CROP MANAGEMENT TECHNOLOGIES

USER GUIDE

NMC-PRO IRRIGATION

NETAFIM™
GROW MORE WITH LESS

TABLE OF CONTENTS

GENERAL

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- To main menu, also acts as "ESC" and "Back" keys.

ENTER- Enter menu, submenu, value, open window, confirm a value or change.

HELP- Access help screens and graphs.

DELETE- Erases typing mistake.

Hot Screens

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

9 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

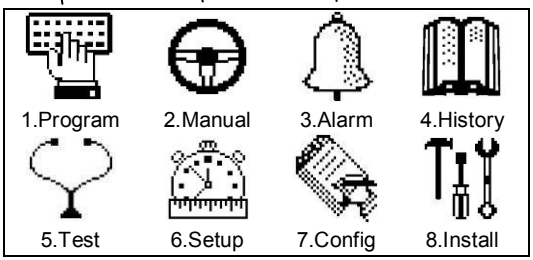
Main Menu Icons

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



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

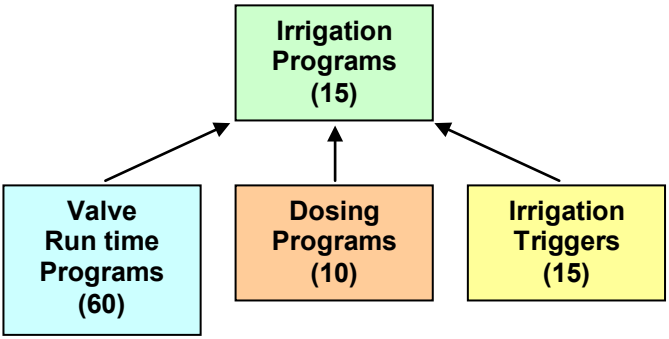
For professional technical use only

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

For professional technical use only

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.



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

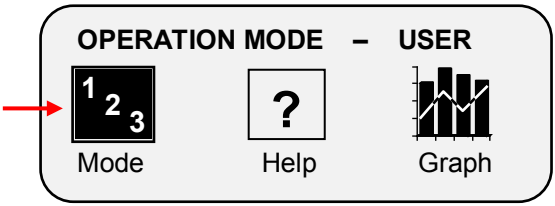
- Start/ Stop up to 2 Dry Contacts
- Start/End time for irrigation period
- Trigger Type

Operation Mode

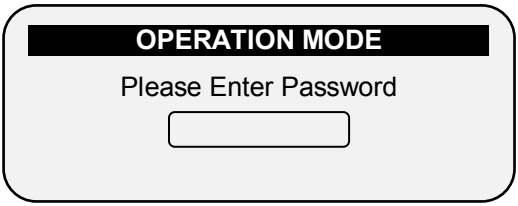
There are three levels of operation:

- **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 **HELP** key



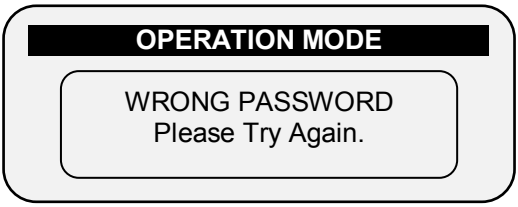
Press **ENTER** when the "**Mode**" icon is selected



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	►	NMC 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.

1. PROGRAM

1.1 Run Time Program

For every irrigation program, define a Run Time recipe

1. Program

→ 2. Water Run Time

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.	0.000	0.000
4	QTY.	0.	0.000	0.000
5	QTY.	0.	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

QTY.
TIME

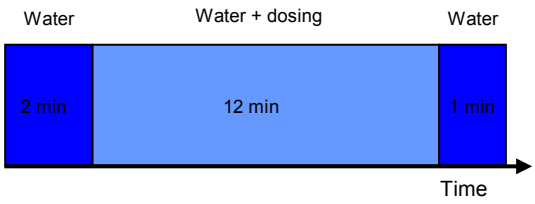
→ Define Time →

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

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



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

1.2 Dosing Program

For every irrigation program, define a Dosing recipe

1. Program

➡ 3. Dosing

Dosing Channel Definition (Channel mode pre-configured by technician):

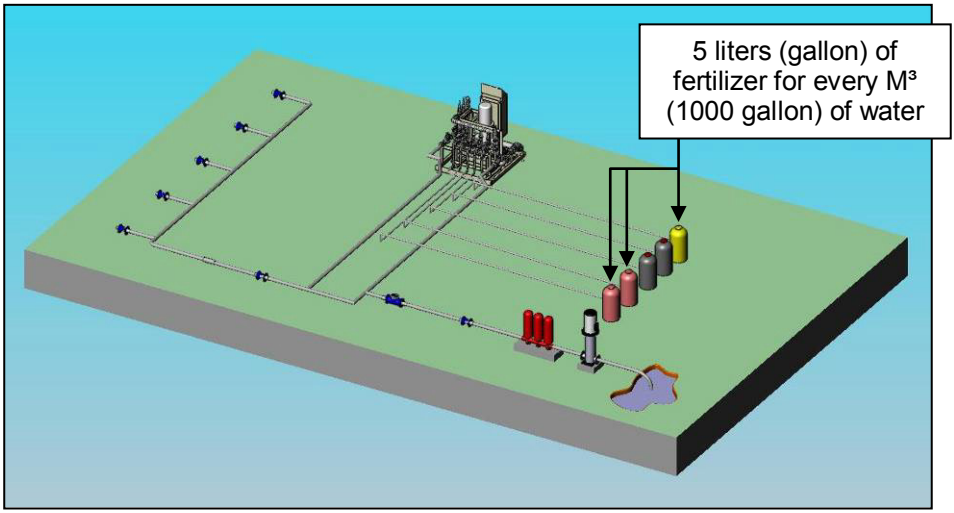
Channel

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

Proportional Qty. (1/1000, Litre/m³, gallon/1000gallons):

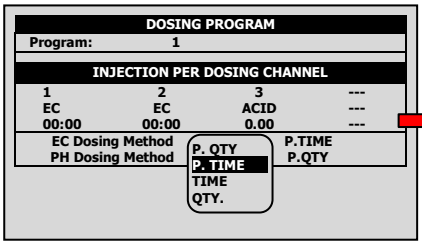
➡

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	

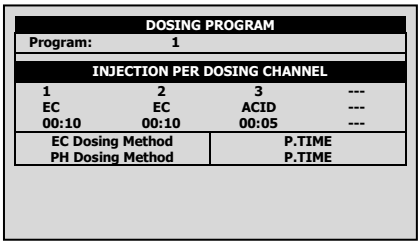


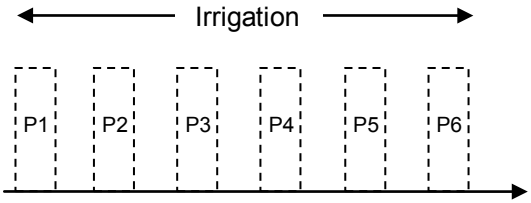
Proportional Time:

P. Time



Define minimum dose for each channel





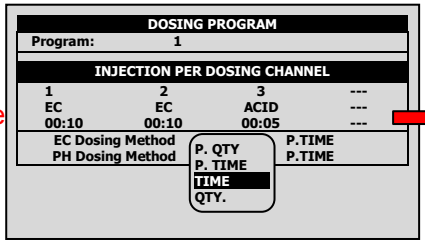
Ex: Ch 1= P1+P2+P3…+Pn= 10 min.

Time in pulses for Channel 1 or 2

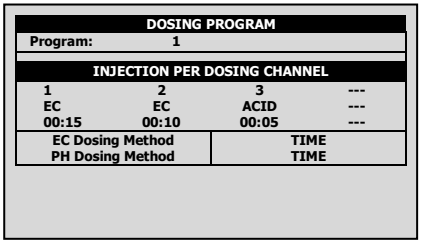
NOTE: *Proportional Time= Take desired dosing time and spread out dose over irrigation program in open/close pulses per channel.*

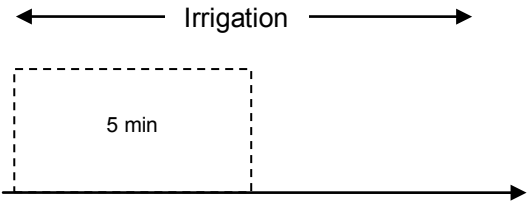
Time:

Time



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



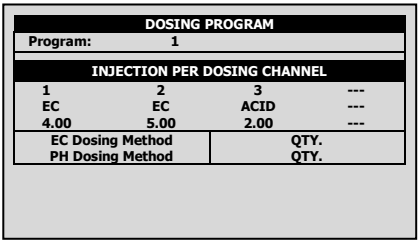


Ex: Ch 3= P1= 5 min. (1 pulse)

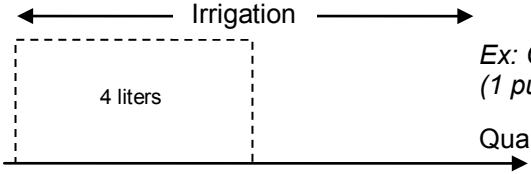
Time in bulk Channel 3

Quantity: (Example shows liters, in USA use gallons.)

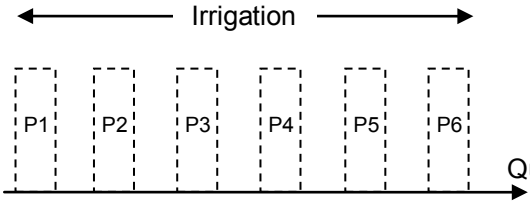
Qty.



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

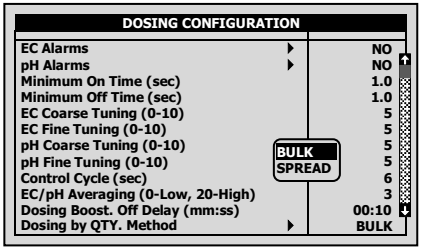


- **Option B**- Spread Out (According to dosing configuration done by technician).

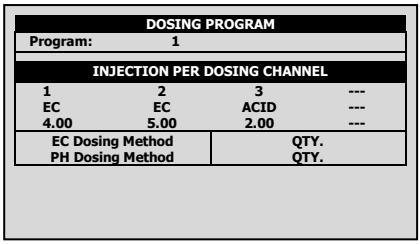


Main Menu

7. Dosing Configuration

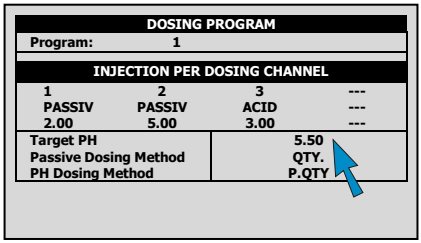


Define according to Bulk or Spread

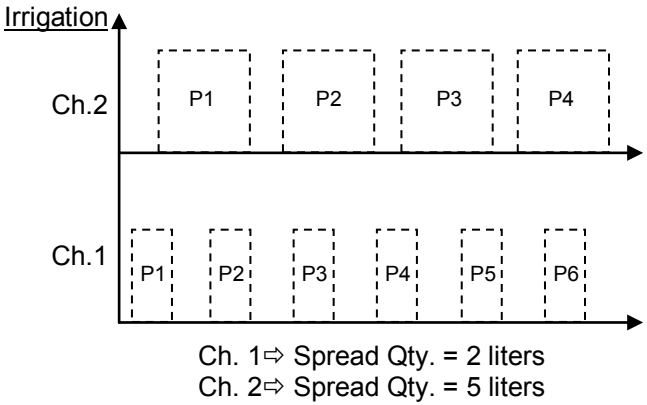


Back in Dosing Program menu, define Injection per Dosing Channel.

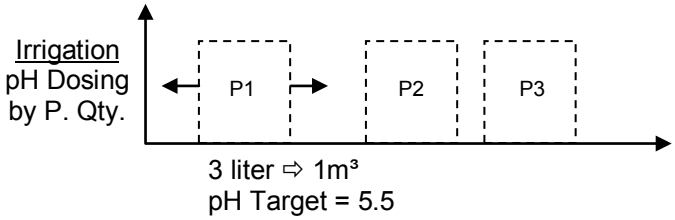
Common Dosing Program for Open Fields (example):



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



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



Controlled EC/pH based on P.Qty. (example):

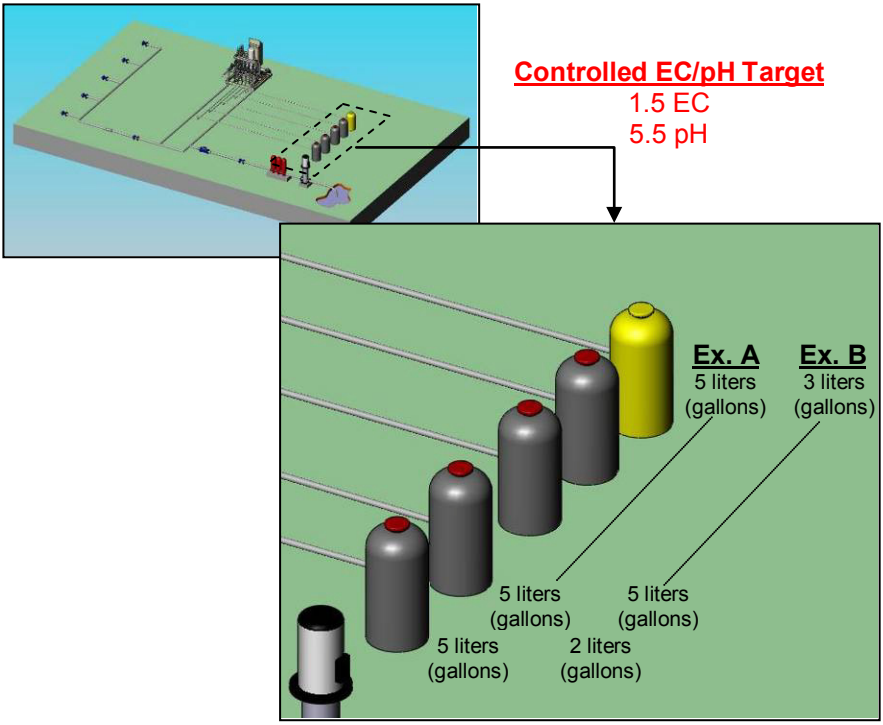
Example A-

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	

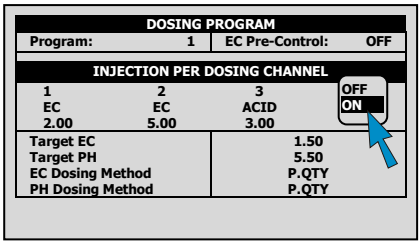
Define dosing program:
Nutrient amount and
desired EC/pH levels

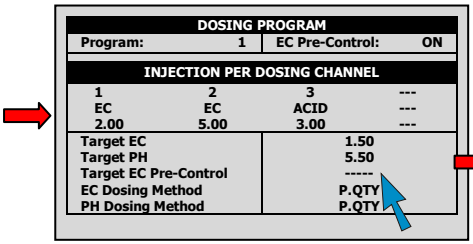


EC Pre-Control (example if previously defined by technician):

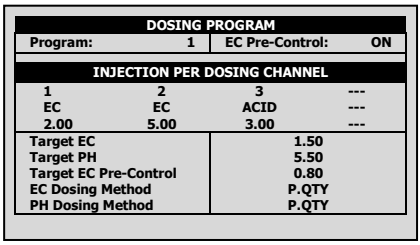
For hydraulic pre-control systems in greenhouses: When collecting excess water from drains, grower can set EC target before water goes through irrigation system. Discrepancies

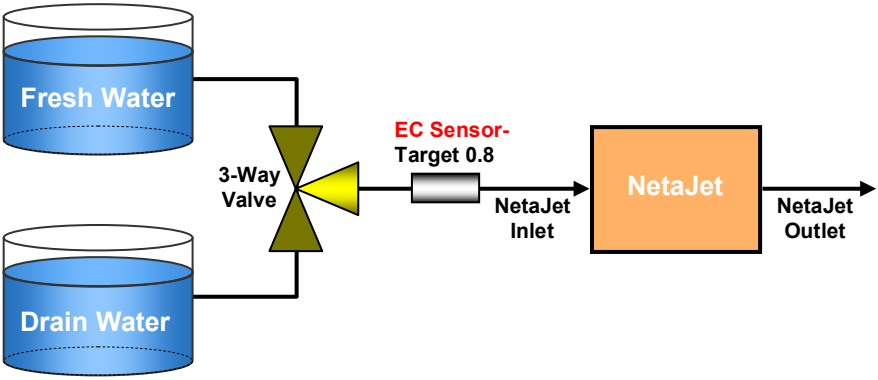
EC Pre-Control **ON**
*Only if this was pre-defined by technician during installation.





Define pre-controlled EC target



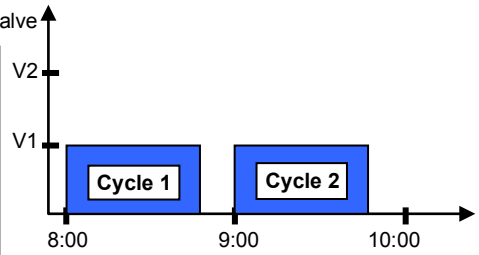


1.3 Irrigation Based on Time

1. Program → 1. Irrigation → Select program

Example 1

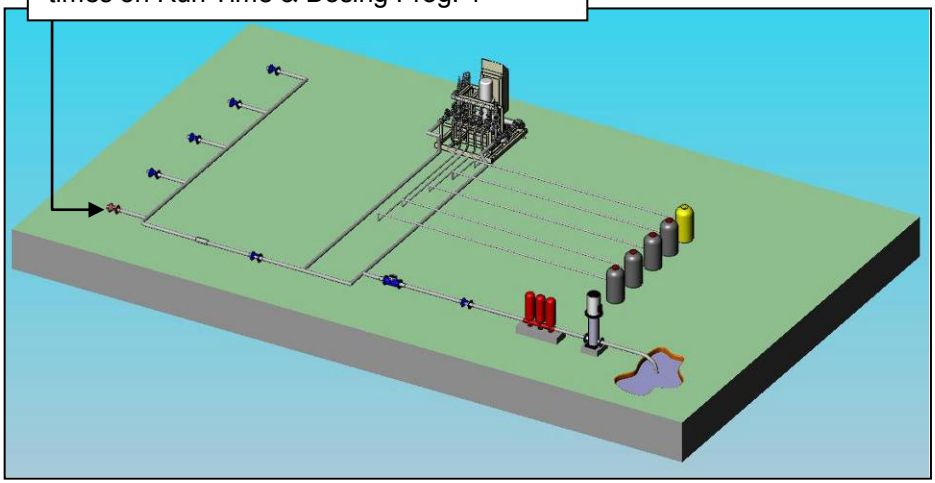
DATE : 19-Apr-07		TIME : 16:12:32
IRRIGATION PROGRAM		
Program: 4	Priority: --	Const. 0%
Start Time	08:00	
Clock Start	2	
Min. Time	01:00	
Valve #	001	
Run Time #	1	
Dosing Prog	1	
Day: 01/01	1	
Dose/Water	D	



Irrigation program for 1 valve 

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

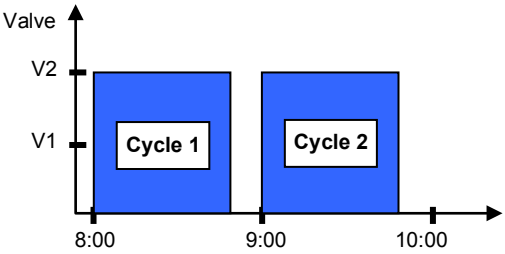
Valve 1- runs 2 cycles, 1 hour between start times on Run Time & Dosing Prog. 1



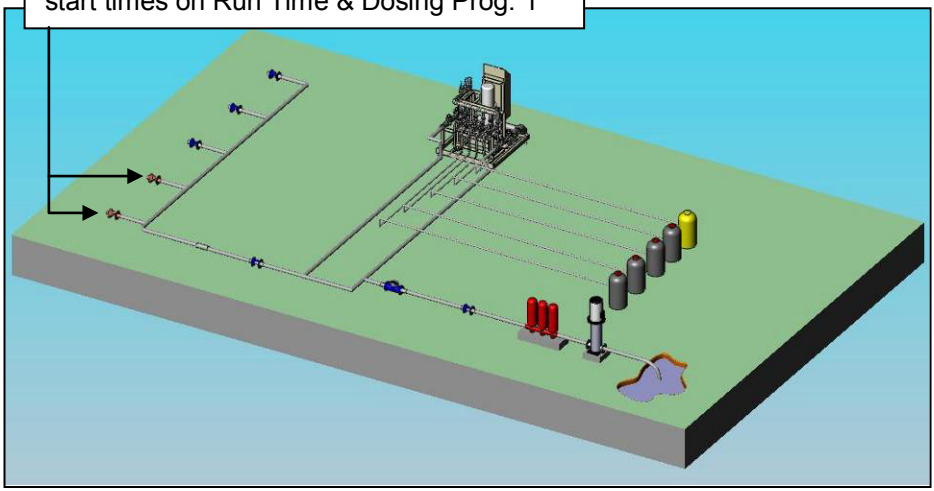
Example 2

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	1	
Dose/Water	D	

Irrigation program for a group of 2 valves



Valve 1 & 2- run 2 cycles, 1 hour between start times on Run Time & Dosing Prog. 1

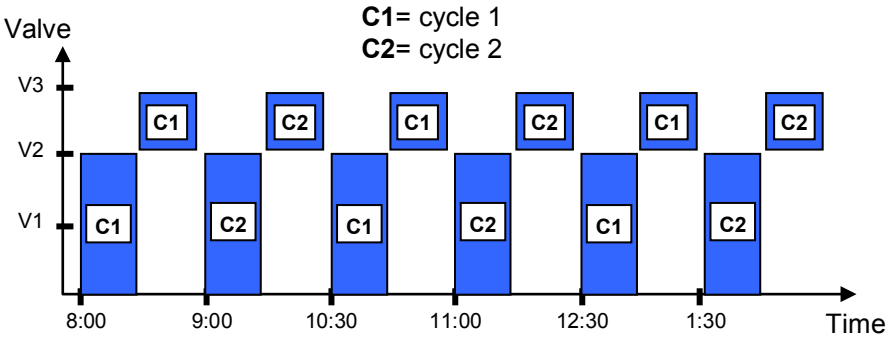


NOTE: *Min. Time= Delay between cycles from start to start*
Clock Start= Number of cycles

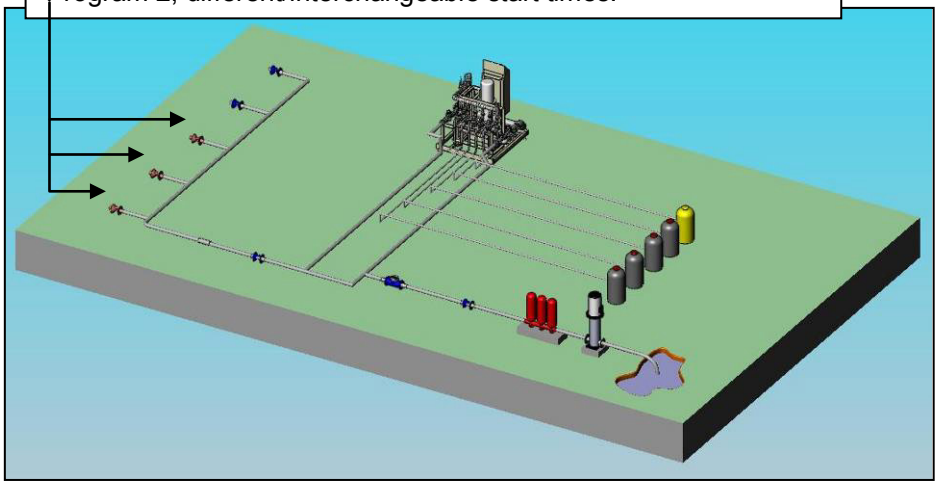
Example 3

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	01:00
Valve #	001+002	003
Run Time #	1 1	2
Dosing Prog	1 1	2
Day: 01/01	1 2	3
Dose/Water	D W	D

Irrigation program for a group and individual valve



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, different/interchangeable start times.



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.

Example 4

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	1	2		
Day: 01/01	1	2	3		
Dose/Water	D	W	-		

If a lot of radiation, want to irrigate more, +20%

(Regular 10min. runtime⇨12 min

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

Example 5

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.*

Select water/dosing program by days of week

Example 6

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	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

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+				
Run Time #	1				
Dosing Prog	1				
Day: 01/01	1				
Dose/Water	D	W	-		

Dose
Water
None

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

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

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

1.4 Irrigation Based on External Condition (Field)

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

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

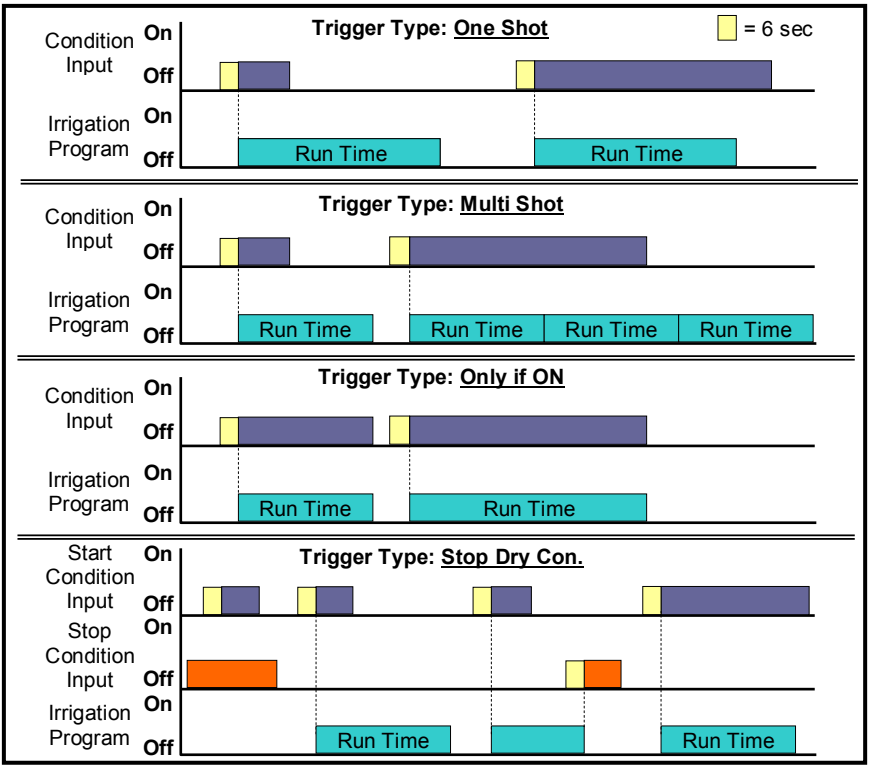
EXTERNAL CONDITION PROGRAM

#	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	One Shot
3	<NONE>	One Shot	Multi Shot
4	<NONE>	One Shot	Only If On
5	<NONE>	One Shot	
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 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

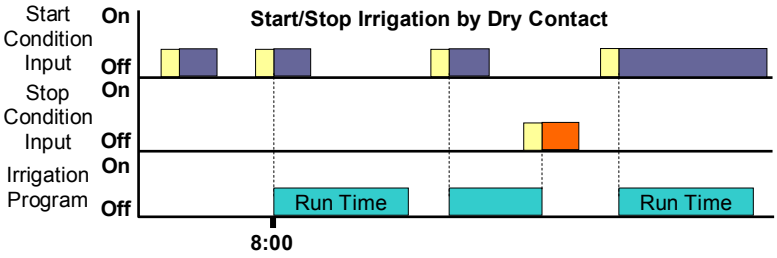
1. Program → 1. Irrigation

DATE : 1-May-07 TIME : 10:12:09

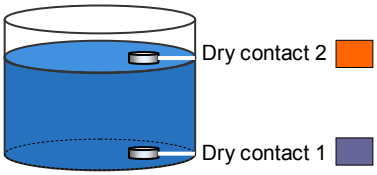
IRRIGATION PROGRAM

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	

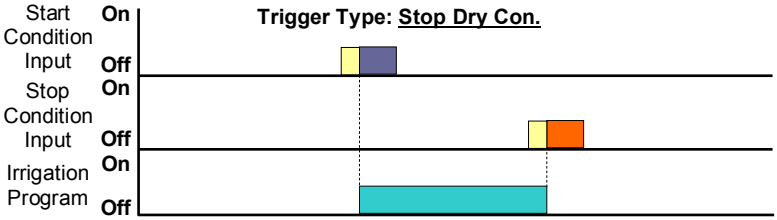
Reaching the bottom line...



Example of tank filling:



Water Tank with Floats



1.5 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 S
Start Time	07:00	08:00	10:00
Clock Start	1	--	--
Rad Sum Li.	----	300	150
Min. Time	--:--	00:30	00:20
Max. Time	--:--	--:--	--:--
Valve #	001		
Run Time #	1		
Dosing Prog	1		

Const.
Daily
Cond.
Rad Sum

For Next Screen Press The DOWN Arrow

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

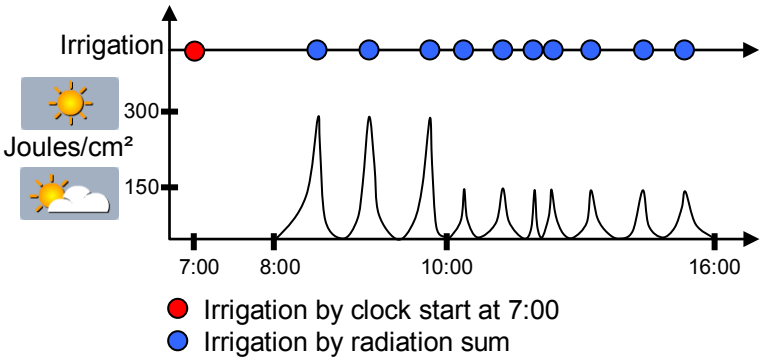
DATE : 1-May-07			TIME : 10:12:09	
IRRIGATION PROGRAM				
Program: 1	Priority: --		Rad Sum	
Start Time	07:00	08:00	10:00	16:00
Clock Start	1	--	--	--
Rad Sum Li.	----	300	150	----
Min. Time	--:--	00:30	00:20	--:--
Max. Time	--:--	01:00	01:00	--:--
Valve #	001			
Run Time #	1			
Dosing Prog	1			

For Next Screen Press The DOWN Arrow

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



1.6 Agitator

To operate fertilizer tanks with mixing devices

1. Program

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 Dosing Not Active	01:00 05:00	05:00 60:00
Operation Mode	Parallel	

Parallel
Serial

OR

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

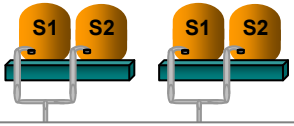
1.7 Selector

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

1. Program

6. Selector

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

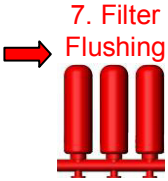


Dos. Chan. 1 / Dos. Chan. 2

1.8 Filter Flushing

Program filter flushing during irrigation process

1. Program



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

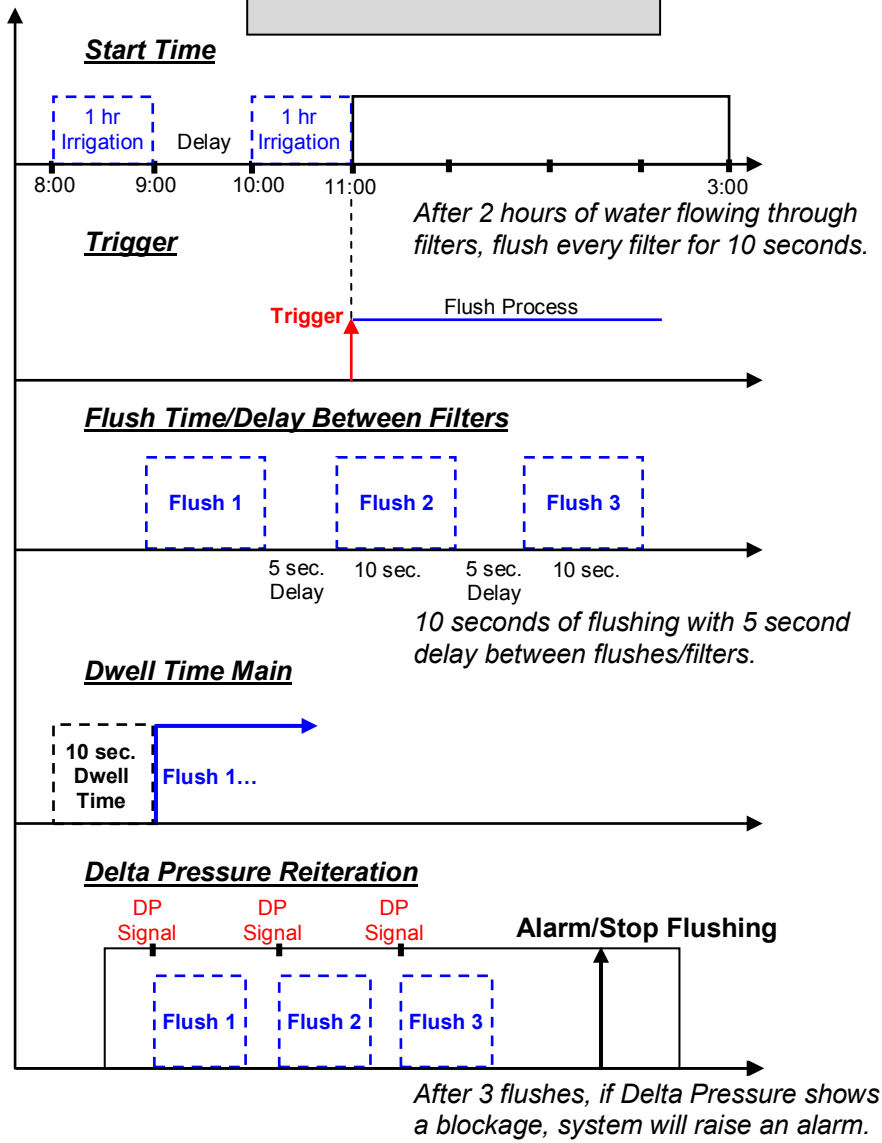
NOTE: *Filter flush process can start only after main water line is full. Default set at 1 min., see menu 3.3.*

ALARM DEFINITION	
Water Fill Up (min)	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

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.
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



1.9 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.)

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.

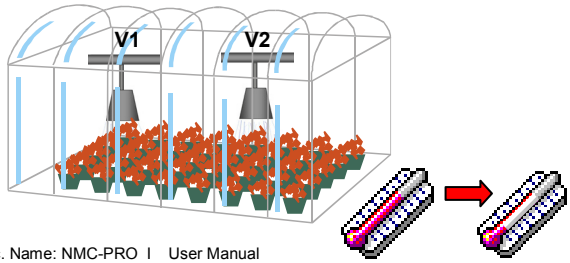
COOLING/HUMIDIFICATION PROGRAM			
Program: 1	Status: Cooling		
	From	To	Above t°
1	08:00	16:00	25.0
2	08:00	16:00	35.0
Cool#	1 2 - - - - - - - -		
Temp. Sens.: 1 2	Hum. Sens.: 1 2		

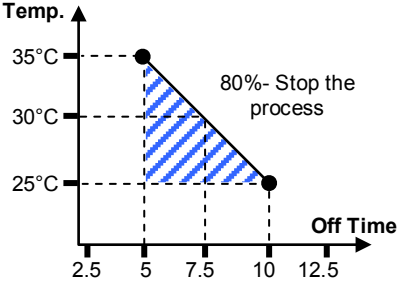
→

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





1.10 Misting

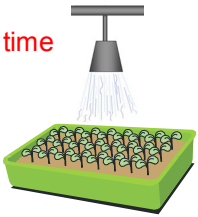
General program using a timer

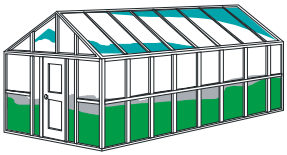
1. Program

➡ 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





1.11 Water Heating

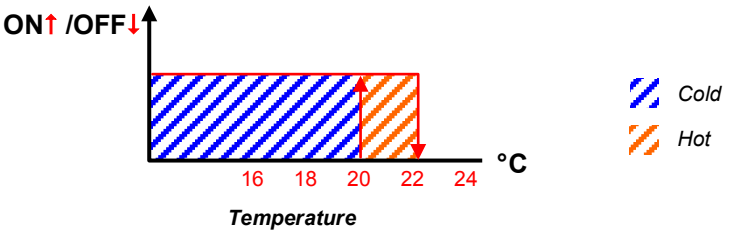
Heat water in cold areas/seasons

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

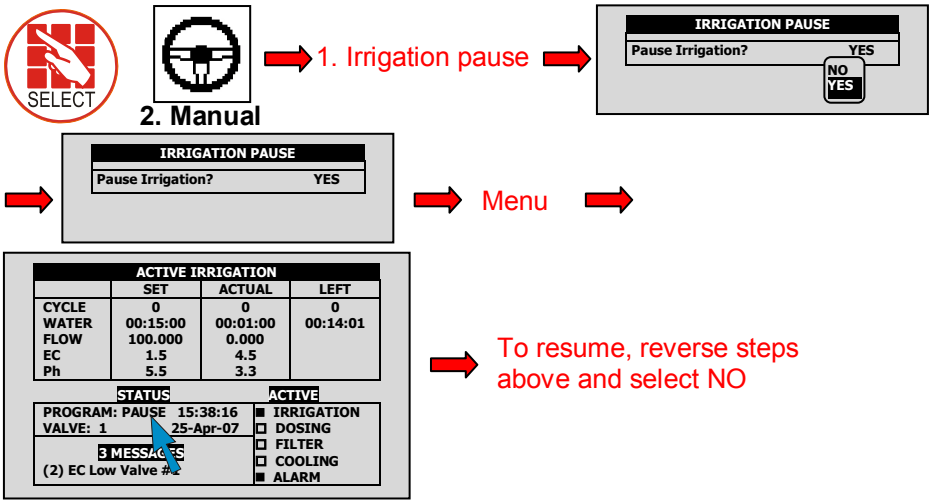
➡ ⇨ Define Start/End time
⇨ Define Water Temp. ± Difference (dead band) to stop
⇨ Define sensors



2. MANUAL

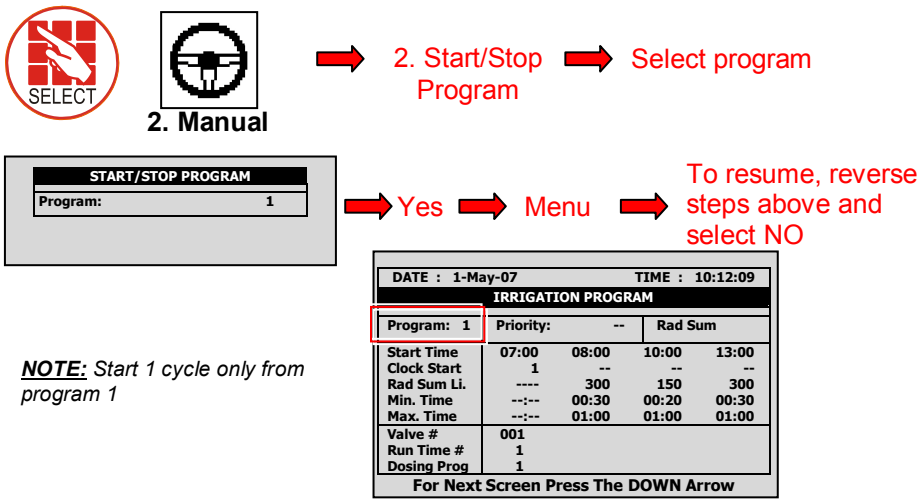
2.1 System Pause

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



2.2 Start/Stop program

Manually start/stop a program

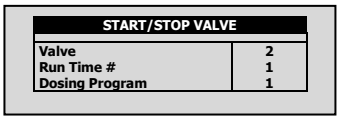


NOTE: *Start 1 cycle only from program 1*

2.3 Start/Stop Valve

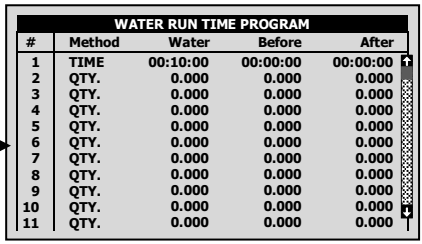
Manually start/stop a valve

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

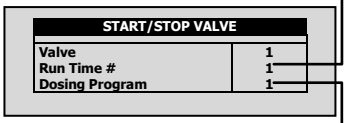
→ Menu → Yes → To resume, reverse steps above and select NO



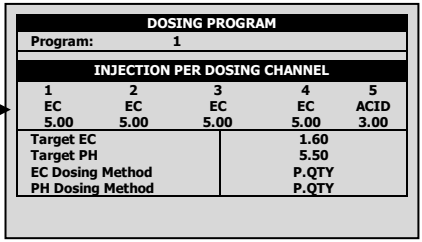
WATER RUN TIME PROGRAM

#	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

Run Time Program (1)



START/STOP VALVE	
Valve	1
Run Time #	1
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

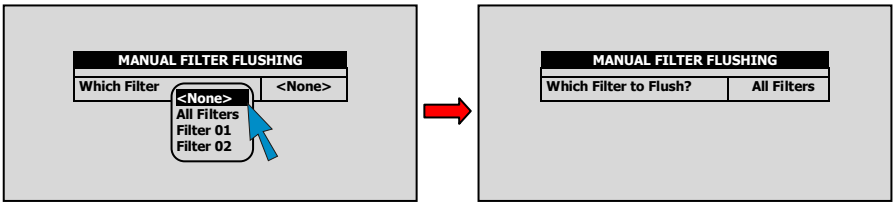
Target EC	1.60
Target PH	5.50
EC Dosing Method	P.QTY
PH Dosing Method	P.QTY

Dosing Program (1)

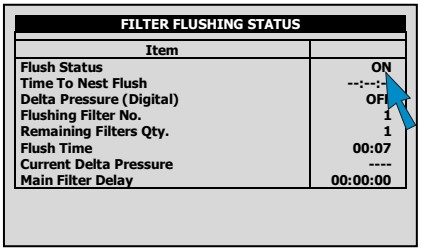
2.4 Manual Filter Flush

Manual filter flush only when system is irrigating

2. Manual → 4. Filter Flush → Select filters (usually all)

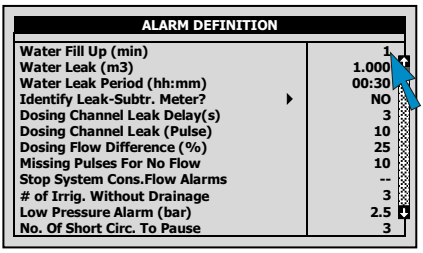


→ Yes → Menu → Hot Screen 5 to view flushing status



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*



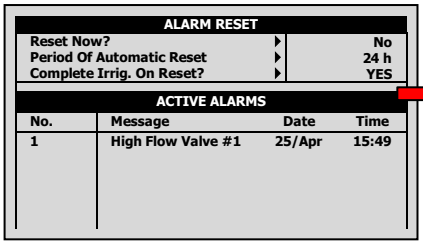
3. ALARM

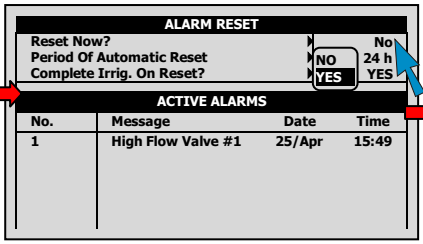
3.1 Reset

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

3. Alarm

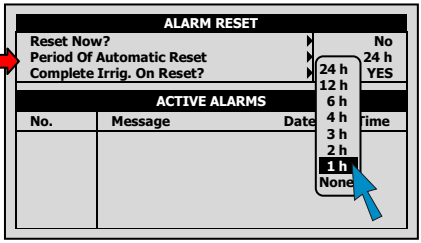
➡ 1. Alarm Reset ➡ Option A: Reset manually



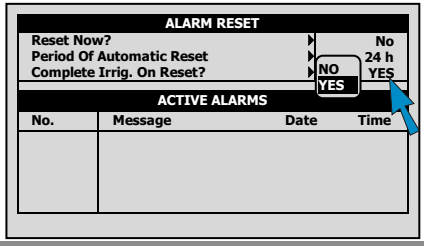


Yes

Option B: Automatic reset to check itself every so often as desired:
⇨ Select how often system should reset itself

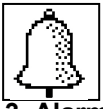


➡ "Complete Irrig. On Reset?" Select Yes or No



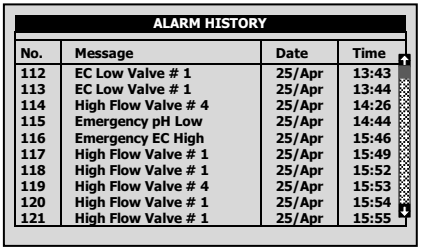
3.2 Alarm History

View alarm history (Read-Only)



3. Alarm

➡ 2. History



NOTE: *Logs up to 250 alarms*

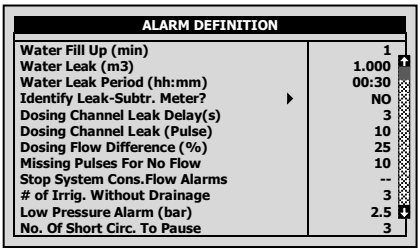
3.3 Alarm Definition

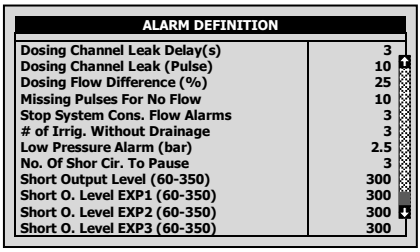
Define system threshold

3. Alarm

→ 3. Alarm Definition

→ Define trigger: deviation from target pressure, flow…





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.
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.

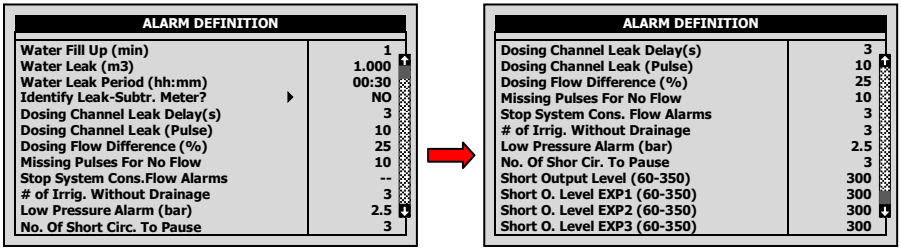
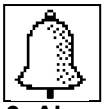


Table continued…

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.
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)

3.4 Alarm Setting

Set alarms and define action in event of an alarm



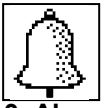
3. Alarm → 4. Alarm Setting

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).

3.5 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 bellow 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.

3.6 EC/pH Alarm Setting

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

3. Alarm → 6. EC/pH Alarm Setting

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).

3.7 SMS Subscription

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

3. Alarm

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* (Menus 6.11-6.13) *in the* **Installation manual** *for more information on the SMS feature.*

4. HISTORY

4.1 System History

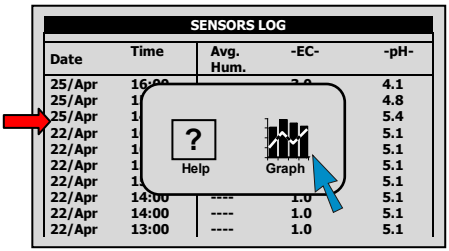
Read-Only screens of system's history (measurements, settings, processes, events, graphs…)

4. History

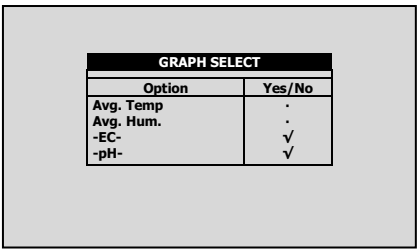
11. Sensor Log

SENSORS LOG

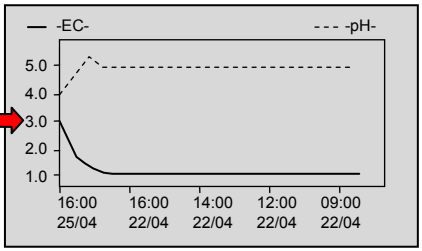
Date	Time	Avg. Hum.	-EC-	-pH-
25/Apr	16:00	----	3.0	4.1
25/Apr	15:00	----	1.4	4.8
25/Apr	14:00	----	1.1	5.4
22/Apr	16:00	----	1.0	5.1
22/Apr	16:00	----	1.0	5.1
22/Apr	15:00	----	1.0	5.1
22/Apr	15:00	----	1.0	5.1
22/Apr	14:00	----	1.0	5.1
22/Apr	14:00	----	1.0	5.1
22/Apr	13:00	----	1.0	5.1



Select sensors using +/- key (no more than 3 per graph)

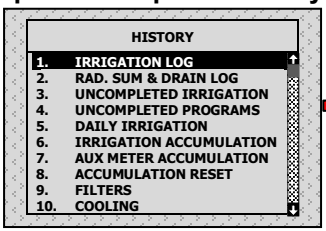


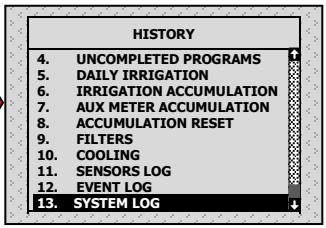
Menu



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

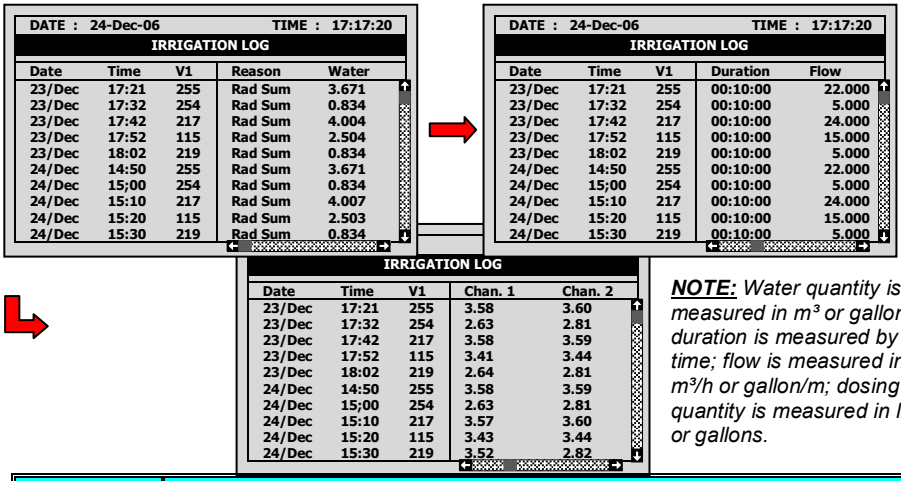
The history menu provides extensive information regarding measurements and processes performed by the NMC-Pro.





IRRIGATION LOG

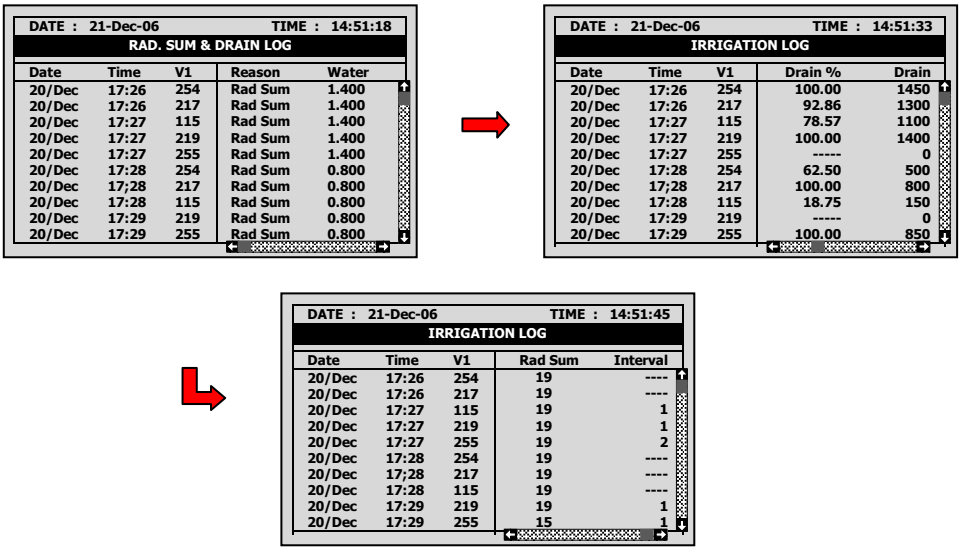
The Irrigation Log table includes up to 200 rows of the last irrigations' data.
Each row includes information regarding a specific irrigation.
To view additional information, use the left/right arrow keys.
To switch between dosing quantities or time simply press the '+/-' key.



NOTE: *Water quantity is measured in m³ or gallons; duration is measured by time; flow is measured in m³/h or gallon/m; dosing quantity is measured in liters or gallons.*

Item	Description
Date	Date in which the irrigation started.
Time	Time in which the irrigation started.
Valve	Leading valve; the first valve set for the group of valves
Reason	Specification of the irrigation triggers; time, condition, Rad Sum, etc.
Water	Irrigation quantity (m³ or gallon) or irrigation time.
Duration	Irrigation duration (hh:mm:ss).
Flow	Average flow throughout the irrigation cycle.
Chan. #	Dosing quantities per channel (liter or gallon) or dosing time.
EC Low	Lowest EC value recorded during irrigation.
EC Avg.	Average EC value recorded during irrigation.
EC High	Highest EC value recorded during irrigation.
pH Low	Lowest pH value recorded during irrigation.
pH Avg.	Average pH value recorded during irrigation.
pH High	Highest pH value recorded during irrigation.

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

DATE : 21-Dec-06 TIME : 14:51:33

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

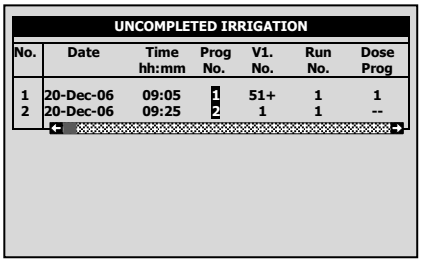
IRRIGATION LOG

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 (m^3 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.

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.



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 NMC-Pro 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.

In order 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.

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 haven't 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.

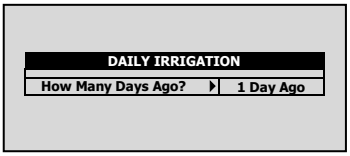
UNCOMPLETED PROGRAMS

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.

DAILY IRRIGATION

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



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	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

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

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.

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

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

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

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

AUX METER ACCUMULATION

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

AUX METER ACCUMULATION

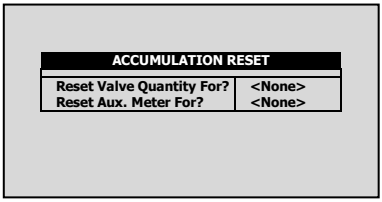
Meter	Quantity	Date
1	4.600	20-Dec-06
2	3.500	20-Dec-06
3	2.200	20-Dec-06
4	2.500	20-Dec-06
5	3.450	20-Dec-06
6	3.600	20-Dec-06
7	5.700	20-Dec-06
8	4.200	20-Dec-06

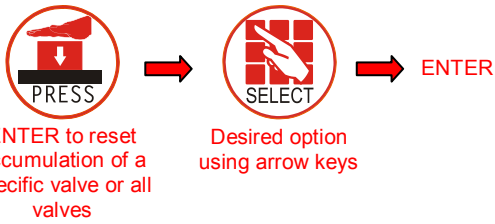
The quantities displayed are in liters (gallons) up to 9999.999.

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.

ACCUMULATION RESET



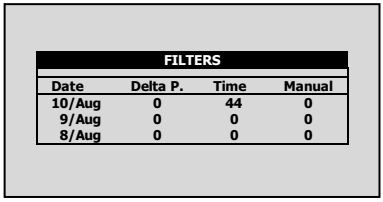


NOTE: When resetting a valve (or all valves), its history will be erased from the following tables:
-Daily Irrigation
-Irrigation Accumulation

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

FILTERS

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

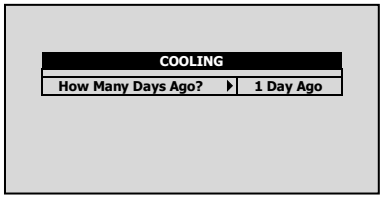


FILTERS

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

COOLING

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



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	--:--	--:--	-----

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.

SENSOR LOG

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

EVENT LOG

The table provides information of all the processes performed by the NMC-Pro 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.

SYSTEM LOG

This table provides information of all the system changes.

SYSTEM LOG

No.	Event	Date	Time
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.

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