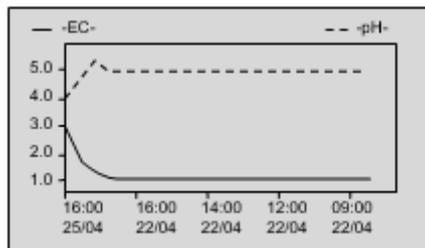
NOTE To view the graphs, press the Mode key.

NOTE Use ⇧⇩ arrow keys to zoom in/out. Use ⇦⇨ arrow keys to scroll.

The history menu provides extensive information regarding measurements and processes performed by the Green DC.
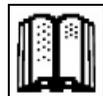
 SELECT   **4. History**   →

HISTORY
1. IRRIGATION LOG
2. RAD. SUM & DRAIN LOG
3. UNCOMPLETED IRRIGATION
4. UNCOMPLETED PROGRAMS
5. DAILY IRRIGATION
6. IRRIGATION ACCUMULATION
7. AUX METER ACCUMULATION
8. ACCUMULATION RESET
9. FILTERS
10. COOLING
11. SENSORS LOG
12. EVENT LOG
13. SYSTEM LOG

6.2 Irrigation Log

The Irrigation Log table includes up to 200 rows of the last irrigations' data. Each row includes information regarding a specific irrigation.

- To view additional information, use the left/right arrow keys.
- To switch between dosing quantities or time simply press the '+/–' key.

First log (top left):

DATE :	24-Dec-06		TIME :	17:17:20
IRRIGATION LOG				
Date	Time	V1	Reason	Water
23/Dec	17:21	255	Rad Sum	3.671
23/Dec	17:32	254	Rad Sum	0.834
23/Dec	17:42	217	Rad Sum	4.004
23/Dec	17:52	115	Rad Sum	2.504
23/Dec	18:02	219	Rad Sum	0.834
24/Dec	14:50	255	Rad Sum	3.671
24/Dec	15;00	254	Rad Sum	0.834
24/Dec	15:10	217	Rad Sum	4.007
24/Dec	15:20	115	Rad Sum	2.503
24/Dec	15:30	219	Rad Sum	0.834

Second log (top right):

DATE :	24-Dec-06		TIME : 17:17:20	
IRRIGATION LOG				
Date	Time	V1	Duration	Flow
23/Dec	17:21	255	00:10:00	22.000
23/Dec	17:32	254	00:10:00	5.000
23/Dec	17:42	217	00:10:00	24.000
23/Dec	17:52	115	00:10:00	15.000
23/Dec	18:02	219	00:10:00	5.000
24/Dec	14:50	255	00:10:00	22.000
24/Dec	15;00	254	00:10:00	5.000
24/Dec	15:10	217	00:10:00	24.000
24/Dec	15:20	115	00:10:00	15.000
24/Dec	15:30	219	00:10:00	5.000

Third log (middle):

DATE :	24-Dec-06		TIME :	17:17:20
IRRIGATION LOG				
Date	Time	V1	Chan. 1	Chan. 2
23/Dec	17:21	255	3.58	3.60
23/Dec	17:32	254	2.63	2.81
23/Dec	17:42	217	3.58	3.59
23/Dec	17:52	115	3.41	3.44
23/Dec	18:02	219	2.64	2.81
24/Dec	14:50	255	3.58	3.59
24/Dec	15;00	254	2.63	2.81
24/Dec	15:10	217	3.57	3.60
24/Dec	15:20	115	3.43	3.44
24/Dec	15:30	219	3.52	2.82

NOTE Water quantity is measured in m^3 or gallons; duration is measured by time; flow is measured in m^3/h or gallon/m; dosing quantity is measured in liters or gallons.

Description	Item
Date in which the irrigation started.	Date
Time in which the irrigation started.	Time
Leading valve: the first valve set for the group of valves	Valve
Specification of the irrigation triggers; time, condition, Rad Sum, etc.	Reason
Irrigation quantity (m^3 or gallon) or irrigation time.	Water
Irrigation duration (hh:mm:ss).	Duration
Average flow throughout the irrigation cycle.	Flow
Dosing quantities per channel (liter or gallon) or dosing time.	Chan. #
Lowest EC value recorded during irrigation.	EC Low
Average EC value recorded during irrigation.	EC Avg.
Highest EC value recorded during irrigation.	EC High
Lowest pH value recorded during irrigation.	pH Low
Average pH value recorded during irrigation.	pH Avg.
Highest pH value recorded during irrigation.	pH High

6.3 Rad. Sum & Drain Log

DATE : 21-Dec-06			TIME : 14:51:18	
RAD. SUM & DRAIN LOG				
Date	**Time**	**V1**	**Reason**	**Water**
20/Dec	17:26	254	Rad Sum	1.400
20/Dec	17:26	217	Rad Sum	1.400
20/Dec	17:27	115	Rad Sum	1.400
20/Dec	17:27	219	Rad Sum	1.400
20/Dec	17:27	255	Rad Sum	1.400
20/Dec	17:28	254	Rad Sum	0.800
20/Dec	17;28	217	Rad Sum	0.800
20/Dec	17:28	115	Rad Sum	0.800
20/Dec	17:29	219	Rad Sum	0.800
20/Dec	17:29	255	Rad Sum	0.800

IRRIGATION LOG				
Date	**Time**	**V1**	**Drain %**	**Drain**
20/Dec	17:26	254	100.00	1450
20/Dec	17:26	217	92.86	1300
20/Dec	17:27	115	78.57	1100
20/Dec	17:27	219	100.00	1400
20/Dec	17:27	255	-----	0
20/Dec	17:28	254	62.50	500
20/Dec	17;28	217	100.00	800
20/Dec	17:28	115	18.75	150
20/Dec	17:29	219	-----	0
20/Dec	17:29	255	100.00	850

DATE : 21-Dec-06			TIME : 14:51:45	
IRRIGATION LOG				
Date	**Time**	**V1**	**Rad Sum**	**Interval**
20/Dec	17:26	254	19	----
20/Dec	17:26	217	19	----
20/Dec	17:27	115	19	1
20/Dec	17:27	219	19	1
20/Dec	17:27	255	19	2
20/Dec	17:28	254	19	----
20/Dec	17;28	217	19	----
20/Dec	17:28	115	19	----
20/Dec	17:29	219	19	1
20/Dec	17:29	255	15	1

Item	Description
Time	Time irrigation started.
Valve	Leading valve.
Reason	Specification of the irrigation triggers; time, condition, Rad Sum, etc.
Water	Irrigation quantity (m³ or gallon) or irrigation time.
Drain %	Percentage of drain for relevant irrigation cycle.
Drain	Drain quantity related to relevant irrigation.
Rad Sum	Accumulated radiation sum level when irrigation started.
Interval	Time (in minutes) since last irrigation cycle. Refers to the last irrigation of a specific valve.

6.4 Uncompleted Irrigation

The Uncompleted Irrigation table provides information of irrigations that were started but could not be completed due to a failure. To understand why irrigation was not completed, it is advisable to cross-reference between this table and the Alarm Definition in section 4.3. The Uncompleted Irrigation table consists of up to 200 lines. Note that if the letter 'C' appears, it refers to a program that was triggered by condition program.

UNCOMPLETED IRRIGATION						
No.	Date	Time hh:mm	Prog No.	V1. No.	Run No.	Dose Prog
1	20-Dec-06	09:05	1	51+	1	1
2	20-Dec-06	09:25	2	1	1	--

Each line includes information regarding when the irrigation was stopped and added to the uncompleted irrigations table.

Item	Description
Date	Date in which the current line was added to the uncompleted irrigation table.
Time	Time in which the current line was added to the uncompleted irrigation table
Prog. No.	92: The program that was added to the table was started manually. 93: The relevant irrigation was added to the uncompleted irrigations table for the second time (or more) consecutively.
Vl. No.	Indicates the associated valve. If a group of valves that is configured to irrigate together is stopped, only the first valve is written but a '+' sign is added next to it to indicate that more valves are associated.
The Green DC will attempt to complete the irrigations from the current day (until end day time) upon manual or automatic alarm reset. The valve column of irrigations that are to be completed will be highlighted. The valve column of irrigations that are currently being completed will blink	
Run No	Indicates the associated run time program.
Dose Prog.	Indicates the associated dosing program.
Prog. Qty.	Planned quantity according to the run time program.
Left Qty.	Uncompleted quantity.

To manually stop an uncompleted irrigation you must go to the START/STOP VALVE in section 3.3 because the activation is according to single valves.

6.5 Uncompleted Programs

The Uncompleted Programs table provides information on programs that could not be completed. It is important to understand the difference between this table and the Uncompleted Irrigations table; this table consists only of irrigation cycles that have not been started and could not be completed during the current day. This can happen due to wrong system setup (more tasks than could be completed), or because the system was not active for a long period of time, for example due to a power failure, and could not complete its tasks.

	UNCOMPLETED PROGRAMS					
No.	**Date**	**Time hh:mm**	**Prog No.**	**Start Time**	**Prog Cyc.**	**Left Cyc.**
4	9/Aug	20:00	10	19:00	1	1
5	9/Aug	21:00	10	20:00	1	1
6	10/Aug	04:00	1	13:00	2	2
7	10/Aug	05:00	1	04:00	2	2
8	10/Aug	06:00	10	21:00	1	1
9	10/Aug	07:00	1	05:00	2	2
10	10/Aug	09:00	1	07:00	2	2
11	10/Aug	11:00	1	09:00	2	2
12	10/Aug	13:00	1	11:00	2	2
13	10/Aug	14:00	10	06:00	1	1

The uncompleted program table consists of 200 lines.

6.6 Daily Irrigation

This table allows you to view history of irrigation quantities or time per valve.

DAILY IRRIGATION	
How Many Days Ago?	1 Day Ago

Example: 1 day ago means you would like to view yesterday's history, and Today means you would like to view the accumulated history since the last End Day.

To open the selection list

Relevant day using arrow keys

ENTER   Current date viewed at top of screen.

DATE :   20-Dec-06

	DAILY IRRIGATION		
Valve	**Chan. 1**	**Chan. 2**	**Chan. 3**
213	0.00	0.00	0.00
214	0.00	0.00	0.00
215	211.36	211.37	211.37
216	3.93	3.94	3.94
217	30.87	30.82	30.83
218	19.06	19.97	18.12
219	25.25	26.01	24.49
220	0.00	0.00	0.00
221	0.00	0.00	0.00
Press +/- to Toggle Quantity/Time			

DATE :   20-Dec-06

	DAILY IRRIGATION		
Valve	**Water**	**Drain%**	**Dra. Q.**
213	0.000	100	0.000
214	0.000	100	0.000
215	70.800	11	8.350
216	1.400	0	0.000
217	15.900	34	5.500
218	7.200	45	3.300
219	13.600	20	2.850
220	0.000	100	0.000
221	0.000	100	0.000
Press +/- to Toggle Quantity/Time			

Daily Irrigation table contains all water (m3 or gallon) and dosing (liter or gallon). To toggle the view between quantities and time, press the '+/–' key.

6.7 Irrigation Accumulation

The Irrigation Accumulation table allows you to accumulate water and dosing quantities for the required periods. The accumulation of each valve can be reset separately in the ACCUMULATION RESET table.

DATE : 21-Dec-06			
IRRIGATION ACCUMULATION			
Valve	Date	Water	Chan. 1
214	20-Dec-06	0.000	0.00
215	20-Dec-06	70.800	211.36
216	20-Dec-06	1.400	3.93
217	20-Dec-06	19.100	35.28
218	20-Dec-06	7.200	19.06
219	20-Dec-06	16.800	29.65
220	20-Dec-06	0.000	0.00
221	20-Dec-06	0.000	0.00
222	20-Dec-06	0.000	0.00
Press +/- to Toggle Quantity/Time			

DATE : 21-Dec-06			
IRRIGATION ACCUMULATION			
Valve	Chan. 1	Chan. 2	Chan. 3
214	0.00	0.00	0.00
215	211.36	211.37	211.37
216	3.93	3.94	3.94
217	35.28	35.21	35.21
218	19.06	19.97	18.12
219	29.65	30.38	28.86
220	0.00	0.00	0.00
221	0.00	0.00	0.00
222	0.00	0.00	0.00
Press +/- to Toggle Quantity/Time			

To toggle the view between quantities and time, press the '+/–' key

Water quantity is measured in cubic meter or gallons; dosing quantity is measured in liters or gallons.

6.8 AUX Meter Accumulation

The Auxiliary Meter Accumulation table allows you to accumulate quantities from meters that do not have designated software, for example, to measure the drain water quantity or to measure the cooling system's consumption.

AUX METER ACCUMULATION		
Meter	Quantity	Date
1	4.600	20-Dec-06
2	3.500	20-Dec-06
3	2.200	20-Dec-06
4	2.500	20-Dec-06
5	3.450	20-Dec-06
6	3.600	20-Dec-06
7	5.700	20-Dec-06
8	4.200	20-Dec-06

NOTE Water meters are accumulators only and are not a part of the irrigation control.

To reset an auxiliary meter refer to the ACCUMULATION {XE "Reset Total Quantity" } table below.

The quantities displayed are in liters (gallons) up to 9999.999.

6.9 Accumulation Reset

ACCUMULATION RESET	
Reset Valve Quantity For?	<None>
Reset Aux. Meter For?	<None>

PRESS → SELECT → ENTER

NOTE When resetting a valve (or all valves), its history will be erased from the following tables:

- Daily Irrigation
- Irrigation Accumulation

 ENTER to reset an individual auxiliary meter or all auxiliary meters ➡   Desired option using arrow keys ➡ ENTER

NOTE When resetting an Aux meter (or all Aux meters), its history will be erased from the Aux Meter Accumulation table.

6.10 Filters

NOTE The filters history table provides daily information of the number and cause of flushing.

FILTERS			
Date	Delta P.	Time	Manual
10/Aug	0	44	0
9/Aug	0	0	0
8/Aug	0	0	0

6.11 Cooling

Viewing the history of cooling activities or time per valve is allowed.

COOLING	
How Many Days Ago?	1 Day Ago

 ENTER to open selection list ➡   Relevant day using arrow keys ➡ ENTER

For example, 1 day ago means you would like to view yesterday's history, and Today means you would like to view the accumulated history since the last End Day.

COOLING			
Prog. No.	From hh:mm	To hh:mm	Cycles
1	13:10	18:14	60
2	13:13	18:14	9
3	--:--	--:--	-----
4	--:--	--:--	-----
5	--:--	--:--	-----
6	--:--	--:--	-----
7	--:--	--:--	-----
8	--:--	--:--	-----

6.12 Sensor Log

The sensors Log table includes history of average measurements of logged sensors. To define which sensor to log, the user should access menu 6.8 – Sensor Logging, and mark by +/– button the required sensor.

To define the measurement interval, the user should go to menu 6.2 and choose the required History resolution.

SENSORS LOG				
Date	Time	Avg. Hum.	Temp-1	Temp-2
10/Aug	16:28	22.7	22.7	----
10/Aug	16:27	22.7	22.7	----
10/Aug	16:26	22.7	22.7	----
10/Aug	16:26	22.7	22.7	----
10/Aug	16:25	22.7	22.7	----
10/Aug	16:24	22.7	22.7	----
10/Aug	16:23	22.7	22.7	----
10/Aug	16:22	22.7	22.7	----
10/Aug	16:21	22.7	22.7	----
10/Aug	16:20	22.7	22.7	----

The sensors Log table contains up to 10,000 data fields. Date and time are 2 fields per line and every sensor is an additional field.

For example: logging of 2 sensors uses 4 data fields; 2 for time and date and 1 for each sensor. In this case, the table will consist of a maximum of 2,500 lines.

6.13 Event Log

The table provides information of all the processes performed by the Green Field DC including their time and date.

EVENT LOG			
No.	Event	Date	Time
1	Water Leak # 4	20/Dec	09:01
2	Program # 1 Manual On	20/Dec	09:03
3	Valve #51 Manual Off	20/Dec	09:04
4	Program # 1 Man. Off	20/Dec	09:04
5	Program # 1 Manual On	20/Dec	09:04
6	Valve #51 Low Flow	20/Dec	09:04
7	Program # 1 Man. Off	20/Dec	09:05
8	Program # 2 Rad. On	20/Dec	09:21
9	Valve # 1 High Flow	20/Dec	09:23
10	Program # 2 Rad. Off	20/Dec	09:25

The table consists of the last 999 events.

6.14 System Log

This table provides information of all the system changes.

No.	Event	Date	Time
	SYSTEM LOG		
1	PC Irri. Prog #10 Ch.	20/Dec	09:01
2	Reset Alarm	20/Dec	09:03
3	PC Table #1.3 Change	20/Dec	09:04
4	PC Irri. Prog #1 Ch.	20/Dec	09:04
5	PC Irri. Prog #1 Ch.	20/Dec	09:04
6	Irrig. Prog #1 Ch.	20/Dec	09:04
7	Irrig. Prog #2 Ch.	20/Dec	09:05
8	Table #7.7 Change	20/Dec	09:21
9	Table #1.3 Change	20/Dec	09:23
10	Table #1.7 Change	20/Dec	09:25

The table consists of the last 999 events.

Examples of system changes are changes of triggered by the controller, the PC communication, a power off, etc.

7 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 Farm Link, (for example Farm Link's 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.