NMC-DC

	Name	Signature	Date
Written By:			
Checked By:			
Checked By:			
Approved By:			

Updates

Rev	Change Description	Change No.	Date	Authorizer's Name

Table of Contents

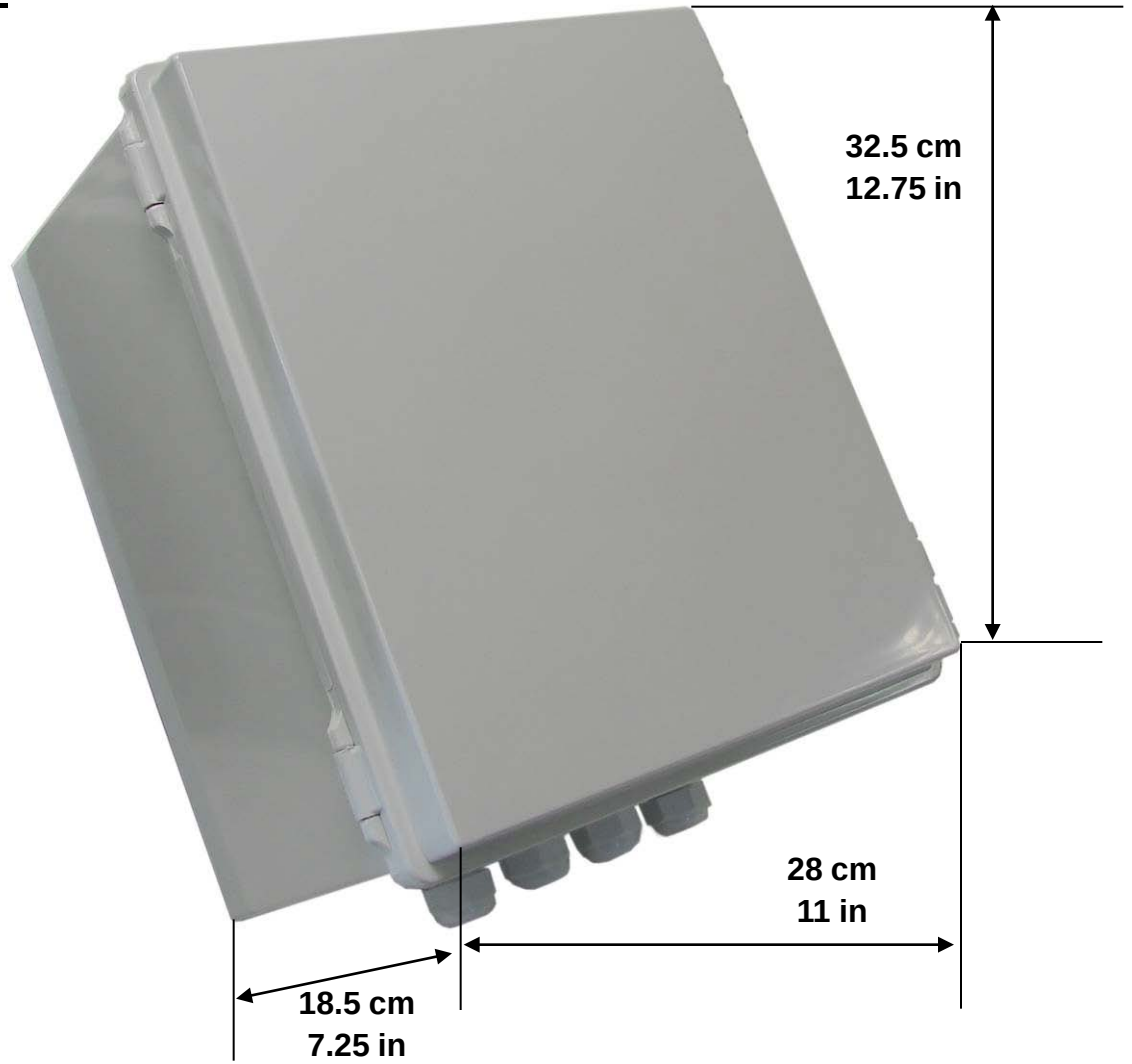
1. General Instructions

- Installation should be performed by authorized technicians only.
- Verify that field components are working properly.
- All safety regulations are to be applied.
- Do not apply force or pressure on components during the installation procedure.
- Refer to your supervisor if problems occur during installation procedure.

2. Basic Requirements for On-Site Preparation

- Verify Main Battery 12VDC and solar panel.
- Environment temperature between (-10^{o}c)-(+60^{o}c).
- Verify protection from damaging climate conditions.

3. General Dimensions



4. Unpacking and Installation

4.1 Unpacking

1

Package carefully

2

Solar Panel and accompanying accessories

NMC-DC

3

OPEN

Package carefully

4

REMOVE

User manual

5

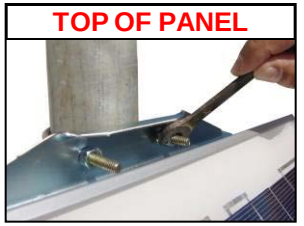
REMOVE

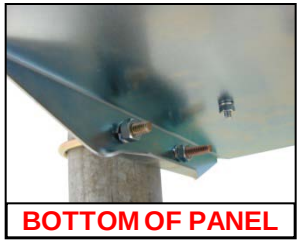
NMC-DC and accompanying accessories

4.2 Solar Panel and Controller Installation

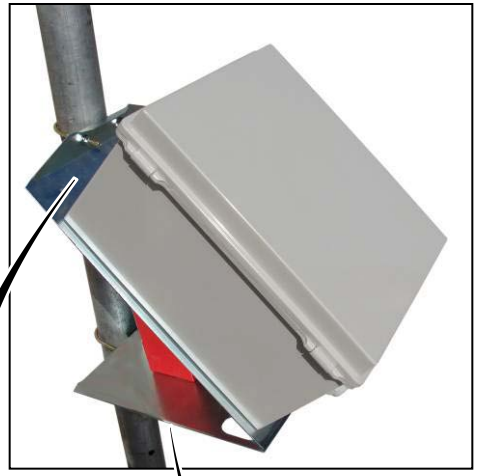
1 ASSEMBLE Solar Panel on pole

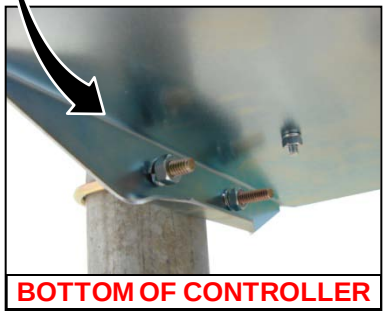
2 TIGHTEN Washer and nut x4





3 ASSEMBLE Controller on pole





4 TIGHTEN Washer and nut x4

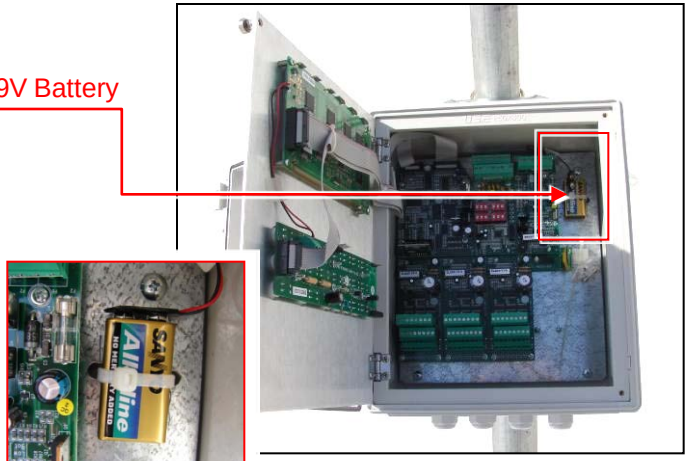
5. Power Supply Wiring

5.1 Main Battery Wiring

CAUTION! SHOCK HAZARD! The electrical installation should be performed by a qualified electrician only!

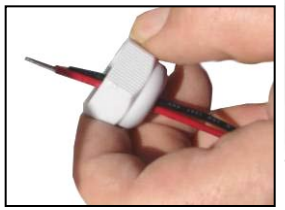
1 OPEN — Controller case and cover

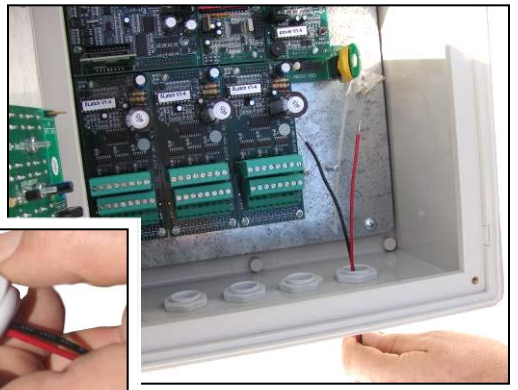
2 CONNECT — 9V Battery



3 REMOVE — Gland cover

4 ROUTE — Wire through gland and into the controller





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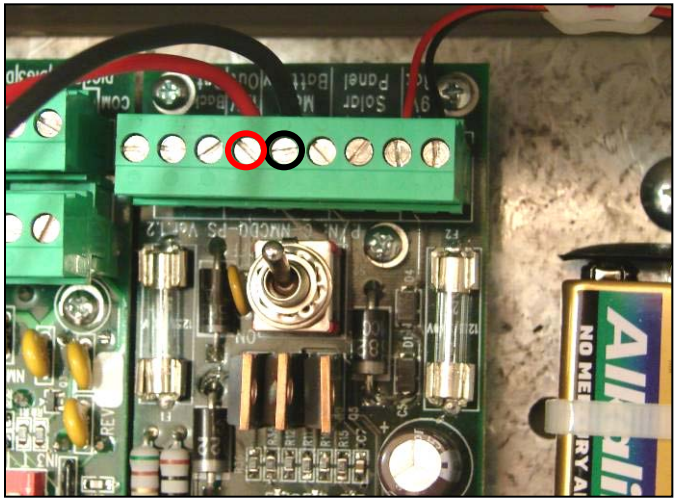
5

LOOSEN — Terminal screw

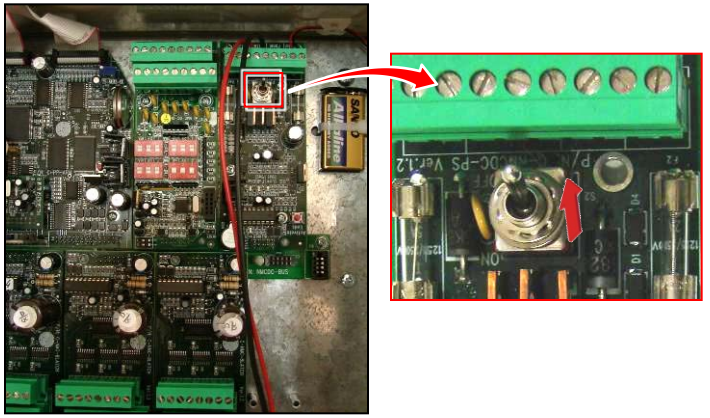
INSERT — Wires as shown

TIGHTEN — Terminal screw



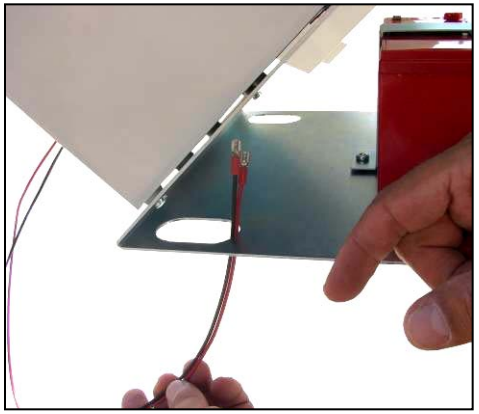
ATTENTION

Battery switch is in OFF position!



6

ROUTE — Wires



7

CONNECT — Wires to 12VDC battery

NOTE: Recommended battery is 17Ah or more.

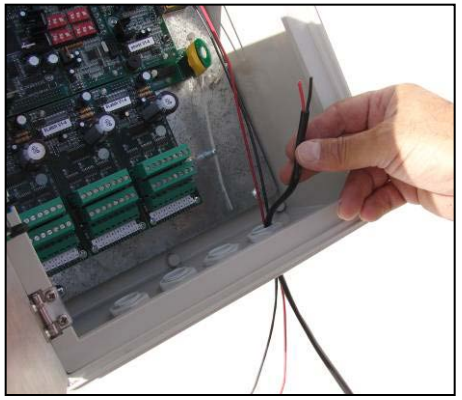
5.2 Solar Panel Wiring

1

Solar Power Cable

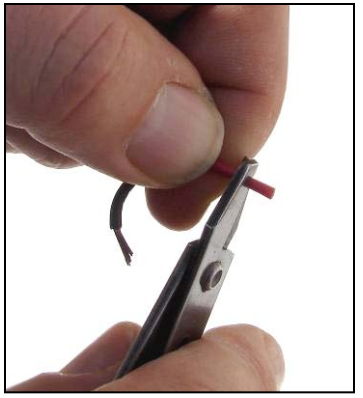
2

Cable into Controller through gland



3

Sleeves to expose wires

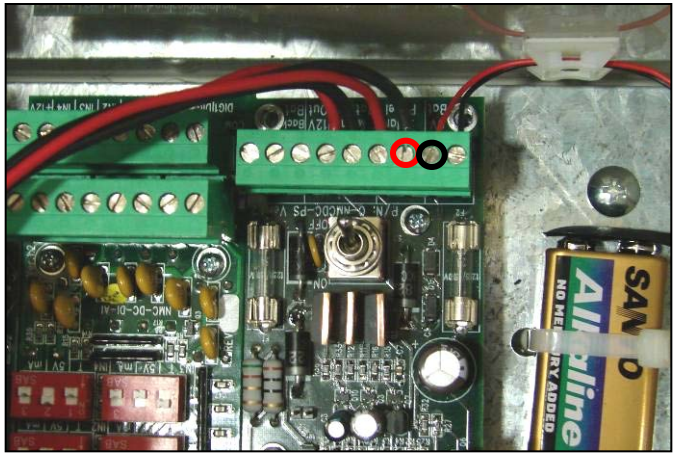


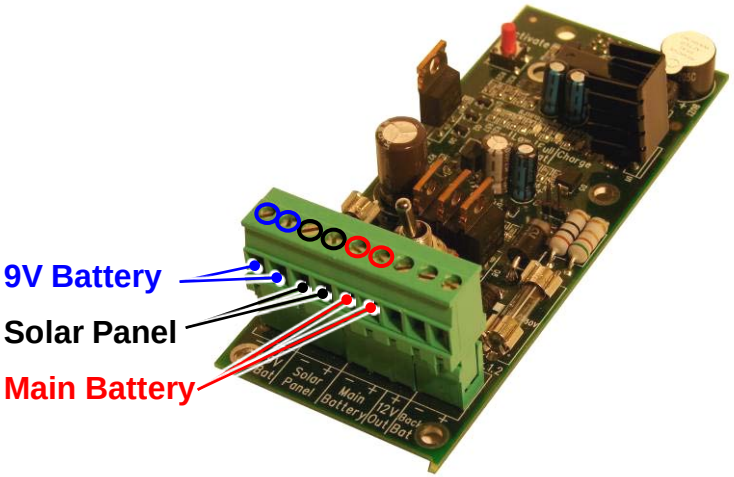
4

Terminal screw

Wires as shown

Terminal screw

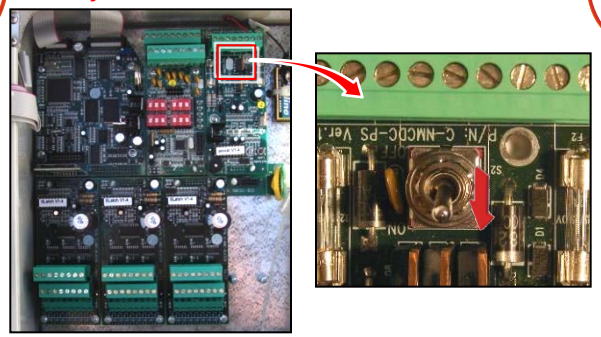




5.3 Cold Start

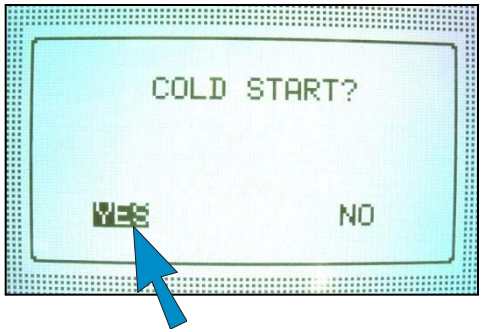
1

Battery Switch



2

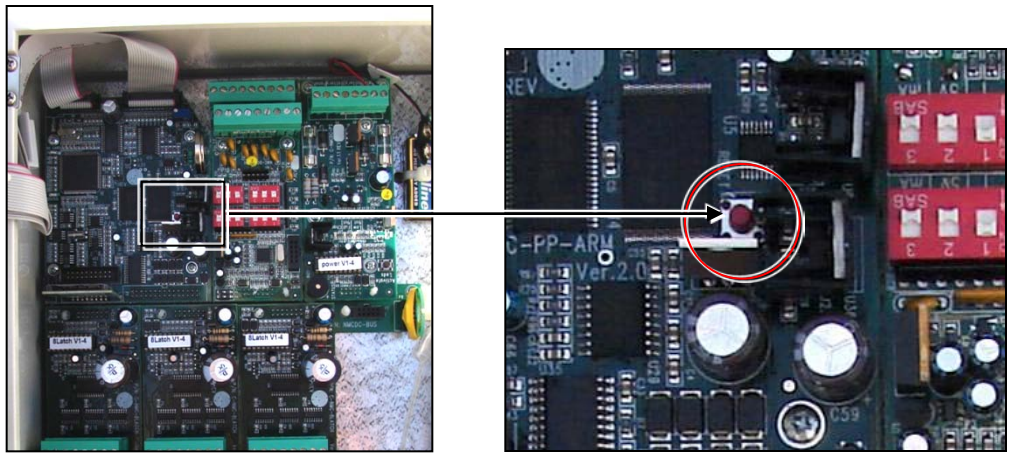
Delete



In case cold start was not done on time:

2

Brown button



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3

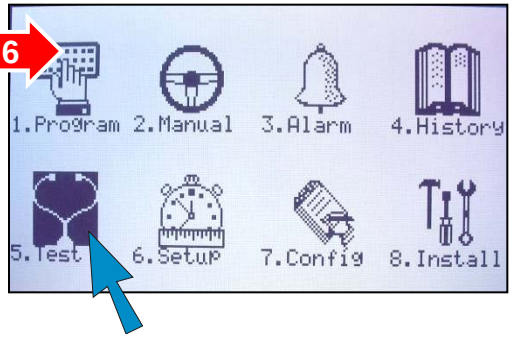
Delete button until 'Cold Start' message appears

4

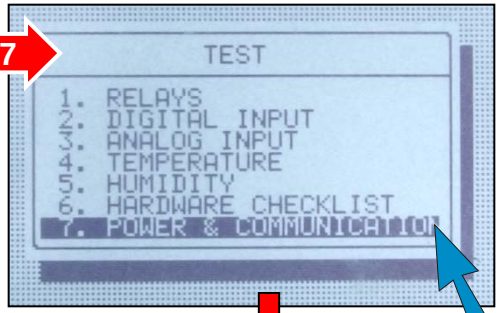
5

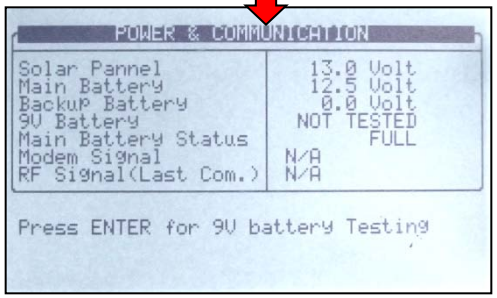
For process to end

6



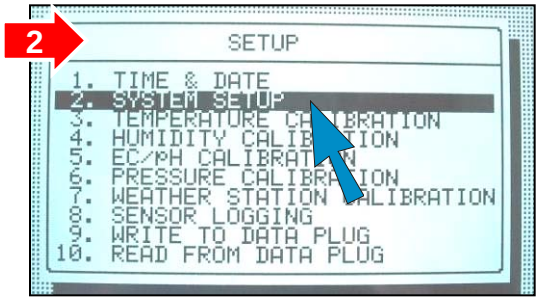
7



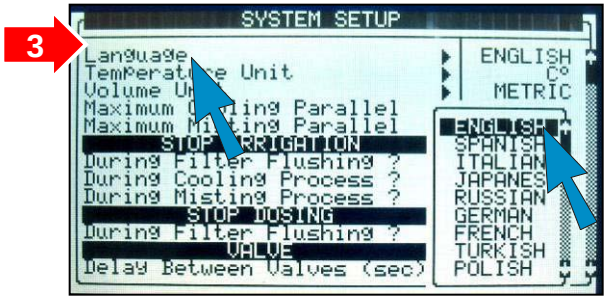


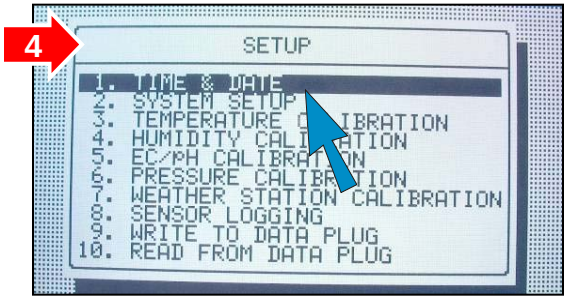
5.4 Set Language, Time and Date

"MENU" on touch pad



⇨ "6. Setup" in Main Menu
⇨ "2. System Setup"
⇨ Enter desired language and volume unit
⇨ "1. Time & Date" in Setup menu and set

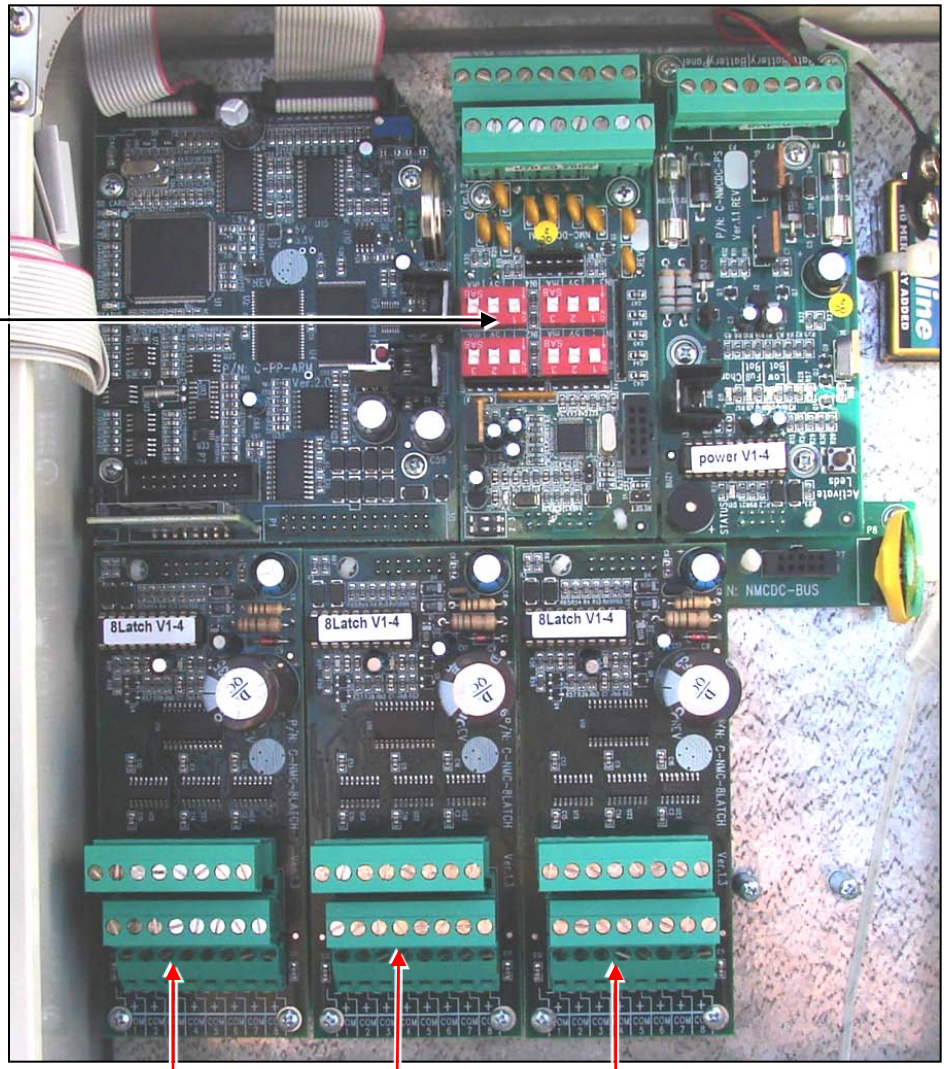




Note: In any given menu, you may use arrow and ENTER keys on touch pad to make a selection or press the corresponding number and ENTER on touch pad as a short cut.

6. Electrical Installation

6.1 Input/Output Layout



DI – digital input (water meter, fertilizer meter)

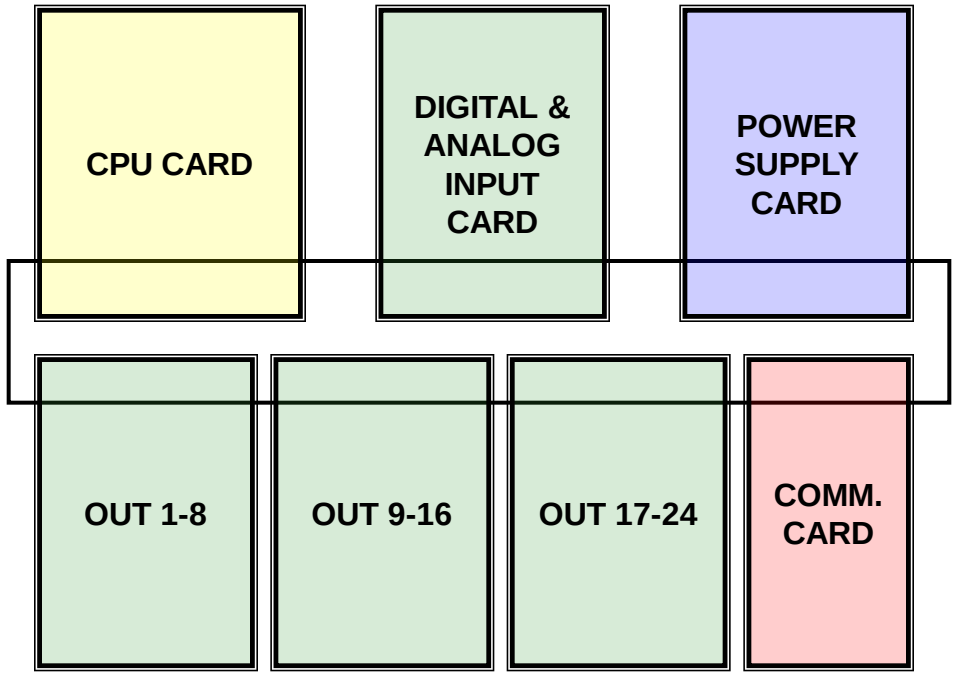
AI – analog input (EC, pH, Temperature…)

Out – output (Pumps, Valves, Filters…)

6.1.1 I/O Card Layout

Modular I/O Bus:

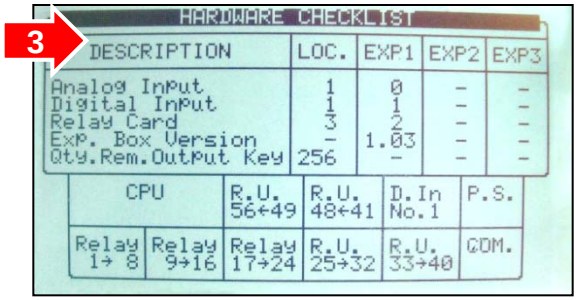
- Up to 4 I/O Cards
- 2 I/O Card Options
  - DC Latch Output Card
  - Digital & Analog Input Card
- LED Status Lights for:
  - DC Latch Output Card
  - Digital & Analog Input Card



6.2 Controller Hardware Verification

SELECT

⇨ ”8. Install”
⇨ ”6. Hardware checklist”



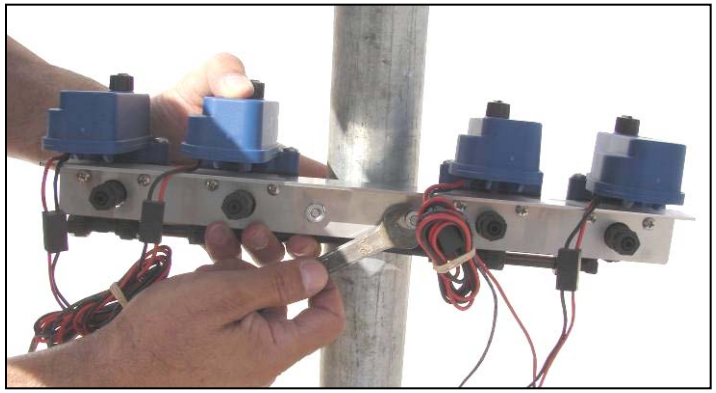
ENSURE

Hardware OK

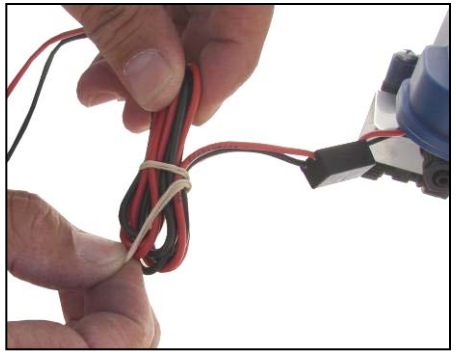
6.3 Solenoid Installation

1 ASSEMBLE Solenoids on pole

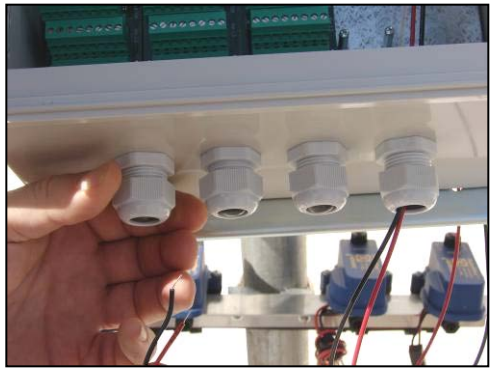
2 TIGHTEN Washer and nut x2



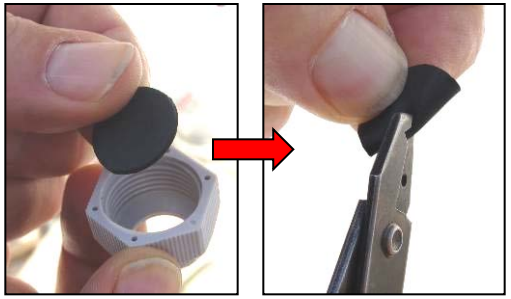
3 REMOVE Rubber band



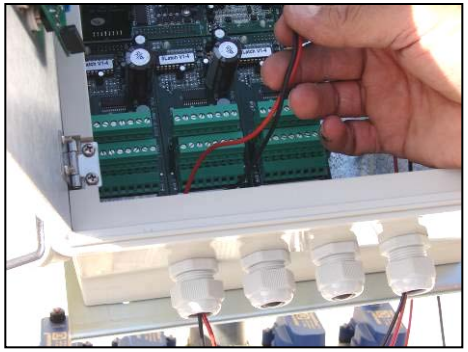
4 REMOVE Gland cover



5 REMOVE And **CUT** pad



6 REMOVE Wires through gland, pad and into the controller



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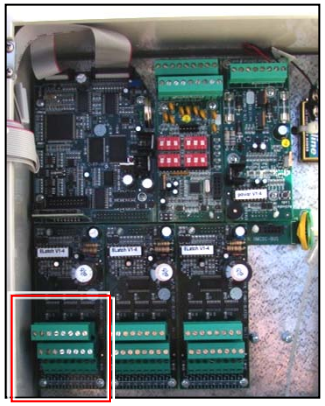
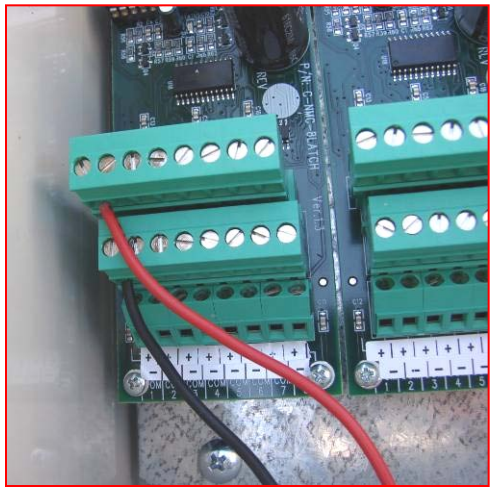
7

Terminal screw

Wires as shown

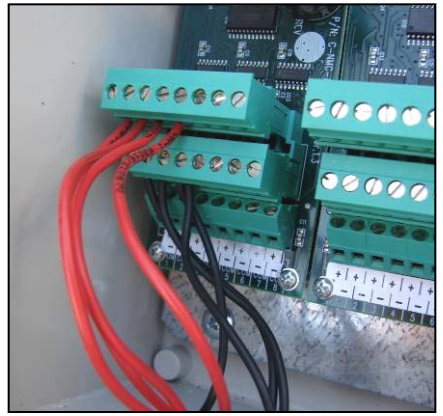
Terminal screw





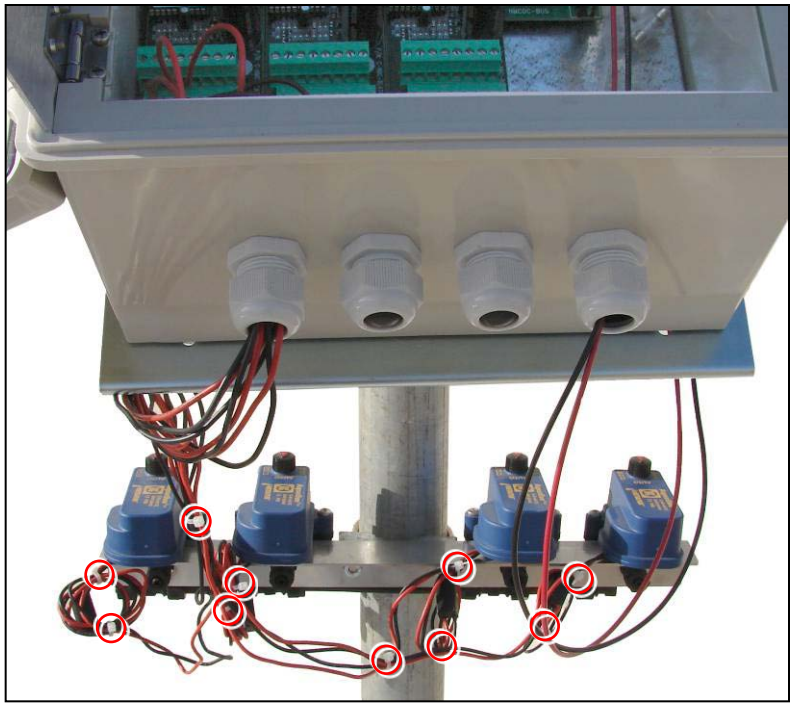
8

Previous step for all wires



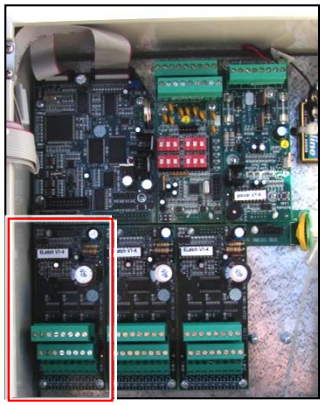
9

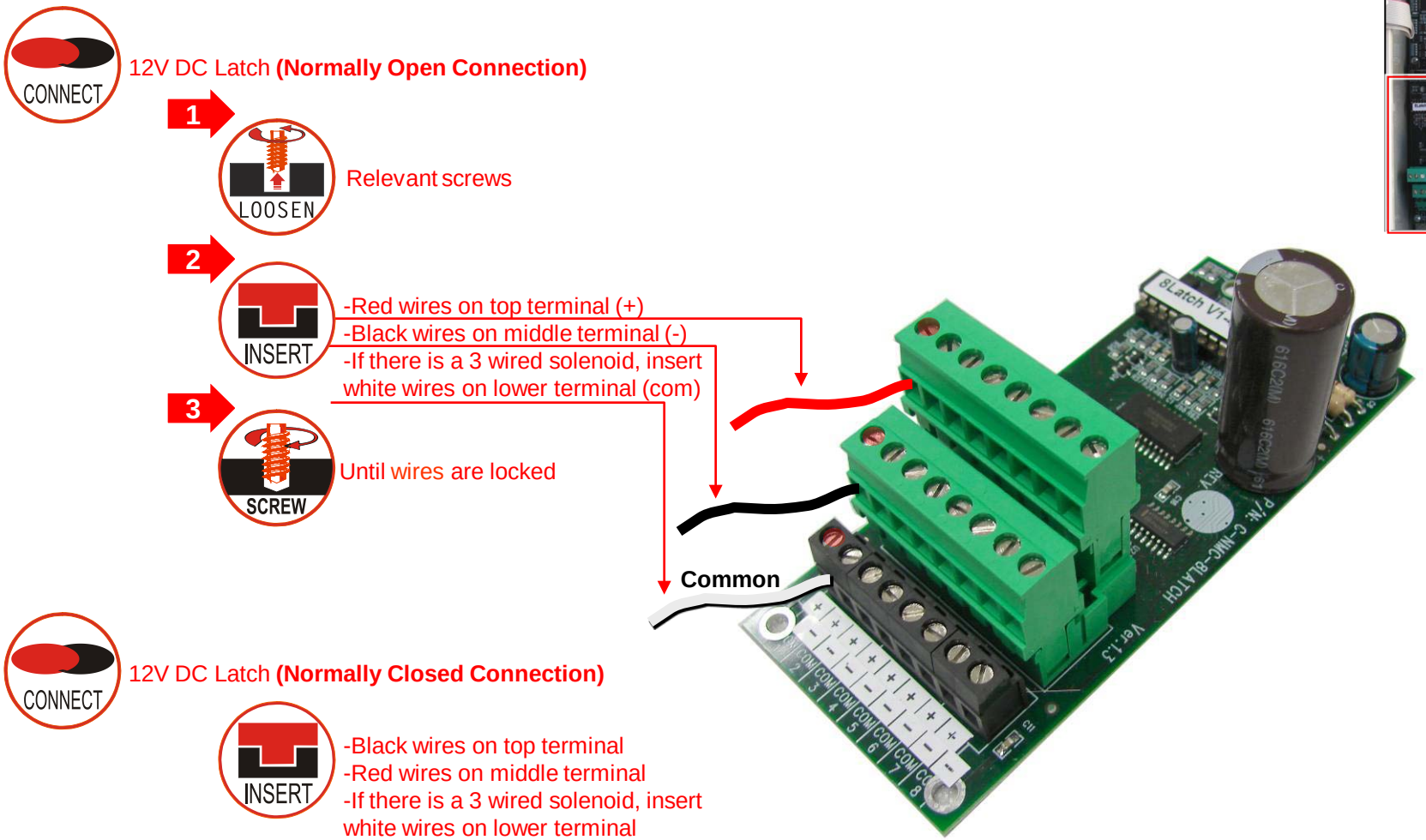
Wires using tie wraps x10



6.4 Output Terminals

6.4.1 12V DC Latch Connection





6.4.2 12V DC Latch Hydraulic Connection (Normally Open/Closed)

AquaTive^{Plus}® DC

2 wire activated

Presssure range (NC, NO):	0-10 bar (0-140 psi)
Ambient temp. max:	60°C (140°F)
Filtration:	80 mesh min
Fluid temp. max:	60°C (140°F)
Voltage range:	12-40 VDC
Pulse width:	min. 80, max.500 ms
Plastic parts:	Reinforced nylon
Command diaphragm:	EPDM
Hydraulic outlet:	1/8" bsp
Valve anchoring:	Two screws (self tapping) 10 x 1.5
Leads:	2 X AWG22 (120 cm)
Bracket material:	Stainless steel 316

Hydraulic 3 ports (1/8" BSP): COM – command to valve A & B

Maximum distance from AquaTive^{Plus} to controller: 13.5VDC 80 ms 4700 µf

Cable gauge (awg)	diameter (mm)	cross section (mm^2)	max. distance (m)
20	0.8	0.5	150
17	1.1	1.0	240
15	1.4	1.5	380

Recommended working condition capacitor mode

Voltage (VDC)	Capacitor (µf)	Min. pulse (ms)
12-18	4700	80
18-28	3300	80
28-40	2200	80

Electrical connection

Two wires: orange + / black & white - common

(changing wire connections will change NC to NO)

It is recommended to isolate wires connections from water to prevent corrosion).

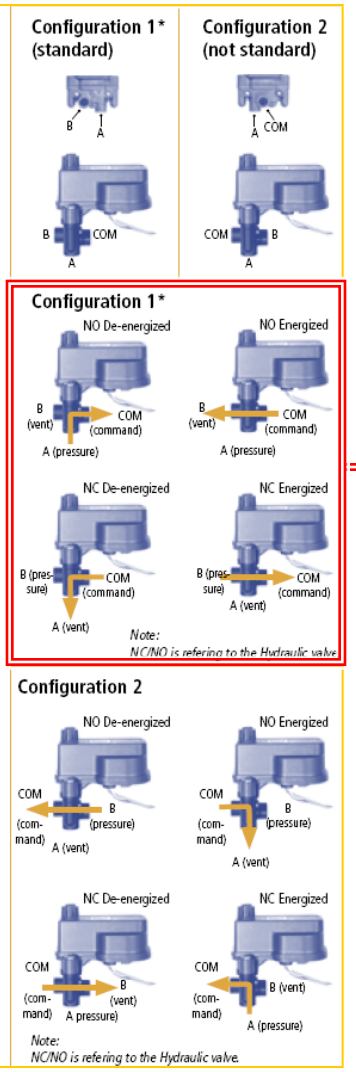
AquaTive^{Plus} is compatible with most DC latch controllers MOTOROLA, ELDAR-GAL ,TALGIL, PROGRES with two or three wire output (with 3-to-2 wire converter). For specific models, please contact your Netafim representative.

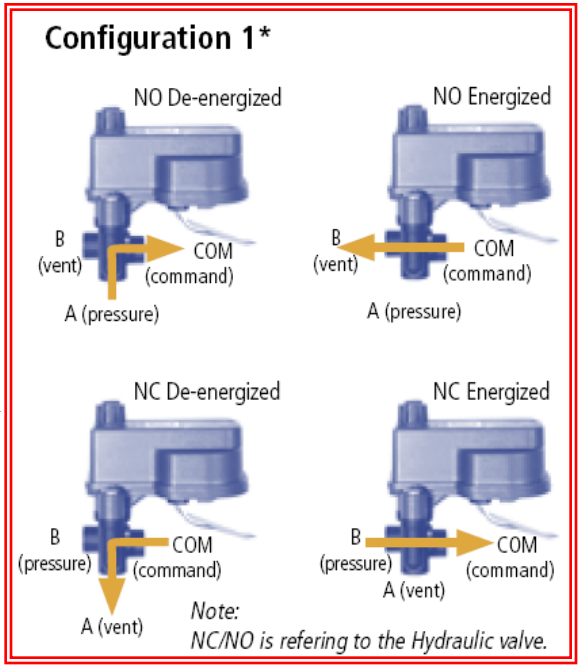
3-to-2 wire converter Catalog No. 35500-003450

Catalog No.

No. of actuator (s)

1 w/o brackets	35500-001900
1 w/o brackets configuration 2	35500-001920
1 w/ brackets	35500-002000
2 w/ brackets	35500-002100
3 w/ brackets	35500-002200
4 w/ brackets	35500-002300
5 w/ brackets	35500-002400
6 w/ brackets	35500-002500





Electrical connections:
Red wires to top terminal (+)
Black wires to middle terminal (-)
If there is a third white wire, connect to lower terminal (com)

To change from Normally Open to Normally Closed:
-Reverse vent and pressure inputs as described in the picture above.

6.5 Input Terminals

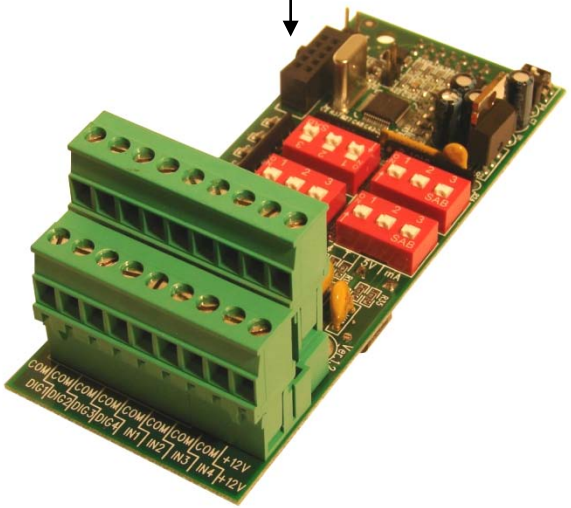
6.5.1 Wiring

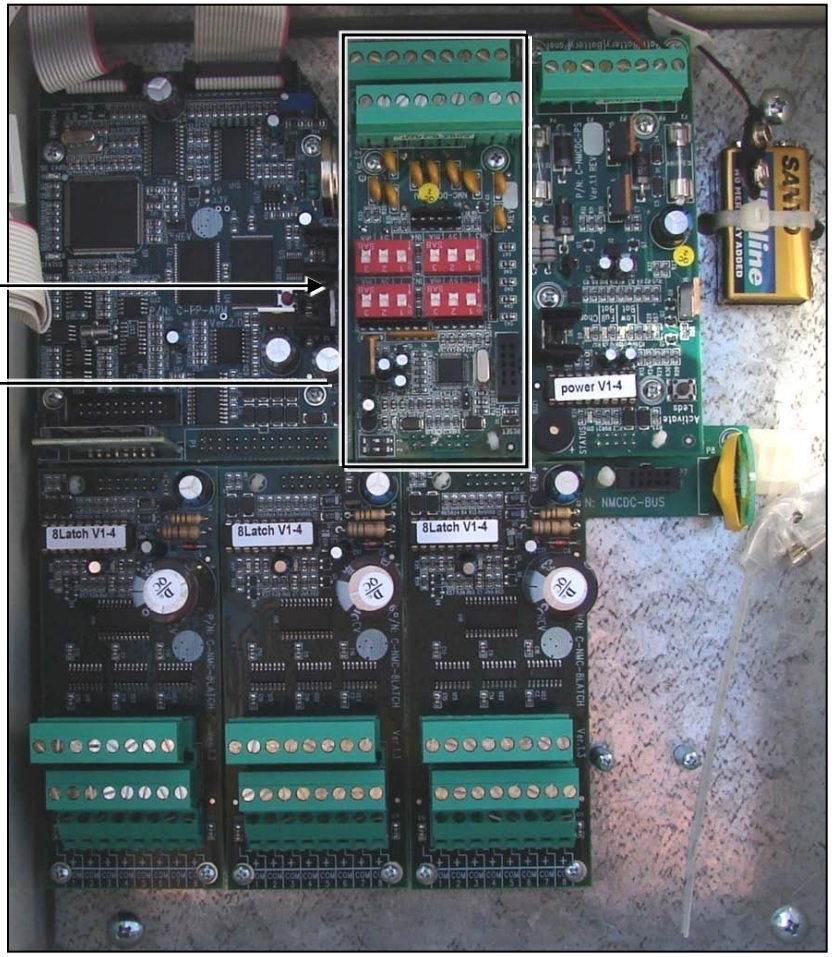
1

CONNECT

Digital and Analog Inputs as required

Digital & Analog Input Card





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2

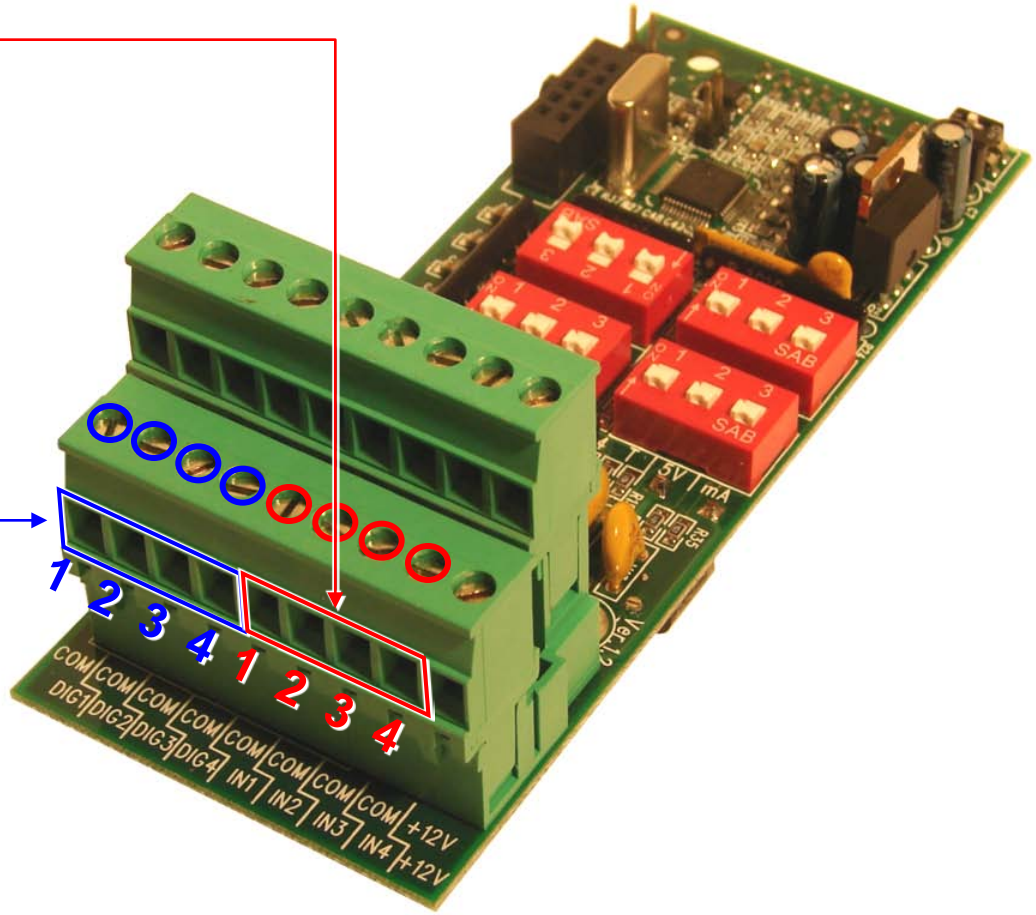
CONNECT

Analog Inputs (1-4):
⇨ EC/pH
⇨ Temperature
⇨ Humidity
⇨ Any other analog sensor

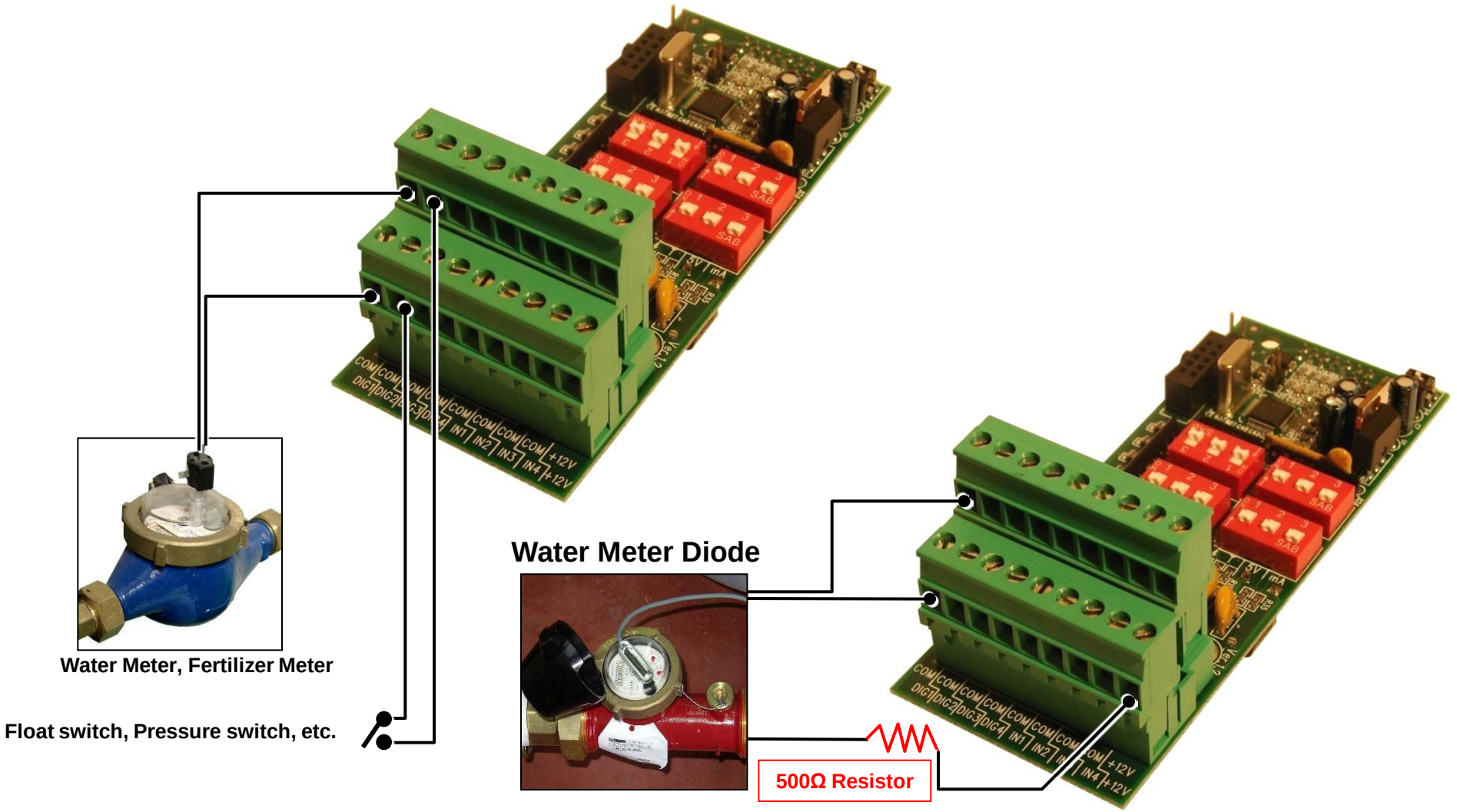
3

CONNECT

Digital Inputs (1-4):
⇨ Water Meter
⇨ Pressure switch
⇨ Floats
⇨ Any other ON/OFF inputs

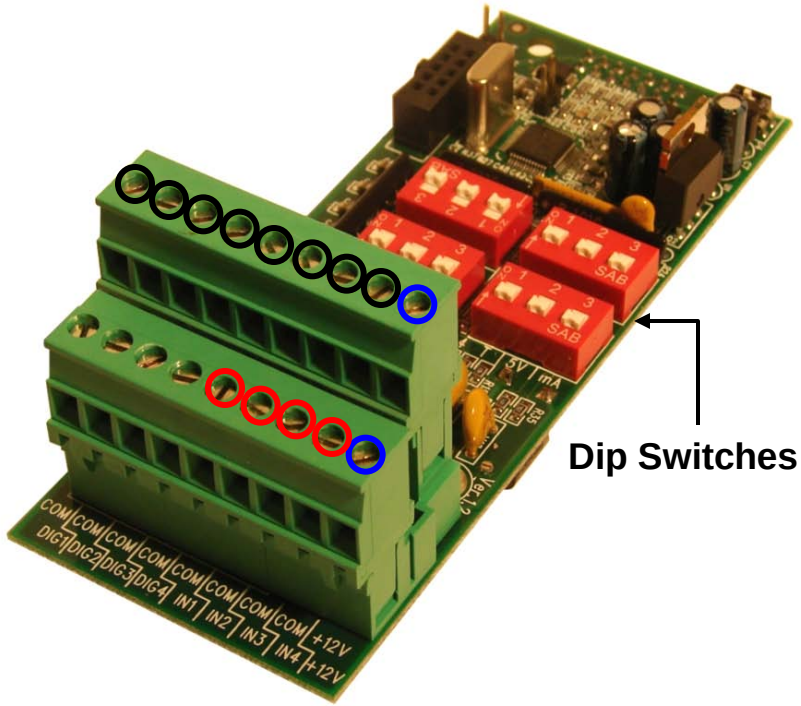


6.5.2 Digital Input Connection



6.5.3 Analog Input Connections

- **The Analog input card includes 4 x Analog inputs**
- **The type of every input can be selected by a dip switch positioning**



Common

Input #1 to #4

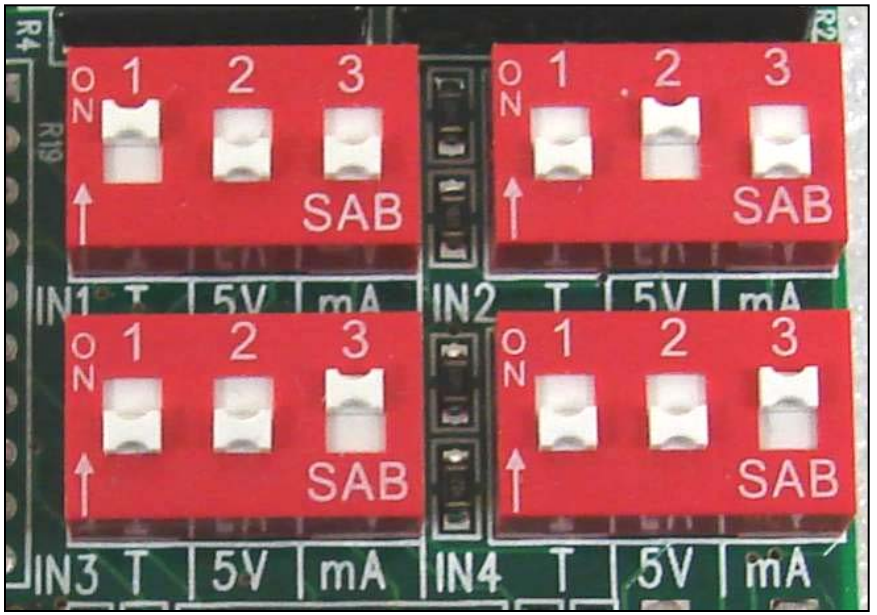
+12VDC supply for Humidity and Pyranometer sensors

+12VDC for peripheral equipment, maximum consumption 100mA

6.5.4 Analog Input Dip Switch Selections

Dip switch position for each input as needed according to location

Dip switch position	Sensor type
Temp	Temperature sensor (30kΩ)
0-5V	Humidity, Radiation, Pressure…
4-20mA	**EC, pH**

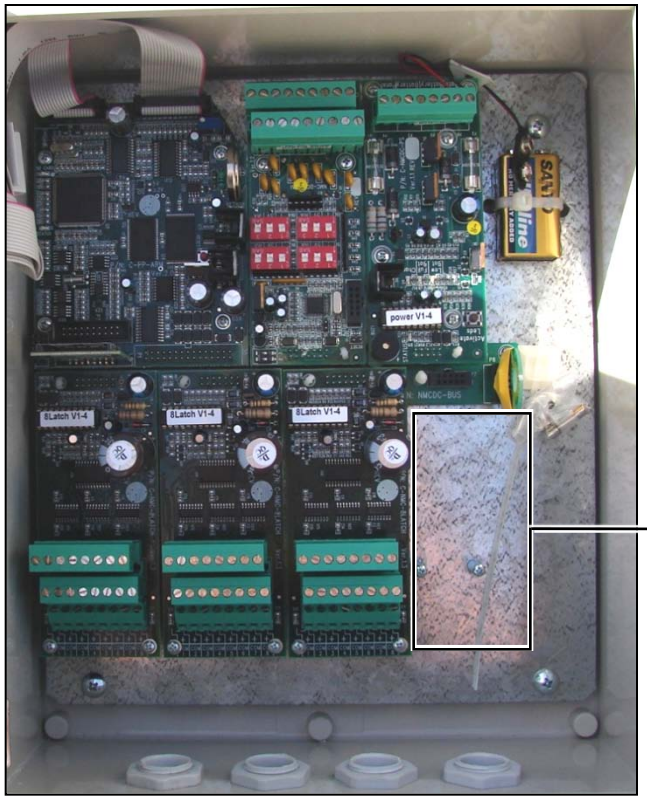


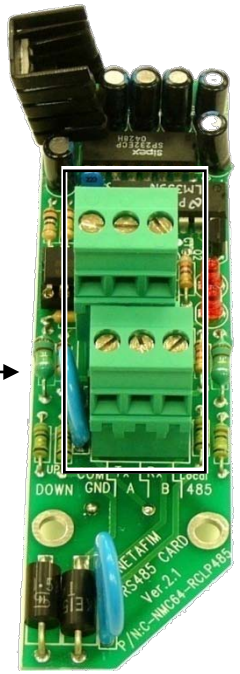
6.6 PC and Inter-Controller Communication

6.6.1 Card Installation

Insert RS-485/485x2 card

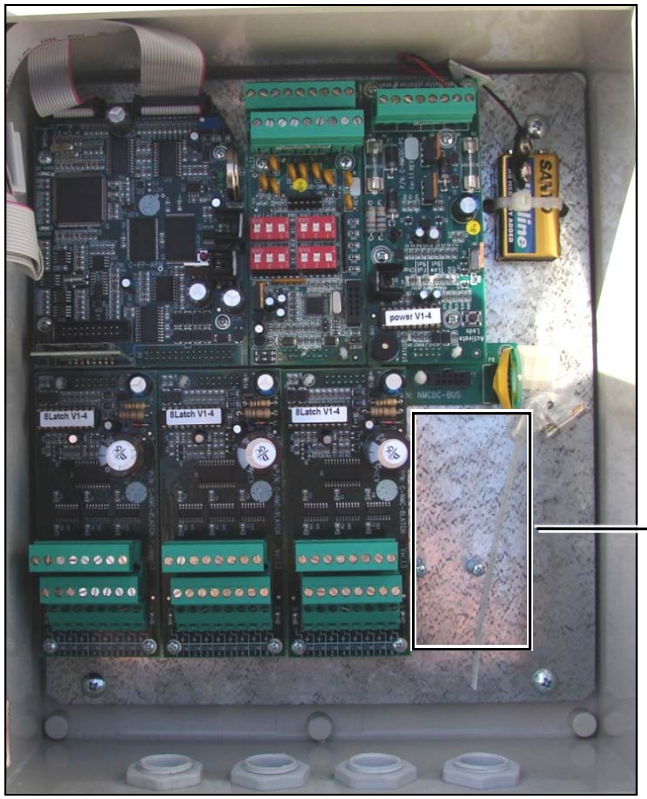
Option A: RS-485

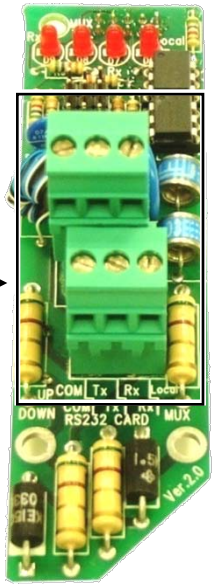




Insert RS-232 card

Option B: RS-232





NMC-DC

6.6.2 Wiring and Controller Setup

Option A: RS-485

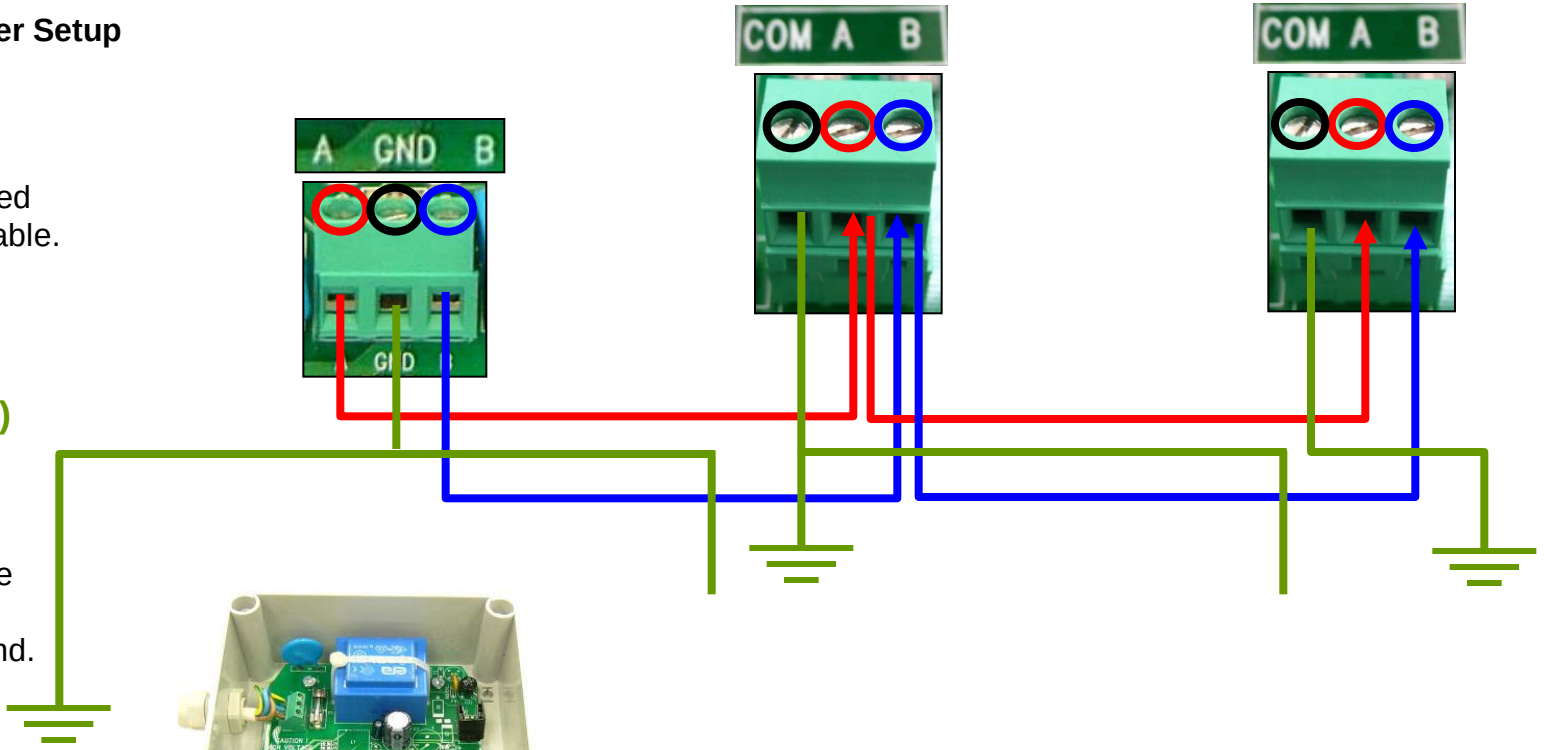
Use 2 wire shielded communication cable.

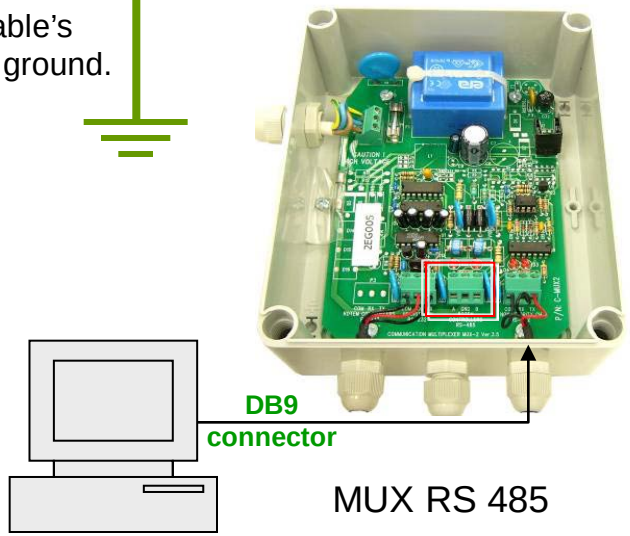
A

Ground (shield)

B

Do not connect the end of the cable's shield to the ground.





MUX RS 485

NMC-DC Controller 1

NMC-DC Controller 2

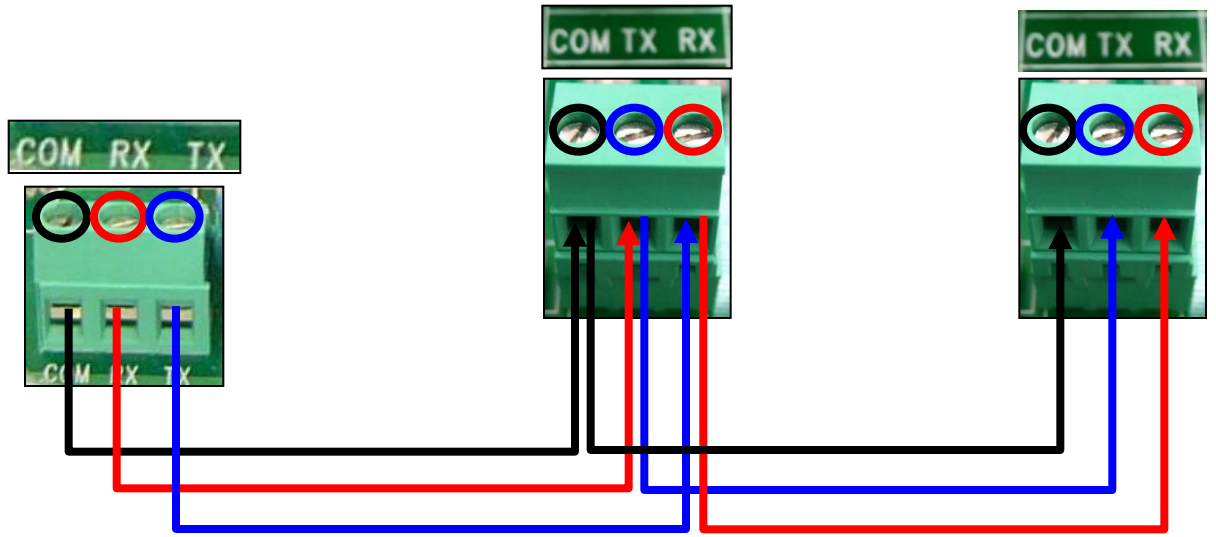
NMC-DC

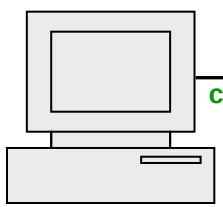
Option B: RS-232

Use 3 wire shielded communication cable.

- **Com**
- **Rx**
- **Tx**
- **Ground (shield)**

Do not connect the end of the cable's shield to the ground.





DB9 connector

MUX RS-232

NMC-DC Controller 1

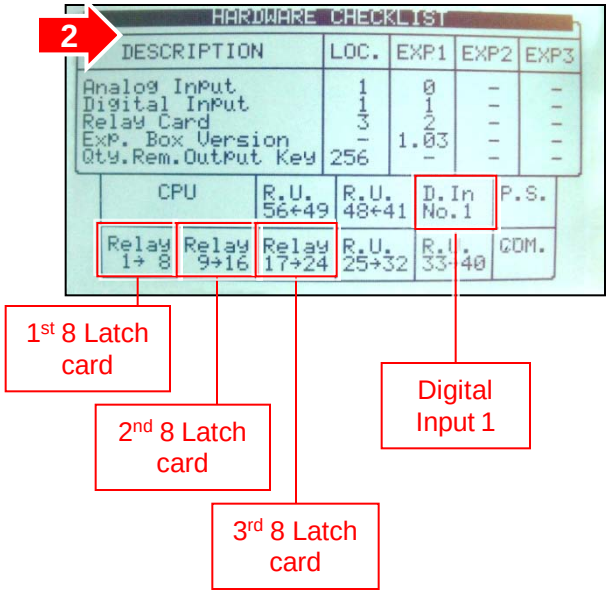
NMC-DC Controller 2

7. Controller Set-Up

7.1 Hardware Checklist

SELECT

"7. Hardware Check list" in Installation menu



CHECK

For Reference Only- overview of hardware check inputs and outputs

System is equipped with:
24 outputs
4 digital inputs
4 analog inputs

7.2 Output Definition

SELECT

⇨ “8. Install” in main menu and press ENTER
⇨ “1. Device Layout” and press ENTER

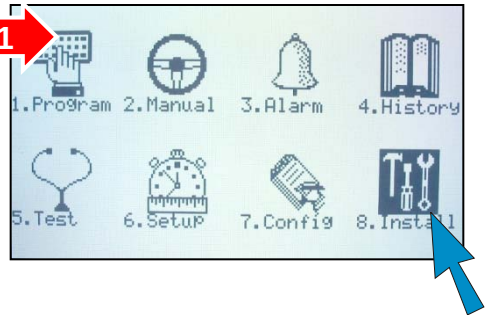
ENSURE

Technician writes an I/O list

SELECT

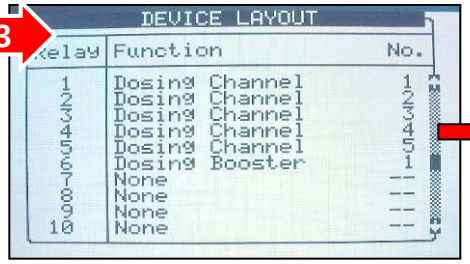
Define devices:
Ex. Valve 1 and 2
Relay 9 and 10 as Output 9 and 10
(Relay 9=1st Output of 2nd card…)

1

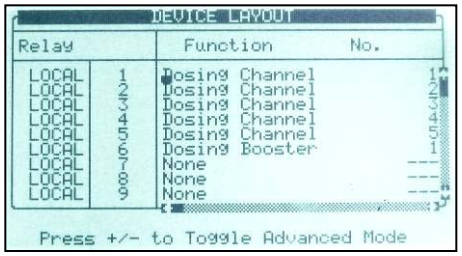


2

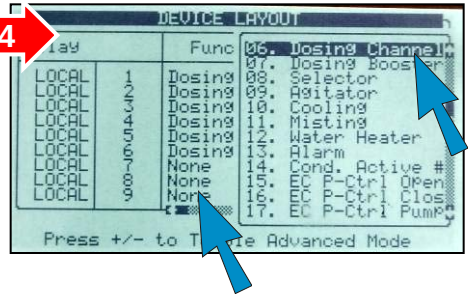
3

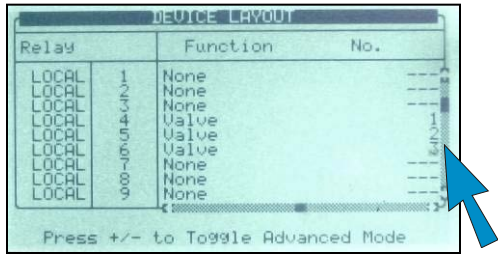


Press (+/-)



4

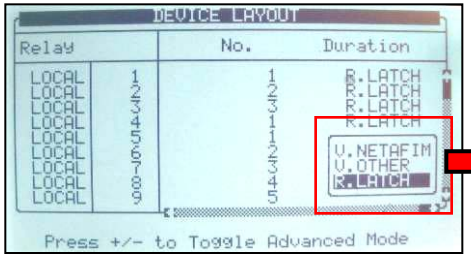


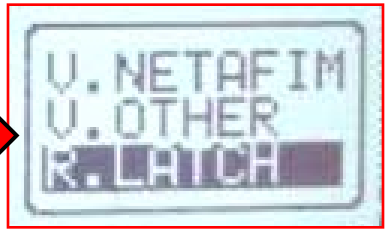


NMC-DC

5

SELECT ENTER



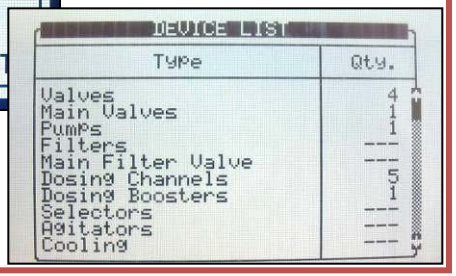


NOTE: Choose the appropriate option depending on the type of solenoid.

- Netafim solenoid has a pulse rate of 90 msec.
- Other solenoid has a pulse rate of 40 msec
- Relay Latch has a pulse rate of 15 msec..

REPEAT These steps for every output

VERIFY "2. Device List" is read-only overview list of definitions for verification



7.3 Digital Input Definition

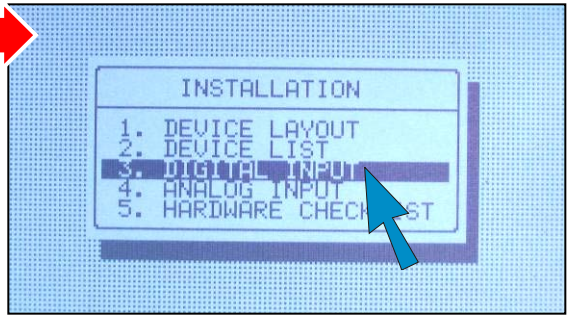
SELECT

⇨ “3. Digital Input 1” in Installation menu
⇨ Input 1 set definition

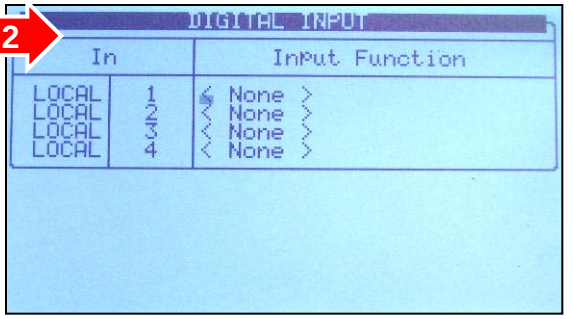
REPEAT

Steps 2-4 for all Input definitions- **according to technician and equipment in field**

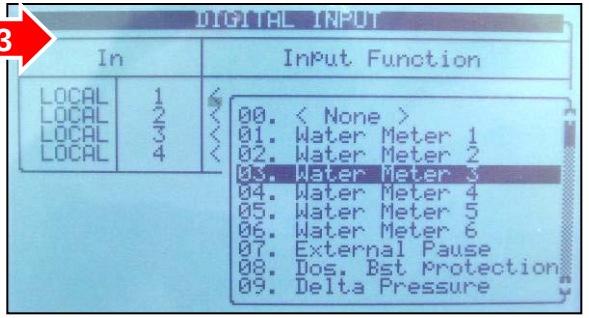
1



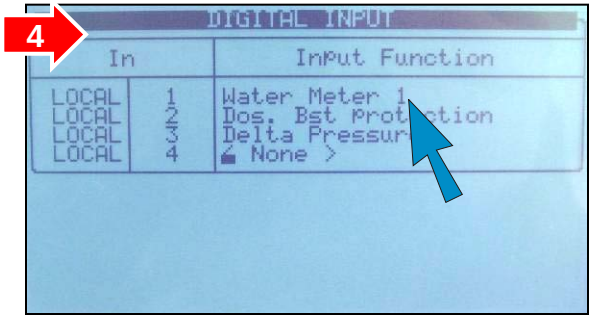
2



3



4



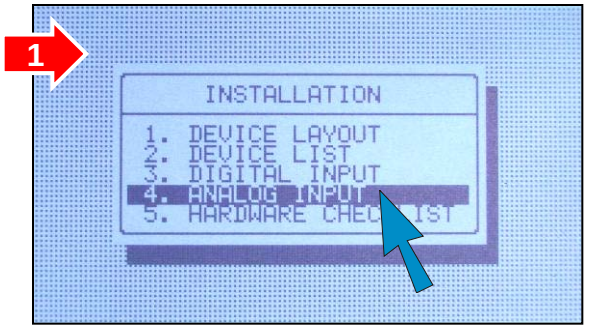
7.4 Analog Input Definition

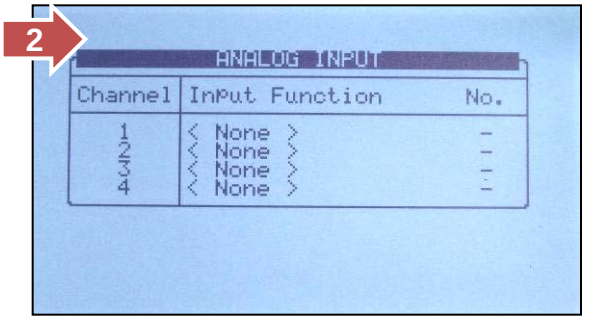
"5. Analog Input 1" in Installation menu

Pre-programmed at factory:
1. EC Sensor
2. PH Sensor

Channel 1 and enter additional sensors according to terminal and dip switch position

Previous step for all other analog input sensors





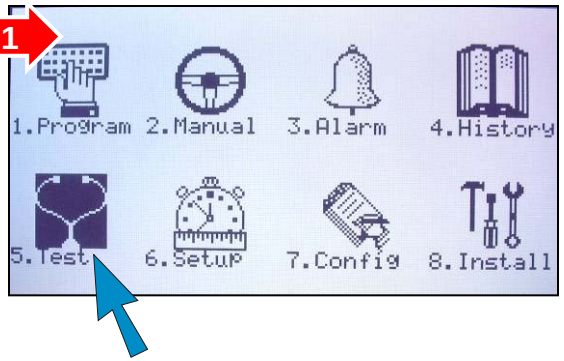
8. Controller Test Procedure

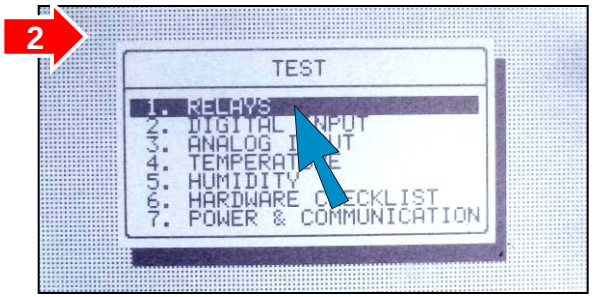
8.1 Test Relays

NOTE: In order to bring solenoid to Normally Open/Closed position either manually open and close each output, or switch controller off and back on again for automatic positioning.

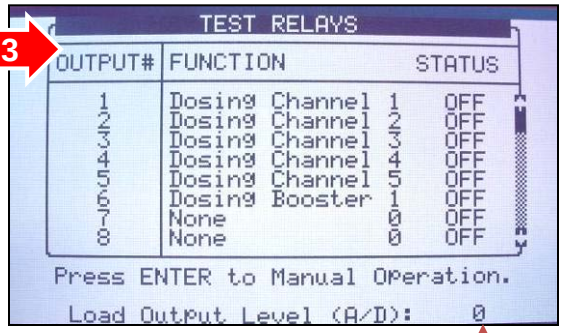
RUN TEST

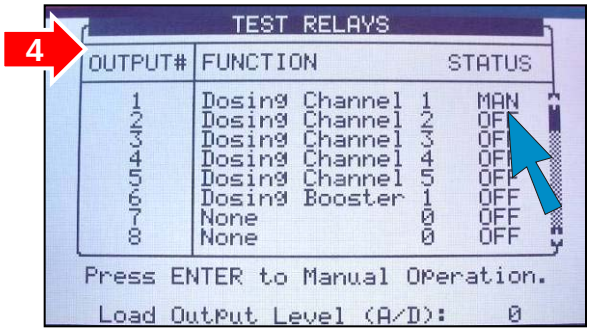
SELECT "5. Test" in Main Menu





SELECT ⇨ "1. Relays" to test output devices in the field (dry test)
⇨ Highlight status, press ENTER, "MAN" appears
⇨ To end process press ENTER again



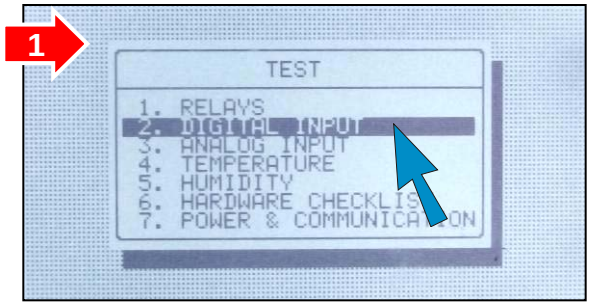


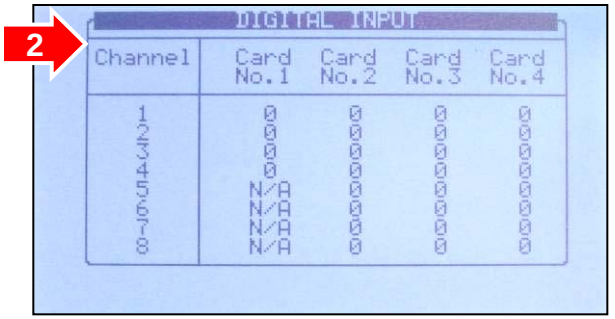
CHECK For Irrigation valve test, send someone out in field with Walky-Talky to verify status

CHECK Output Level (A/D): ≤300 A/D when all outputs are on.
If output level is above 300, see Troubleshooting Appendix B

8.2 Digital Input Test

SELECT "2. Digital Input" in Test menu





PERFORM Dry test- Get a pulse using magnet; attach magnet to get a pulse from the "read" of the cable

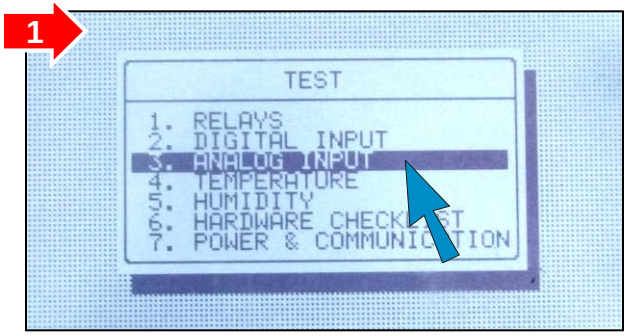
VERIFY
- ⇨ Water, fertilizer and any auxiliary meters: Count up 1-255
- ⇨ Delta pressure: 1= **ON**, 0= **OFF**

8.3 Analog Input Test

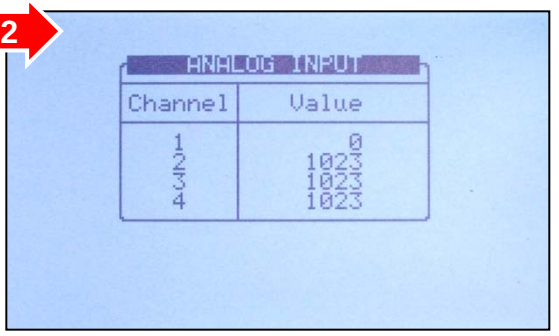
SELECT

"3. Analog Input" in Test menu
See Table 6.4 (Next Page)

1



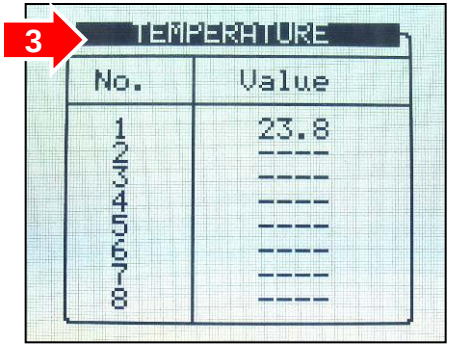
2



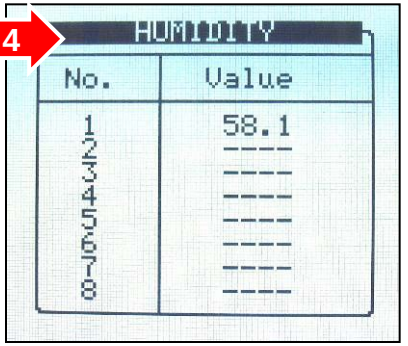
SELECT

"4. Temperature" or "5. Humidity"-values will be displayed

3



4



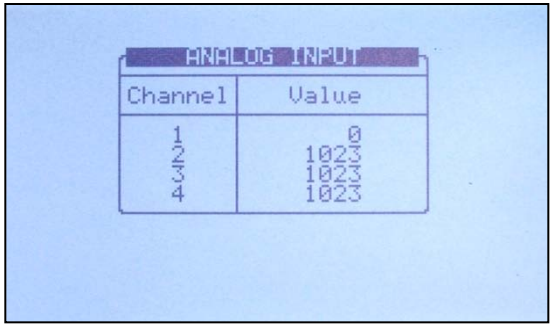


Table 6.4

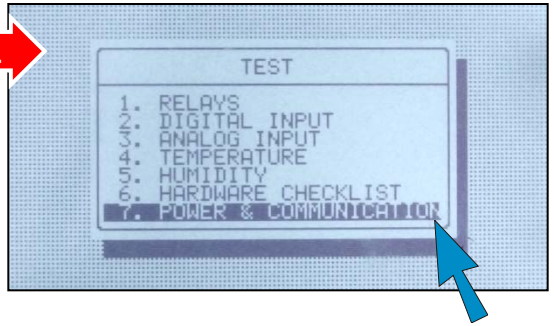
Sensor type	Description
pH sensor	pH = 0 – A/D = 205
	pH = 7.0 – A/D = 615
	pH = 14.0 – A/D = 1023
EC sensor	EC = 0 – A/D = 205
	EC = 2.0 – A/D = 370
	EC = 10.0 – A/D = 1024
Humidity sensor	RH% = 0 – A/D = 0
	RH% = 50 – A/D = 308
	RH% = 100 – A/D = 620
Temp sensor	T°C = 0 – A/D = 768
	T°C = 25 – A/D = 489
	T°C = 50 – A/D = 250

8.4 Power & Communication Test

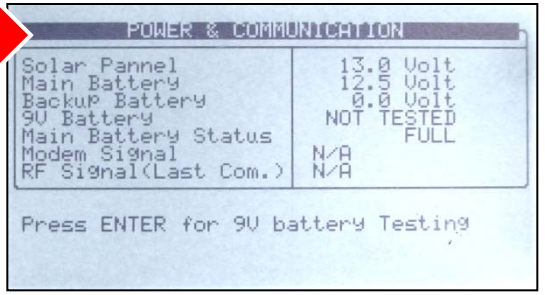
SELECT

"7. Power & Communication" in Test menu

1



2



VERIFY

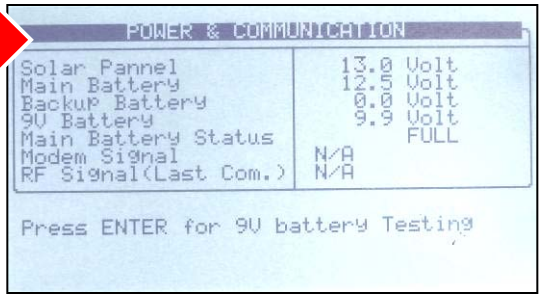
Solar Panel ≈ 13.0 Volts
Main Battery ≈ 12.5 Volts
9V Battery ≈ 9.9 Volts
Main Battery Status = FULL

3

SELECT

ENTER

4



9. System Configuration Procedure

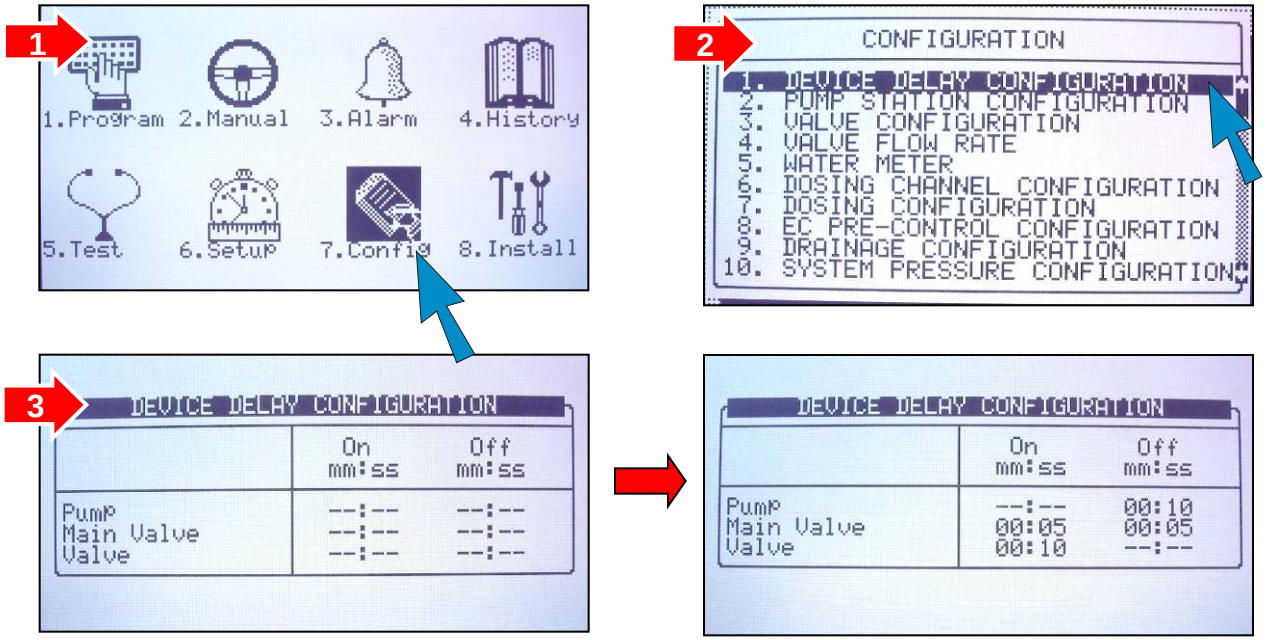
9.1 Device Delay Configuration

RUN PROGRAM

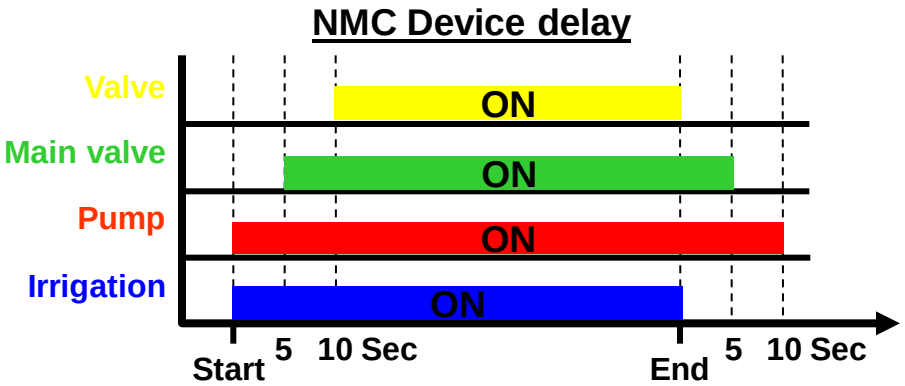
Irrigation system and controller configuration

SELECT

⇨ “7. Config” in Main Menu
⇨ “1. Device Delay Configuration”
⇨ Enter delay values. See table below.



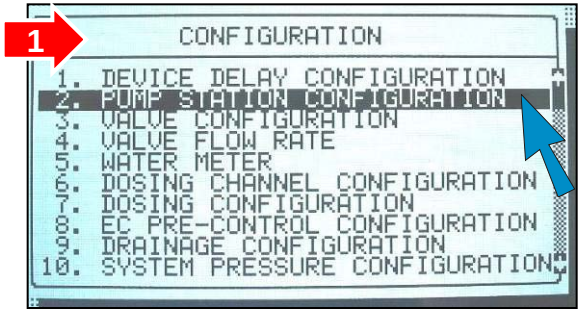
NOTE: Settings in the graph below are for example only.

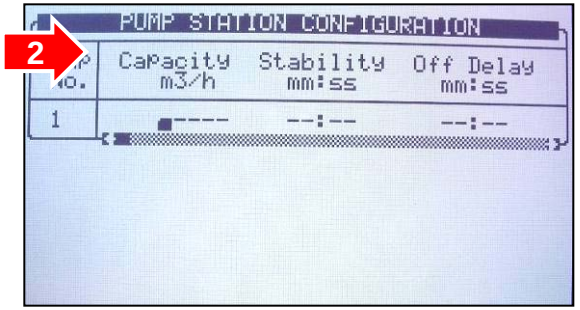


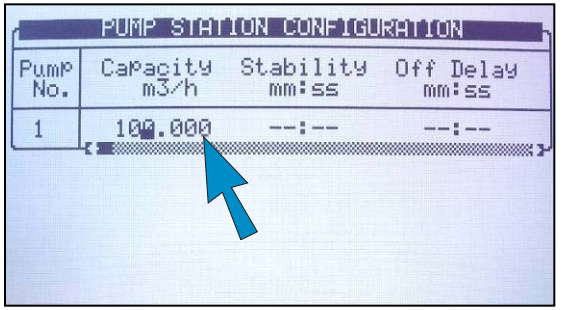
9.2 Pump Station Configuration

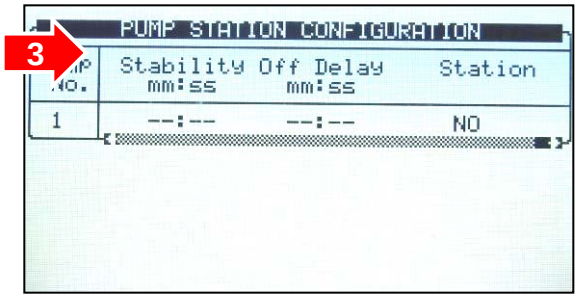
SELECT

⇨ “2. Pump Station Configuration”
⇨ Define capacity of main pump









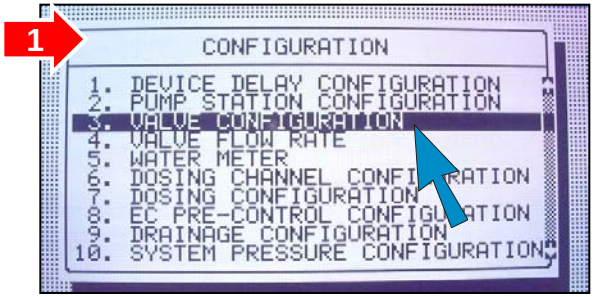
NOTE: If there is more than 1 pump, please refer to NMC-DC *Advanced Settings*

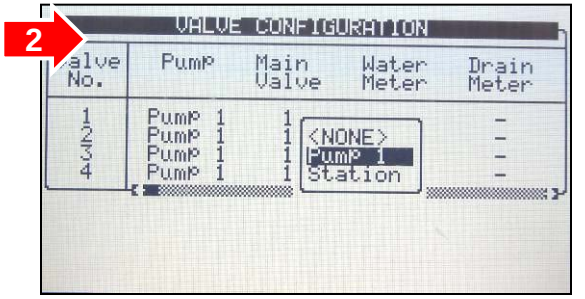
NMC-DC

9.3 Valve Configuration

SELECT

⇨ "3. Valve Configuration"
⇨ Allocate pump, main valve and water meter (Note: If there is more than 1 pump, refer to NMC-DC User Manual)

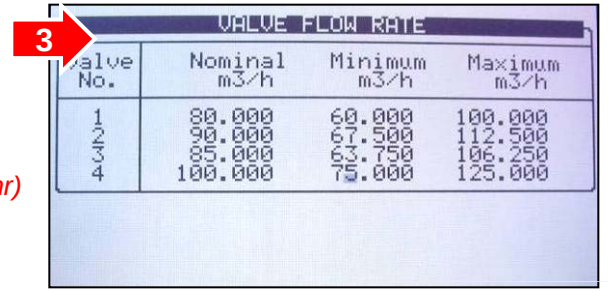




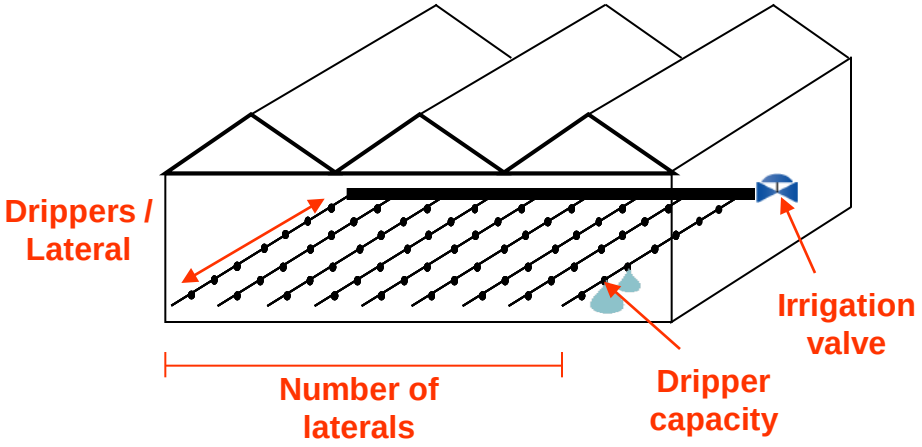
9.4 Valve Flow Rate

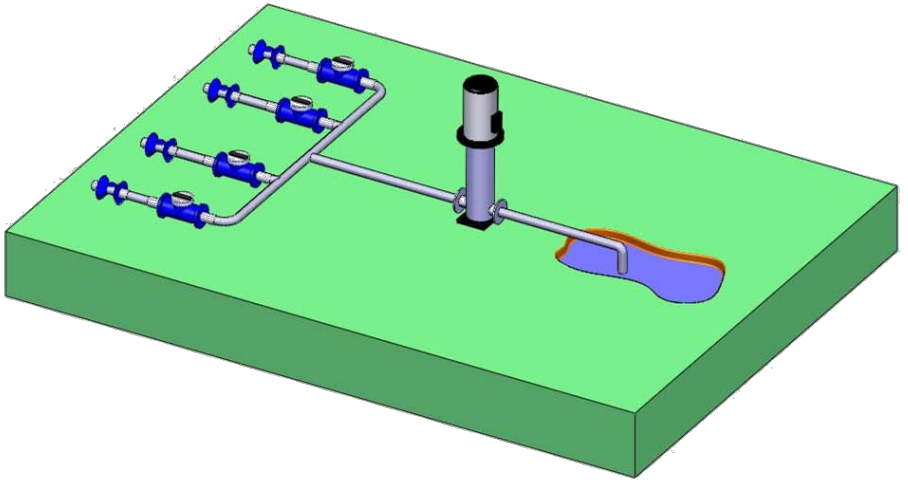
SELECT

⇨"4. Valve Flow Rate"
⇨ Define exact flow consumption of every valve: Technician must calculate formula**:**
[Drippers/lateral x dripper capacity (liters/hr) x # of laterals/valve**]** ÷ 1000 = *nominal flow of valve (m³/hr)*
⇨ Set Min./Max. flow rate limits per valve for alarm (already defined as 25% by default)



NOTE: In case of use of multiple water meters or drain meter, please refer to *Advanced Settings* on page 62/64.



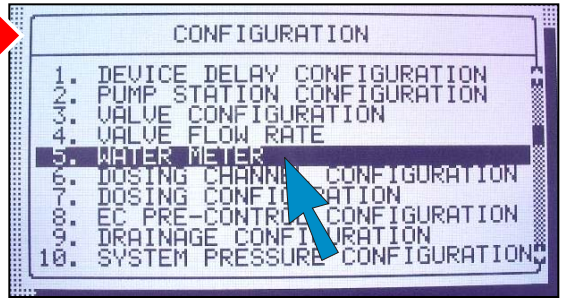


9.5 Water Meter

SELECT

⇨ “5. Water Meter”
⇨ Define resolution of water meter- See label on water meter as shown in Step 2

1

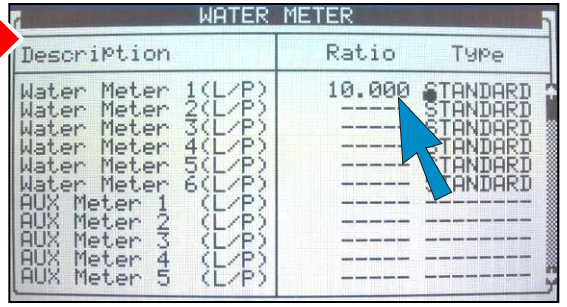


2

CHECK

If there is no label, check data sheet supplied with the meter.

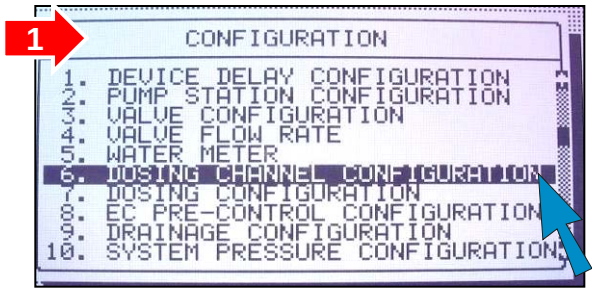
3

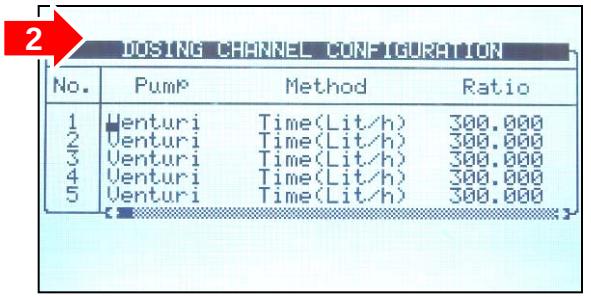


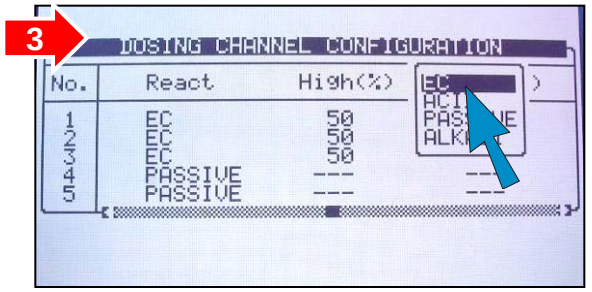
NOTE: If there is more than 1 water meter, please refer to NMC-DC *Advanced Settings*

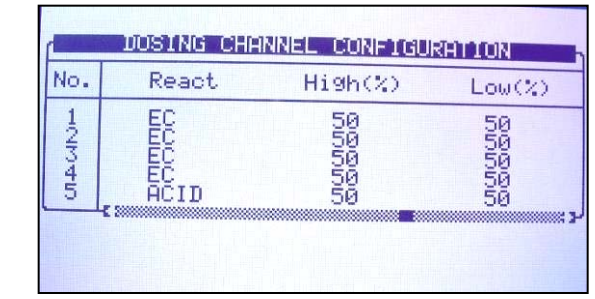
9.6 Dosing Channel Configuration

⇨ “6. Dosing channel Configuration”
⇨ Define flow rate of every Venturi
⇨ Define channels 1-4=EC
⇨ Define channel 5=Acid









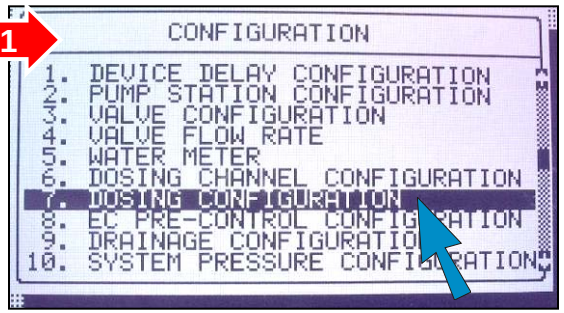
NOTE: In case of different dosing pump (electric) or setting (fertilizer meter), please refer to NMC-DC *Advanced Settings*

9.7 Dosing Configuration

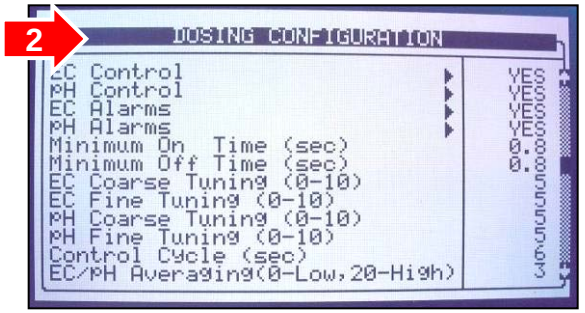
SELECT

⇨ “7. Dosing Configuration”
⇨ EC and PH Control and Alarms to “Yes”
⇨ Set Min. On Time to 0.8≤2.0 seconds
⇨ Set Min. Off Time to 0.8≤2.0 seconds
⇨ To set Control Cycle, run system and measure time in seconds it takes to see reaction of EC/PH meter
⇨ Set dosing Booster Delay to 10 seconds

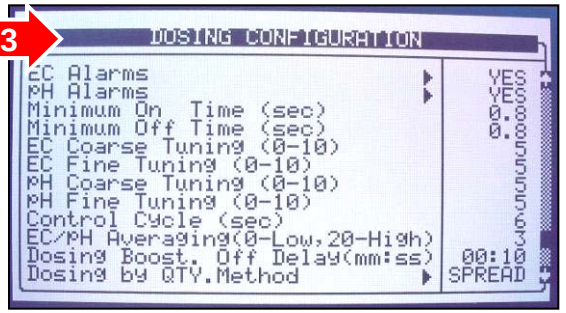
1



2



3



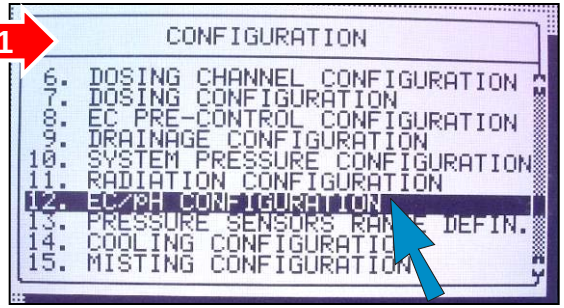
NOTE: For different dosing settings, please refer to NMC-DC *Advanced Settings*

9.8 EC/PH Sensor Range

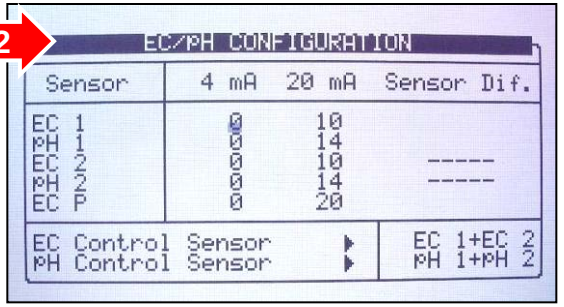
SELECT

⇨ “12. EC/PH Configuration”
⇨ Leave as is

1



2

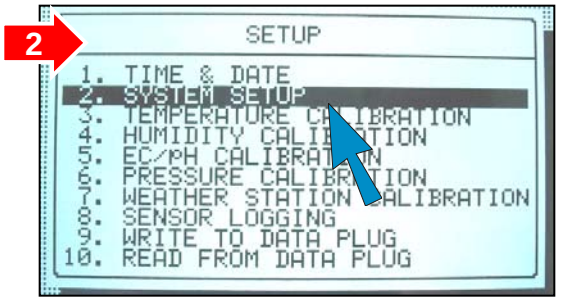


NOTE: When using multiple EC or pH sensors, please refer to NMC-DC *Advanced Settings*

9.9 History Resolution

SELECT

Program how often computer should collect sensor data. (Keep in mind that lower resolution will quickly fill the memory and overwrite the old data - See NMC-DC User Manual)



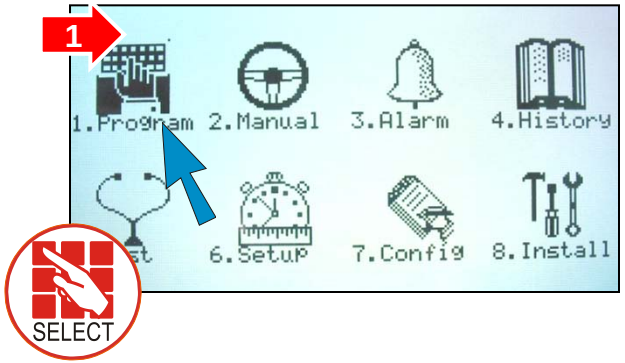
NOTE: *For more details on system setup, please refer to NMC-DC Advanced Settings*

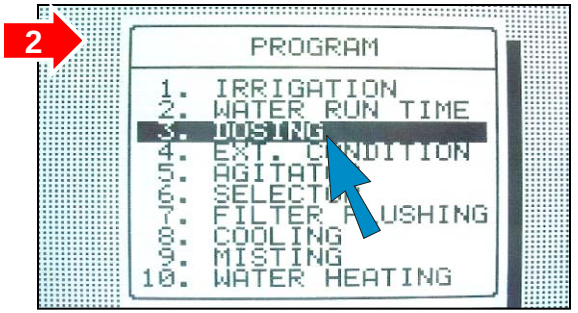
9.10 System Nutrigation™ Check

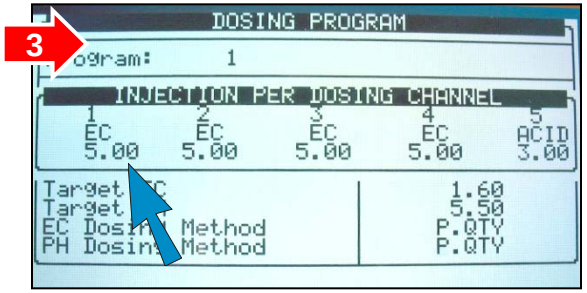
EC/pH is on target

ENSURE

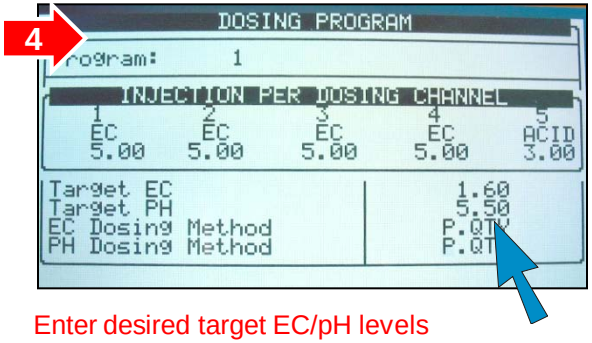
Know limits of irrigation system. Calculate max. allowed injection: (Dosing channel suction flow ÷ average flow rate from field) X 0.8 = Max. injection quantity (lit/m³, USA: Gallon/1000 gallon.)







Enter desired amount of fertilizer to inject per dosing channel in l/m³ (USA: Gallon/1000 gallon)



Enter desired target EC/pH levels

9.10.1 Simulation

ATTENTION

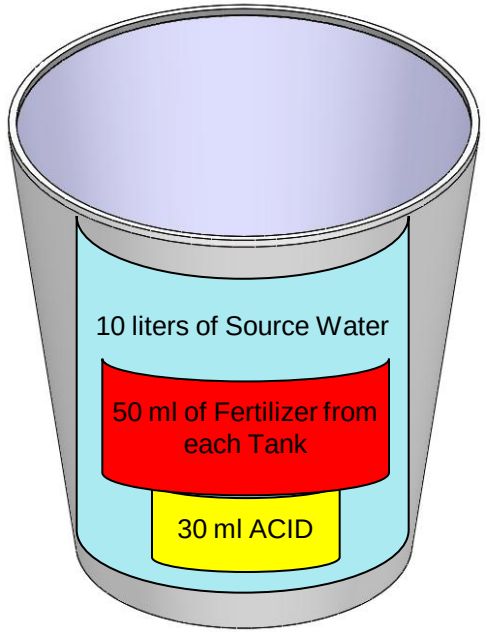
Use protective equipment, gloves and goggles when handling fertilizers, acid and other chemicals!

PERFORM

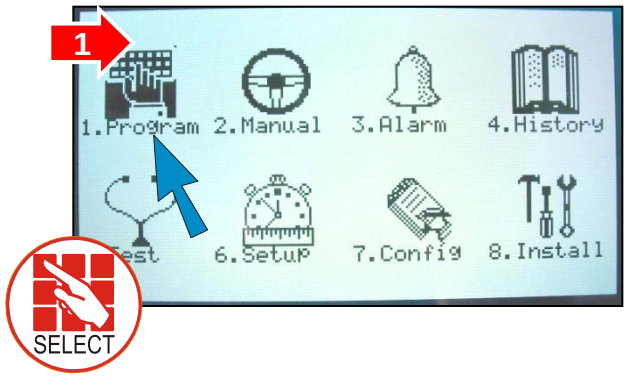
⇨10 liters of water in bucket
⇨ Inject 50 ml of fertilizer from each tank
⇨ Inject 30 ml of acid
⇨ Mix until acid and fertilizer is dissolved

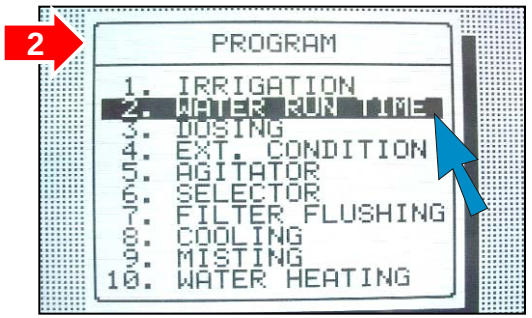
CHECK

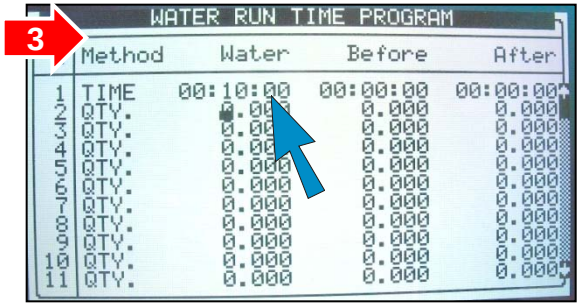
⇨ EC and pH levels.
⇨ Results should be relatively close to desired target.
⇨ Deviation of ≤0.5 from target is allowed.



9.10.2 Water Run Time

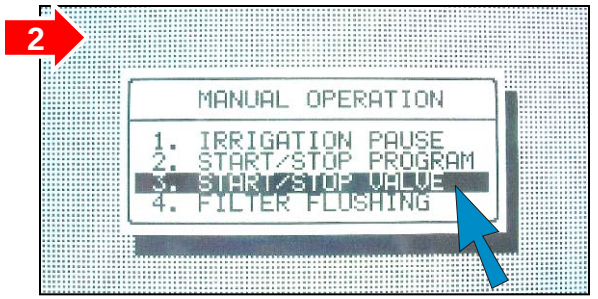


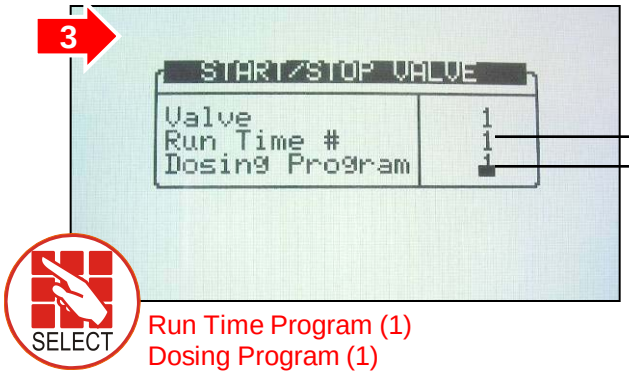




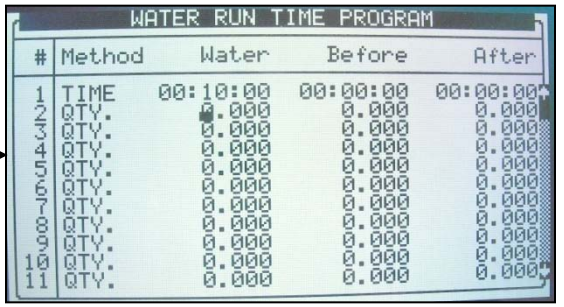
Enter water run time or quantity

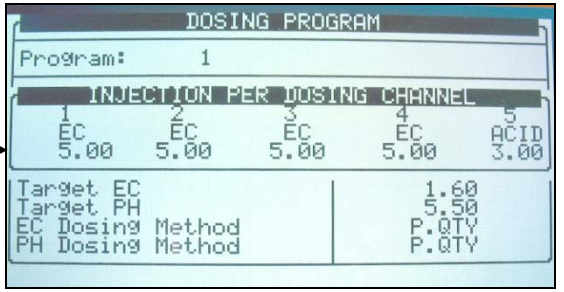
9.10.3 Start/Stop Valve



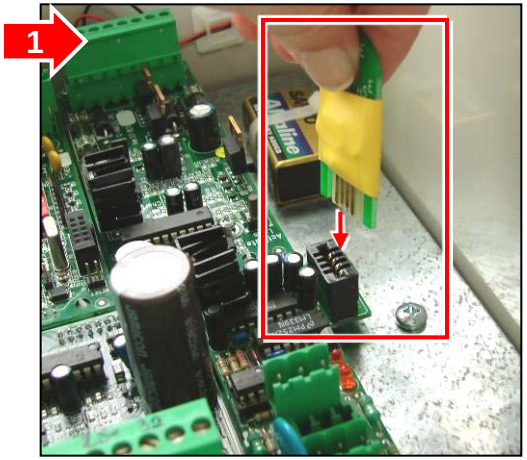


Run Time Program (1)
Dosing Program (1)

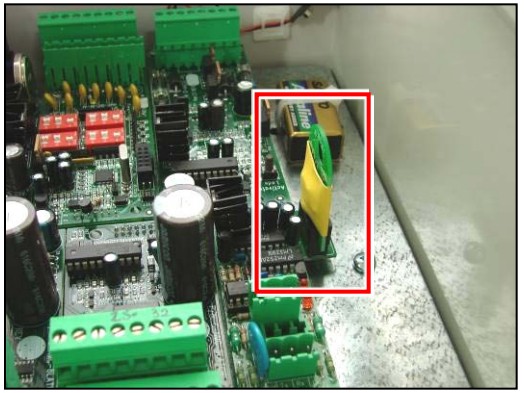


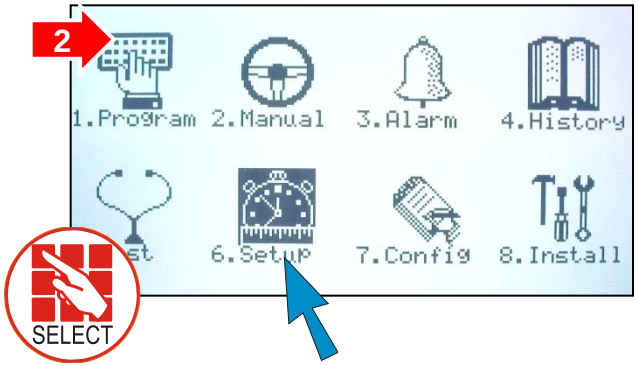


9.11 Data Plug

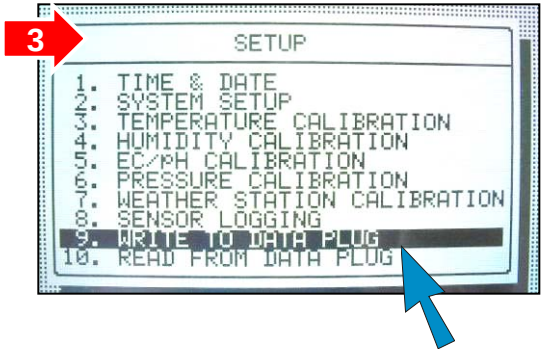


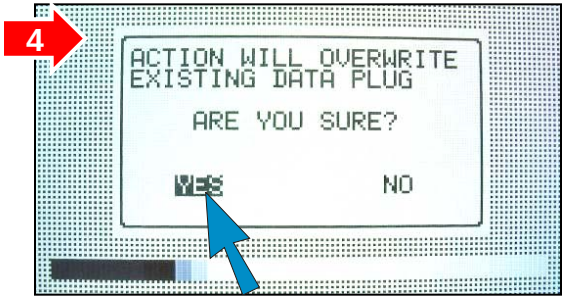
Data plug into terminal

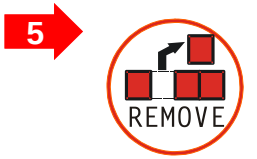




System is idle and not in process before “Write to Data Plug”



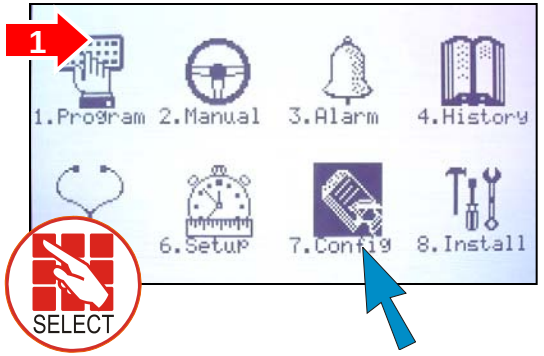


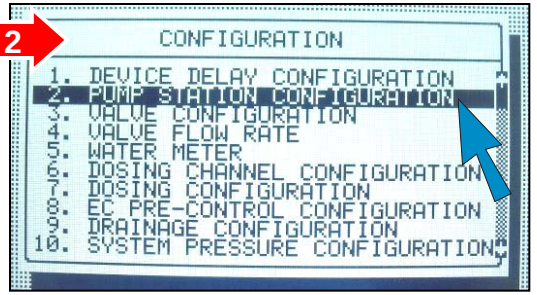


Data Plug from terminal at end of process

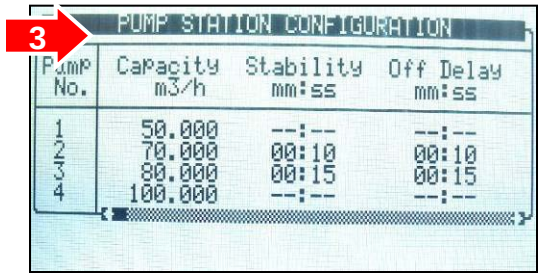
10. Controller Advanced Settings

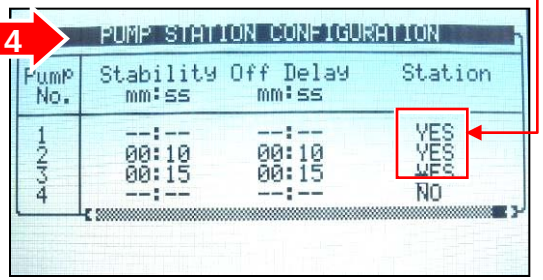
10.1 Pump Station Configuration

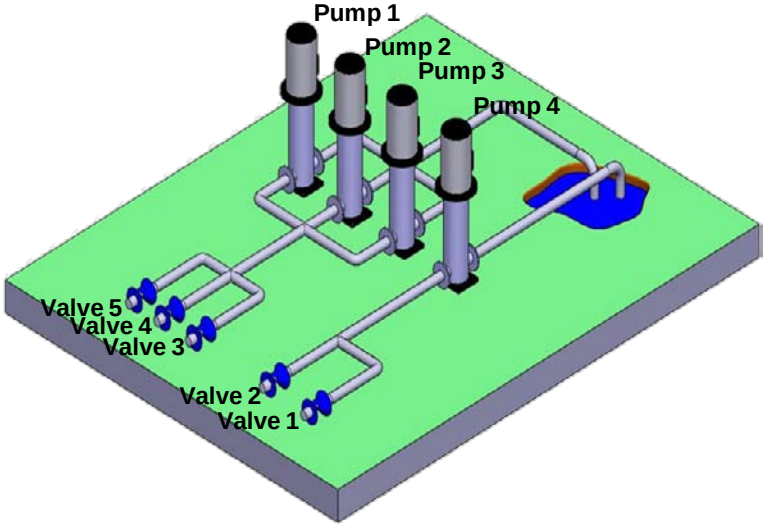




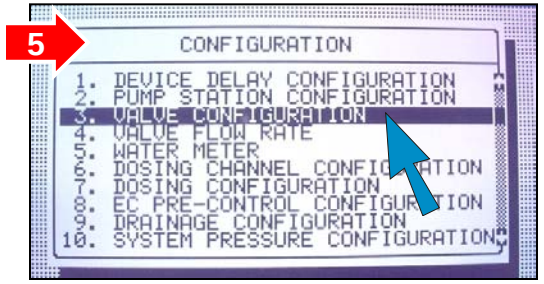
Pumps 1, 2 & 3 form a station

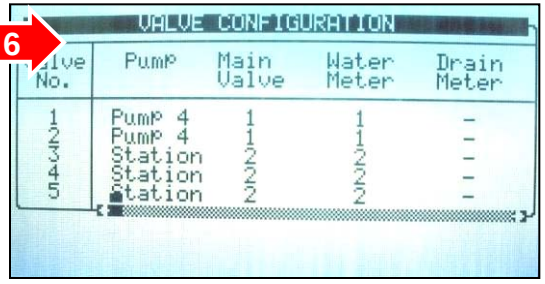






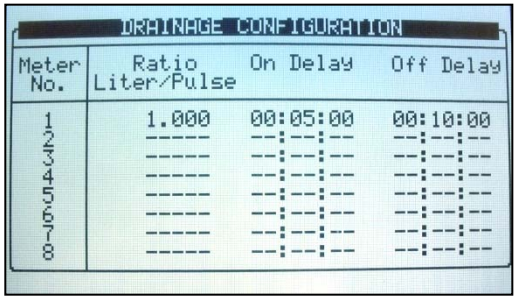
Stability: Time between each pump start
Off Delay: Time delay between switching each pump Off

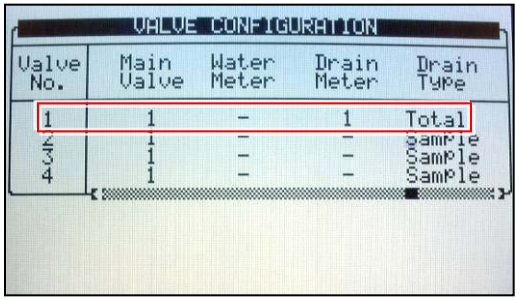


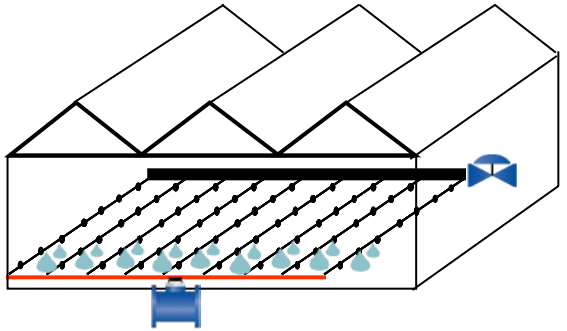


Valves 1 & 2 allocated to Pump 4
Valves 3, 4 & 5 allocated to station of pumps 1, 2 &3

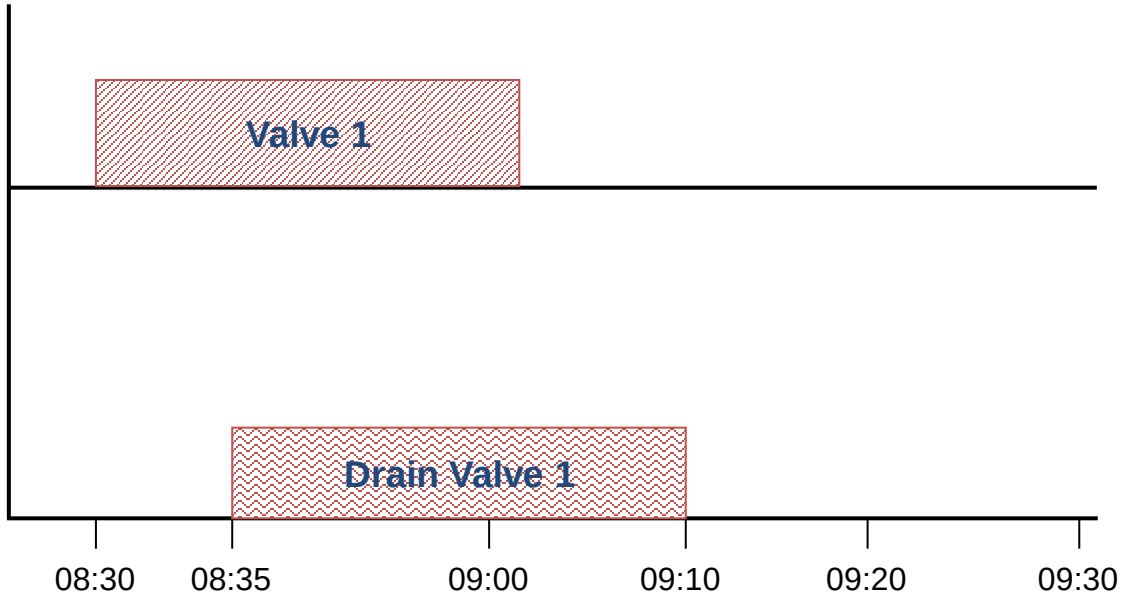
Drainage Timing Option A- **When irrigating 1 valve which allocated to the a drain meter**







Drain meter 1



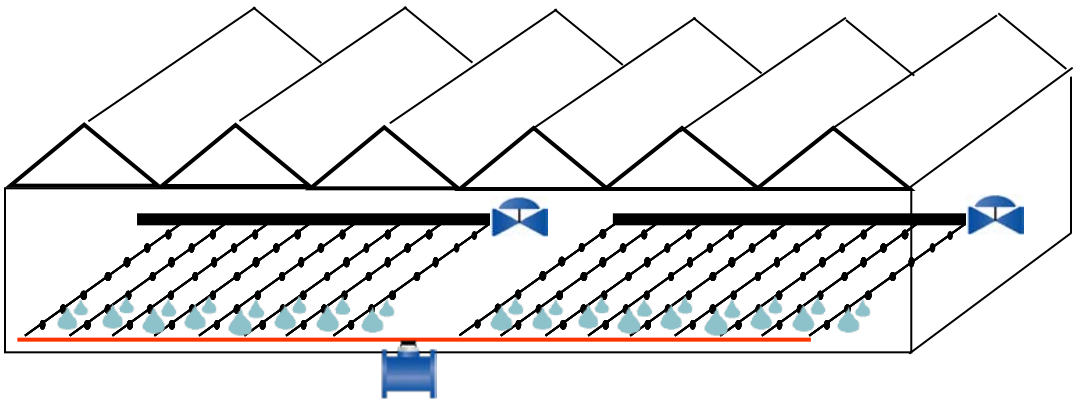
Drainage Timing Option B- **When irrigating 2 consecutive valves which allocated to the same drain meter**

DRAINAGE CONFIGURATION

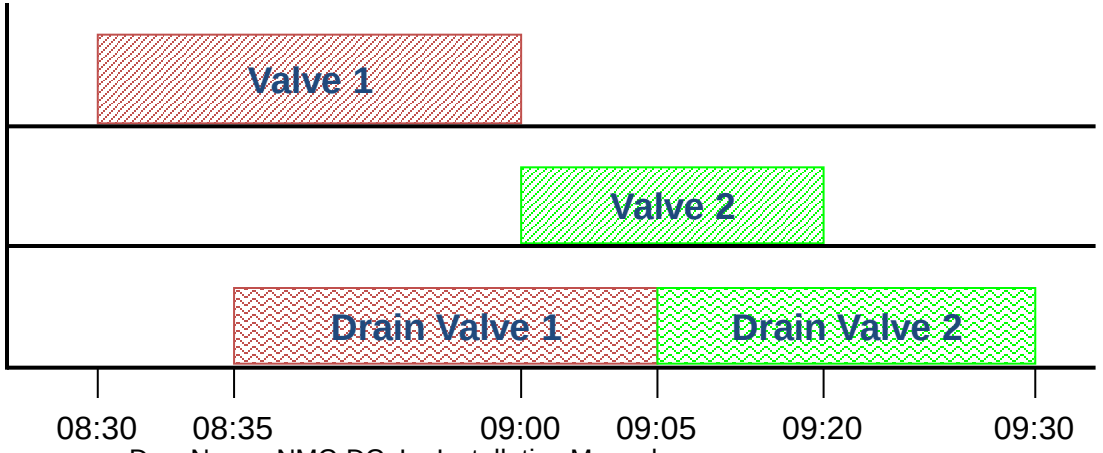
Meter No.	Ratio Liter/Pulse	On Delay	Off Delay
1	1.000	00:05:00	00:10:00
2	-----	--:--:--	--:--:--
3	-----	--:--:--	--:--:--
4	-----	--:--:--	--:--:--
5	-----	--:--:--	--:--:--
6	-----	--:--:--	--:--:--
7	-----	--:--:--	--:--:--
8	-----	--:--:--	--:--:--

VALVE CONFIGURATION

Valve No.	Main Valve	Water Meter	Drain Meter	Drain Type
1	1	-	1	Total
2	1	-	1	Total
3	1	-	-	Sample
4	1	-	-	Sample



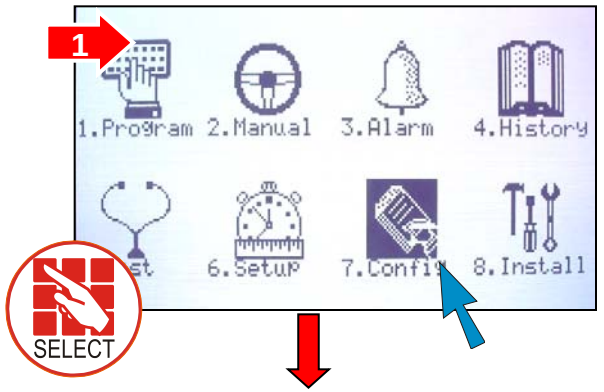
Drain meter 1

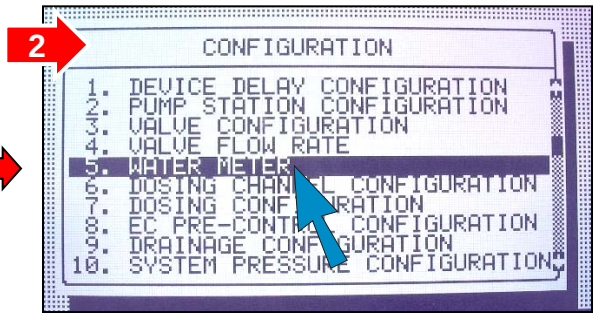


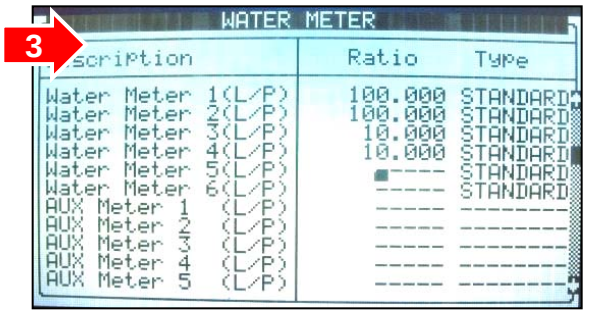
NOTE: Valve 2 “On Delay” is taking control of valve 1 “Off Delay”. Means that valve 1 drain measurement finished while valve 2 drain measurement just started

10.2 Multiple Water Meters

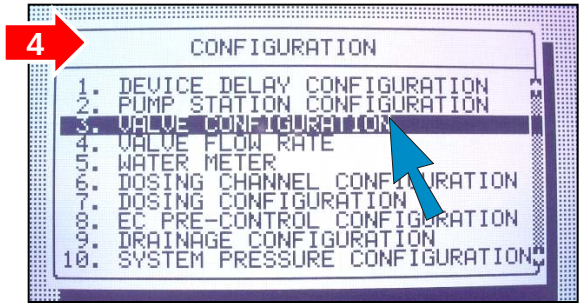
Option A- Standard Use/Measurement

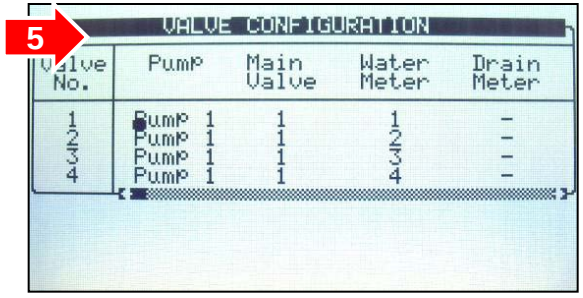


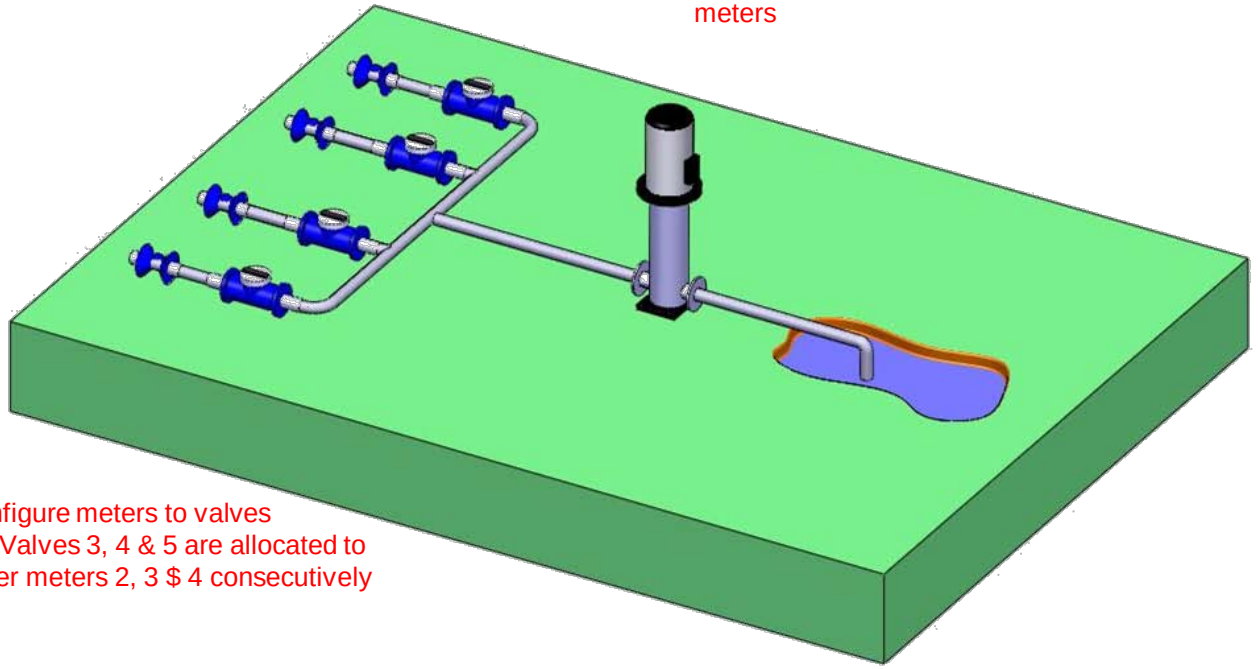




Enter capacity and type for additional water meters







Configure meters to valves
Ex: Valves 3, 4 & 5 are allocated to water meters 2, 3 $ 4 consecutively

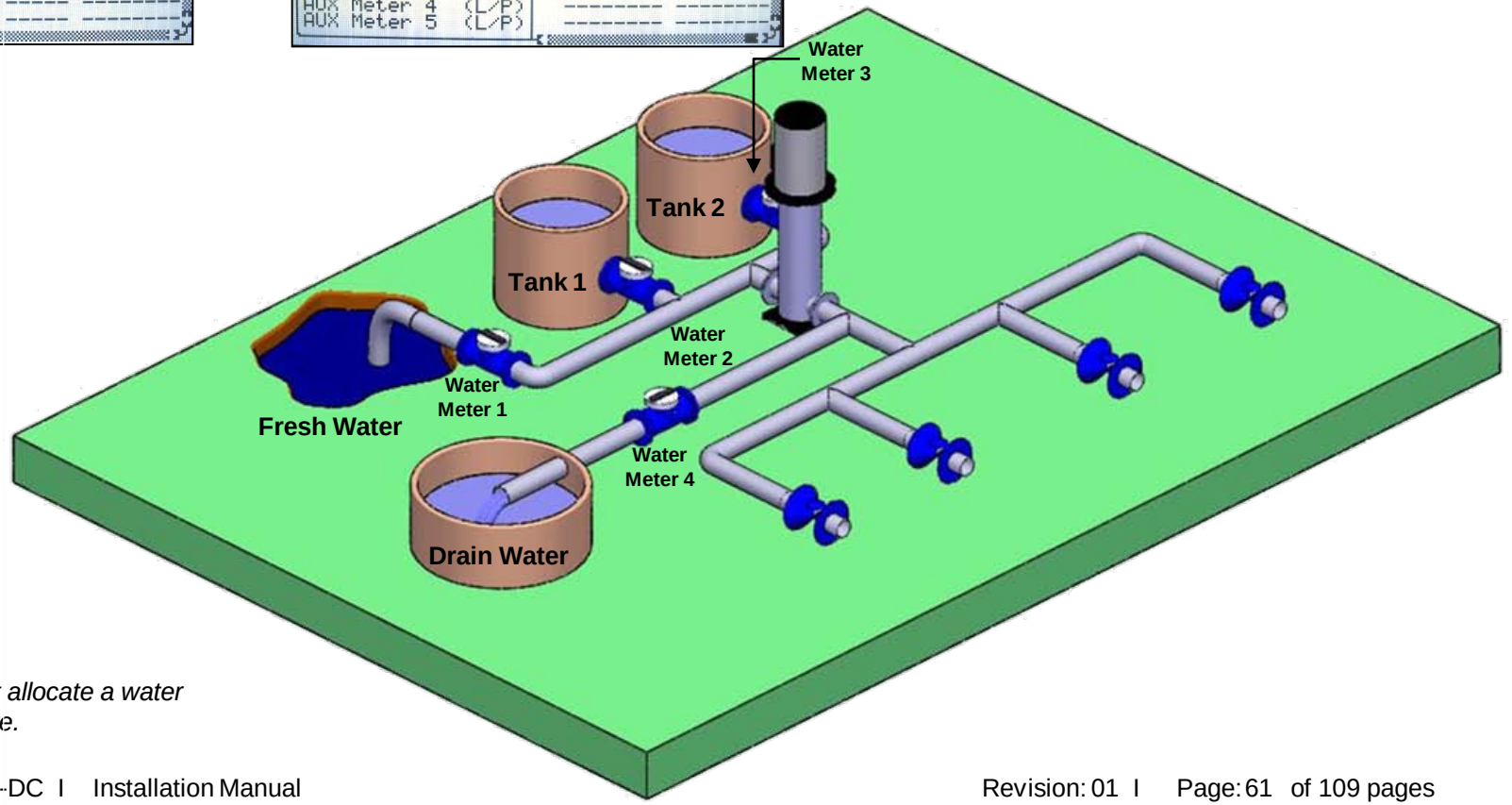
Option B- Multiple Water Sources (Used for water management, meters are located before the irrigation system)

WATER METER

Description	Ratio	Type
Water Meter 1(L/P)	100.000	W.SOURCE
Water Meter 2(L/P)	100.000	W.SOURCE
Water Meter 3(L/P)	10.000	W.SOURCE
Water Meter 4(L/P)	10.000	W.SOURCE
Water Meter 5(L/P)	------	W.SOURCE
Water Meter 6(L/P)	------	W.SOURCE
AUX Meter 1 (L/P)	------	--------
AUX Meter 2 (L/P)	------	--------
AUX Meter 3 (L/P)	------	--------
AUX Meter 4 (L/P)	------	--------
AUX Meter 5 (L/P)	------	--------

WATER METER

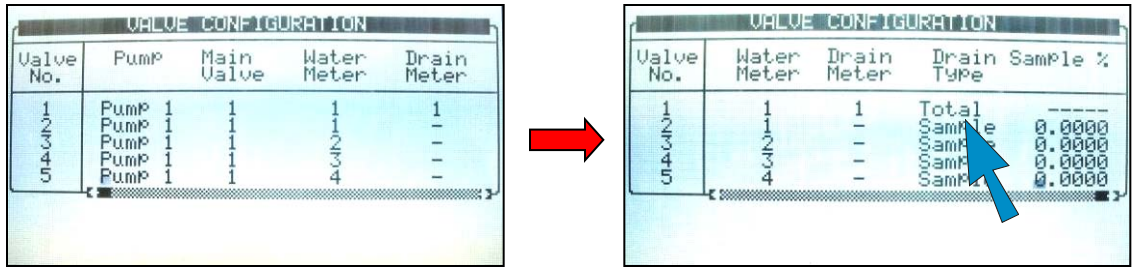
Description	Type	Sum
Water Meter 1(L/P)	W.SOURCE	+
Water Meter 2(L/P)	W.SOURCE	+
Water Meter 3(L/P)	W.SOURCE	+
Water Meter 4(L/P)	W.SOURCE	-
Water Meter 5(L/P)	W.SOURCE	+
Water Meter 6(L/P)	W.SOURCE	+
AUX Meter 1 (L/P)	--------	--------
AUX Meter 2 (L/P)	--------	--------
AUX Meter 3 (L/P)	--------	--------
AUX Meter 4 (L/P)	--------	--------
AUX Meter 5 (L/P)	--------	--------

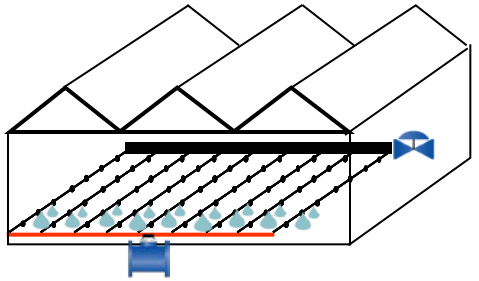


NOTE: *Cannot allocate a water meter to a valve.*

10.3 Drain Meter Measurement **(Drain applications for greenhouses)**

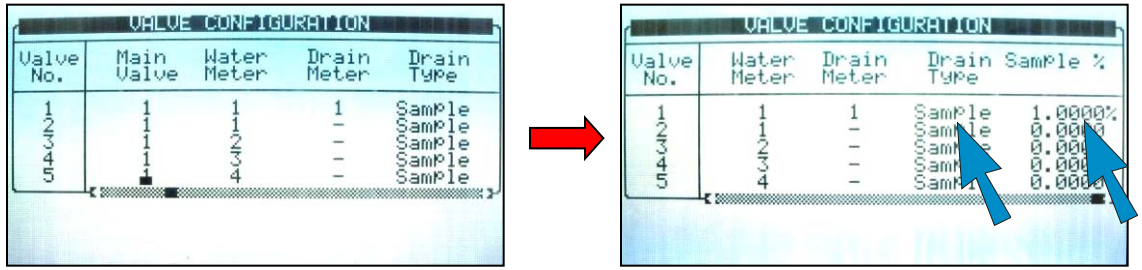
Option A- Total Measurement

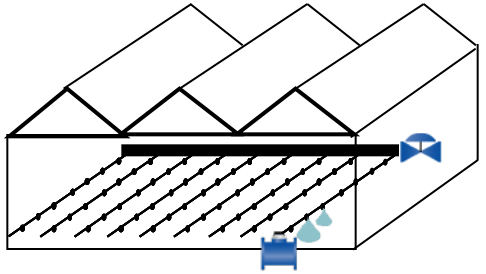




Total Flow

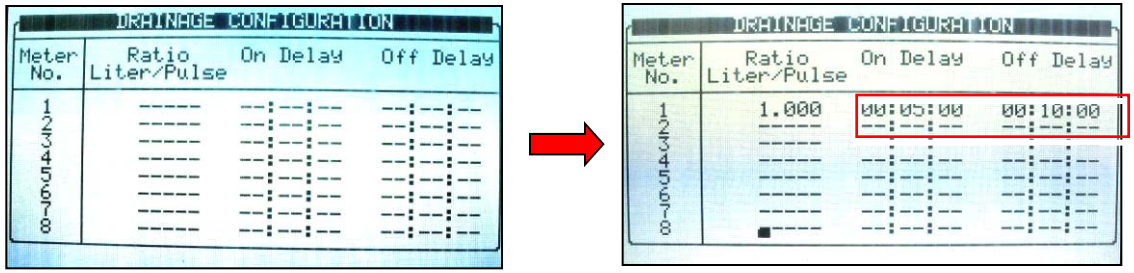
Option B- Sample Measurement





Sample

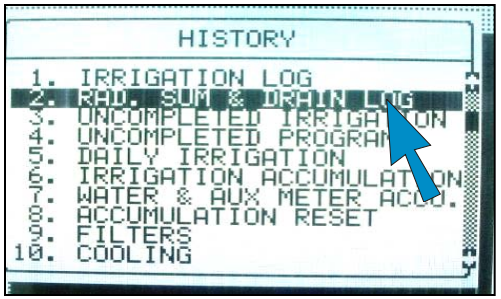
Collect sample from drain of 1 lateral=simulate the total amount of drain water per valve/shift

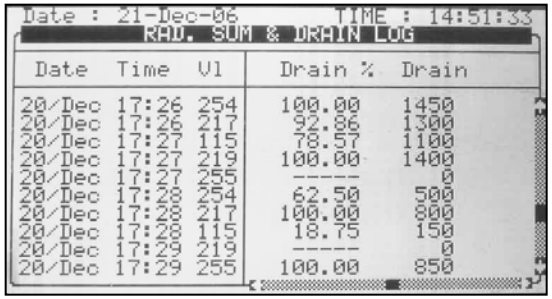


Measure delay:
On delay= time it takes for water to get through the system.
Off Delay= time after irrigation it takes for water to fully drain and stop drain measurement.

10.3.1 Drain Log

History Menu



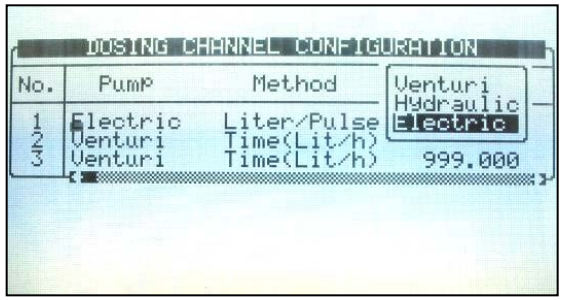


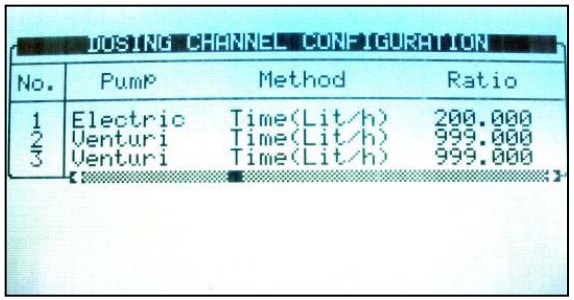
View drainage history log

10.4 Various Dosing Configurations

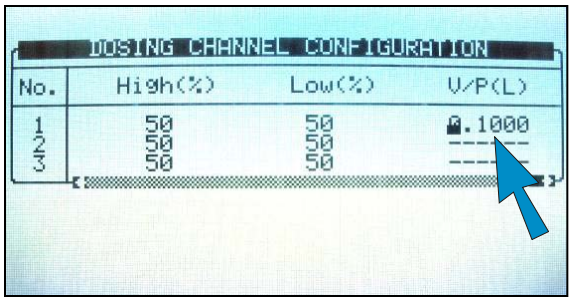
10.4.1 Method 1- Dosing Pump control =Nominal Flow Rate
Dosing pump measurement= Fert. Meter
Dosing pump type= Venturi or Electric

Inject fertilizer according to nominal capacity of pump/measure from fertilizer meter for verification purposes





Set nominal pump capacity

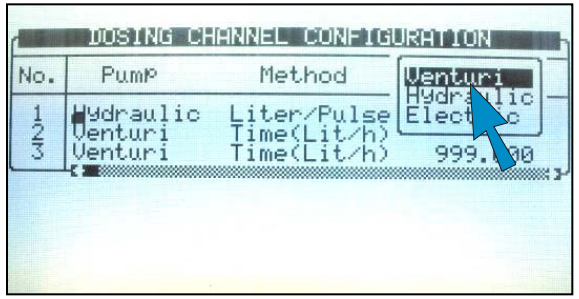


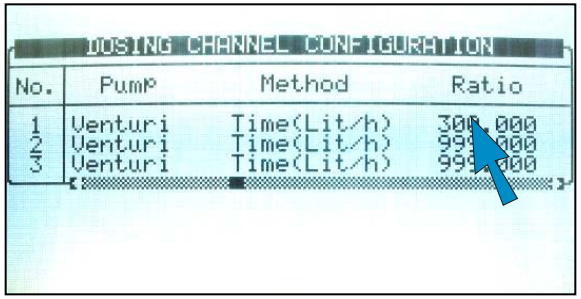
Set dosing meter ratio V/P of dosing meter, = volume per pulse in liter (L) or gallon (G)

Alarm Menu

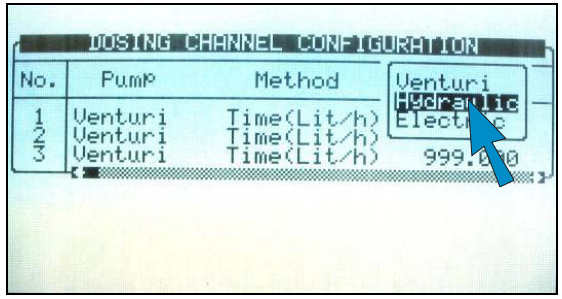
Set alarm when the difference between the nominal dosing flow and the measured dosing flow is ±xx% (default set at recommended 25%)

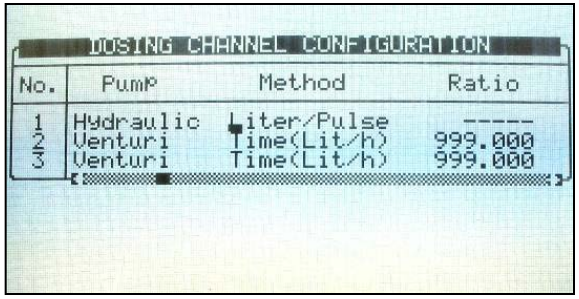
10.4.2 Method 2- Dosing Pump control =Nominal Flow Rate
Dosing pump measurement= Calculate dosing pump flow rate
Dosing pump type= Venturi or Electric

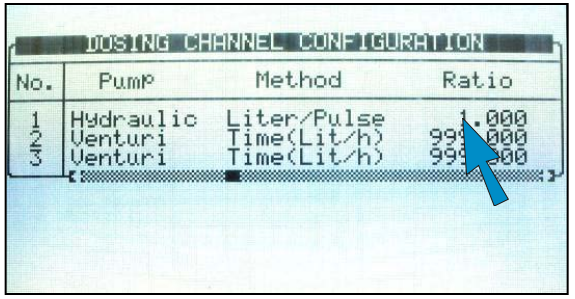




10.4.3 Method 3- Dosing Pump control =According Fert. meter pulses (For quantitative injection only)
Dosing pump measurement= Fert. Meter
Dosing pump type= Hydraulic







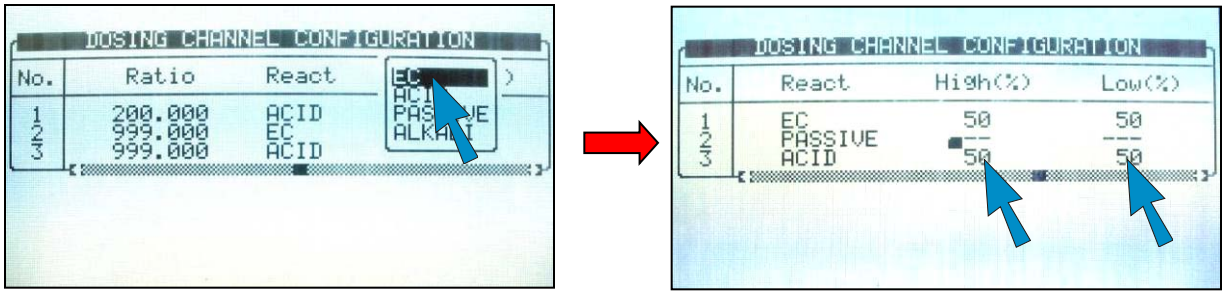
10.5 Dosing Configuration

ATTENTION

Type of each channel configured by technician during installation process

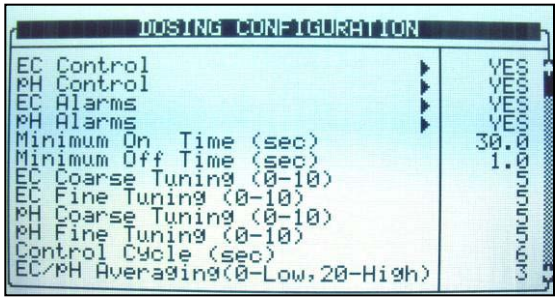
EC- channel influenced by EC levels
ACID- channel to inject acid to reduce pH levels
PASSIVE- no EC/pH influence
ALKALI- channel to increase pH levels

10.5.1 EC/pH Control- System will inject +/- depending on EC levels, auto-adjust to meet target levels.
Set limits for controller adjustments when levels are too high/low



Ex: If dosing channel 1 is set by the grower to inject 10 liter/m^3, the controller auto adjust range is 5 to 15 liter/m^3 in order to meet the EC level.

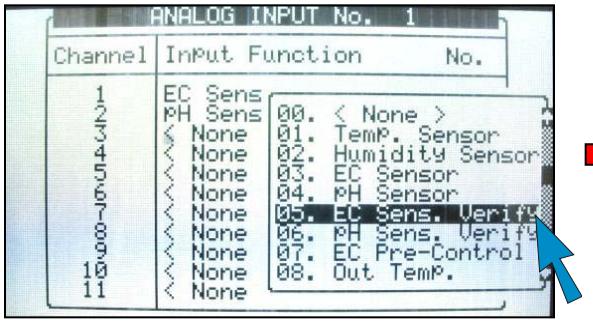
10.5.2 EC/pH Control- Alarm Setting

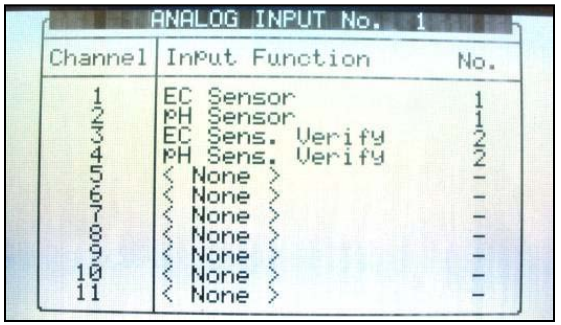


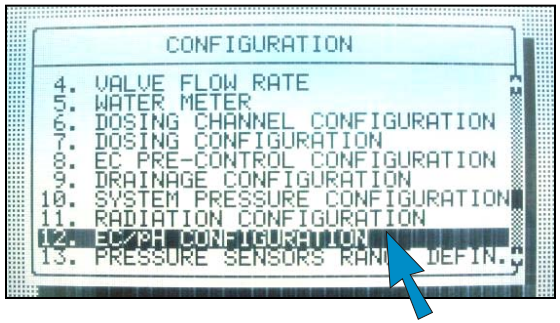
EC/pH coarse tuning- when way off target, faster/stronger correction
EC/pH fine tuning- off target is low, slow/light correction
Control cycle- Delay time from fertilizer/Acid injection point to EC/pH sensors reading
EC/pH averaging- balanced reading from EC/pH sensors
Dose boost off delay- time clear water circulated through system after fertigation stops and venturi closes

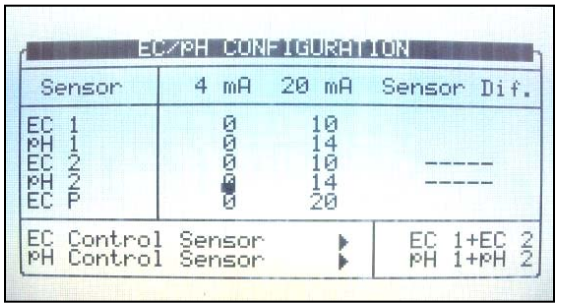
10.6 Dual EC/pH Sensors- **Additional sensors as fail-safe and to verify if difference occurs, alarm will signal.**

Install sensors as in section 7.4

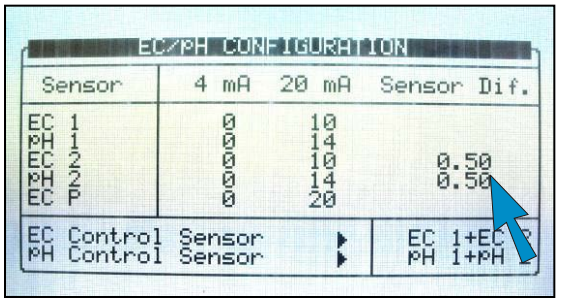




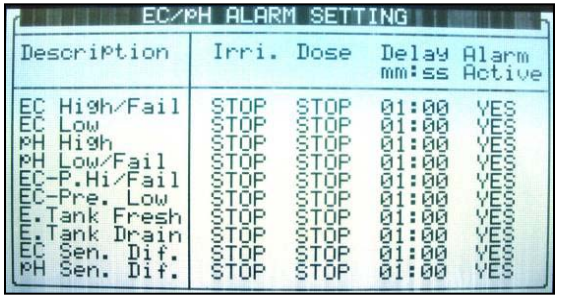




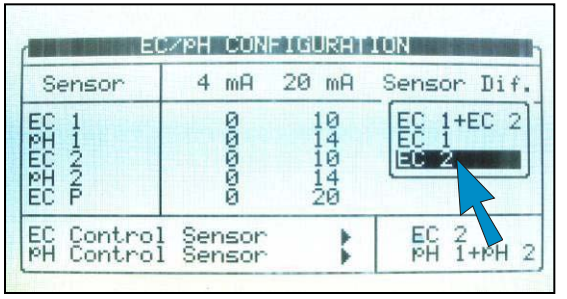
Enter sensor difference to set alarm



Select action and delay-
if 1 sensor fails, sensor 2 activated

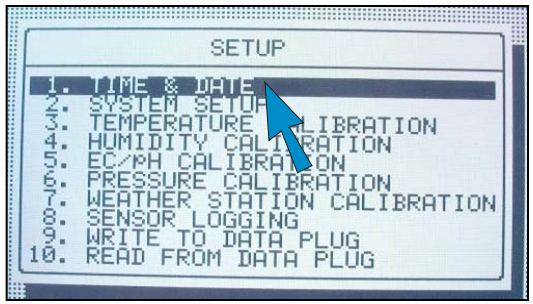


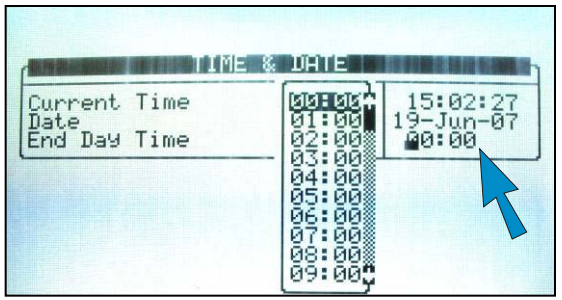
At end, if one sensor fails, the technician can set the system to be controlled by the 2nd sensor



10.7 Advanced System Setup

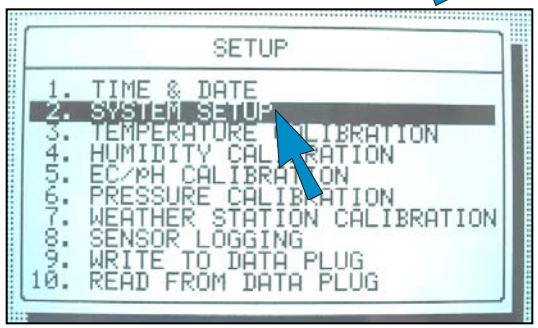
End day time



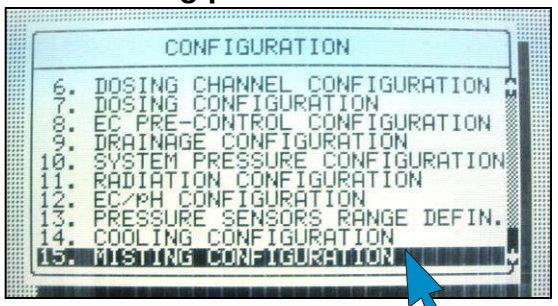


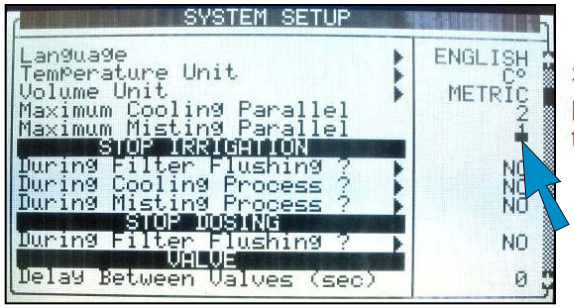
Stop time for measuring water and dosing accumulating information from irrigation valves and dosing channels

Max. cooling parallel

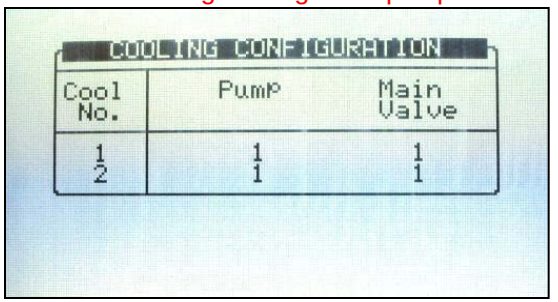


Max. misting parallel





Define cooling/misting valve/pump

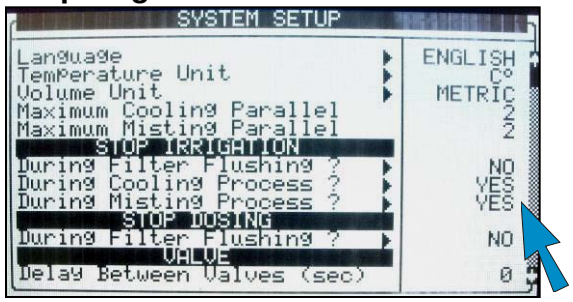


Set max. cooling/misting programs working together

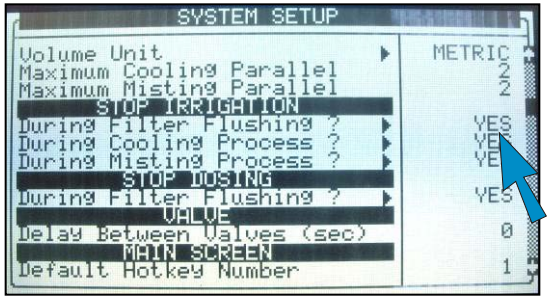
NOTE: *Use only when the system has a limited capacity to operate max # cooling/misting programs simultaneously.*

NMC-DC

Stop irrigation?

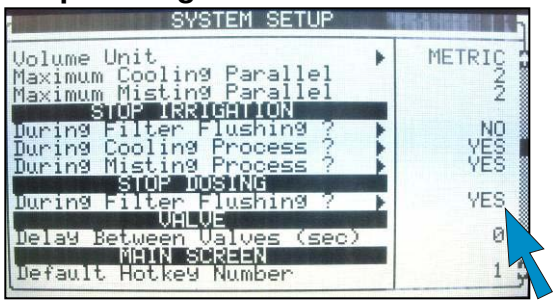


Set to pause irrigation during cooling/misting process, then resume irrigation



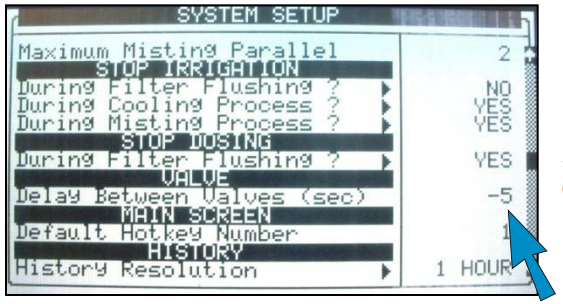
Set to pause irrigation during filter flushing process, then resume irrigation

Stop Dosing?



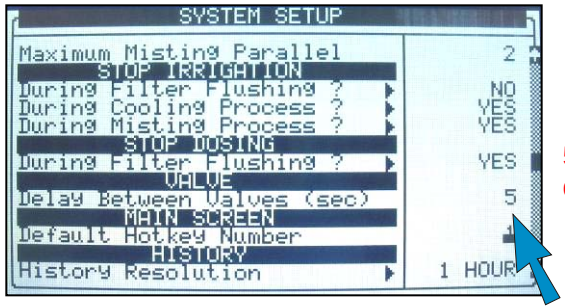
Set to pause dosing during filter flushing process, then resume irrigation

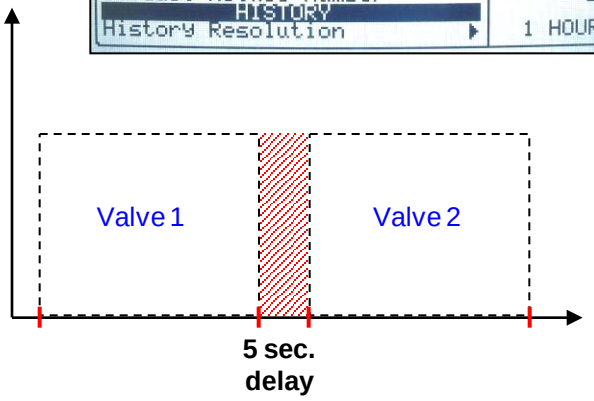
Valve transition



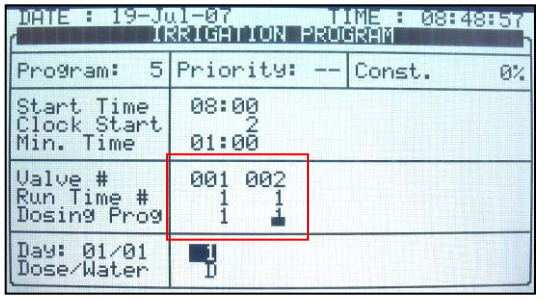
Set delay between valves or set to overlap valves in order to create pressure before opening them by pressing +/- key

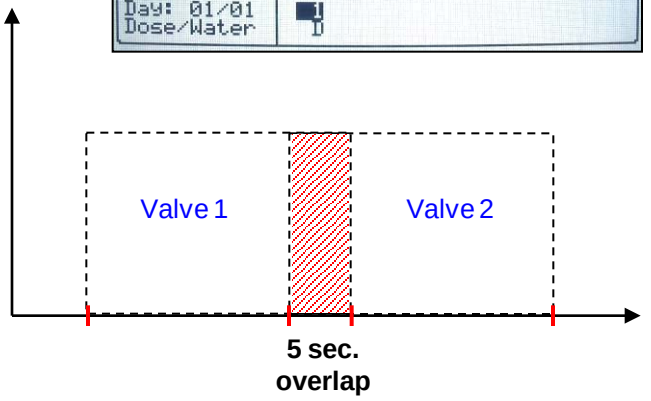
5 second overlap





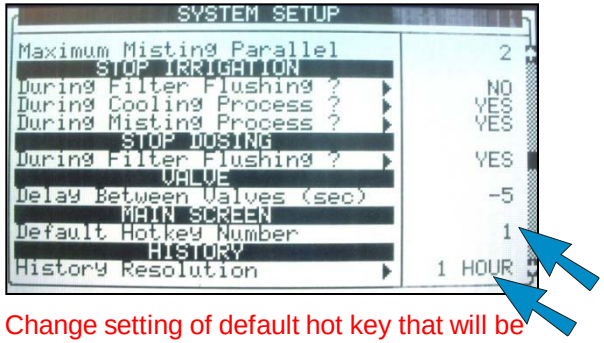
5 second delay





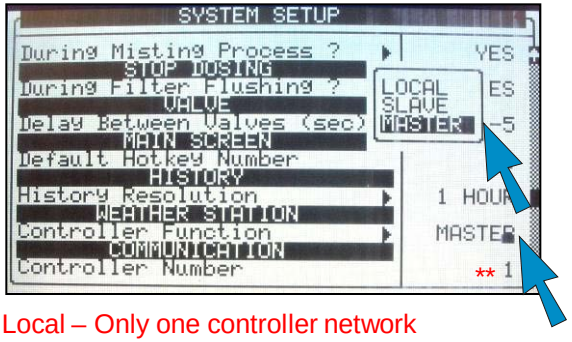
NMC-DC

Default hot key/ History resolution



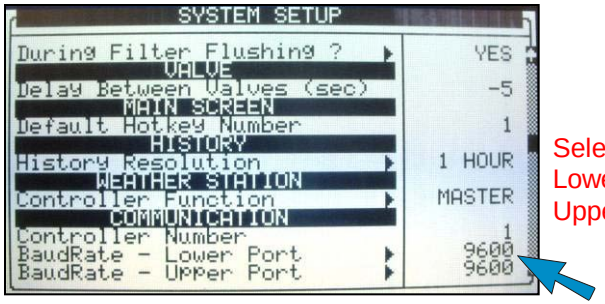
Change setting of default hot key that will be present for the grower as a default.
Set history resolution-how often system saves information

Weather station



Local – Only one controller network
Master- connected to station, transfers data to slave controller
Slave- more than 1 controller network, not connected to weather station but receive data by communication to the Master
**Each controller must be given I.D. # prior to this setting

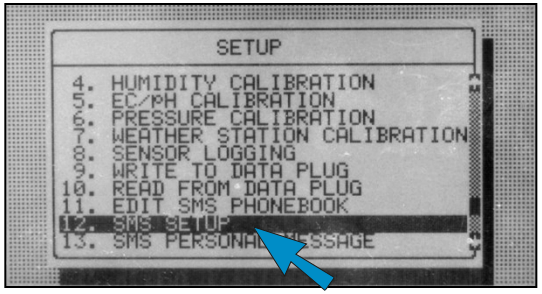
Baud rate

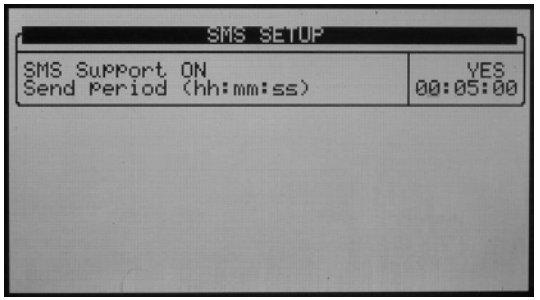


Select baud rate of communication:
Lower Port - Controllers and PC
Upper Port - Controller and its expansion boxes/Remote unit (SingleNet)

10.8 SMS Setup

Setup Menu

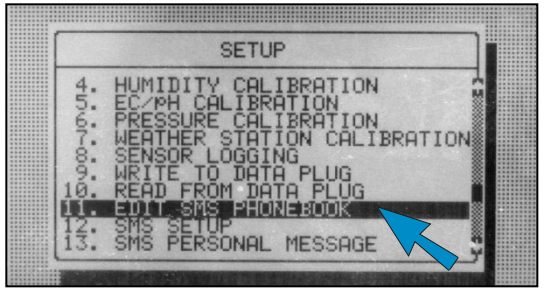




SMS Support ON –
Select **YES** in order to activate the SMS feature

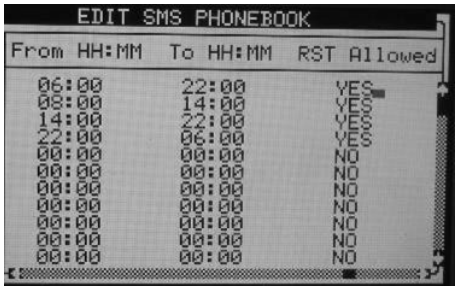
Send Period (hh:mm:ss) –
Define how often the controller will check for new alarms to send
Default: every 5 minutes 00:05:00

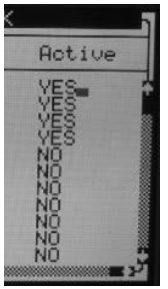
EDIT SMS PHONEBOOK



The *Edit SMS Phonebook* screen allows you to add and edit subscribers for the SMS service.

Scroll right

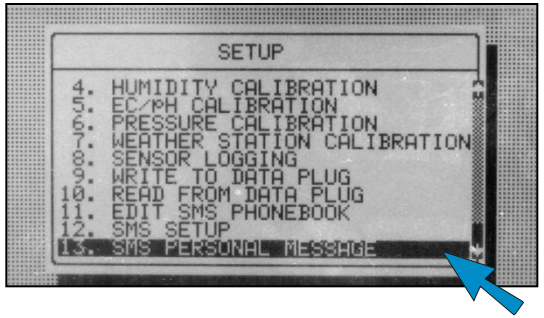


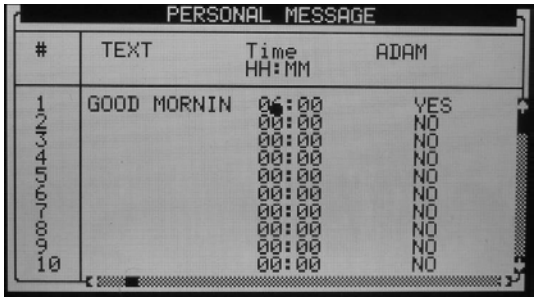


User name – Enter the recipient name using the numeric keypad (can be up to 11 characters long)
Phone number – Enter the recipient's phone number (can be up to 20 characters long)

From HH:MM / To HH:MM – Schedule the time period for each subscriber, From (time) / To (time) in a 24 hour format (Example: 2:00pm = 14:00)
RST Allowed – Define permission for the subscriber if to be allowed to reset the alarms
Active – Define **YES** if the subscriber will receive SMS alarms

SMS PERSONAL MESSAGE





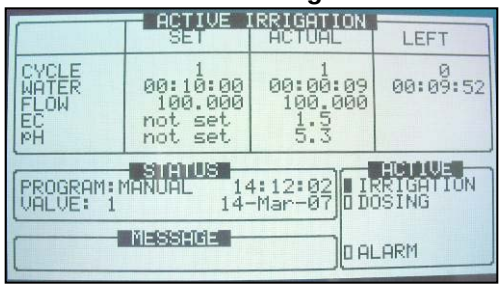
1	2	3	+/-
' "	ABC	DEF	+ - < > #
4	**5**	**6**	**0**
GHI	JKL	MNO	SPACE ( )
7	**8**	**9**	**.**
PQRS	TUV	WXYZ	. , ! ? $

Up to 12 personal messages can be programmed to be sent out at a preset time to any of the subscribers. The personal message can be up to 70 characters long.
For the text use the numeric keypad

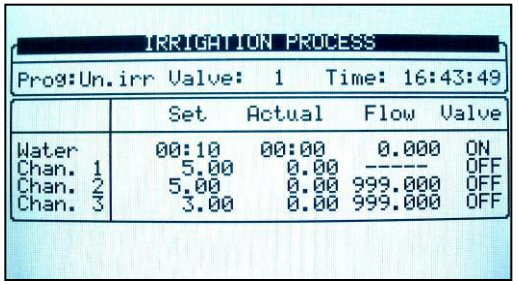
11. Hot Keys and Status Screens

In the Active Irrigation screen, can view status of the system by pressing number keys corresponding to each hot screen.

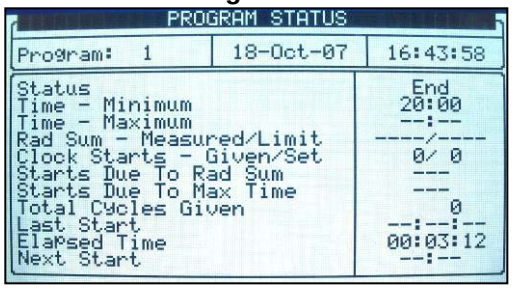
Hot Screen 1- Active Irrigation



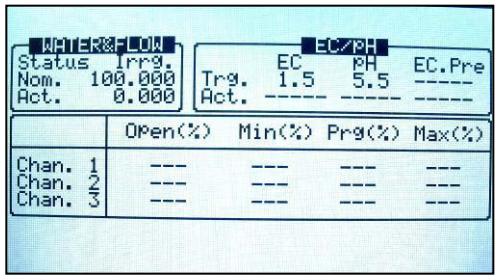
Hot Screen 2- Irrigation Process Status



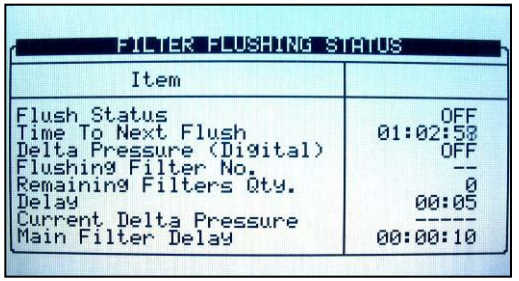
Hot Screen 3- Program Status



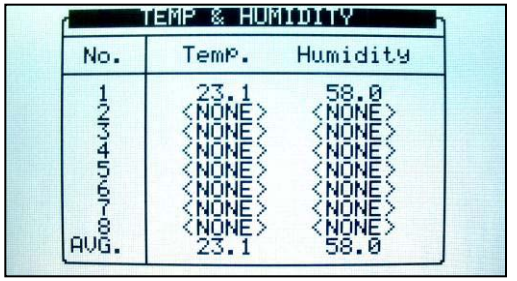
Hot Screen 4- Water Flow & EC/pH Status



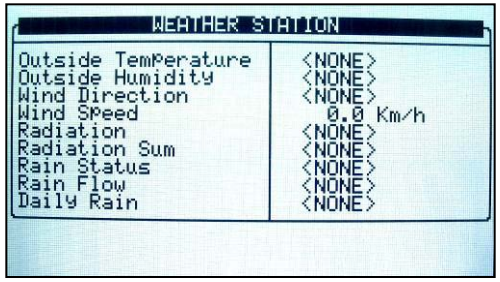
Hot Screen 5- Filter Flushing Status



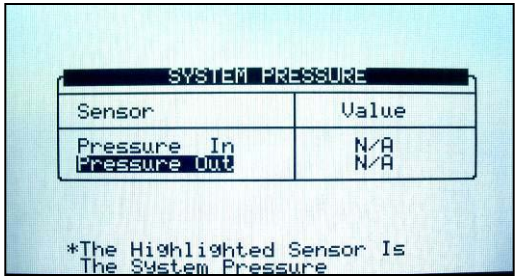
Hot Screen 6- Temp. & Hum. Status



Hot Screen 7- Weather Station Status



Hot Screen 8- System Pressure Status

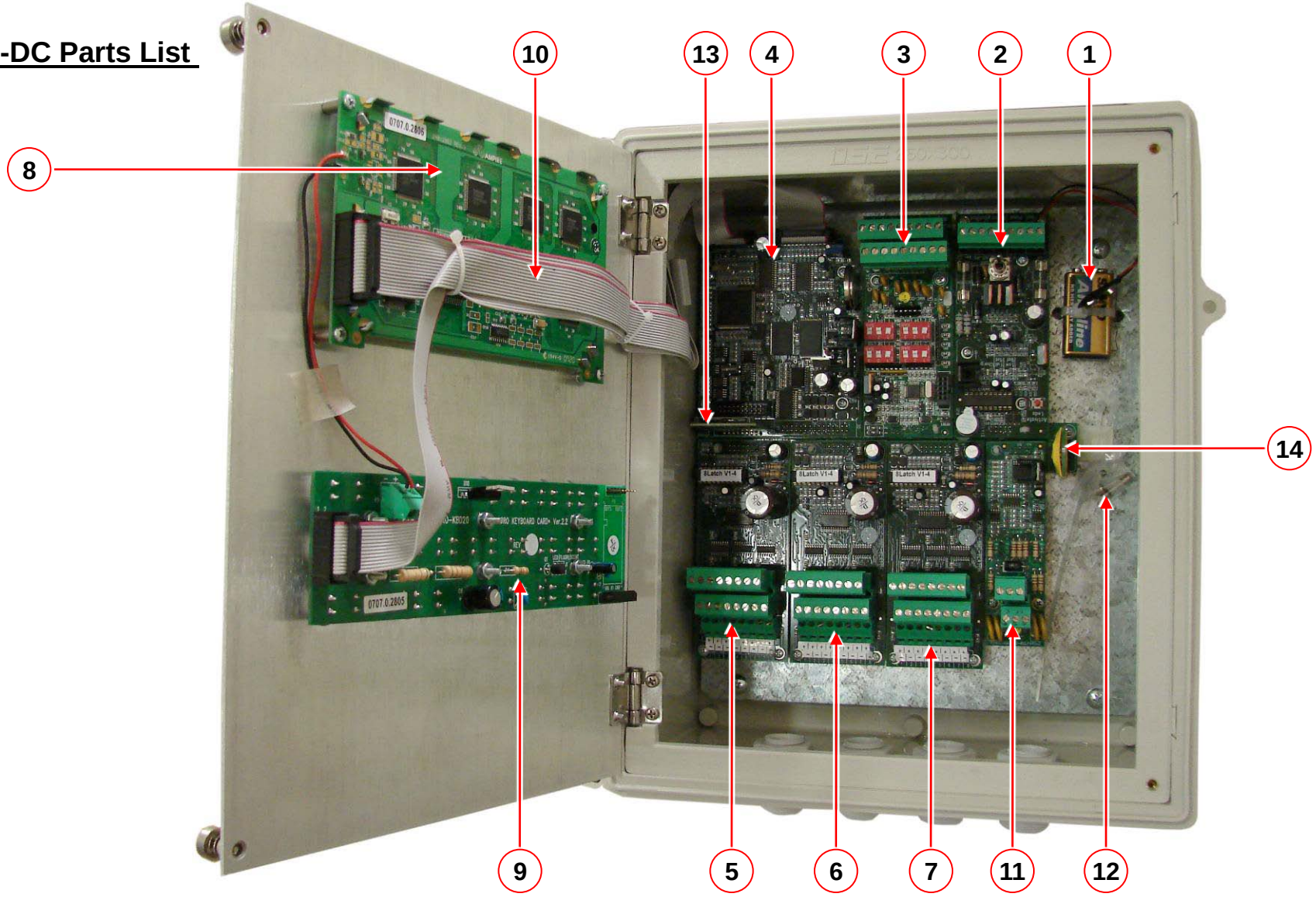


APPENDIX A

NMC-DC Parts List

NMC-DC

NMC-DC Parts List



NMC-DC Parts List Con't…

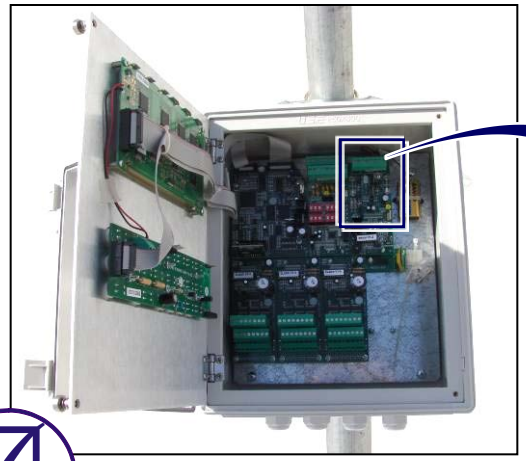
Item	*Description*	*Netafim Cat. #*
1.	9V Battery	
2.	NMC-DC Power Supply card	
3.	NMC-DC Digital & Analog Input card	
4.	NMC-DC CPU card	
5.	NMC-DC 8 Latch Output card	
6.	NMC-DC 8 Latch Output card	
7.	NMC-DC 8 Latch Output card	
8.	NMC-DC Display card	
9.	NMC-DC Keyboard card	
10.	Flat Cable	
11.	NMC-DC Communication card	
12.	Spare Fuse x2	
13.	NMC-DC SD card	
14.	NMC-DC Data Plug	

APPENDIX B

Troubleshooting

Troubleshooting

1. Power Fail

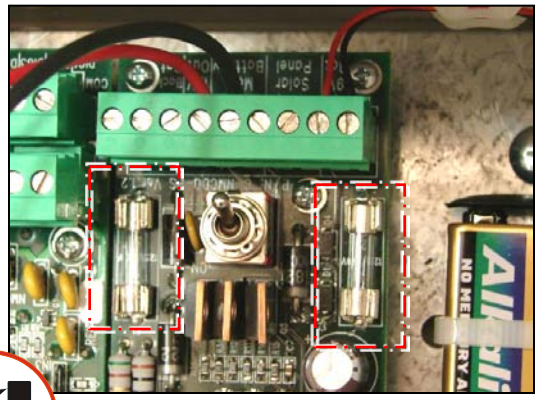


ENSURE

Switch is in the ON position.

Option A – Replace Fuse

If controller still is not working then turn switch OFF and:



REPLACE

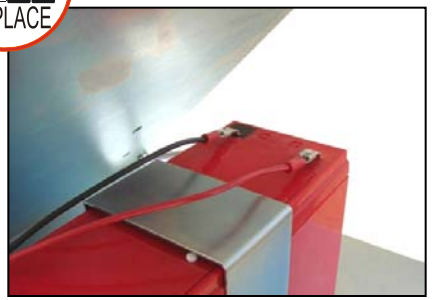
Fuse x2

IF CONTROLLER STILL IS NOT WORKING THEN:

FINAL SOLUTION

REPLACE

Battery

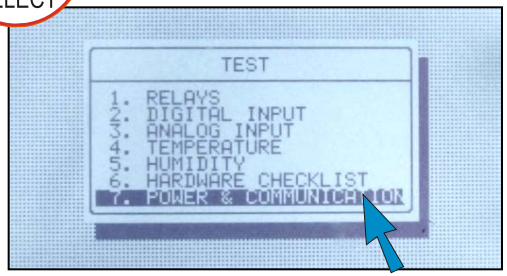


Option B – Replace Battery

If controller turns on and off:

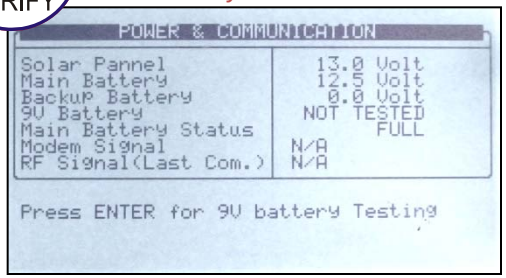
SELECT

⇨ ”5. Test”
⇨ ”7. Power & Communication”



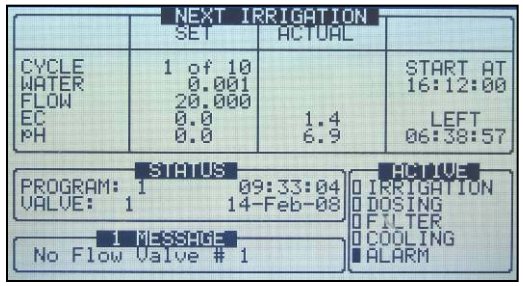
VERIFY

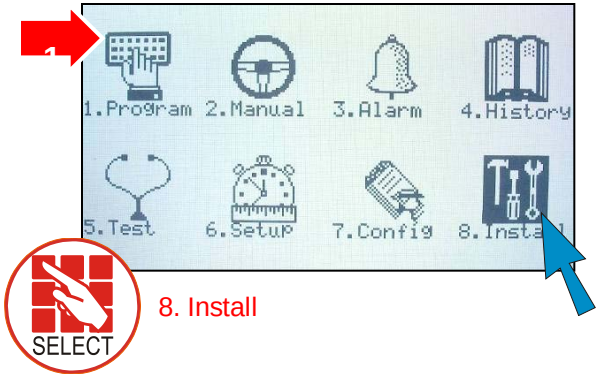
Solar Panel ≈ 13.0 Volts
Main Battery ≈ 12.5 Volts
Main Battery Status = FULL



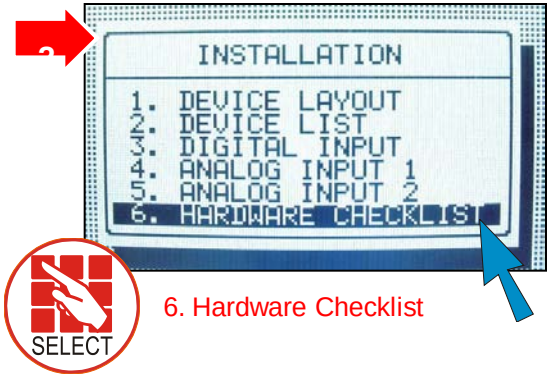
2. "No Flow" Alarm

If a "**No Flow**" alarm appears go through the following steps to identify the problem.



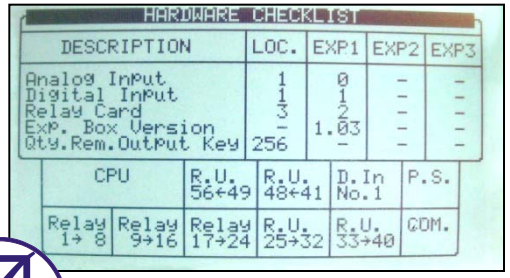


8. Install



6. Hardware Checklist

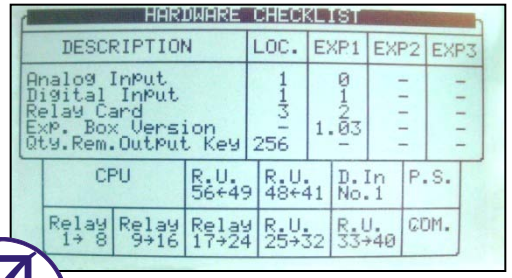
Option A – Relay Card Malfunction



All RELAY cards installed are present

If one of the RELAY cards is not present, go to *Appendix C – Replacement and Additional Installations*. Follow the steps for replacing the appropriate Relay Latch card.

Option B – Digital Input Card Malfunction

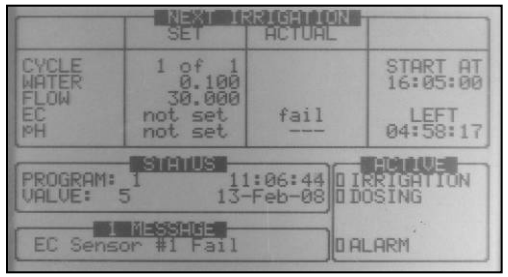


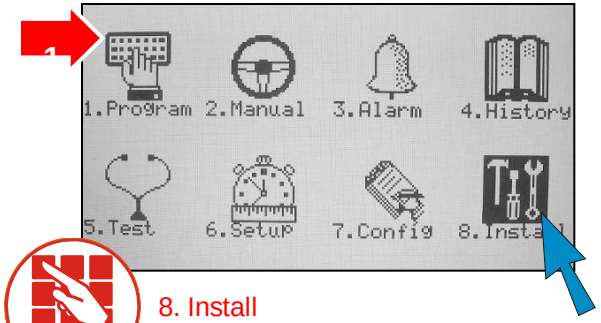
D. In (Digital Input Card) is present

If Digital Input card is not present, go to *Appendix C – Replacement and Additional Installations*. Follow the steps for replacing the Digital Input card.

3. “Sensor Fail” Alarm

If a “**Sensor Fail**” alarm appears go through the following steps to identify the problem.

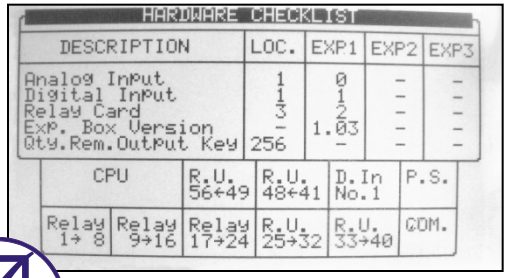




8. Install

6. Hardware Checklist

Option A – Digital Input Card Malfunction



ENSURE

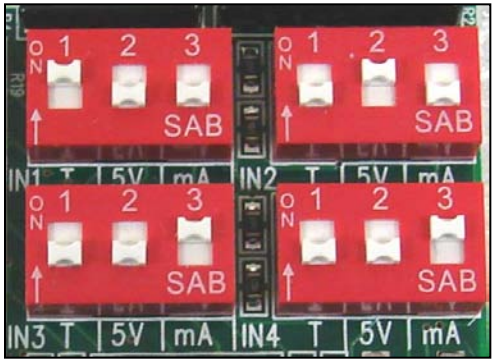
D. In (Digital Input Card) is present

If Digital Input card is not present, go to *Appendix C – Replacement and Additional Installations*. Follow the steps for replacing the Digital Input card.

Option B – Dip Switches Position Incorrect

VERIFY

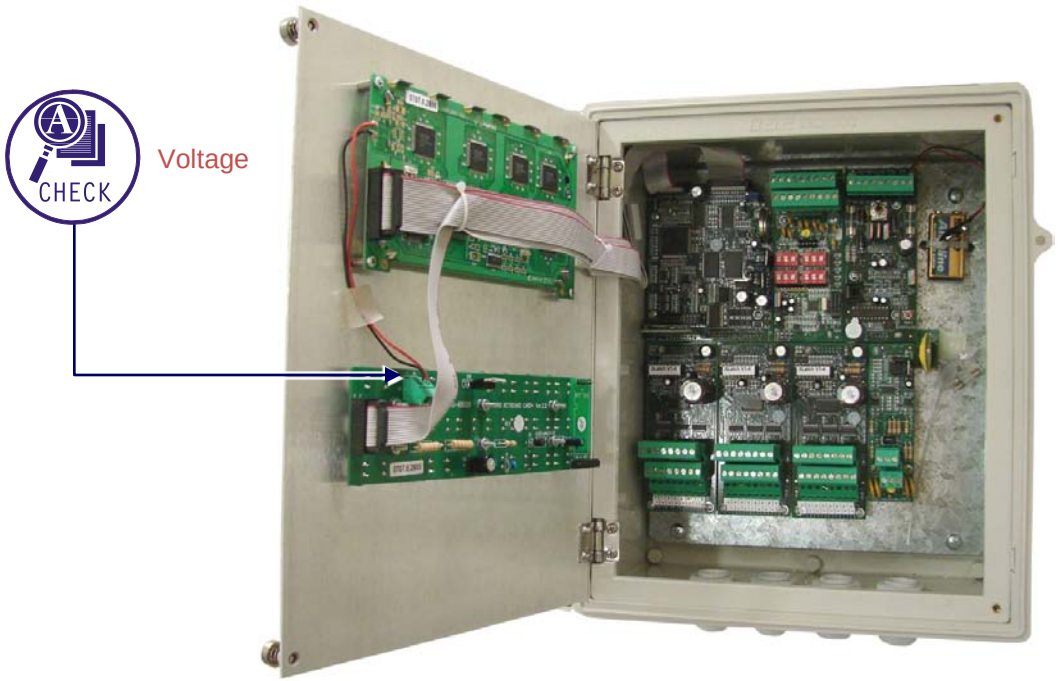
Dip Switches are correctly arranged according to *Appendix D - Sensor Installation and Definition*



Option C – Sensor Malfunction

If Dip switches are correctly positioned, go to section *8.3 Analog Input Test* and make sure controller receives proper sensor readings.

4. Display Backlight Failure



Option A – Keyboard Card

No Voltage: Replace Keyboard Card
Appendix C – Replacement and Additional Installations.

Option B – LCD Card

Voltage: Replace LCD Card
Appendix C – Replacement and Additional Installations.

APPENDIX C

Replacement and Additional Installations

Replacement and Additional Installations

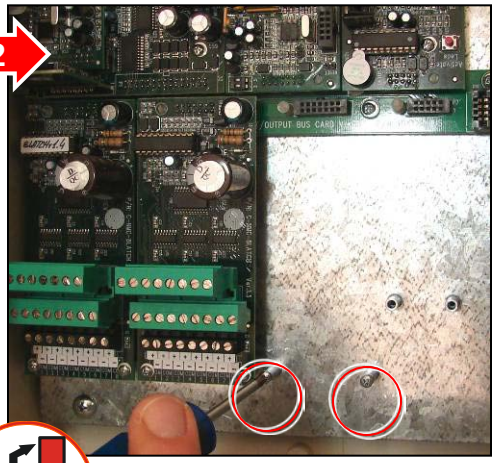
1. Install 8 Latch Output Card

1

REMOVE Card from box

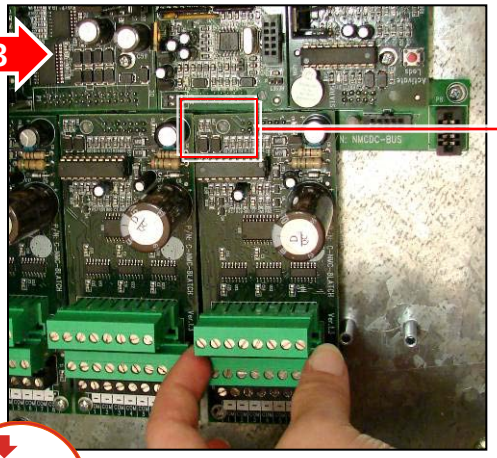
SWITCH OFF Controller

2



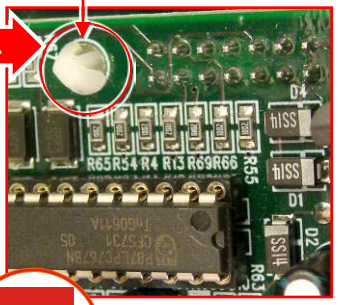
REMOVE 2 screws

3



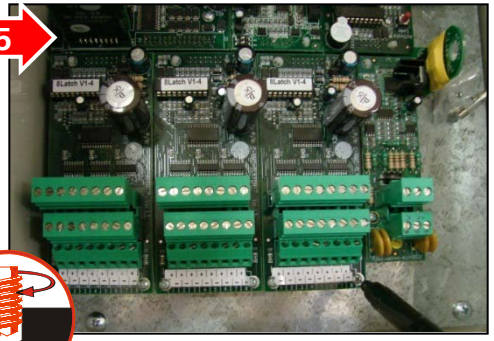
LOCATE 12V DC 8 Latch Card

4



ATTACH Card to locator stub

5



SCREW 2 Screws

6

CONNECT To outputs

7

SWITCH ON

Controller

8

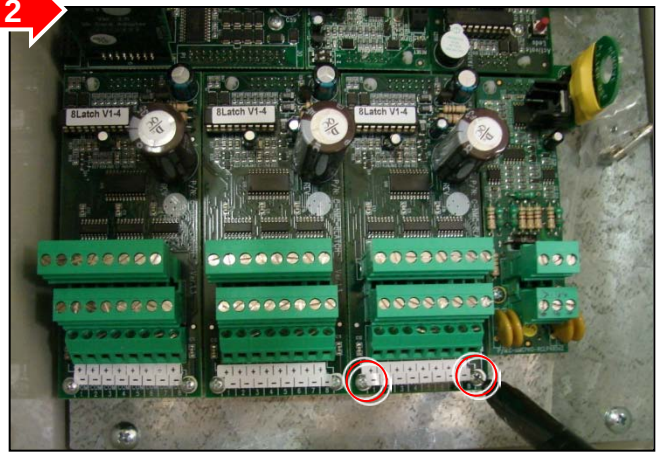
2. Remove a Card (Same for all cards)

1

SWITCH OFF

Controller

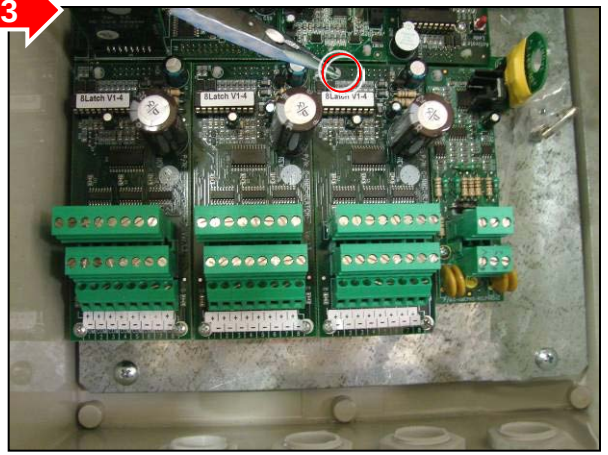
2



REMOVE

Wires and 2 Screws

3



TOOLS

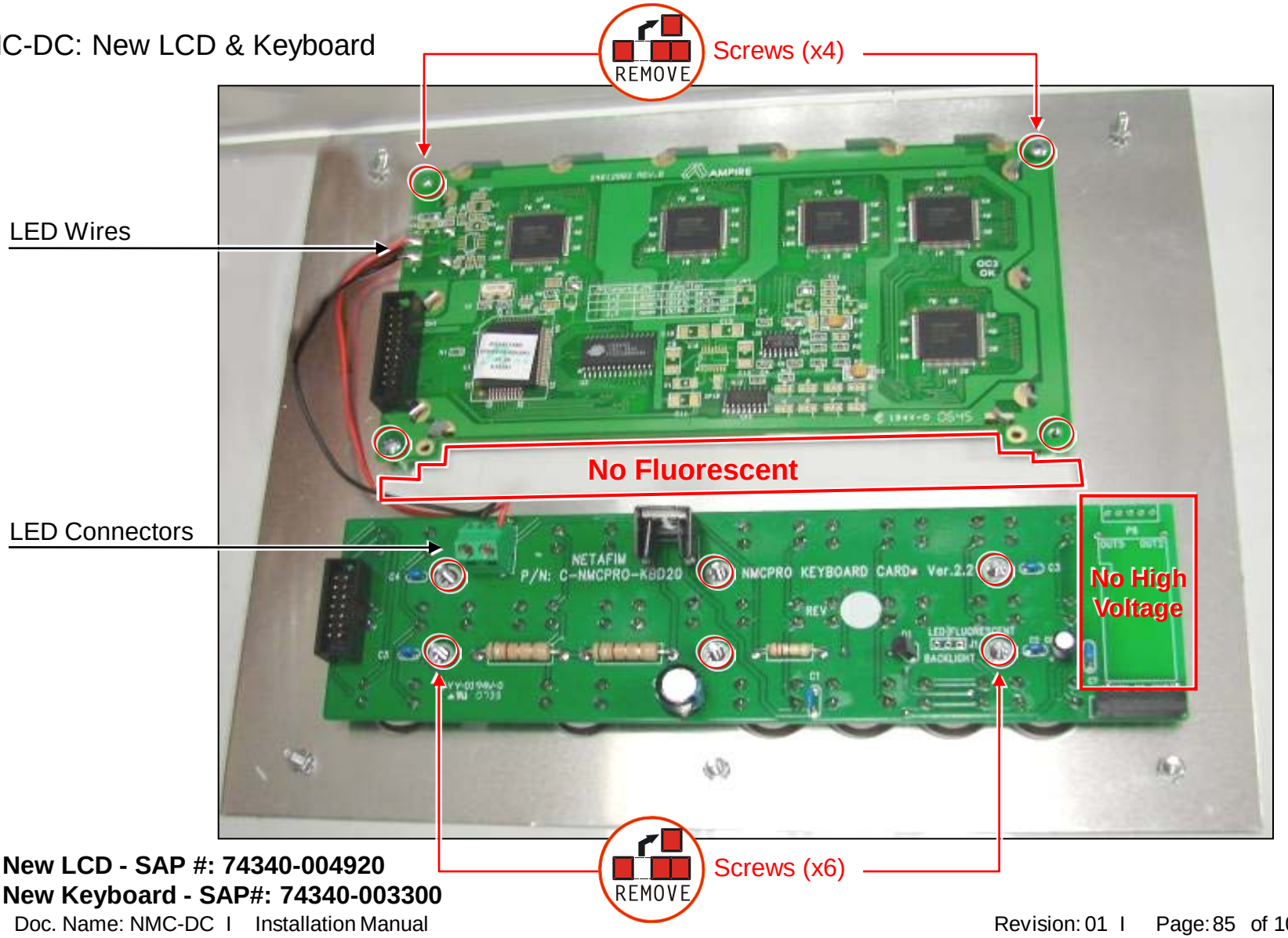
Pliers

PERFORM

Use pliers to squeeze stub back through hole and gently manipulate card forward to remove

NMC-DC

3. NMC-DC: New LCD & Keyboard



Order New LCD - SAP #: 74340-004920
Order New Keyboard - SAP#: 74340-003300

APPENDIX D

Sensor Installation and Definition

NMC-DC

1. EC – pH Sensor Connection

LOCATE

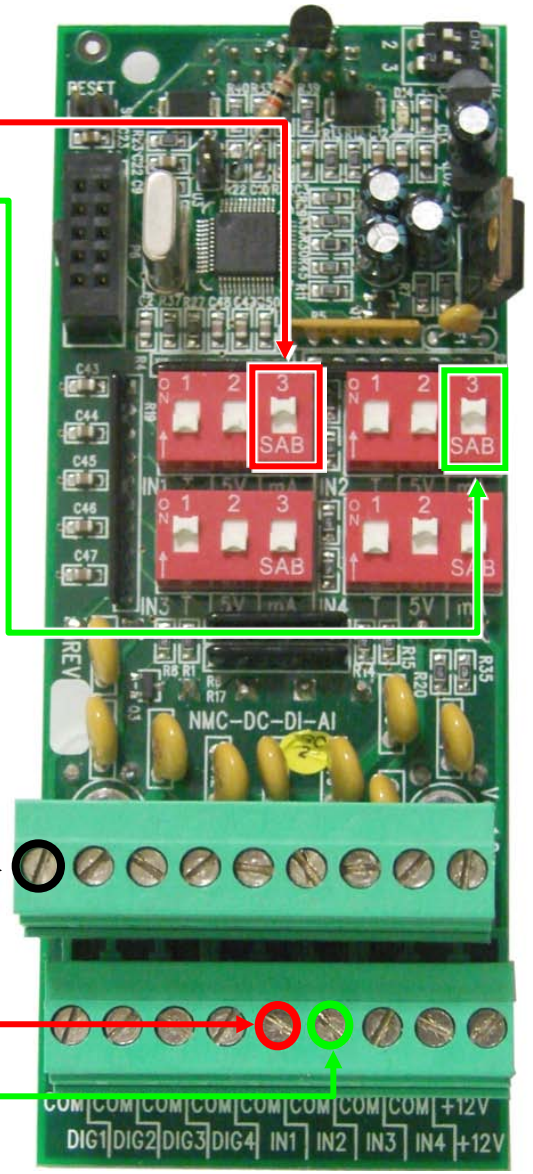
Dip switches for each input as needed according to location

Jumper positioning	Sensor type
Temp	Temperature sensor (30kΩ)
0-5V	Humidity, Radiation, Pressure…
4-20mA	**EC, pH**

Dip Switch position

EC – IN 1 :

pH – IN 2 :



Transmitter Terminals

Cable type

COM/EC/pH- 3x0.5mm² (20AWG) Shielded

24VAC- 2x0.5mm² (20AWG)

24VAC

COM

EC

pH

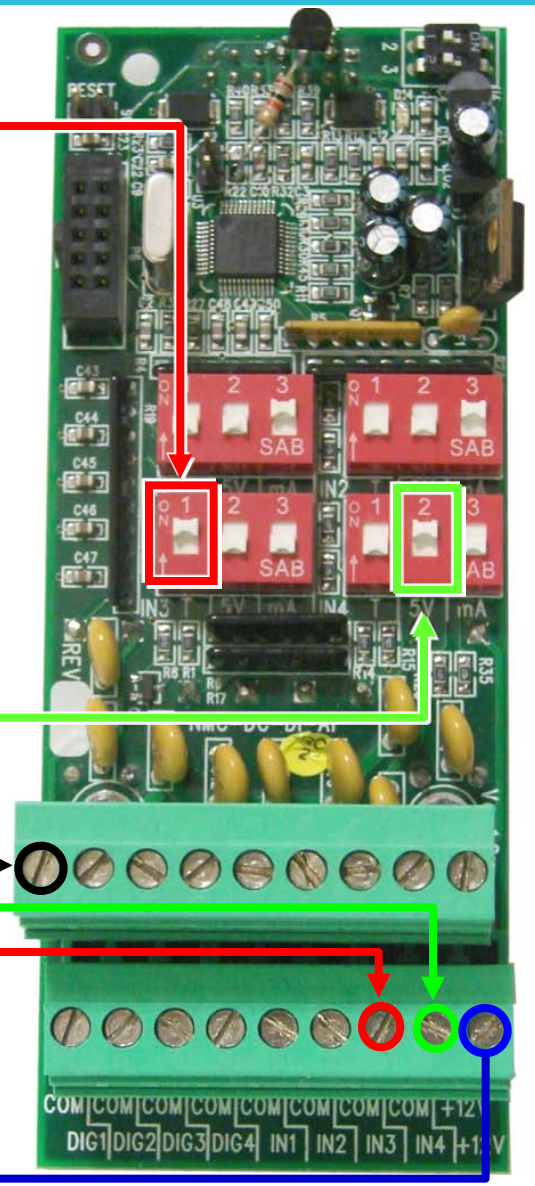
NMC-DC

Sensor Installation and Definition

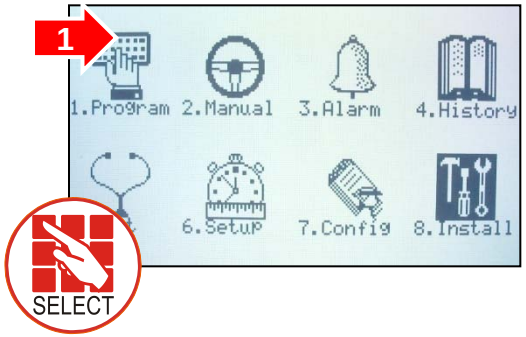
1. Outside Temp/Hum Sensor Connection

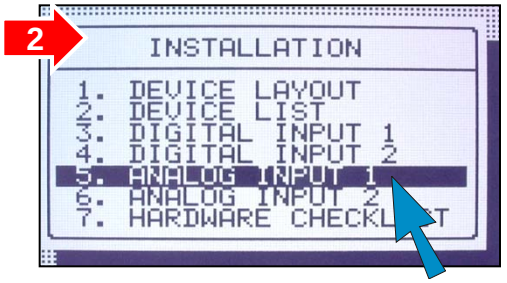
Dip Switch position	Sensor type
Temp	Temperature sensor (30kΩ)
0-5V	Humidity
4-20mA	EC, pH, CO2…

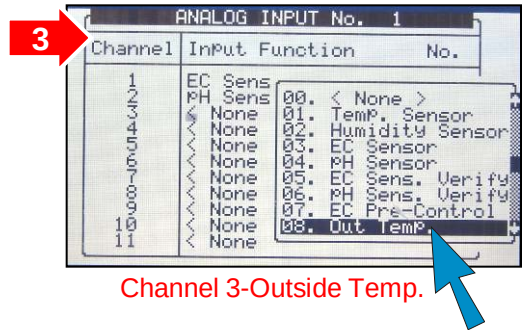
Cable type
4x0.5mm² (20AWG)



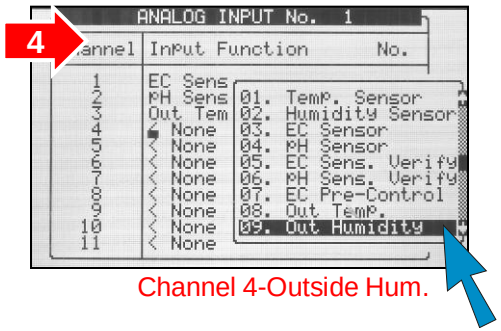
1.1 Sensor Definition



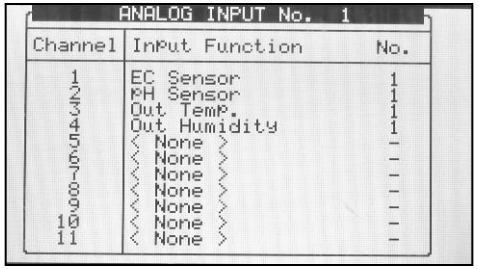




Channel 3-Outside Temp.



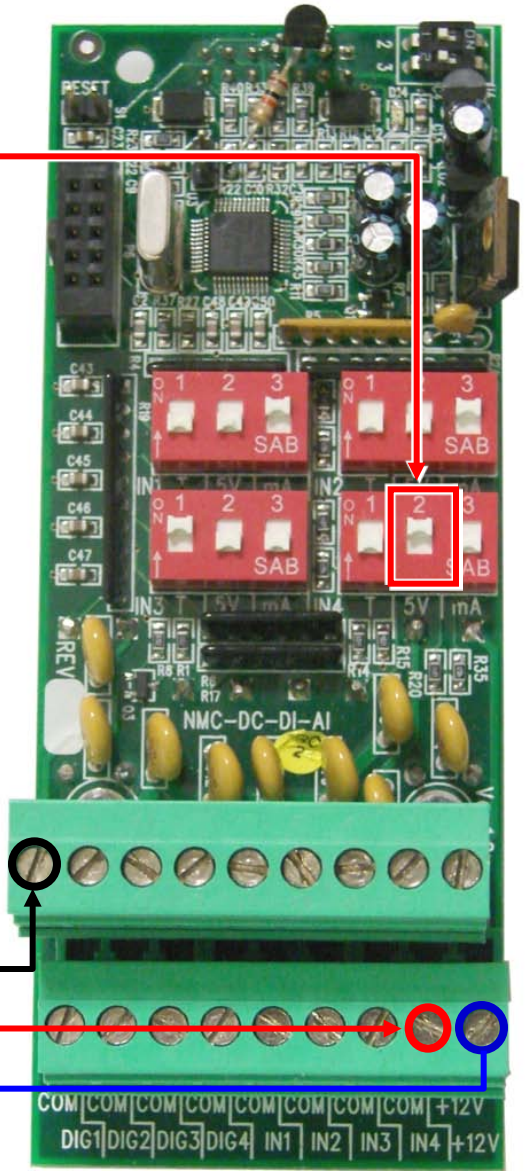
Channel 4-Outside Hum.



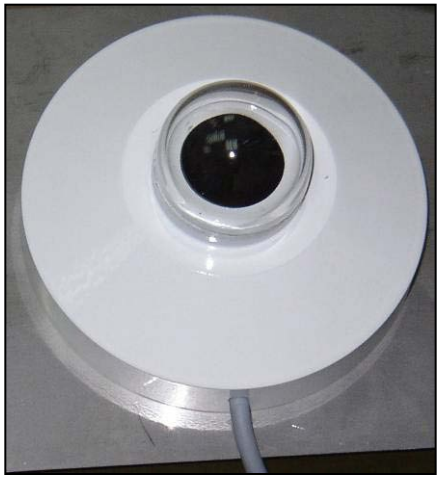
2. Pyranometer Connection- Netafim

Dip Switch position

Pyranometer – IN 4 :



Dip Switch position	Sensor type
Temp	Temperature sensor (30kΩ)
0-5V	**Radiation**
4-20mA	EC, pH, CO2…



Cable type
3x0.5mm^2 (20AWG)
Shielded

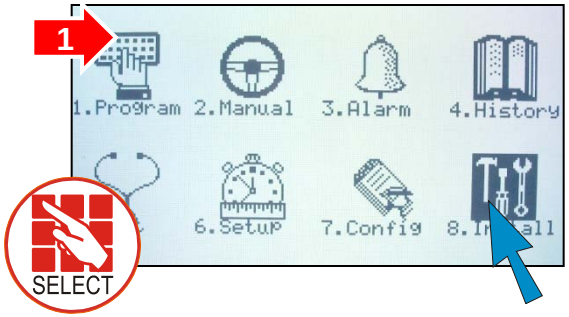
Sensor Wires

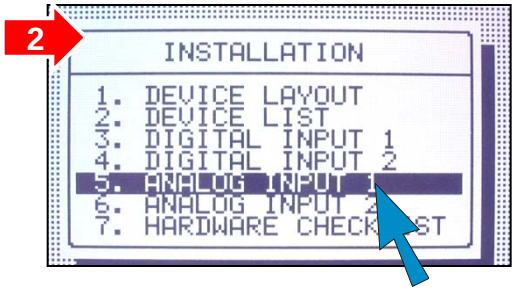
Green - COM

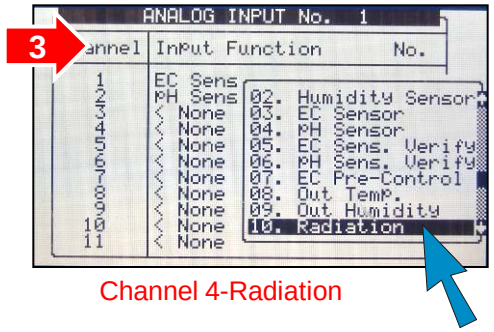
White - Input

Brown +12VDC

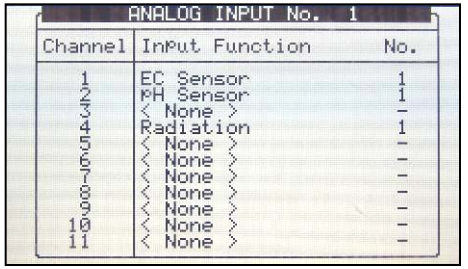
2.1 Radiation Sensor Definition



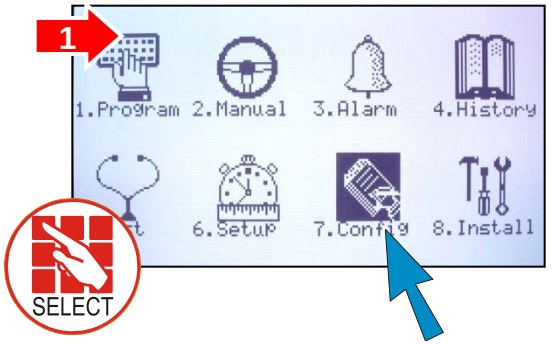


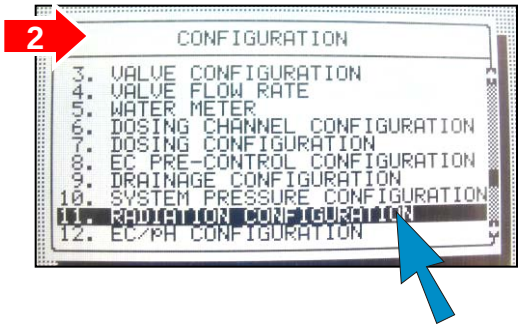


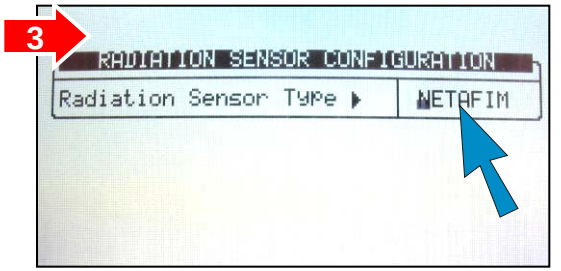
Channel 4-Radiation

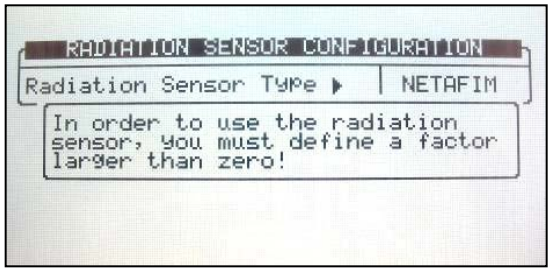


2.2 Radiation Sensor Configuration Option A- Netafim



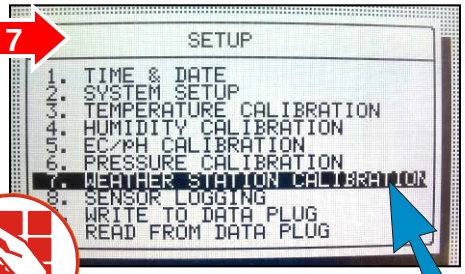




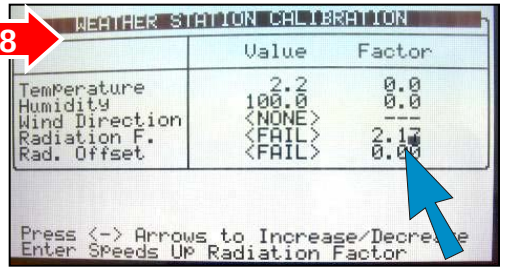


NMC-DC

7



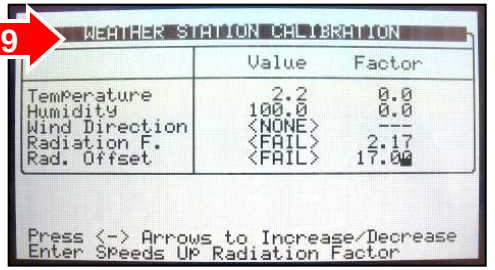
8



ATTENTION

Define Radiation Factor according to value on sensor milivolt/watt/m². To Increase/Decrease faster, use arrows while holding down ENTER

9



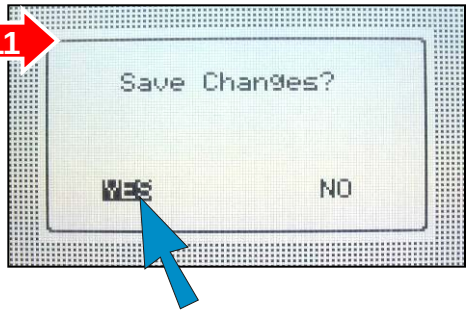
ATTENTION

Set Radiation Offset to ≥17.00 for after sunset when there is no radiation

10

MENU

11



NMC-DC

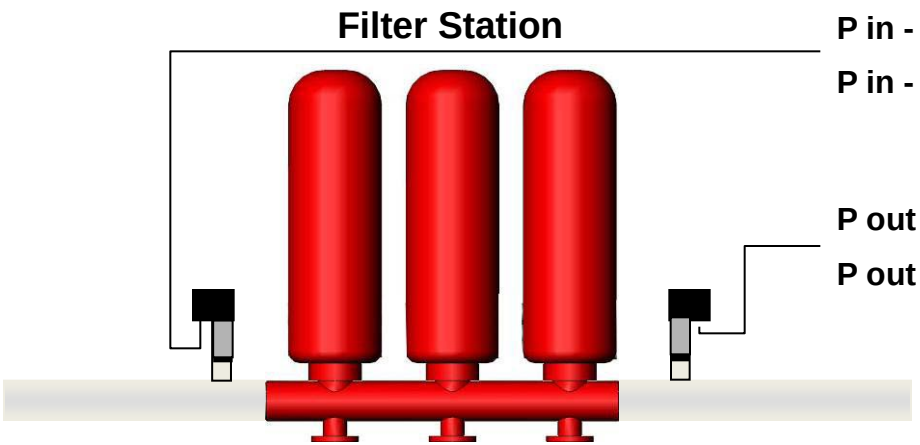
3. Pressure Transducer Connection

Pressure inlet – IN 2 :

Pressure outlet– IN 3 :

Dip Switch position	Sensor type
Temp	Temperature sensor (30kΩ)
0-5V	**Pressure inlet, Pressure outlet**
4-20mA	**Pressure inlet, Pressure outlet**

Cable type
3x0.5mm² (20AWG)
Shielded

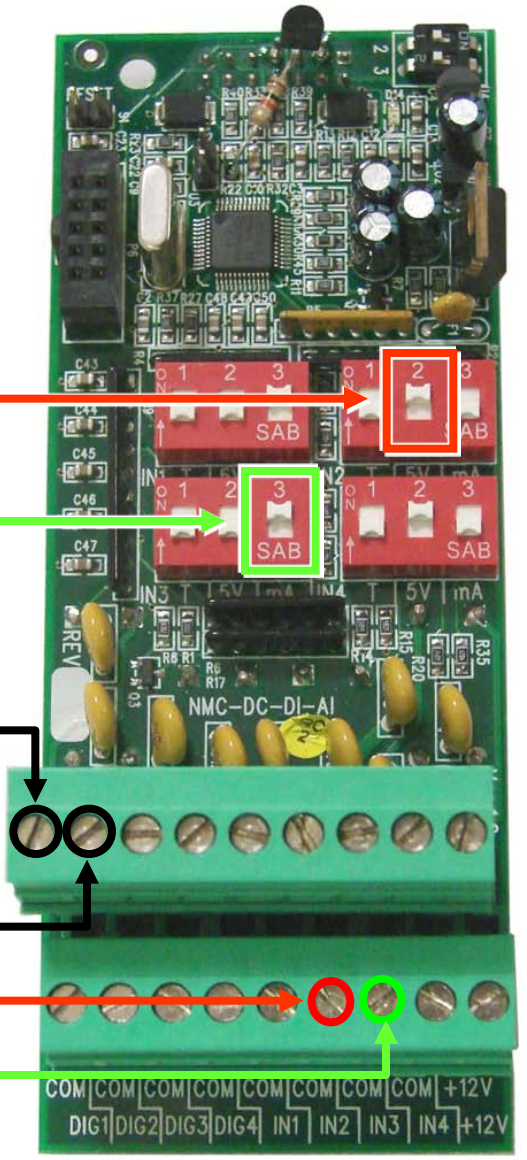


P in - COM

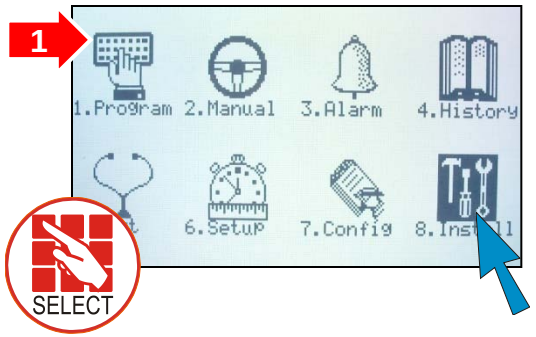
P in - Input

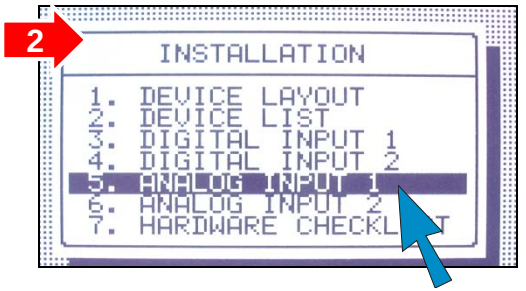
P out - COM

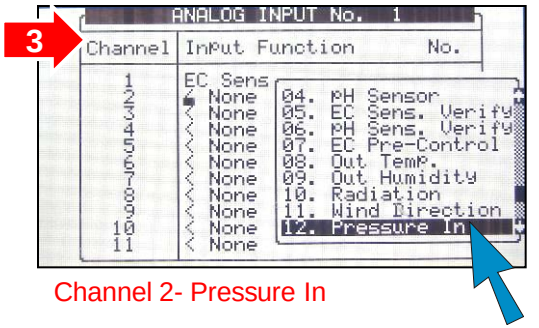
P out - Input



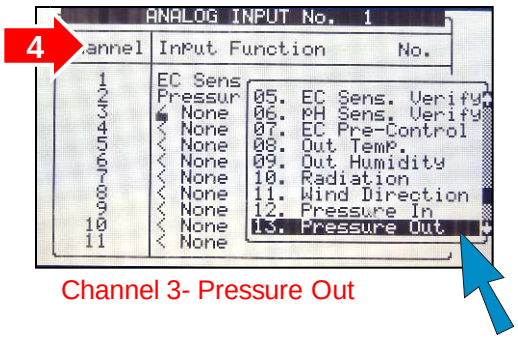
3.1 Analog Pressure Sensor Definition



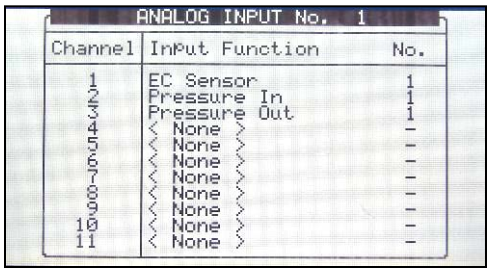


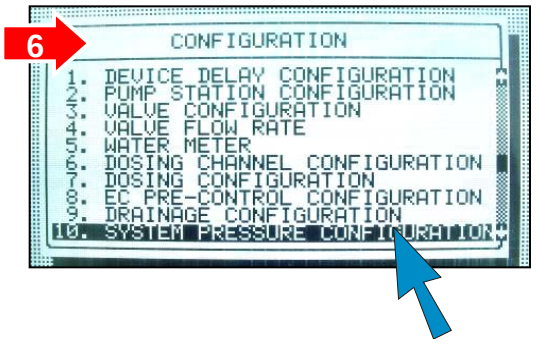


Channel 2- Pressure In



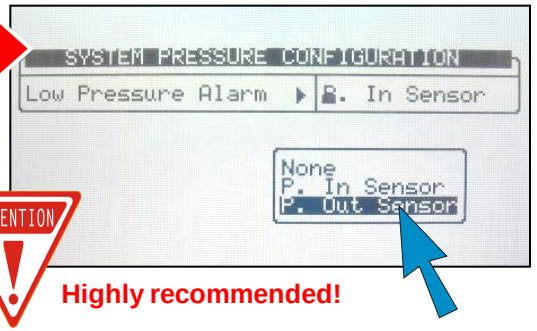
Channel 3- Pressure Out





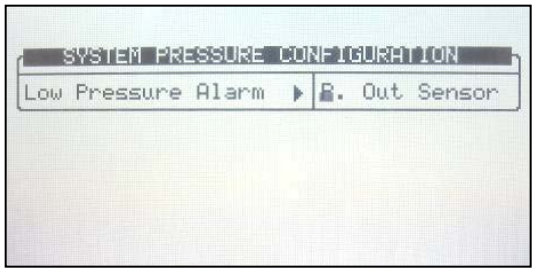
NMC-DC

7



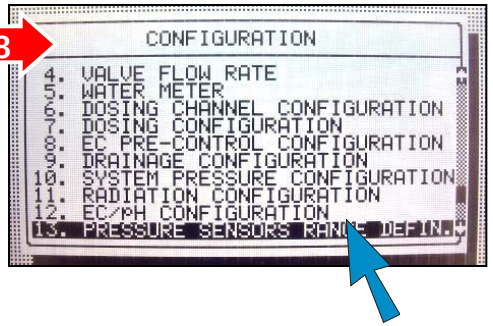
ATTENTION

Highly recommended!

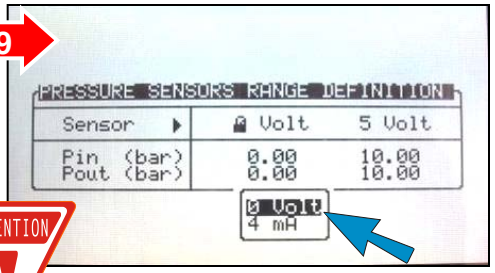


Netafim pressure sensor specifies:
0.5 Volt = -1.25 Bar
4.5 Volt = 11.25 Bar

8



9



ATTENTION

Define units 0-5V or 4-20 mA
according to sensor range
(ex: 0-10 bar)

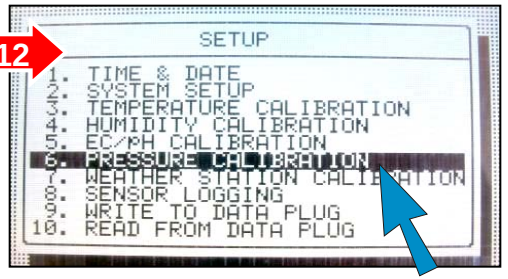
10

SELECT

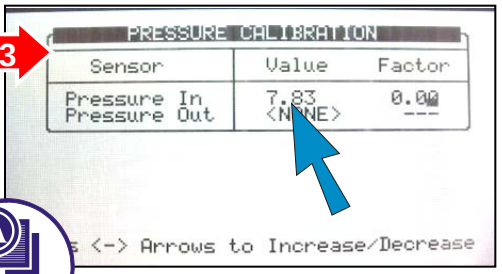
MENU

11

12



13



CHECK

Pressure value matches value
on pressure gauge of main line

4. Sensor and Cable Specifications

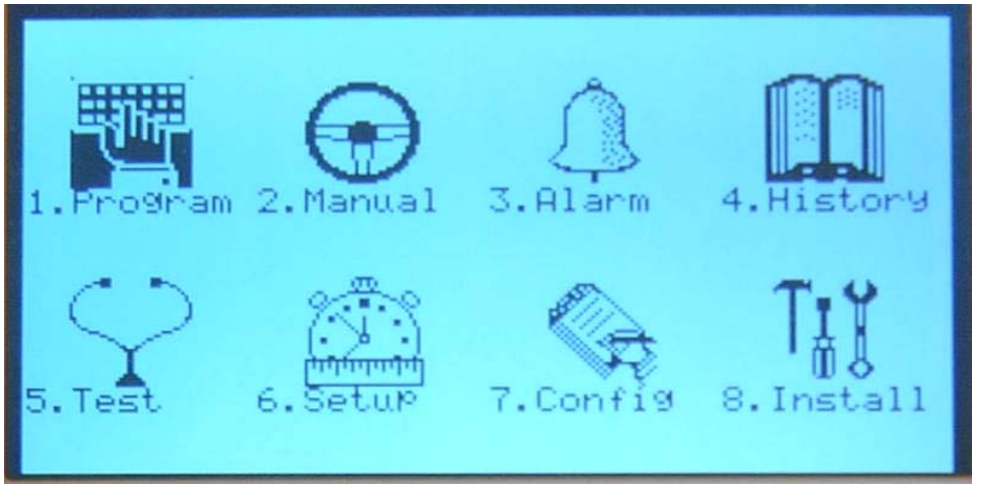
Sensor Type	Measured Values	Accuracy	Input Range	Maximum Cable Length	Cable Type
Temperature – RTS-s	-20°C to 50°C/ -4°F to 122°F	0.3°C	30kOhm	500 meter (1640 feet)	2x0.5mm² (20 AWG)
EC	0 to 10mS (old transmitters used 20mS)	0.05 to 0.1mS	4 – 20mA	---	3x0.5mm² (20 AWG) Sheilded
pH	0 - 14	0.1	4 – 20mA	---	
RH – RHS-10	0 – 100%	±2% (10%-90% RH), ±3.5% (90%-100% RH)	0 – 3 VDC	300 meter (985 feet)	3x0.5mm² (20 AWG)
Pyranometer-Netafim	300-2800nanometer (Up to 1500W/m²)	±5%	0 – 5VDC	---	3x0.5mm2 (20AWG) Shielded
Wind Speed	4-280 km/hr (2-175 mph)	±5%	Pulse output (Wind Cups & Magnetic Switch)	100 meter (330 feet)	4x0.5mm² (20 AWG)
Pressure	Up to 10bar (145 PSI)	---	0 – 5 VDC	---	3x0.5mm2 (20AWG) Shielded
Rain Collector	"Rain amount (mm or inch) Collection area: 200 cm2 (31 inch²) Resolution: 0.254mm (0.01"")"	"±2%, Rainfall count between 0.2-50mm/hr (0.01-2""/hr)±3%, Rainfall count between 50-150mm/hr (2-4""/hr)"	Dry contact (tipping bucket)	100 meter (330 feet)	---
Rain Detector	Rain, No Rain	0.2mm/hr	"Dry contact/0-5VDC"		

APPENDIX E

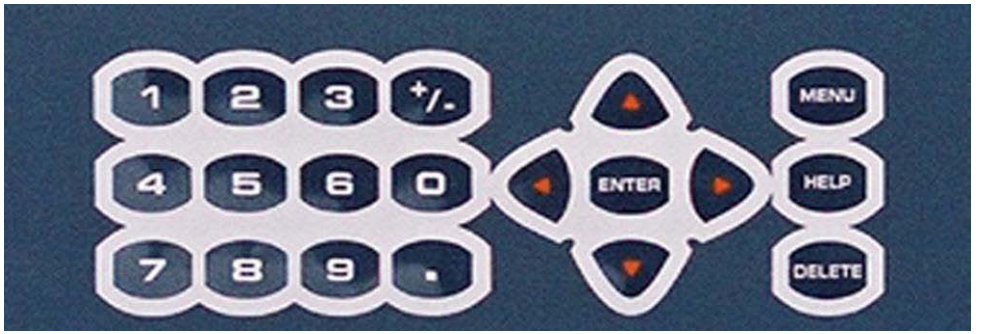
Technical Specifications

1. Controller Components

1.1 KEYBOARD & DISPLAY



- Graphical LCD Display
- Back light
- 5.5”

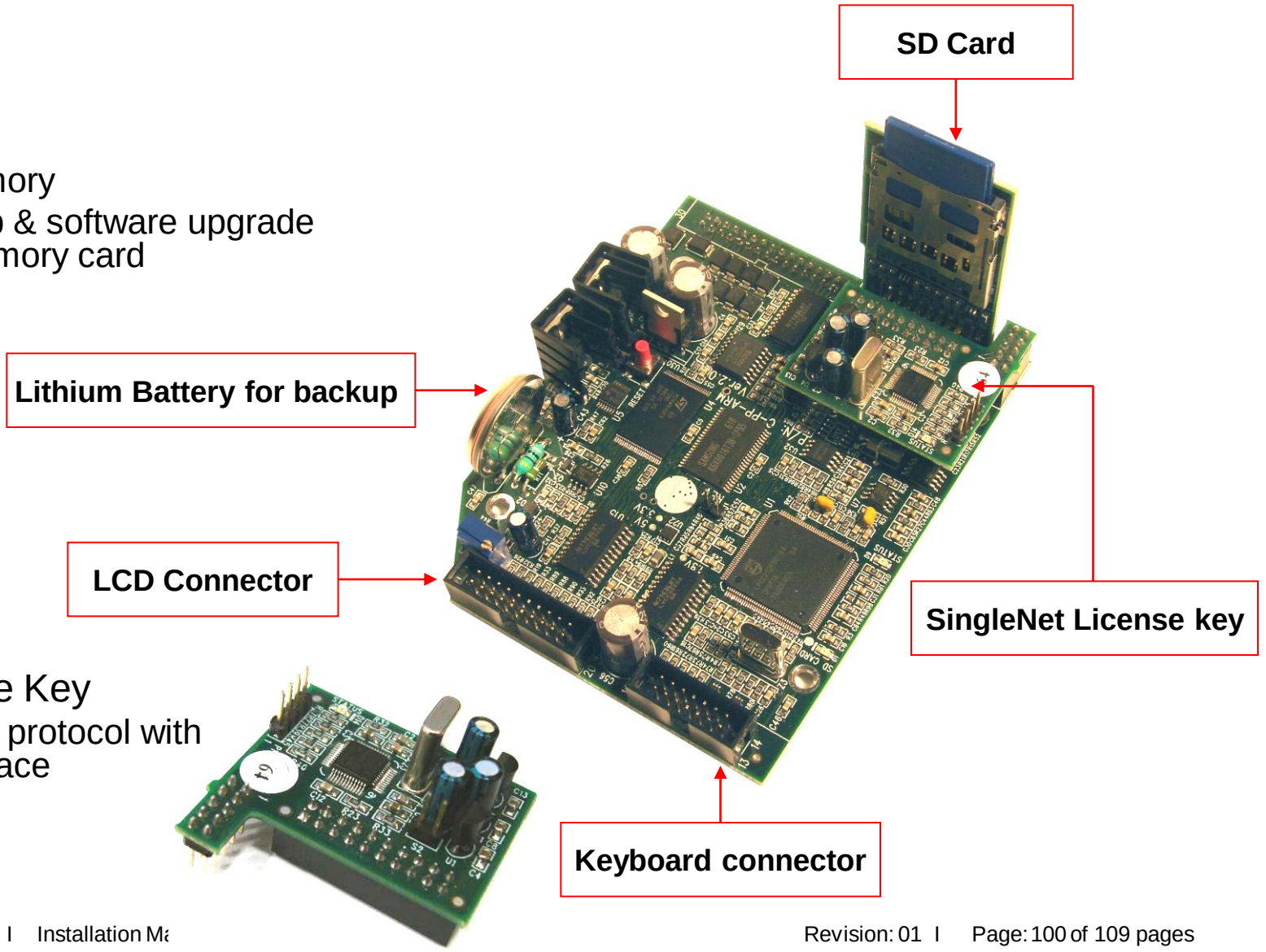


- Tactile feel Keyboard

NMC-DC

1.2 CPU

- 32bit CPU
- 8Mb Flash memory
- Settings backup & software upgrade through SD memory card

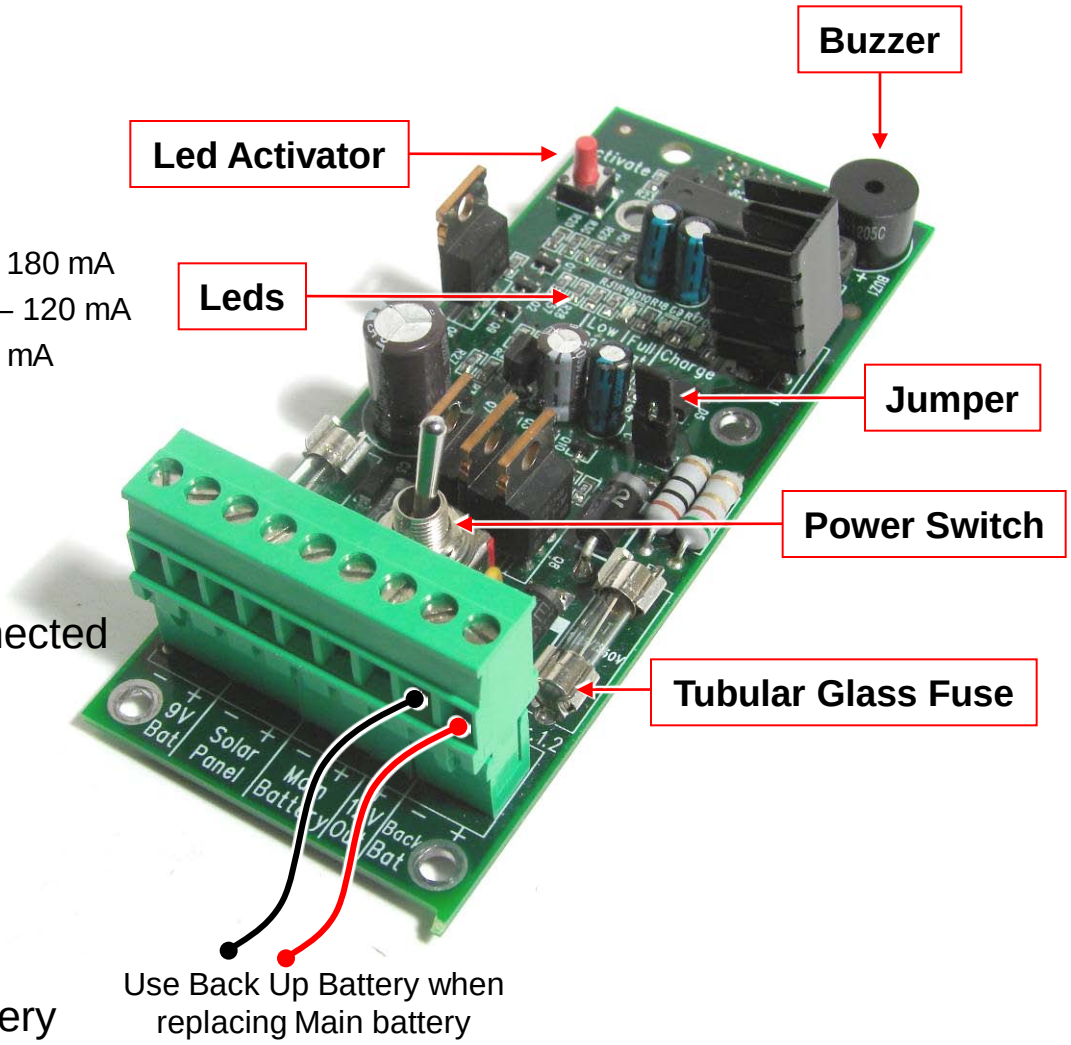


SingleNet License Key

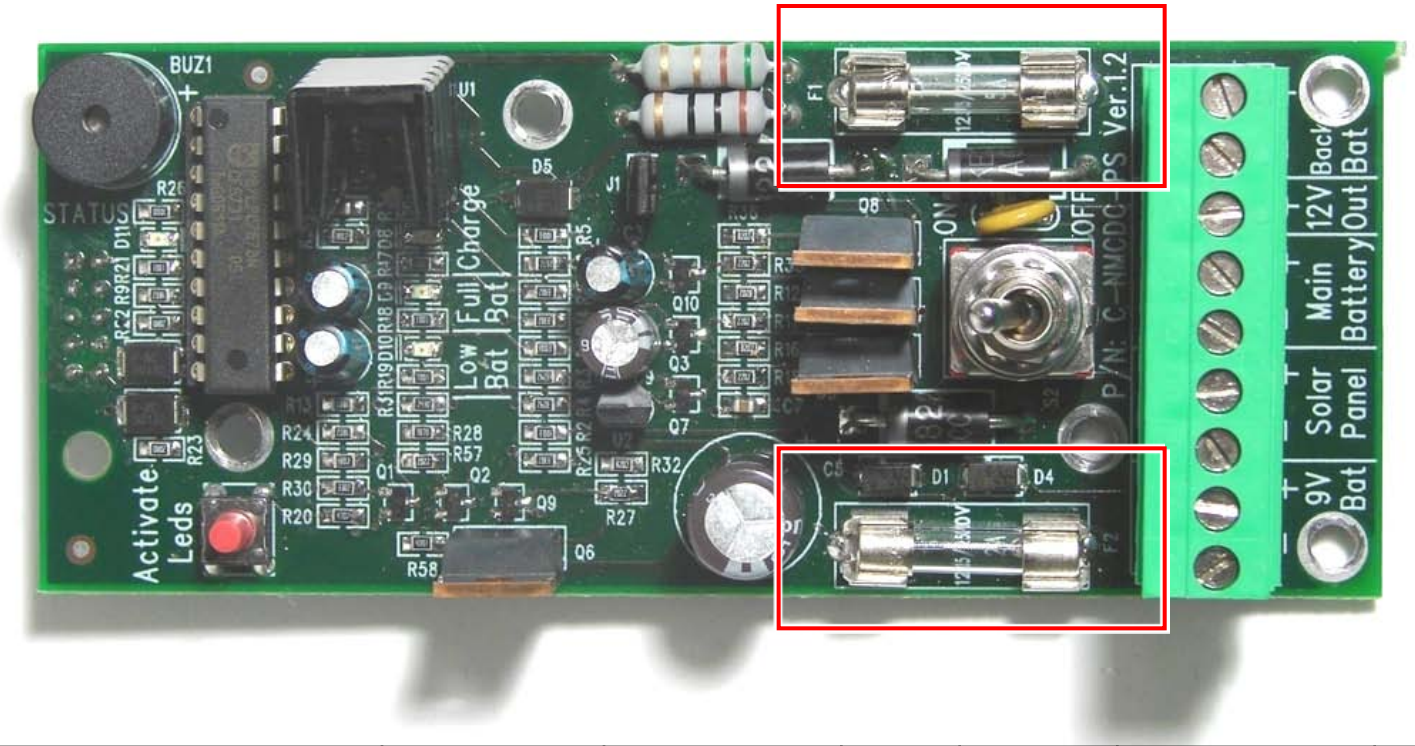
- Communication protocol with SingleNet interface

1.3 Power Supply

- DC Power Supply
  - 12V DC
  - Power Consumption
    - ❖ Display ON - Operating comm. Card (485) – 180 mA
    - ❖ Display OFF - Operating comm. Card (485) – 120 mA
    - ❖ Display ON - Modem RCLP GSM –200-250 mA depends on state (receiving / broadcasting)
- Protection
  - Tubular glass fuse
- Buzzer
  - Sounds when Back Up Battery is connected
- Leds (Main Battery Status)
  - Low Battery
  - Full Battery
  - Charge
- Jumper
  - Always needed for charging Main Battery



1.4 Power Supply Fuse Protection

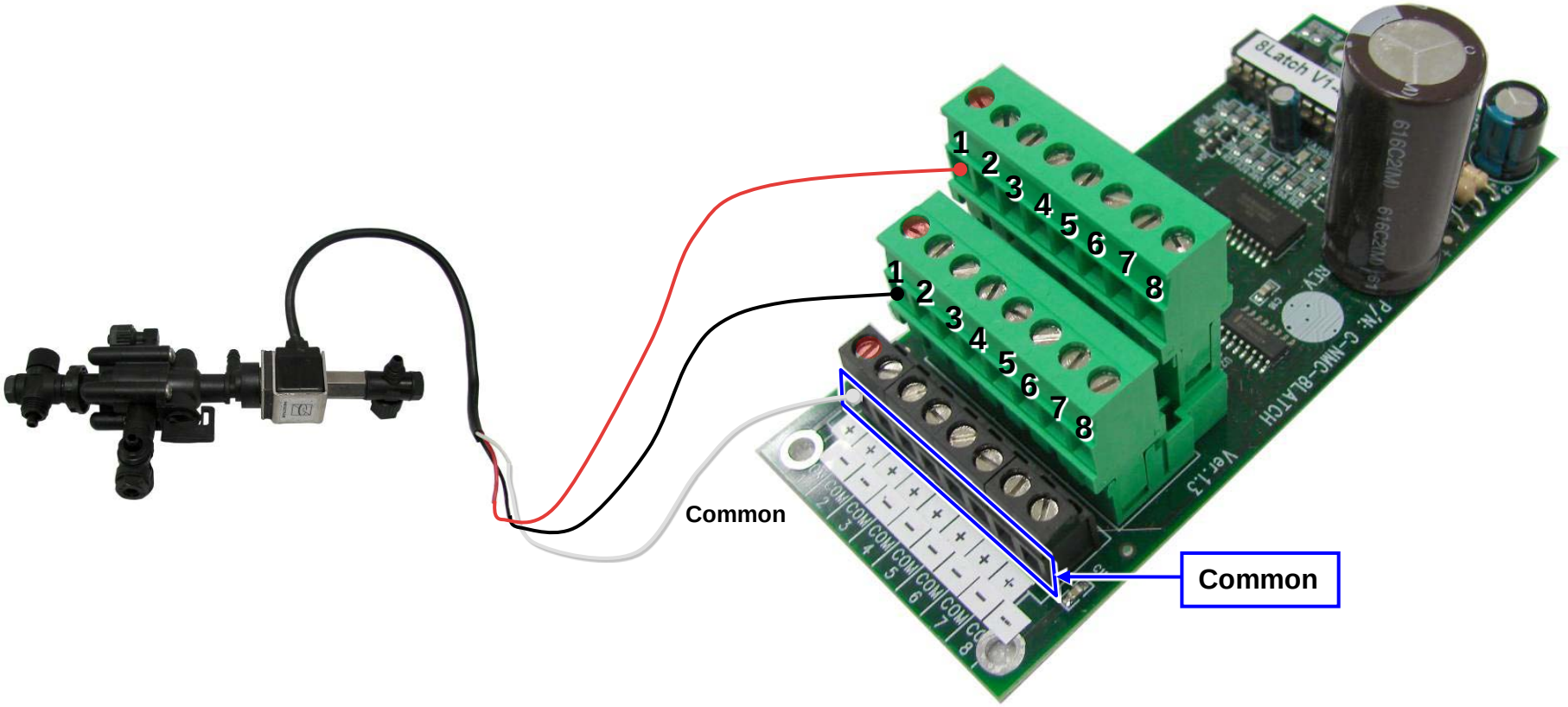


Location	Designation	Type	Style	Rating	Reaction Time	Dimensions
NM-DC Power Supply, Solar Battery	F1	Tubular Glass	M205	5.0 Amp	Slow Blow (T)	20mm x 5mm
NM-DC Power Supply, Main Battery	F2	Tubular Glass	M205	2.0 Amp	Slow Blow (T)	20mm x 5mm

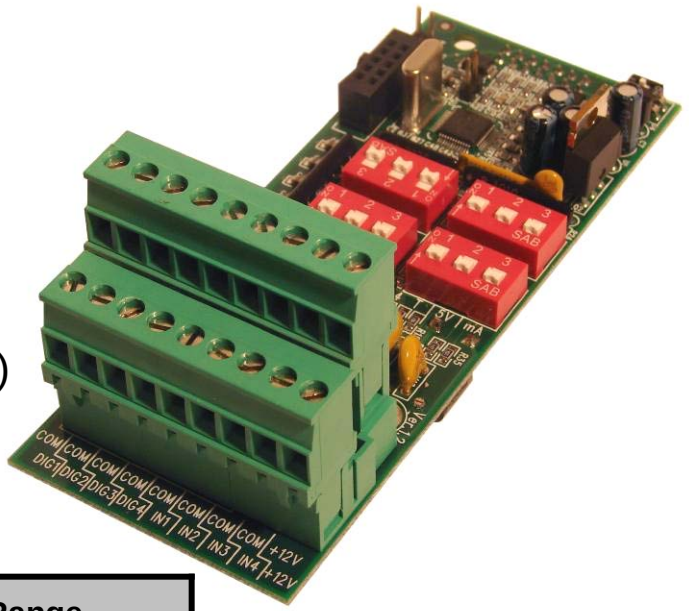
1.5 Outputs

12V DC Latch Output Card

- 8 Outputs
- Single output changing duration = 0.015 sec. 0.04 sec. 0.09 sec.



1.6 Digital & Analog Input Card



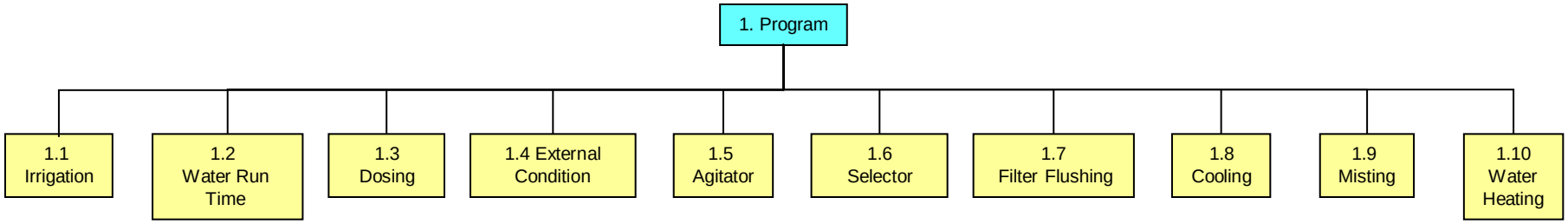
- 4 x D.I. Inputs
- 4 x A.I. Inputs
- Maximum pulse rate 50pulse/sec (<50 Hz)
- Inputs 1 – 4: Temperature (NTC 30KΩ), 0-5VDC (Radiation, Relative Humidity, Pressure…), 4-20mA (EC, pH, Pressure…)

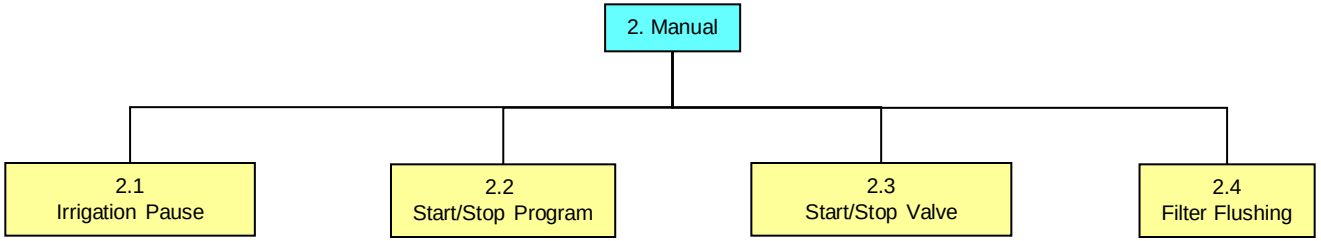
Common Analog Sensor Specifications

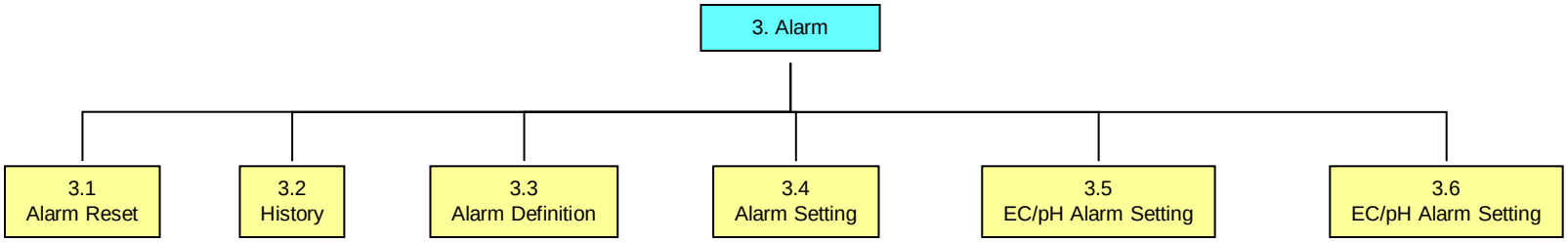
Sensor	Measured Values	Input Range
Temperature – RTS-s	-20°C to 50°C/ -4°F to 122°F	30kOhm
EC	0 to 10mS (old transmitters used 20mS)	4 – 20mA
pH	0 - 14	4 – 20mA
RH – RHS-10	0 – 100%	0 – 3 VDC
Pressure	Up to 10bar (145 PSI)	0 – 5 VDC
Radiation	0 – 1800 w/m²	0 – 5 VDC

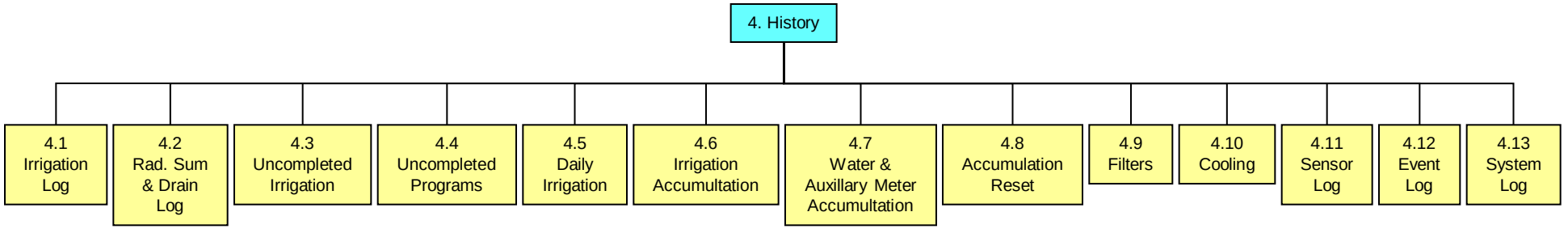
APPENDIX F

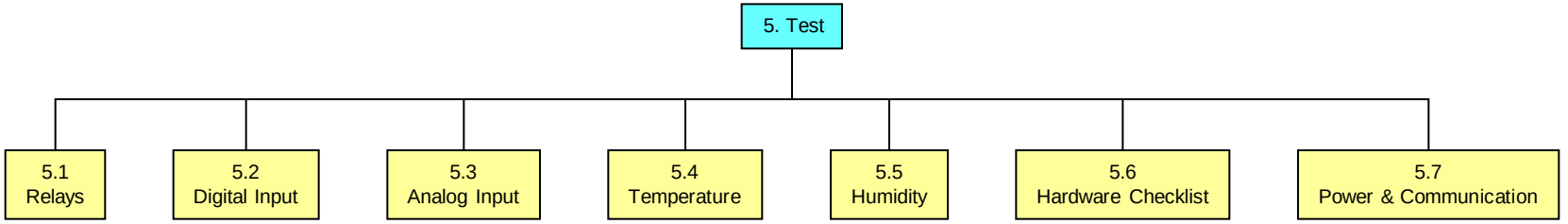
Main Menu Tree

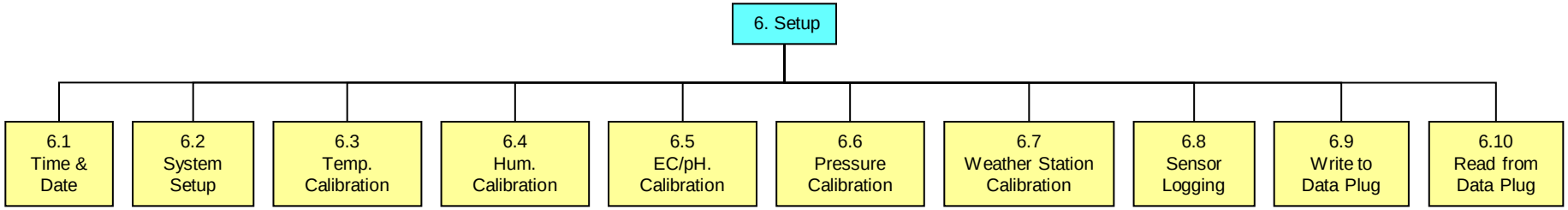

1. Program
1.1 Irrigation
1.2 Water Run Time
1.3 Dosing
1.4 External Condition
1.5 Agitator
1.6 Selector
1.7 Filter Flushing
1.8 Cooling
1.9 Misting
1.10 Water Heating

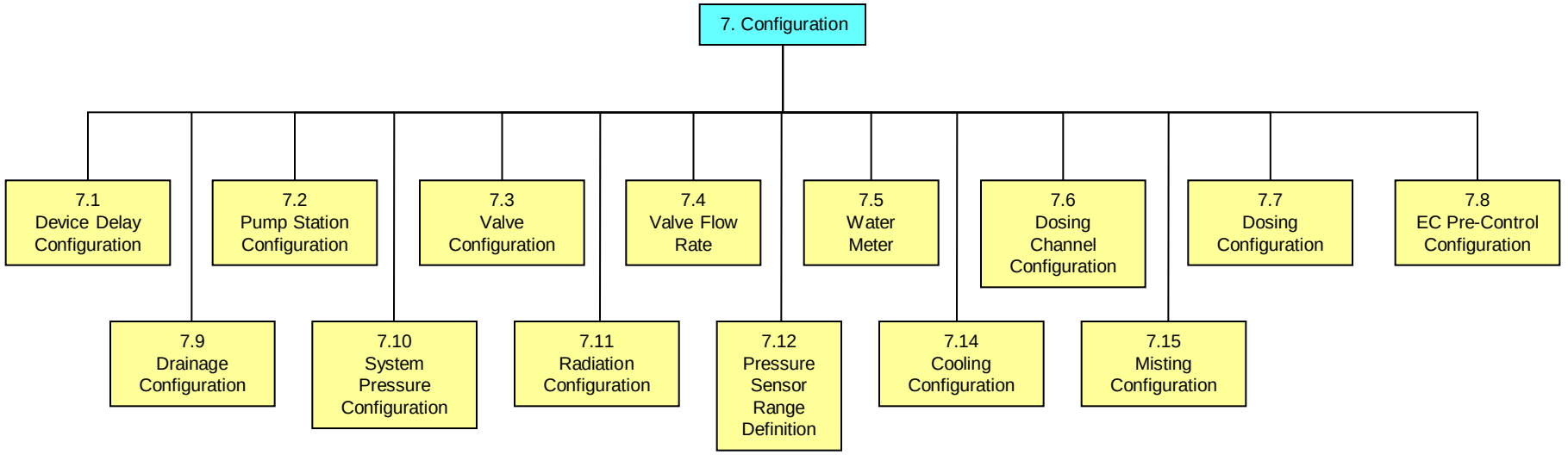

2. Manual
2.1 Irrigation Pause
2.2 Start/Stop Program
2.3 Start/Stop Valve
2.4 Filter Flushing

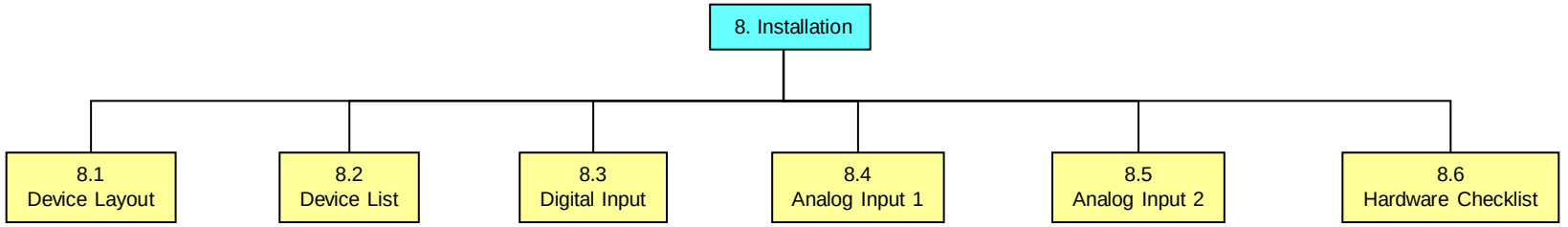

3. Alarm
3.1 Alarm Reset
3.2 History
3.3 Alarm Definition
3.4 Alarm Setting
3.5 EC/pH Alarm Setting
3.6 EC/pH Alarm Setting


4. History
4.1 Irrigation Log
4.2 Rad. Sum & Drain Log
4.3 Uncompleted Irrigation
4.4 Uncompleted Programs
4.5 Daily Irrigation
4.6 Irrigation Accumultation
4.7 Water & Auxillary Meter Accumultation
4.8 Accumulation Reset
4.9 Filters
4.10 Cooling
4.11 Sensor Log
4.12 Event Log
4.13 System Log


5. Test
5.1 Relays
5.2 Digital Input
5.3 Analog Input
5.4 Temperature
5.5 Humidity
5.6 Hardware Checklist
5.7 Power & Communication


6. Setup
6.1 Time & Date
6.2 System Setup
6.3 Temp. Calibration
6.4 Hum. Calibration
6.5 EC/pH. Calibration
6.6 Pressure Calibration
6.7 Weather Station Calibration
6.8 Sensor Logging
6.9 Write to Data Plug
6.10 Read from Data Plug


7. Configuration
7.1 Device Delay Configuration
7.2 Pump Station Configuration
7.3 Valve Configuration
7.4 Valve Flow Rate
7.5 Water Meter
7.6 Dosing Channel Configuration
7.7 Dosing Configuration
7.8 EC Pre-Control Configuration
7.9 Drainage Configuration
7.10 System Pressure Configuration
7.11 Radiation Configuration
7.12 Pressure Sensor Range Definition
7.14 Cooling Configuration
7.15 Misting Configuration


8. Installation
8.1 Device Layout
8.2 Device List
8.3 Digital Input
8.4 Analog Input 1
8.5 Analog Input 2
8.6 Hardware Checklist

WARRANTY

Controller:

Netafim warrants the electronic components of the NMC-DC Controller on to be free of defects in materials or workmanship for **1 (one)** years from the date of purchase by end user. If a defect is discovered during the applicable warranty period, Netafim will repair or replace, at its option, the product or the defective part.

Note: lightning and surge damages are not covered by warranty.

Date of commissioning:

Customer's representative:

Name:

_____

Signature:

_____

Netafim's representative:

Name:

_____

Signature:

_____