

GRYPHON Automation

# CDN MANUAL

Irrigation Controller

4/1/2011

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## **INTRODUCTION**

We are pleased to welcome you to this equipment which we believe represent the utmost quality available in the market.

The machine is equipped with the most modern computer for control of fertilization and irrigation and we have paid special attention to making the equipment easy and intuitive to program. The lay-out of the menus is made in a very logical manner and in a language which is easy to understand.

The hydraulics are constructed with total attention to a precise and efficient control of fertilizer dosage.

All the know-how that has gone into our machine is based virtually exclusively on experience from growers and horticultural technicians. Our aim is, and has been for nearly 20 years that the equipment we manufacture is adapted to modern agriculture and is based on hands-on experience.

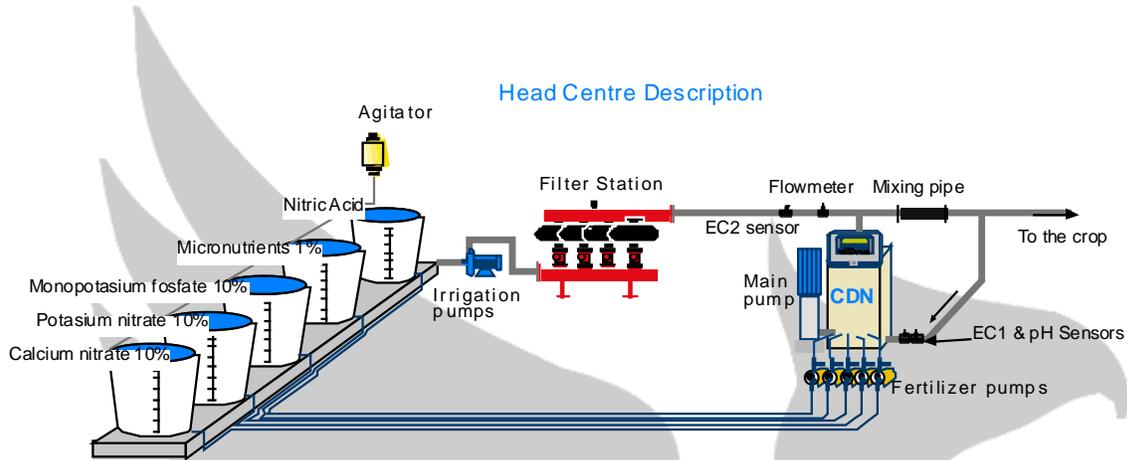
We sincerely believe that the equipment that you have purchased is a highly reliable and efficient machine that will optimize your plant production.

Finally we will ask you to read the manual that you have in your hand very carefully in order to take advantage of this very complete piece of machinery. Please also fill in the registration card that is supplied along with the equipment. This ensures that any new technical information that is published also reaches you.

The staff at INTA is very pleased with your trust in our product. We would like to take the opportunity to thank you for your confidence in us and we are pleased to confirm our total commitment through our distribution network to serving and assisting you in any doubts or questions you might have. To us happy clients are what drive our daily work.

## IMPORTANT CONCEPTS

Based on the diagram below of an installation of an irrigation equipment we will describe the basic elements of our product:



**Fertilizer Tanks :** In which the fertilizer is diluted in water for easy distribution. The computer has the capacity of dosing from up to 8 different mother solution tanks. In general up to 7 are for fertilizers and the eighth is for either acid or base – the latter in order to control the pH of the nutrient solution.

**Irrigation Pumps:** In this case only one pump is displayed but the CDN computer can control up to three(3) pumps with the possibility of pre-starting or delaying the start and stop of the pumps independently of the computer controlling the opening/closing of the irrigation valves.

**Filter Station:** The equipment offers a system of automatic rinsing of a filter station. The rinsing can take place based on various forms, pressure difference, irrigated volume, irrigation time or a combination of these possibilities.

**Dosing unit for fertilizer injection:** Normally made up of an injector and a controlling solenoid valve.

**Mixing Tank:** In the mixing tank the fertilizer solutions are blended with fresh water in order to obtain a uniform nutrient solution.

**Main Pump of the Equipment:** The main pump of the equipment can either be installed in such a manner that all water passes the mixing tank or as is the case of the diagram above part of the irrigation water passes the mixing tank resulting in a more concentrated mixture which is mixed into the main irrigation line resulting in the same result, a uniform and correctly balance irrigation solution.

**Sensors for pH and Electrical Conductivity:** Highly necessary for the control of the dosification of nutrients and acid/base. The CDN computer is equipped with the best brands on the market. It is possible to incorporate a second EC sensor (EC2) in order to control relative conductivity and for control of recirculated water.

**Main Flow Meter:** Very useful in order to recognize the consumption of the various parts of the farm or greenhouse and for programming irrigation based on volume. Furthermore is necessary for the activation of the flow alarm.

**Fertilizer Flow Meters:** Very useful in order to control the amounts of fertilizers dosed to each crop.

## **THE PRINCIPLES OF THE CDN FERTIGATION COMPUTER**

This is a system that is developed in order to work with nutrient solutions in a form that supplies the plants with all their needs for nutrients and water. The system changes the supply to the plants depending of the vegetative stage of development so that all the nutritional needs are covered resulting in a optimum growth and production.

In each of the groups or areas of your farm or nursery the valves are put together in such a way that the ones that are fed the same nutritional solution and enjoy the same start conditions are grouped and are watered at the same time.

There are a total of 10 groups in the computer in which you can freely organise up to 32 valves per group. The irrigation time can be set independently for each valve - this can be either on time or volume to irrigate.

The start conditions and the priority of irrigation controls the manner in which the valves of each group are activated. The computer has ample option for controlling the frequency of the irrigation – options that can be combined between themselves supplying you with many possibilities of control. The computer offers a wide range of control making it adaptable to virtually any crop grown whether under cover or in the open field.

In dosification we establish the amount to be dosed of each fertilizer. This can be controlled based on the actual conductivity and pH or as relative conductivity and pH. The possibility of proportional dosing in relation to the volume of irrigation water is of course also included.

As another unique feature the equipment is able to combine the control of conductivity with proportional dosing depending on volume of water. You can for

example choose to dose from tank 1 and 4 based on conductivity and from tank 5 based on proportional flow as tank 5 contains microelements which do not increase the conductivity.

The precision of the system can be adjusted by setting the exact flow rate from each fertilizer and the system will then automatically compensate for the differences of flow.

By installing the optional flow metres for fertilizer it is possible to monitor and follow exactly the amount of fertilizer that has been added from each tank.

The system of alarms is supplied to a very high degree of security which ensures that no damage is done to the crop in case of unforeseen events. The EC and pH alarms as well as monitoring the rhythm of the dosing units / injectors in relation to the volume of water, establish limits that are able to detect and warn of any situation outside the normal.

With the CDN equipment it is possible to recirculate up to 5 basins which can be controlled by blending a part of clear water into the recirculated irrigation solution, and in this manner maintaining the solution stable.

As you can realize the system has vast possibilities to offer you and is easily adapted to the requirements of any crop resulting in an optimized production.

A PC programme is also available for the CDN machine. The PC programme collects data of all the activities of the CDN as well as facilitating an easy and fast programming of the CDN.

## **INFORMATION CONCERNING INSTALLATION OF THE CDN**

In connection with the installation of the CDN fertilizer mixer it is important to add some consideration where to place the unit.

Keep in mind that you need to be able to operate the machine with ease. At the same time the installation has to be made in such a manner that it is easy for technicians and service personnel to access the unit – this saves time and money.

## **DEMANDS TO ELECTRICAL AND WATER INSTALLATIONS**

In the place where the unit is to be installed it is necessary to have the correct power supply as well as sufficient supply of clean water.

The mixer is supplied with connection for 3 x 400 Volt, Neutral (0) and ground (\*). The dimension of the overload fuses depend of the total power consumption of the installation.

The calculation of the clean water supply for the CDN depends of the fresh water supply pump. As a rule of thumb the fresh water supply pump should have a surplus capacity of app. 10% in regards to the size of the pump of the fertiliser mixer.

Before installing a fertiliser mixer you always need to control the quality of the water. This quality of the water is important in regard to a correct functioning of valves and pumps. In case of the water containing impurities an efficient filter system should be installed avoiding unnecessary delay in the irrigation process.

### **FRESH WATER SUPPLY TO THE CDN FERTILIZER MIXER**

The supply of fresh water happens via a special 1,5" (ell. 2") hydraulic controlled valve. The valve is installed on the top of the mixing tank unit. The supply pipe can be made in metal or PVC and always having in mind that the material can not contain substances that are harmful for the growth of the plants.

It is important that any installation of a CDN fertiliser mixer is made according to the laws and regulation of the country. In order to facilitate fast and easy servicing of the machine it is highly recommended to install manual valves in order to be able to separate the system from the main irrigation system.

### **HOW THE WATER INLET VALVE WORKS**

The water inlet valve is a special hydraulic controlled valve working in conjunction with the level valve in the mixing tank. The principle of the valve is very simply, pressure from the inlet of the valve runs through a thin pipe into the upper chamber of the valve and in this forcing the valve to close. Once the water in the mixing tank disappears the valve opens and allows for water to pass into the mixing tank again. This process is a continuous process depending on the water consumption of the fertiliser mixer.

### **CONNECTION OF FERTILIZER STOCK TANKS**

The pipe connection between the stock tanks, filters and the pump has to be made preferable in fixed and chemical-resistant materials like PVC or PE. On the outlet of the stock tanks a manual valve should be place facilitating the cleaning of the fertiliser filter and tank. Remember to place the filter correctly, the arrow shows the direction of the flow. Finally the piping from the stock tank is connected to the inlet of the dosing pump.

### **RETURN FLOW TO STOCK TANKS**

When no dosing is needed the stock solution is automatically returned to the stock solution tanks. This happens through piping from the outlet of the three way valve placed on top of the dosing pump. It is important that the piping is made in such a way that the pipe has no bends obstructing the return of the liquid to the stock tanks. The ideal solution is fixed pipes of pvc.

All pipes and tubes used for the transport of fertiliser, acid and other chemicals should be placed correctly avoiding that unauthorized personal comes in contact with the these substances. For security reasons all stock tanks should have lit on top of the fertiliser tanks.

## **CLEANING OF STOCK SOLUTION FILTERS**

It is good to make a habit of cleaning the fertilizer filters once a week.

Regular cleaning of fertilizer filters avoid clogging up and reduction of the injection capacity. Clogged up filters is the number one reason for unequal dosing of fertilisers and is a frequent reason for unnecessary visits from service engineers.

The filter is easily taken apart and rinsed, just turn the lower part anti-clockwise and pull it away from the top part, rinse thoroughly and assemble again.

## **CONNECTION OF CDN TO THE IRRIGATION SYSTEM**

The irrigation pump is supplied with a flange connection depending on the pump size or alternatively with a 1,5 " threaded connection.

The best installation is made by use of fixed piping. A non-return valve should always be connected in direct connection after the pump.

For service reasons it is a very good idea to mount a manual valve between the pump and the rest of the installation.

## **MAINTAINANCE AND TROUBLESHOOTING FOR DOSING PUMPS**

The fertiliser pumps are so-called magnetic pumps – DO NOT OPERATE WITHOUT LIQUID! At the start-up of the system all pipes, pumps and dosing valves must be controlled for air-pockets.

The air pockets are eliminated by first opening for the supply from the stock solution tanks and in this way filling the filter and the pump with fertiliser solution. In continuation the dosing valve is activated manually in such a manner that the valve and part of the dosing pipe to the mixing tank is filled with fertiliser solution. Repeat this for all stock tanks. In case the system is out of operation for a longer period the pipes, filters and dosing pumps should be emptied. This is also the case should the temperature drop below 0°.

## **REGULARY CHECK OF DOSING PUMPS DURING OPERATION**

Control the pressure on the inlet side of the pump, the dosing volume and dosing speed. Also control the sound of the pump and the pump motor.

In case of abnormal conditions please investigate and correct these errors. The dosing pumps should be revised once a year and according to need. Open the pumphouse and control all parts that are in contact with the fertiliser solution. Change any defect parts and clean parts that are to be reused. Before mounting the pump again please control all pipes and valves on both sides of the pump.

## **TROUBLESHOOTING**

### No pumping or too little volume:

- manual valve has been closed obstructing the flow;
- pipe from stock tank, inlet to pump or propeller wheel inside pump obstructed;
- pipe from stock tank is leaking;
- airpockets have formed inside pipes or pumps;
- fertilizer filter is partly or completely clogged up;
- pump worn down;
- dosing valve does not open;

### VIBRATION AND NOISE:

- pump running dry;
- bearings worn down or broken.

## **MAIN PUMP OF THE CDN FERTILIZERMIXER**

Before activating the CDN main pump, the pump needs to be full of liquid. This is done by closing the manual valve on the pressure side of the pump which will make the mixing tank fill up. In this manner the air inside the pump is automatically pushed out through the pipe to the conductivity sensor. You can now open the manual valve and the pump is ready for activation.

By start up of the system the direction in which the pump is turning must be controlled. The correct direction of the pump is shown on the ventilation shield on top of the motor. In case the direction is wrong, change two of the cable for the power supply to the motor.

DO NOT OPERATE PUMP WITHOUT LIQUID INSIDE.

## **FROST PROTECTION**

Pumps exposed to frost must be emptied and kept dry. Unscrew all pipes etc. to pump. Please study information from the pump manufacturer for more.

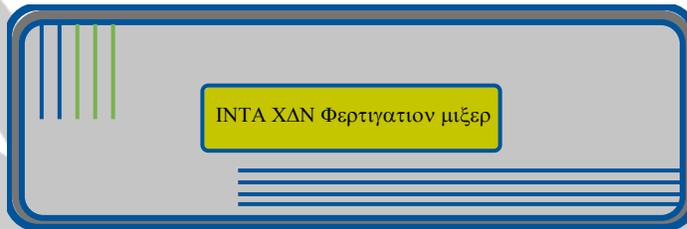
## **MAINTAINANCE OF CONDUCTIVITY SENSOR AND pH PROBE**

The sensors for conductivity and pH are the important sensors of the CDN fertiliser mixer. Their maintenance and adjustment are crucial for a correct functioning of the machine thus these sensors must be checked frequently. In case of poor water quality the sensors must be serviced and adjusted with few days interval. If the fresh water is of good and clean quality then weekly service is sufficient.

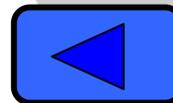
Should you suspect the readings of the sensors then do not hesitate to contact the supplier of the machine.

## HOW TO PROGRAM THE CDN FERTIGATION COMPUTER

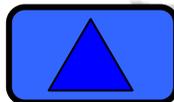
The computer is equipped with a 4 line and 40 character display and a keyboard of six keys. The six keys are used to move around in the menu allowing you to select and modify/introduce any value you need to change.



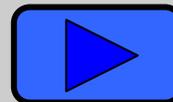
Go back through menus  
Cancel changes



Move cursor to the left



Next line in the menu  
Increase values/numbers



Move cursor to the right



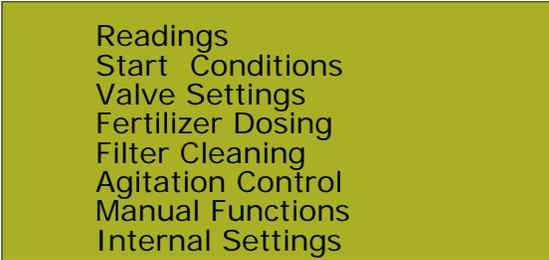
Previous line the menu  
Increase values/numbers



Confirm changes  
Press for entering submenus

## **MAIN MENU**

By using of the Up and Down arrows you can move around in the main menu containing the following menu's:



- Readings
- Start Conditions
- Valve Settings
- Fertilizer Dosing
- Filter Cleaning
- Agitation Control
- Manual Functions
- Internal Settings

### **READINGS**

This menu provides information about the functions of the equipment. Readings of pH, EC, Flow, Solar Radiation, radiation energy accumulated, consumption of fertilizer, etc.

Furthermore there is a section revealing data about the present alarms as well as a list of alarms in the past. All in all this is the menu to go to in order to test the working of the irrigation equipment.

### **START CONDITIONS (& PRIORITY)**

This menu defines the conditions for activating the irrigation in the different groups/sectors of the farm/nursery. The Start Conditions available are Fixed Irrigation Time, Fixed Intervals, Solar Radiation, External Signal, Drainage Control or combinations of these Start Conditions.

### **VALVE SETTINGS**

This menu provides the lay-out of the valves through out the farm/nursery. Here you group the valves and decide in which order they are to be activated. It is of course also here that you set the irrigation time or the irrigation volume for each valve. The menu also provides access to control of the starting and stopping of pumps and auxiliary pumps as well as the time of Pre-irrigation, rinse etc.

### **FERTILIZER DOSING**

This is for control of the dosing of fertilizer. Here you set the different mode for controlling the addition of nutrients to the irrigation water. You have the option of control via the selected EC and pH or via proportional dosing as well as a combination of these two. This menu is also the gateway to the use of recirculation/basin; control, blending of different water sources as well as the establishment of the alarm limits that sophisticated equipment like this has to have.

### **FILTER CLEANING**

Here you control the cleaning of the filters, the manner in which the filter cleaning has to happen. The modes in which the cleaning of the filters can be carried out are very versatile. Filter cleaning can happen either as control via Pressure Difference, Irrigated Time, Irrigated Volume, or combinations of these. It is also here that you set the time for the cleaning of the filters for each filter module. You can select to have a pause in between the cleaning of each filter. In this menu you also do the setting of the auxiliary pumps for the actual cleaning of the filters and finally it is here you decide whether to interrupt the irrigation if the need for filter cleaning is becoming necessary or wait till the irrigation is finished before cleaning the filters.

### **AGITATION CONTROL**

Here is where the agitation of the stock solution tanks with nutrients is controlled. It is possible to set the activation at specific times of the day or sequentially during a part of the day.

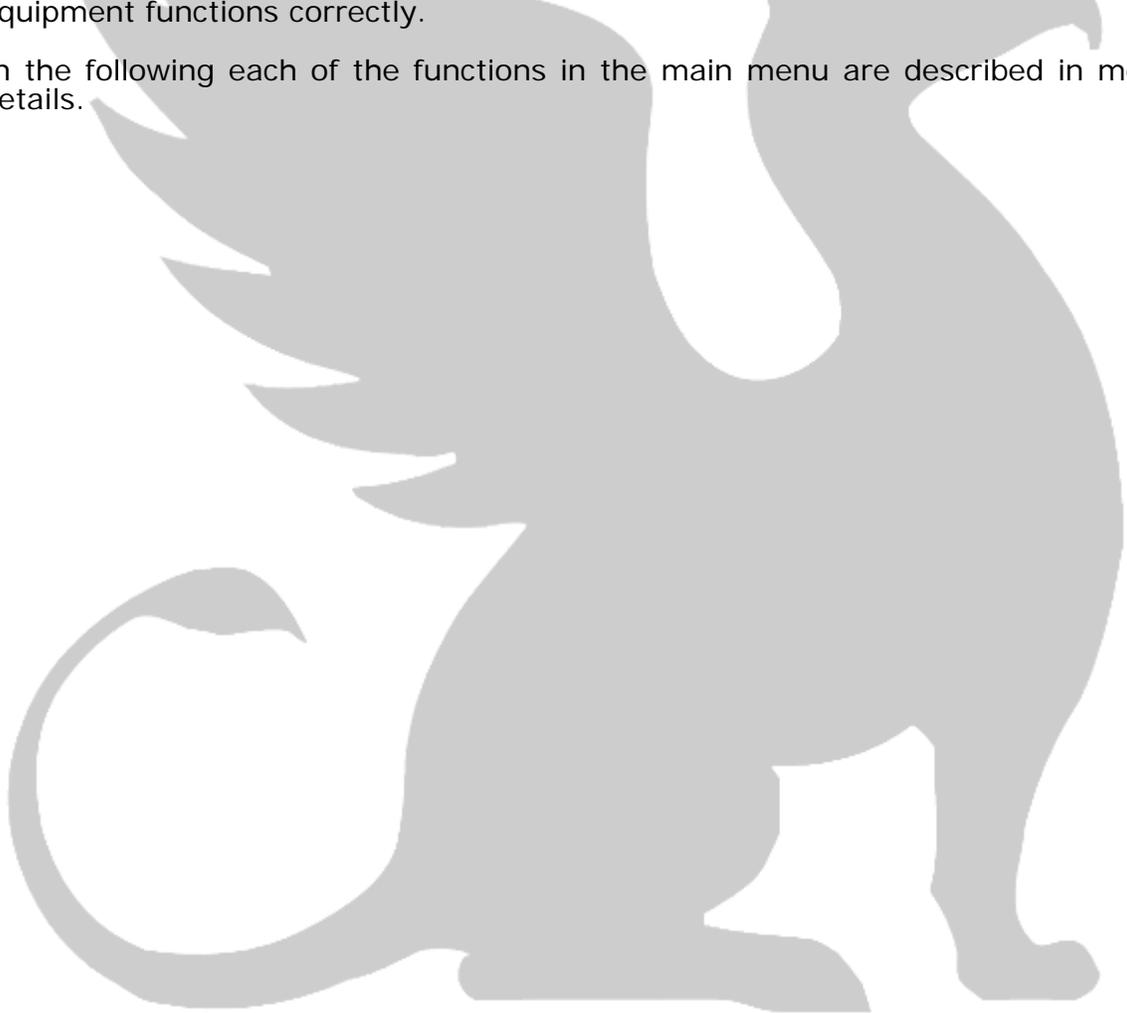
### **MANUAL FUNCTIONS**

The menu where you can start and stop irrigations, test the functions of all parts of the system such as the likes of valves, pumps, injectors etc.

### **INTERNAL SETTINGS**

This menu is an essential part of the system that has to be revised and adjusted once the equipment is started up for the first time, and when ever you make changes or revision of the system. In this menu you have access to adjustments of sensors, flowmeters as well as assigning the output for pumps for recirculation and the valves for return water. It is also here that the pause settings for break-down and other alarm incidents is available as is the installation of expansion of extra solenoid valves etc. It is a very important menu which should be treated with exactness and caution in order to ensure the equipment functions correctly.

In the following each of the functions in the main menu are described in more details.



## READINGS

In this part of the menu you obtain all the available information referring to the functions of the equipment, like alarms etc. The menu has the following parts:

```

Date / Time:      Wednesday 01/02/01 08:15:30
EC, pH readings
Group, active valves
Fertilizer dosing duty cycle
Recirculation – Status
Alarms
Alarm summary
Solar radiation          00184 W/m2
Sol. Rad. accum. per group
Drainage – Status
Present Flow            0000 m3/h
Water consump. per group
Fertilizer consump. per group
Irrigations pending
External signal – Counter
Special sensors readings
External input          0 0 0 0 0 | | |
  
```

### EC, pH READINGS

Here you can read the pH value as well as the values of the EC at the moment, and this is independent of the equipment being active or not.

This is the screen displaying the pH and EC while the equipment is in operation. This screen displays the readings from all the active sensors.

```

***** READINGS *****
EC1= 1,70 M +30 EC= 2,3 SRC=+0,0 ECS2= 0,0
pH = 05,80 M+25 pH= 5.7          pHSeg=5,90
  
```

When CDN detects that EC security sensor is connected, shows ECseg=EC3 in the place of EC2, informing in that way the value of third sensor.

**EC1:** The conductivity of the water in mS in the position of main EC sensor.

**EC2:** The conductivity of the water in the position of the second EC sensor, this sensor is necessary in case you want to use relative EC control. Reading is in mS.

**EC3:** Reading of a third sensor which can be placed anywhere in the system. Reading in mS.

**pH:** Readout of the pH of the irrigation solution.

Temperature (EC1): The temperature of the nutrient solution in degrees Celsius.

**M:** The percentage of the total capacity where the dosing of fertilizer has been occupied (calculated by the computer).

**EC=2,50 SR=+0,0:** The selected Electrical Conductivity (EC set point) with the variation caused by the level of the Solar Radiation.

**pH=6,52:** This is the pH of the nutrient solution.

**M:** The percentage of the total capacity where the equipment has been dosing acid in order to control the pH.

**pH=6,50:** This is the Selected pH that you have programmed (set point).

### **GROUP, ACTIVE VALVES**

When the equipment is inactive the following is displayed on the screen.

Gr.	Yester	Today	Irrig. Counter
01	00:15:00	00:45:00	I= 03, 04, 05, 00, 01

**GR:** The Group that you have in the display.

**YESTER:** The time that this particular group was irrigating yesterday.

**TODAY:** The accumulated irrigation time during today.

**IRRIG. COUNTER:** Here you can see the number of irrigations that the equipment has performed during the last five days. In the example above we can see: today 3 irrigations, yesterday 4 irrigations and day before yesterday 5 irrigations.

When the equipment is active the following display is shown:

***** READINGS *****	
Gr: 01 N 1000 P 100 18:15	T: 00:07:25 T25°C
VALV:001.....	
EC1= 1,7 M +30 EC= 2,3 SRC+0,0	ECSeg= 0,0
pH = 5,8 M+25 pH= 5.7	pHSeg=5,9

**Gr:** Active group.

**N:** The active auxiliary output, (for example **N0010** indicates that the output N3 is active)

**P:** Active pumps, (for example **P101** Pump 1 and 3 are active)

**18:15** The present time of the day

**T25°C** The reading of temperature of the water. Reading is taken by the conductivity sensor.

**T:** Indicates how much of the present irrigation that has been executed. By irrigations of less than 10 minutes the time is counting DOWN!

**VALV:** Valve or Valves which are active at this moment.

**EC1:** The conductivity of the irrigation water measured in mS/cm.

**EC:** The programmed value for the active group.

**SRC:** Solar radiation compensation (expressed in mS), this shows what influence the solar radiation compensation has on the control of the conductivity in this very minute.

**EC Seg:** This is the reading of the EC safety sensor in case you have such a sensor connected.

**EC3:** Reading of conductivity of a possible third sensor installed anywhere in the installation where you want to monitor the conductivity. Reading in mS.

**pH:** Reading of the pH of the irrigation water (for example 5,8).

**pH:** Set point of pH (for example 5,7).

**M:** The percentage of the total capacity where the dosing of fertilizer has been occupied (calculated by the computer).

### **FERTILIZER DOSING DUTY CYCLE**

In this place during the fertigation we can see the duty cycle of each dosing path (pump + dosing valve) expressed in %, as well as current flow (reading from the main flowmeter). In the example below we can see that dosing valve of Fertilizer1 is opened 50% of the dosing time, and dosing valve of Fertilizer2 is opened 100% of dosing time.

```
Fertil: F1 F2 F3 F4 F5 F6 F7 F8
Inject:050 100 000 000 000 000 000 000
Present flow:                0013 m3/hour
```

### **RECIRCULATION - STATUS**

This information is displayed when the recirculation/basin control is inactive.

```
***** Readings recirculation *****
```

```
Recirculation inactive !!
```

When the recirculation is cancelled for any reason like e.g. that there is no water in the basin the following message is displayed:

```
***** Readings recirculation *****
```

```
Recirculation suspended !!
```

This is the screen that is displayed during normal conditions and when the recirculation of water is active.

```
***** READINGS - RECIRCULATION *****
```

EC2=0,00 M=+30 EC=1,0 mS Valve: 015%  
 B: 0 CV:00 RV:00

**EC2:** Present reading of the EC by the entrance.

**M:** Actual work load of the machine controlling EC.

**EC2:** The selected EC2

**Valve:** The percentage of opening 3 way valve

**B:** Basin / **CV:** Control valve / **RV:** Return Valve

## ALARMS

Here we have a summary of the all alarms of the equipment. If some of the conditions for activation of the alarms have been met – the time that these conditions have been active and “YES” is displayed on the corresponding line in the display (YES means that this alarm is active because the condition of this start exists longer that alarm delay time). By pressing ENTER on the active alarm, normal activity is resumed.

***** ALARMS *****		
Saturated EC duty cycle	(01:23)	NO
Max.EC – Absolute	(00:00)	NO
EC Max. level	(00:00)	NO
EC Min. level	(00:00)	NO
Saturated pH duty cycle	(00:00)	NO
Min. pH - Absolute	(00:00)	NO
Max. pH - Absolute	(00:00)	NO
pH Min. level	(00:00)	NO
pH Max. level	(00:00)	NO
Max. Irrigation Time	(00:00)	NO
Max. Irrigation Flow	(00:00)	NO
Min. Irrigation Flow	(00:00)	NO
External Signal Alarm	(00:00)	NO
EC sensor alarm	(00:00)	NO
pH sensor alarm	(00:00)	NO
Fertilizer Filter Alarm	(00:00)	NO
Fertilizer Valve Alarm	(00:00)	NO

### Saturated EC duty cycle

When the percentage of dosing of fertilizer supersedes 100% or is in negative figures and stays there for a certain time (default 2:00 min) – a time that we have programmed in “Alarm delay for EC ” (which is explained in this manual on page under “Control of dosing, Adjustment of alarms”.) the equipment enters into alarm mode. If for some reason the selected EC is not reached – there is a need for revising the equipment. This type of alarm is optional and it can be activated or deactivated in the menu of “Adjustment of alarms”.

### **Max.EC – Absolute**

In case the EC of the irrigation water rises above the value set in Max. EC Absolute the irrigation is set on stand-by and the equipment will enter into alarm mode until you can test the reason for and reset the alarm condition.

### **EC Max. level**

If the EC of the irrigation water rises above the max. relative level – an alarm is activated but the irrigation continues and not the injection of fertilizers.

Example: If the relative EC max. level is 1 and the selected EC is 2 – the dosing of fertilizer is suspended once the EC level passes 3. These settings are sufficient to correct any small deviations in the control of the EC.

### **EC Min. level**

If the conductivity stays below the EC minimum relative level the alarm is activated but neither the irrigation nor the dosing of fertilizer is stopped, as this is not considered an imminent danger to the crop.

### **Saturated pH duty cycle**

When the percentage of work load of dosing acid or alkali rises above 100% or negative values occur and stay there during a certain time (fixed in alarm delay –explained further on in this manual) the irrigation goes into Alarm Mode and the irrigation is detained. If for some reason the right level of pH is not obtained it is necessary to revise the total system. This alarm is optional and can be activated in the Alarm adjustment menu.

### **Min. pH - Absolute**

When the pH of the irrigation solution passes the value set in this setting the irrigation is detained and the equipment will go into alarm mode. This is a dangerous situation which can affect the crop severely.

### **Max. pH - Absolute**

As the previous setting (Min. pH – Absolute) but for the high pH Level.

### **pH Min. level**

When the pH of irrigation solution passes below the pH relative minimum level the alarm is activated and the dosing of acid is stopped however the irrigation continues. This safety measure secures that dangerous situation of low pH are avoided.

### **pH Max. level**

When the pH of the irrigation solution passes above the relative max. level of the pH, the alarm will be activated but neither the irrigation nor the dosing of acid will be affected. This is because a high pH level is normally not a dangerous situation for the crop.

### **Max. Irrigation Time**

This alarm is related to the flow. This alarm has effect when the irrigation mode is by volume and it is activated only after the programmed irrigation time is surpassed. This alarm secures that in case of a faulty flow metre the water consumption is not getting out of control. In any case a maximum irrigation time is performed.

### **Max. Irrigation Flow**

This alarm is also related to flow. It is activated at the moment when the instant flow passes the programmed value in this setting during the delay time programmed. The irrigation stop and the following group start but if the alarm is activated again the equipment come in standby until you reset the alarm condition.

### **Min. Irrigation Flow**

This is the last alarm related to the flow and it is activated when the instant flow is below the determined value during the delay time programmed.

The all three alarms of flow (Max. irrigation time, Max. irrigation flow, Min. irrigation flow) work in the same way. When the first alarm of the flow occurs, the current irrigation is stopped, the alarm is showed for 10 seconds, and then next irrigation can be realized. If second irrigation also causes flow alarm, CDN will be stopped in the alarm state. But if second irrigation will be realized without any flow alarm, all flow alarms will be cleared.

### **External Signal Alarm**

This alarm is protecting irrigation system from the continuous irrigation caused by external signal (in case that start tray, pressostat, etc. is broken and is sending start signal continuously).

### **EC sensor alarm**

This setting is only active if the CDN has an extra EC sensor connected as a safety alarm. In case the readings between the normal conductivity sensor and the safety sensor exceed the max. difference programmed under the INTERNAL SETTINGS.

### **pH sensor alarm**

This setting is only active if the CDN has an extra pH sensor connected as safety sensor. In case the readings between the normal conductivity sensor and the safety sensor exceed the max. difference programmed under the INTERNAL SETTINGS.

**NOTE:** The deviation between the safety control sensors and the main control sensors is set in the **[Internal settings]** , **[Sensor adjustments]** and then enter into the **[Deviation between EC sensors]** and in the **[Deviation between pH sensors]** .

The calibration is done in the same menu as for the other sensors, **[Internal settings]** , **[Sensor adjustments]** and the enter into **[EC sensor calibration]** and **[pH sensor calibration]**.

### **Fertilizer Filter Alarm**

This alarm is only available when function "Software Calibration" (see page 79) is active and the fertilizer counters are installed. Controller CDN reads continuously the flow of each fertilizer, and when the reading is lower than calculated value this alarm occurs. In that case we suggest checking if the fertilizer filter is dirty and this is the reason of low flow of fertilizer.

**Fertilizer Valve Alarm**

This alarm is similar to Fertilizer Filter Alarm, and is available only when Software Calibration is active. The difference is that this alarm occurs when the real flow of fertilizer is higher than calculated value.

**ALARM SUMMARY**

Information about the alarms in each group and when these have occurred with the date and the hour of the occurrence. The Alarm summary has the capacity for storing up to 15 registers – in other words 15 alarms.

Number of alarms have occurred:

DATE	- TIME	ALARM	GROUP
00/00/00	00:00	NO ALARM	03

In case any alarms have occurred the following screen is displayed:

DATE	- TIME	ALARM	GROUP
12/02/04	16:00	Al. Max. EC Absolute	05

Once the there is 15 alarms registered the new registers are shown eliminating the oldest registers.

**SOLAR RADIATION                      00350 W/m2.**

This readout gives the instant solar radiation.

**SOLAR RADIATION ACCUMULATED PER GROUP**

If you are using the start condition of solar radiation or drainage control it is possible to read the energy accumulated for each group.

	Since Irrig.	Yester.	Today	Total ( Wh/m2)
Gr 01	0400	0040000	035200	132540000

**GR.01:** The group in which to read the energy accumulated. In order to read the data for the other groups – please use the UP and Down Arrows.

**IRRIG:** Under this code you can read the solar radiation accumulated since the last irrigation. Readout in Wh/m2.

**YESTER:** This readout indicates the solar radiation accumulated yesterday.

**TODAY:** Readout of today's accumulated solar radiation up to the present moment.

**TOTAL:** The solar radiation accumulated since the last reset of the counter.

## DRAINAGE – STATUS

Here we have all the information about the parameters for the drainage control (run-off).

Gr: 01 State: NORMAL, INACTIV Pulses: 015

36% Vd00,9 – Vi 002,4L Ti 0:10:00 T01:02 R 02  
S.Radiation: (0123,3 - 0300 Wh/m<sup>2</sup>) T: 0015

**G01:** Indicated the group in which you can read the drainage. In order to read the data from other groups use the UP and Down Arrows.

**State:** The group can exist in two stages, NORMAL stage and SATURATION stage. Both have the possibility of being in three different modes INACTIVE, ACTIVE or WAITING

### SATURATION

ACTIVE

WAIT TI

(waiting time, this is the time that CDN is counting pulses after the irrigation in case to calculate the drainage. This time depends from the set precision: low, medium, high and very high which is 2, 10, 15 and 22 minutes).

WAIT PU

(after "WAIT TI" CDN is still waiting for the pulses coming from the sensor. The time of this state depends from the selected precision (and for example: in precision very high, if during 60 seconds CDN doesn't receive any pulse finishes the state "WAIT PU").

### NORMAL

INACTIV

ACTIVE

WAIT TI

WAIT PU

**SATURATION:** At the start of the active period of irrigation it is often required that the growing media is saturated prior to the start of the drainage control. The saturation of the growing media is normally one or two irrigations.

**NORMAL:** After the saturation period the computer switches to NORMAL control. The growing media is now saturated with water and the computer can now start its work to control the required drainage percent.

**ACTIVE:** The equipment is irrigating at the moment.

**INACTIVE:** The equipment is not watering.

**WAITING:** The equipment is collecting pulse data from the drainage sensor in order to calculate the actual drainage.

**PULSES:** The number of pulses collected by the drain sensor

**00% :** Amount of irrigation water drained off by the last irrigation.



## **FERTILIZER CONSUMED PER GROUP**

Here you can find the information about the consumption of fertilizer per group. In order for this to work correctly it is necessary that the following conditions have been fulfilled: It is necessary that the flow metres have been installed and that the board for the flow metres is connected and finally that the correct amount of pulses for each litre has been adjusted.

Fertiliser consump:	Group 01
Fertiliser 1	[Today 0000, 00 l ]
[ Yest 0000, 00 l ]	[ Total 0000,000 m <sup>3</sup> ]

## **FERTILIZER CONSUMP:**

Group 01: Here you select the group that you are interested in seeing by using the UP and Down Arrows.

**FERTILIZER 1:** Here you select the tank whose consumption you wish to read. In order to change between the tanks you use the LEFT and RIGHT buttons.

**TODAY 0000,00 LITRES:** The consumption of fertilizer today and to this moment

**YESTERDAY 0000,00 l:** Litres of fertilizers consumed yesterday.

**TOTAL 0000,00 M3:** m3 of fertilizer consumed since the last reset of the computer

## **IRRIGATIONS PENDING**

The pending irrigations for each group is displayed in this menu ( the number of irrigations pending are displayed right under the number of each group)

GROUP:	1	2	3	4	5	6	7	8
Irrig.:	00	00	00	00	00	00	00	00

## **EXTERNAL SIGNAL – COUNTER**

The number of external signals received from each GROUP is displayed in this menu (the number is displayed right under the number of each group). Each time a group receives a pulse the number of the external signals increments by one unit. It is recommended to irrigate up to 5 groups with activation by external signal – in case more groups are required to irrigate using this mode you should install the expansion board for external signals, which permits to control up to 8 groups via external signal.

GROUP:	1	2	3	4	5	6	7	8
Ext. S.:	00	00	00	00	00	00	00	00



**MIXER 1**

You have three options available for selection of a mixer – 1, 2 and 3. Mixer 1 is the default where the usual irrigations are programmed. It is however possible to select start of Mixer 2 or Mixer 3 independently and at the same time as mixer 1. This is rather useful in case you need to control a cooling or misting system which obviously will work independently of the irrigation that is programmed in mixer 1. Fertilizer dosing is possible only in Mixer1.

**ACTIVITY PERIOD (HH:MM) 00:01 – 23:59**

This is the time of the day in between which irrigation can take place. Outside the period established here it is not possible to activate irrigation. Irrigations that have started within the activity period will take place even if the irrigation happens outside the activity period.

In older version it was split to two lines:  
 Start activity period 00:00 hh:mm  
 End of activity period 00:00 hh:mm

**NO. OF MAX. IRRIGATIONS PENDING 01**

The number entered in this menu determines how many irrigations can go into the queue waiting to be executed. This ensures that we are not getting accumulations of excessive irrigations.

**TIME BETWEEN IRRIGATIONS 0:00:00**

This is the minimum time between two consecutive irrigations, even if both are in the queue. This function is avoiding excessive water supply because irrigation accumulation.

**DAYS WITHOUT ACTIVITY: 00 day(s)**

Should you wish to have days in-between the active days where no irrigation takes place it is introduced in this menu. A 1 indicates that irrigation will take place every other day – a 2 indicates that irrigation will take place every two day(two days in-between irrigations) etc. This menu you can consider as an alternative to the weekly irrigation mode (See FIXED IRRIGATION TIME).

**SR. LEVEL TO CANCEL TIME MODE 2000 W/m2**

By combining other Start Conditions like Fixed irrigation time or Fixed Intervals it is possible to cancel these conditions once the solar radiation has reached a set level. This is useful on cloudy days when you want to irrigate using time as the start condition whereas on sunny days you prefer to use solar radiation to control the rhythm of the irrigation.

**FIXED IRRIGATION TIME**

In this mode you can programme the start of irrigation in a Group at a fixed time of the day relative to the week or the start of irrigations during the actual day. When you enter this menu the following screen is displayed:

```

**** FIXED IRRIGATION - GROUP 01 ****
Fixed time irrigation ?          YES/NO
Num. of irrigation prog.(max.40)  01
TIME SET-UP                      (ENTER)
  
```

**FIXED IRRIGATION TIME                      YES/NO**

In order to activate this mode choose YES and confirm by ENTER

**NUM. OF IRRIGATION PROG.(MAX.40)        01**

Here you enter the number of irrigations that you are going to programme. Daily or weekly.

**TIME SET-UP    (ENTER)**

By pressing ENTER we enter the programming of the irrigations and the following screen is displayed

```
**** FIXED IRRIGATION - GROUP 01 ****
Num. of irrigation prog.(max.40)    02
Irrig. 01 // Day: Monday 00:00 hh:mm
```

**Irrig. 01 // Day: Monday 00:00 hh:mm**

Here you introduce the settings for this particular irrigation. Each line that you introduce corresponds to a new irrigation start. Pressing ENTER we can see every programmed irrigation.

In the field **DAY:**\_\_\_\_\_ you have the options **Daily, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday And Sunday**. In other words we can program the total irrigation to take place each day or during any day of the week.

In the field **00:00 hh:mm** you enter the time where you want the irrigation to start. If at the same time another irrigation is active and with the same priority then the new irrigation is sent to the queue – pending irrigations and it will be executed once the active irrigation has finished.

We have to consider the activity period established to programme the irrigation time, out of the mentioned period no irrigations take place.

When we choice Daily we can use Days without activity like an alternative to the week irrigation program.

**FIXED INTERVALS**

In this mode you can program irrigation starts in a specific group during a specific time of the day. For example every 30 min from 08:00 to 12:00.

When you enter in this mode the following screen is displayed:

```
*** FIXED INTERVALS - GROUP 01 ***
Fixed intervals ?                      YES/NO
Activity period:                      08:00-20:00 hh:mm
Interval between irrig.              00:00 hh:mm
```

**FIXED INTERVALS?                      YES/NO**

In order to activate this mode you need to choose Yes and press ENTER

**ACTIVITY PERIOD    08:00 – 20:00 hh:mm**

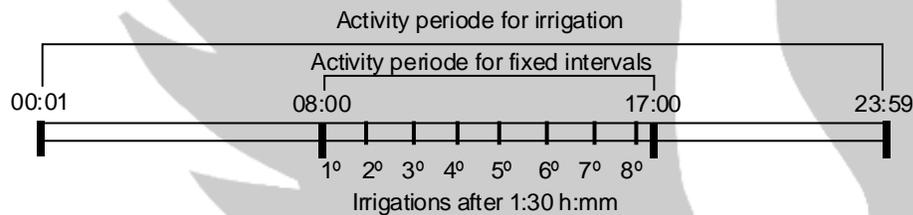
Here you introduce the time for the start of the first irrigation (08:00) and the end time (20:00) of this start condition.

**INTERVAL BETWEEN IRRIG.                      01:30 hh:mm**

The time entered here is the time that will pass in-between irrigations. In this case an irrigation will take place every hour and a half.

**IMPORTANT!!!**

When the irrigation is programmed in the fixed interval mode in combination with other start conditions then the fixed intervals will be zero set in the eventual case that the irrigation is initiated by any of the other start conditions. We can combine the fixed interval start condition with any of the other start conditions. By programming in combination the start condition that triggers the irrigation will zero set all of the other start conditions.



**SOLAR RADIATION**

By programming this menu and by means of a solar radiation sensor it is possible to start the irrigation according to the amount of solar energy that the crop receives. There is a important relationship between the solar radiation that the crop receives and the activity of the plants. The computer is using the radiation accumulated in Wh/m2 as a regulator to control the frequency of the irrigation.

By pressing the ENTER button the following screen is displayed:

```

***** SOLAR RADIATION - GROUP 01 *****
Activation by Sol. Rad. ?                               YES/NO
Activity Period:                                       08:00 - 20:00 hh:mm
SR. accum. for activation                             0500 Wh/m2
Daily reset of accum. SR.                             YES/NO
  
```

**SOLAR RADIATION?    YES/NO**

By entering Yes the Solar Radiation start condition is activated. By entering NO the Solar Radiation is deactivated.

**ACTIVITY PERIOD**

**08:00 – 20:00 hh:mm**

Here you introduce the period in which irrigation caused by solar radiation can take place.

**SR. ACCUM. BY SOL. RAD.**

**0000 Wh/m2**

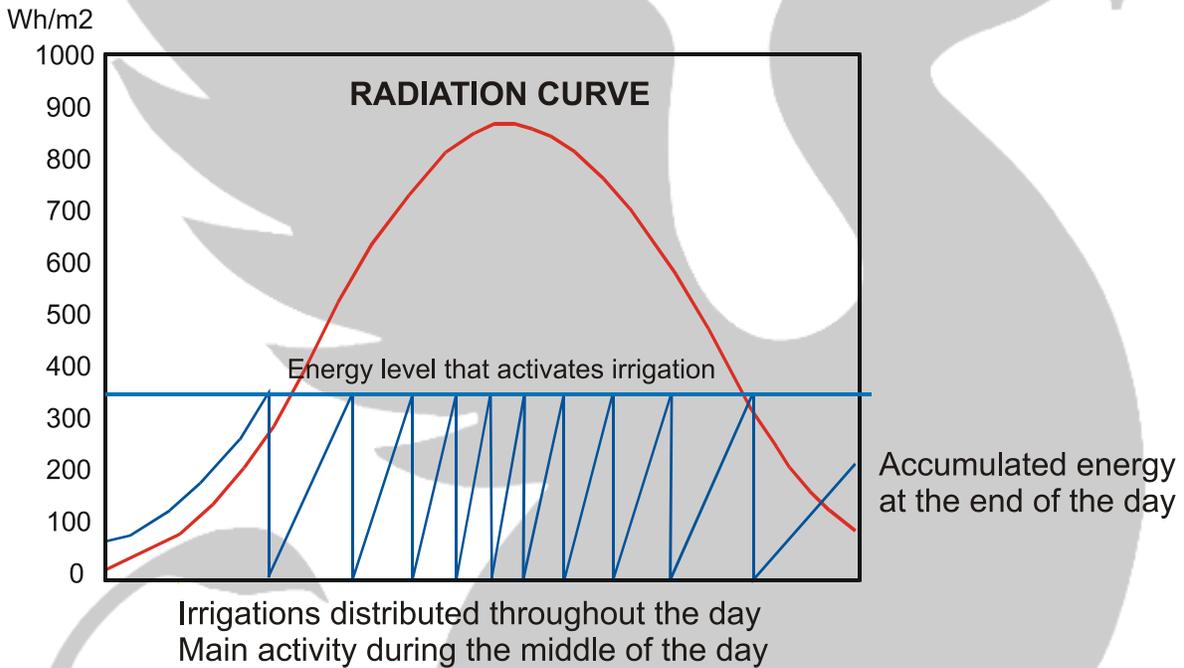
Here you enter the level of solar energy required to activate an irrigation.

**DAILY RESET OF THE ACUM. SR**

**YES/NO**

Once the activity period stops you can choose if you want to conserve the solar radiation that the computer has accumulated and use this energy following day when the activity period starts again. The conserved energy will then serve as a base for the energy accumulated the next day. You can however also choose to eliminate the energy that was accumulated and start from zero next time the activity period is activated. If you want to start from zero energy accumulated you need to enter YES in this menu.

**IRRIGATION CONTROLLED BY SOLAR RADIATION**



**EXTERNAL START**

The Start Condition External Start allows you to control the irrigation via a Start Tray or similar device that has a potential free contact. You can activate the irrigation in one specific group with a Start Tray, a Hygrostat, a Thermostat, Tensionmetre or any other device that detects the need for irrigation. The possibility of hose irrigation is also available through the use of a pressostat as is the automatic start of an irrigation boom in for example a greenhouse with seedlings. Also available is an alarm that informs about incidents of unnatural nature during the irrigation, like when a start signal stays on after an activation. By pressing the ENTER button this screen is displayed:

***** EXTERNAL START - GROUP 01 *****	
Activation by external signal ?	YES/NO
Activity Period (hh:mm):	08:00 - 20:00
N° of pulses for activation	00
External signal alarm ?	YES/NO
Delay between activat.(hh:mm):	40:00 (mm:ss)
Alarm delay	00:04 (tt:mm)
Alarm interrupt irrigation?	NO/ YES
Daily Reset of pulses?	NO/ YES

**GROUP 01:** This indicates the group in which we are going to activate the irrigation via external signal. This function is available for the first five groups – in order to incorporate up to 8 groups activation by external signal it will be necessary to build in a digital input expansion board. The start conditions External Signal can be combined with other start conditions like Fixed Intervals and Solar Radiation and in this way enables the equipment to control the needs of the crop in the best possible fashion. External Signal is also used in the event that control of the drainage is used, in other words for hydroponics crops.

**ACTIVATION BY EXTERNAL SIGNAL? YES/NO**

In order to active this start condition you need to enter Yes. In order to deactivate enter No.

**ACTIVITY PERIOD 08:00 – 20:00 hh:mm**

Here you introduce the period in which irrigation caused by external start can take place.

**NO. OF PULSES FOR ACTIVATION 00**

Here you enter the number of pulses that the activation device (Start Tray etc.) needs to send to the equipment in order to activate an irrigation

**EXTERNAL SIGNAL ALARM? YES/NO**

In order to prevent the situation where the external signal stays activated permanently and thereby fail to activate the irrigation again, the equipment has an alarm incorporated. The alarm will become activated after a waiting period. The waiting period is fixed in the next menu "Time for activation".

**Delay between activat.(hh:mm)**

This delay time is the time that has to pass after first irrigation that next irrigation can be started by the external signal.

**ALARM DELAY**

In case the first irrigation in the morning does not satisfy the external start device an alarm is normally activated. However, often the following irrigations may deliver sufficient water to the plants (and the start device). In order not to active the alarm for the external signal device unnecessary you can here programme a delay which function is exactly this – avoiding alarms of unharful nature.

**ALARM INTERRUPT IRRIGATION**

If the alarm is maintained during longer time an alarm is activated in order to inform the grower of this problem. In this setting you can choose if the irrigation should continue in case of an alarm or that the irrigation should be halted in order for the grower to investigate the situation and find the reason for the alarm.

It is recommended that for the installation of start devices for use with the start condition External signal, you employ the board specially developed for this purpose.

**DAILY RESET OF PULSES? NO/ YES**

Choosing YES we are saying CDN to clear readings of pulse counters, in order to start every day with 0.

**ACTIVATION BY SPECIAL SENSORS**

```

***** SPECIAL SENSORS *****
Activation by special sensor ?      YES
Activity Period:                    08:00 - 20:00
Activation by value:                UNDER
Value for activation 1:             1150 Un.
Delay between activations:          00:01:02

```

**Activation by special sensor ? YES/NO**

By choosing the **[Start by special sensor]** and enter **[YES]** the CDN can activate up to eight groups via signal from special sensors. These sensors can typically be soil moisture sensors or tensiometers. In order for this to work it is necessary that the special sensors send an analogue signal of 4- 20 mA and that the CDC-SAD1 expansion board has been installed together with the CDN machine.

Furthermore the sensors has to be calibrated in the INTERNAL SETTINGS menu under **[ Calibration of special sensors ]**. Please see the description on page 78 in this manual.

**ACTIVITY PERIOD****08:00 – 20:00 hh:mm**

Here you introduce the period in which irrigation caused by special sensors can take place.

**Activation by value:**

It is necessary to set whether the activation of the irrigation has to be from values above the reading of the sensor or below. By choosing [ **Above** ] values above the setting in [ **Value for activation** ] will initiate the irrigation. By choosing [ **Below** ] values below the setting in [ **Value for activation** ] will initiate the irrigation in the group.

**VALUE FOR ACTIVATION 4: 1150 UN.**

Here we can set one from 8 analogue inputs that has to activate the irrigation, in this example we have input number 4, and also the value that has to activate it (in that example 1150 units). The level set in this setting serves as the threshold for the activation of the irrigation. The activation will work depending on the settings in [ **Activation by value** ] .

**DELAY BETWEEN ACTIVATIONS: 00:01:02**

This delay time is the time that has to pass after first irrigation that next irrigation can be started by the analogue signal.

**DRAINAGE CONTROL**

This control of the irrigation is specifically developed for hydroponics crops. By using the drainage control you can automatically control the frequency and the volume of the irrigation in relation to the % of drainage obtained by each irrigation. The end result is that the irrigation is applied in such a manner that the level of saturation (wetness) of the growing media is kept uniform.

In order to use the drainage control you need to have the following items:

- Tray or weight for control of the drainage. Maximum 5 start devices can be connected to each CDN.
- Board for external signal. (Amplifier for external signal)
- Sensor for measuring Solar Radiation.

The menu for setting up of drainage control looks like this:  
 With solar radiation:

**** DRAINAGE CONTROL - GROUP 01 ****	
Drainage control mode:	S. RAD.
Activity Period:	08:00 - 20:00
Required Drainage	15 %
Min. Solar radiation	0250 Wh/m2
Max. Solar radiation	0900 Wh/m2
Tray flow/minute	0300 ml./min.
Drain Sensor ml./pulse	05 ml.
Min. Irrigation time	03:00 mm:ss
Max. Irrigation time	08:00 mm:ss
Saturation time	08:00 mm:ss
Saturation cycles	1
Accuracy	HIGH
Initial Solar radiation	0300 Wh/m2

With weight tray:

**** DRAINAGE CONTROL - GROUP 01 ****	
Drainage control mode:	WEIGHT
Activity Period:	08:00 - 20:00
Required Drainage	15 %
Min. Weight	02,50 KG
Max. Weight	09,00 KG
Tray flow/minute	0300 ml./min.
Drain Sensor ml./pulse	05 ml.
Min. Irrigation time	03:00 mm:ss
Max. Irrigation time	08:00 mm:ss
Saturation time	08:00 mm:ss
Saturation cycles	1
Accuracy	HIGH
Initial Weight	03,00 KG

**DRAINAGE CONTROL MODE?:** NO / WEIGHT / SOLAR RADIATION

It is possible to choose between the following options : **No / Solar Radiation / Weight** . If you choose **No** the drainage control is not active. However the **Solar Radiation** and the **Weight** will both activate the programme for the drain control.

The two forms of drainage control are similar, the only difference is that the drain control is made in combination with *either* solar radiation *or* weight . In the

following we describe the settings particular for the drainage control in combination with solar radiation and in continuation the settings that you need to programme especially for the choice of drainage control combined with the feed-back from a weight.

After this you will find the *settings that are common* for both drain control modes.

### **Set-points SPECIFICALLY FOR Drainage Control and Solar Radiation**

If you choose the drainage control in combination with SOLAR RADIATION then you will have these three menu lines particularly for the solar radiation:

**MIN. SOLAR RADIATION:** **0300 Wh/m<sup>2</sup>**  
Here you select the minimum level for activation of the irrigation.

**MAX. SOLAR RADIATION** **0900Wh/m<sup>2</sup>**  
The maximum level of Solar Radiation required for irrigation.

**INITIAL SOLAR RADIATION** **0300 Wh/m<sup>2</sup>**  
Once is finished the saturation cycles it is the sun energy demanded for the first irrigation.

The Solar Radiation program moves in between the two limits set in the two last menus. The Solar Radiation program is adjusted constantly in order to obtain the desired drainage.

We do recommend that the margins are set wide so that the radiation can move freely and in this way not create problems for the effective functioning of the system.

### **Setpoints SPECIFICALLY FOR Drainage Control and Weight**

If your choice is drainage control in combination with WEIGHT, then you will have these three settings especially minded for the setting of the weight:

**MINIMUM WEIGHT:** **02,50 Kg**  
This is the minimum weight that the weight can register before activating an irrigation. If the irrigation falls below this weight an irrigation is automatically activated.

**MAXIMUM WEIGHT:** **09,00 Kg**  
This is the maximum weight that the irrigation control can calculate to activate an irrigation. If the computer calculate a higher weight ( due to lack of drainage) then the machine will wait until it register the weight set in this setting.



making calculations having more data. The waiting time for each precision is: LOW - 2 minutes, MEDIUM - 10 minutes, HIGH - 15 minutes, VERY HIGH - 22 minutes.

### **INITIAL SOLAR RADIATION**

Once is finished the saturation cycles it is the sun energy demanded for the first irrigation.

### **GENERAL DESCRIPTION OF DRAIN CONTROL**

As soon as the equipment is inside the activity period the first irrigation is executed – this irrigation is called the Irrigation of Saturation. As the growing media (Rockwool, perlite, cocopeat etc) has been without irrigation during the night the moisture level will be low once the day breaks.

The irrigation of saturation takes place in order to bring the moisture level in the growing media up to the correct start level.

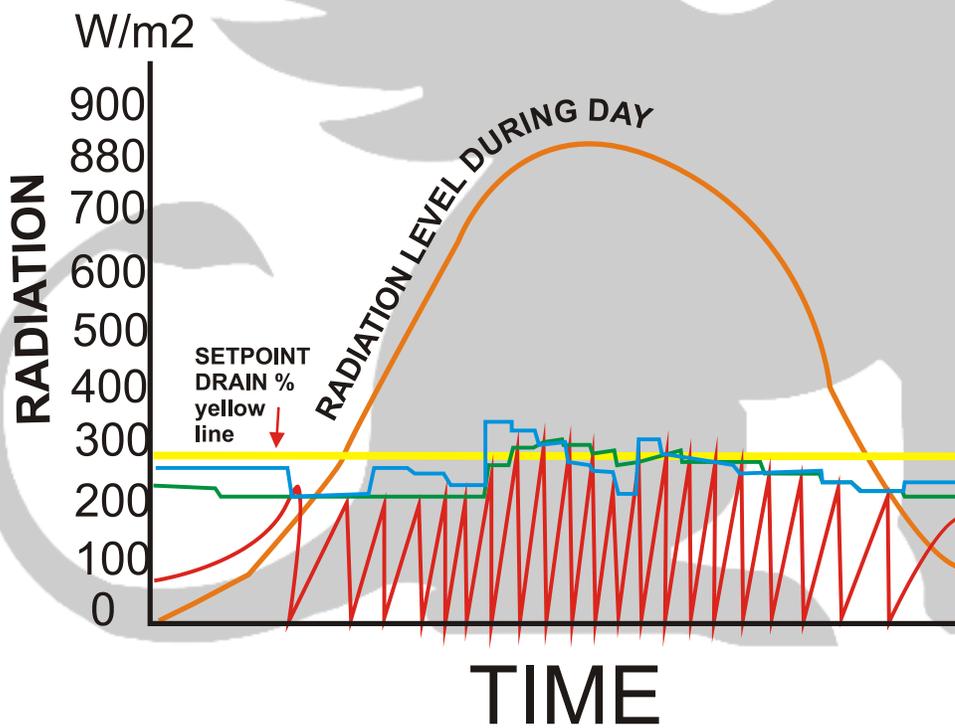
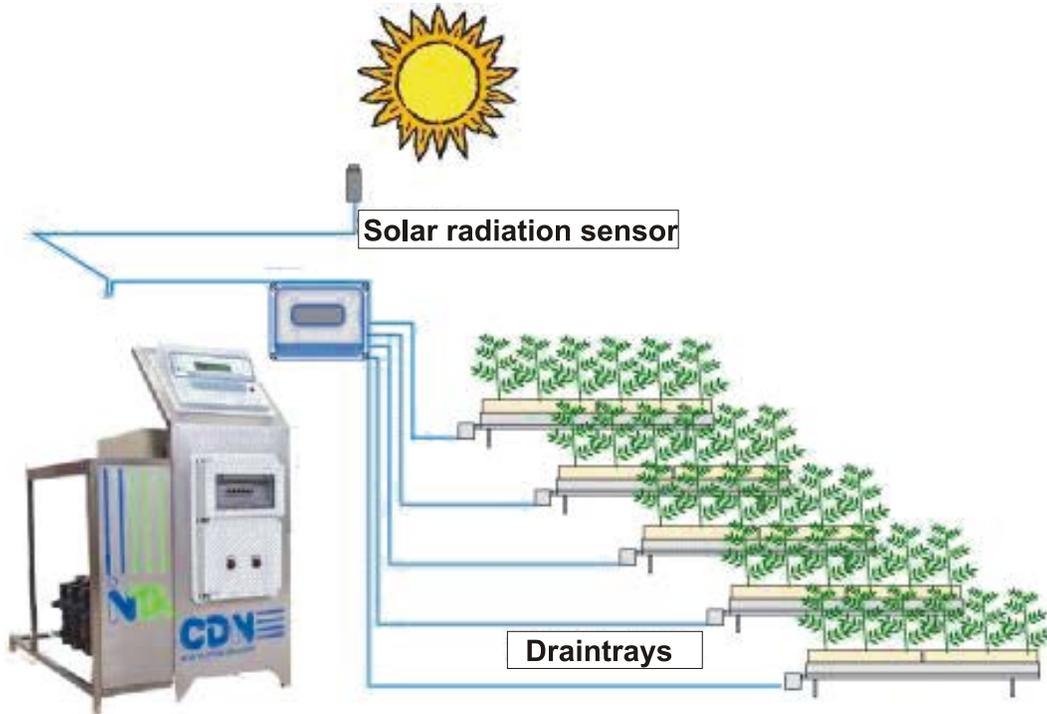
It is possible to program as many irrigations of saturation as you want – in any case once the equipment registers that the drainage has passed more than the desired drainage it will suspend any further irrigation of saturation and pass on to normal irrigations.

The normal irrigation is active as soon as the level of Solar Radiation has reached the amount that we have programmed in Min. Solar Radiation and with the set irrigation time. From this moment on the control is based on the drainage obtained taking into consideration the selected Accuracy.

The obtained drainage and the Required Drainage is compared constantly and based on that, the level of Accumulated Solar Radiation for the starting of the next irrigation and the irrigation time is adjusted (within the set limits). The result of this process is that based on each irrigation the equipment is constantly adjusting the irrigation in order to obtain the required drainage.

When the plants are young and/or the climate is humid the need for irrigation is low during the day – less than 5 irrigations a day result in the drain control being less efficient. The higher the number of irrigations needed during one day the more efficient is the drainage control system.

It is very important to know the flow / minute for each drain tray in order for the calculations of drainage to be exact. The design of the irrigation system of the farm is equally important. The irrigation system must be constructed in such a manner that the irrigation groups (sectors of the farm/greenhouse) that are controlled via drainage control receives water at the moment they ask for it. In the opposite case the precision is lost through incorrect calculations.



### **Example of drainage control in combination with solar radiation.**

This drawing above illustrates the process of the drain control. The curve presents the instant solar radiation during the day. The blue line graph indicates the actual achieved drainage oscillating around the desired drainage level (in this case set at 30 % - the yellow line).

Irrigation is activated once the required energy value is reached. The energy level activating irrigation is dependent upon the obtained drainage level. The program also varies the irrigation time in order to reach the required drainage.

In the afternoon the actual drainage obtained decreases and so does the energy required to start irrigation.

### **DAY VARIATION**

Through this function you can vary some important setpoints of each group by splitting the day into four periods. You have to specify the start and end of each period and variation factor that you want to apply. You can use this variation for the following parameters: irrigation time, irrigation volume, SR energy starting irrigation, required drainage, EC of the irrigation, intervals in fixed intervals, setpoint in the irrigation by special sensors, delay between activation by external signal, and proportions of fertilizer in proportional dosing. Every parameter programmed for each group will then vary according to the percentage that you have established in this menu.

```
*  START CONDITIONS   :   GROUP 01   *  
Use periods?                YES  
PROGRAM SETTINGS           (ENTER)
```

### **USE PERIODS?                      YES/NO**

Here you select the activation or deactivation of the periods variation.

**PROGRAM SETTINGS**

**(ENTER)**

In this place we can configure the duration of each period and also the variation for each parameter.

Periods	1	2	3	4
End of Period:	10:30	13:00	16:00	23:00
Time/Volume:	+000%	+000%	+000%	+000%
Energy:	+000%	+000%	+000%	+000%
Drainage:	+000%	+000%	+000%	+000%
EC:	+000%	+000%	+000%	+000%
Proport. Dos.:	+000%	+000%	+000%	+000%
Intervals:	+000%	+000%	+000%	+000%
Special Sensor:	+000%	+000%	+000%	+000%
External Rep:	+000%	+000%	+000%	+000%

**END OF PERIOD: 10:30 13:00 16:00 23:00**

In this line we can define the end time of each period, in that example period 1 is from the beginning of the activity time of the group till 10:30, second period is from 10:31 till 13:00, third period is from 13:01 till 16:00 and the last one is from 16:01 till 23:00.

**TIME/VOLUME: +000% +000% +000% +000%**

Here we can set the percentage of the change that we want to apply for each period. For example, if the valve is programmed for 3:00 minutes and in the variation we put -50%, the result will be 1:50 minutes.

**ENERGY: +000% +000% +000% +000%**

This percentage refers to the solar energy (Wh/m2) that starts irrigation (Start conditions => Solar Radiation) .

**DRAINAGE: +000% +000% +000% +000%**

This percentage refers to the required drainage (Start conditions => Drainage control).

**EC: +000% +000% +000% +000%**

This percentage refers to the required EC of the irrigation (Fertilizer dosing).

**PROPORT. DOS: +000% +000% +000% +000%**

This percentage refers to the % of the fertilizer dosed by proportional dosing (Fertilizer dosing).

**INTERVALS: +000% +000% +000% +000%**

This percentage refers to the time between irrigations started by Fixed intervals (Start conditions => Fixed intervals).

**SPECIAL SENSOR: +000% +000% +000% +000%**

This percentage refers to the value that starts irrigation by Special sensor (Start conditions => Special sensor)

**EXTERNAL REP: +000% +000% +000% +000%**

This percentage refers to the time between irrigations caused by External signal (Start conditions => External start)

**Example:**

Valve no3 has been programmed to irrigate 10 minutes.

Start of activity

*Percent variation in period 1*                      -010%

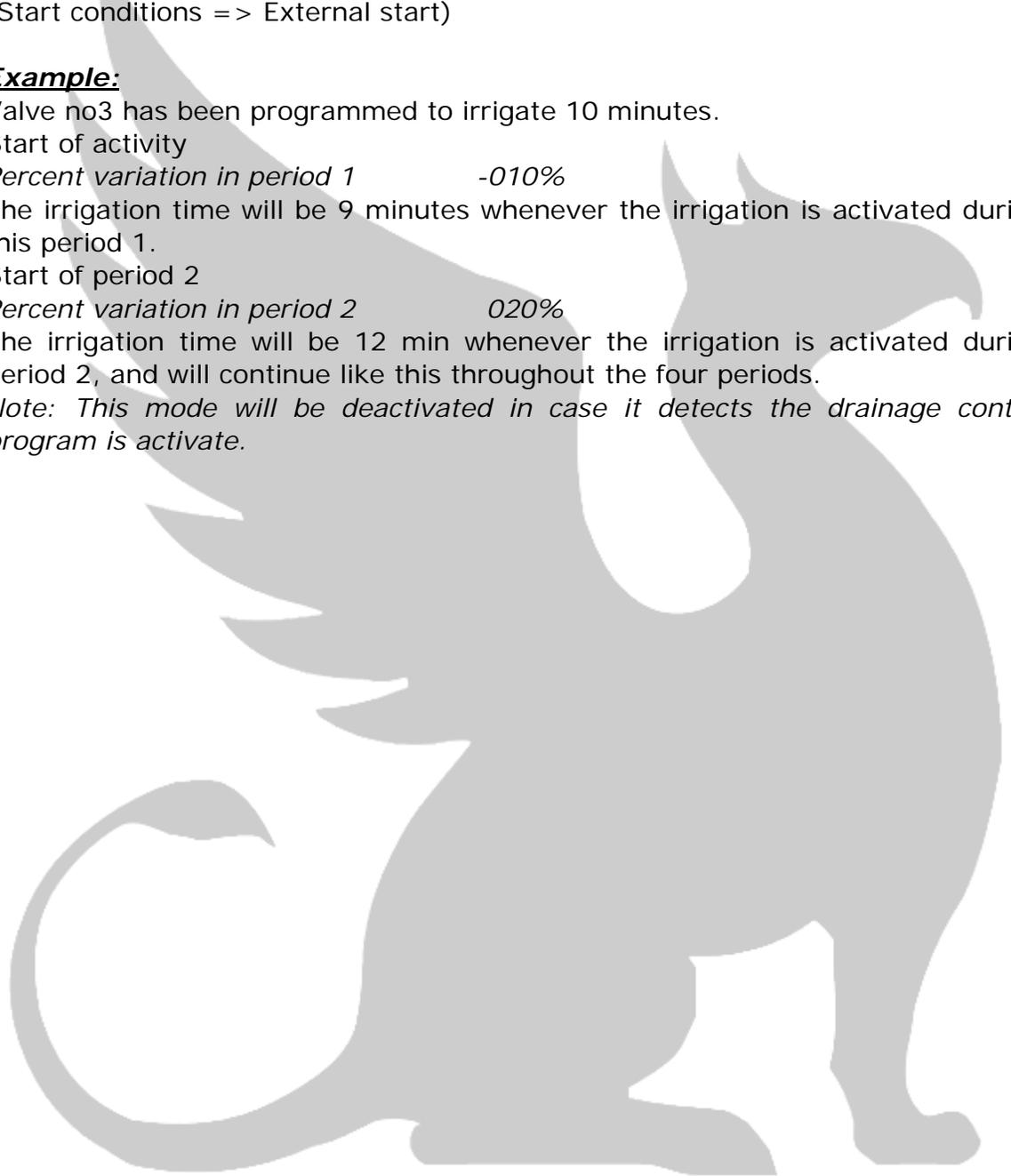
The irrigation time will be 9 minutes whenever the irrigation is activated during this period 1.

Start of period 2

*Percent variation in period 2*                      020%

The irrigation time will be 12 min whenever the irrigation is activated during period 2, and will continue like this throughout the four periods.

*Note: This mode will be deactivated in case it detects the drainage control program is activate.*



## VALVE SETTINGS

This is the menu for programming all the valves of the individual groups with their respective time settings and in the order and combination required. It is also here that you program the time settings, pre-irrigation, rinsing and start and stop of pumps for irrigation and for auxiliary pumps, (recipes).

The submenu have the following lines:

```

***** VALVE SETTINGS - GROUP 01 *****

Irrigation mode                VOLUME /TIME /SIGNAL
Amount of valves                01
Valve programming              (ENTER)
Master valve:                   099
Pre-irrigation time            00:00 mm:ss
Pre-irrigation between subgroups: YES/NO
Rinse time                      00:00 mm:ss
Pause between valves P=NO      00:00 m:ss
Pause between groups           00:00:00 h:m:s
Active Pumps:                  1=YES 2=NO 3=NO
Pump settings:                 (ENTER)
Recipe                          1=YES 2=NO 3=NO 4=NO
Alarm for flow/time            (ENTER)
Irrigation Water Temperature   (ENTER) - option
  
```

### GROUP NO.                    01

Here you choose which of the up to 10 groups that you want to programme at this point .

### IRRIGATION MODE                    Time/volume/ External signal

Here you decide the mode of work of the solenoid valves in the field or nursery. You can choose between three type of mode, Time, where the programming is in hours, minutes and seconds indicating the time you want the irrigation to carry on. Volume, where the programming refers to a volume of water that you want to have irrigated to the crop. The third mode is by Signal where the irrigation is activated by an external sensor which activates its corresponding group and at the end of the irrigation deactivates.

### NUMBER OF VALVES 01

Here you enter the number of valves that you want to include in each group.

### VALVE PROGRAMMING                    (ENTER)





**PUMPS SETTINGS (ENTER)**

You can configure the start of and the stop of the pumps of the system in relation to the start and stop of the irrigation. Each pump can be programmed individually.

***** PUMP SETTINGS *****	
Pump 1 Pre-start	-100 ss
Advanced stop of pump	+100 ss

The pre-start of the pump is done by introducing a positive number while we want to anticipate the connection of the pump by a number of seconds. In order to delay the connection a negative number is programmed in signifying the delay in seconds of corresponding pump.

In order to activate the auxiliary pumps/recipes which handle pre-set recipes during the irrigation time and outside the time of the pre-irrigation and rinse we have the possibility of activating these pumps through their own output. In order to activate the outputs you need to introduce a YES for the each of the corresponding outputs.

**RECIPE 1=YES 2=NO 3=NO 4=NO**

The outputs are very useful in the case where we employ fertilizer injectors or agricultural chemicals which can not be dosed through the normal fertilizer tanks.

**CONFIGURATION OF THE FLOW ALARM (ENTER)**

You also have the possibility of activating an alarm for max. flow and for min. flow which ensures that in case of irregularities during the irrigation an alarm will be activated. This is often in the case of broken main-pipes or malfunctioning valves etc.

***** VALVE PROGRAMMING - GROUP 01 *****	
Flow Alarm Active ?	YES/NO
Maximum Irrigation Time	00:00:00
Maximum Irrigation Flow	100'0 m3/h
Minimum Irrigation Flow	000'0 m3/h
Flow Alarm Delay	01:00 (mm:ss)

**ACTIVATE FLOW ALARM YES/NO**

By entering YES in this menu the alarm is active.

**MAX. IRRIGATION TIME****00:00:00**

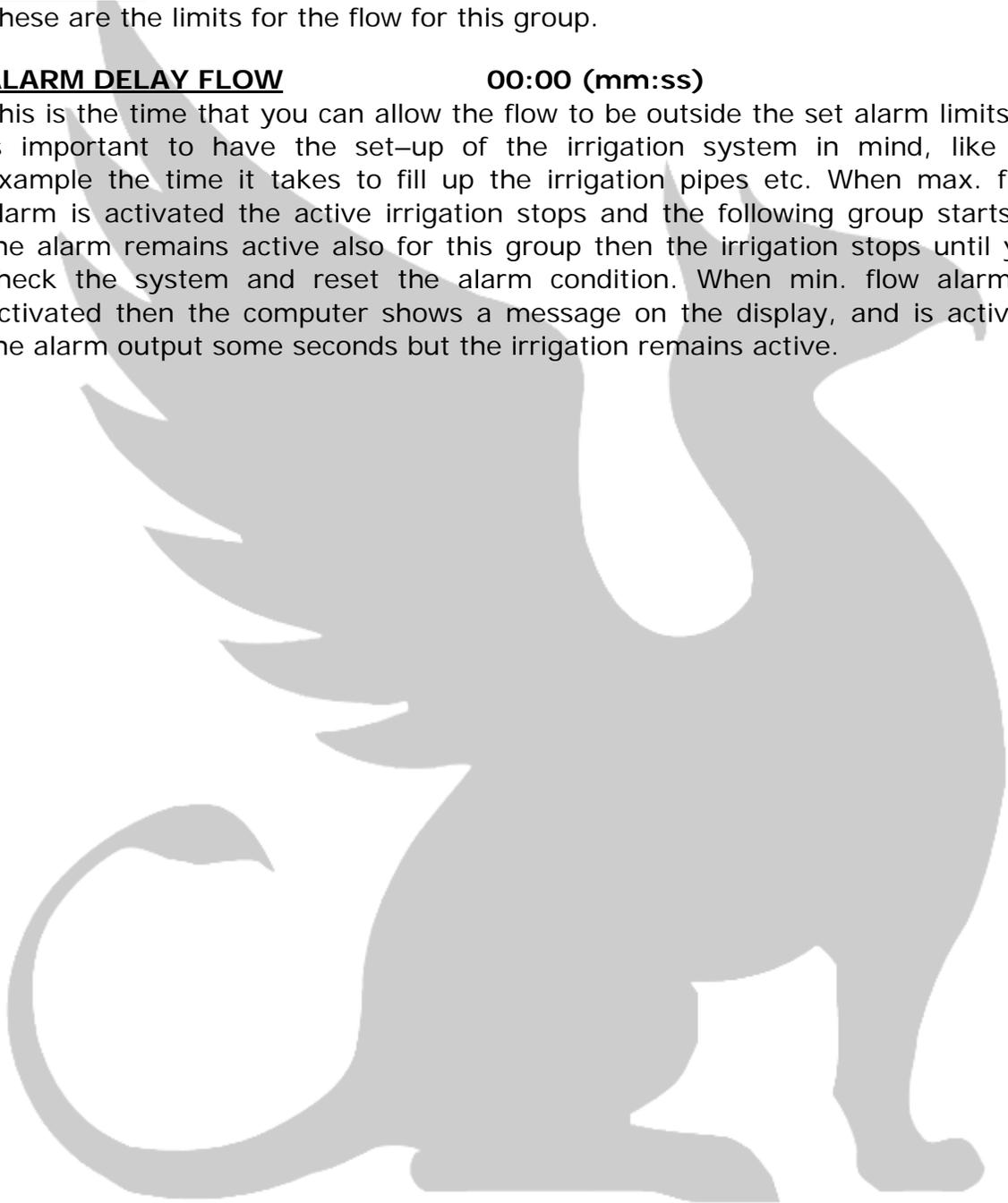
Here you enter the maximum time that the irrigation of a sub-group is allowed to be active, before the alarm is activated.

**MAX. FLOW****100 m<sup>3</sup>/h****MIN. FLOW****000 m<sup>3</sup>/h**

These are the limits for the flow for this group.

**ALARM DELAY FLOW****00:00 (mm:ss)**

This is the time that you can allow the flow to be outside the set alarm limits. It is important to have the set-up of the irrigation system in mind, like for example the time it takes to fill up the irrigation pipes etc. When max. flow alarm is activated the active irrigation stops and the following group starts, if the alarm remains active also for this group then the irrigation stops until you check the system and reset the alarm condition. When min. flow alarm is activated then the computer shows a message on the display, and is activate the alarm output some seconds but the irrigation remains active.



# Valve Control for CDN (1)

ScanGrow A/S

## SET-UP OF VALVE CONTROL



The CDN Irrigation Computer has as standard:

**10 Irrigation Groups. EACH Group can contain**

**32 Subgroups. EACH subgroup contains up to**

**32 Valves**

**EACH Irrigation group can hold a TOTAL of 32 Valves.**

A **valve** is a solenoid valve which is controlled by the CDN

A **Subgroup** contains one or more Valves

A **Group** can hold one or more Subgroups,

Each GROUP can hold up to 32 Subgroups

Each SUBGROUP can hold a total of 32 Valves

Each GROUP can hold a total of 32 Valves.

In order to make this clear You here have additional explanation of how the Valvecontrol is build up:

### EXAMPLE 1



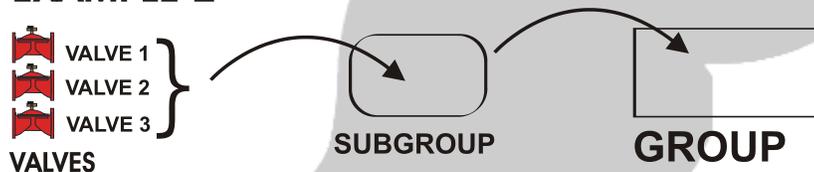
VALVE

SUBGROUP

GROUP

You can have just one valve i one Group. This valve will then automatically be placed in its own Subgroup inside the Group.

### EXAMPLE 2



VALVES

SUBGROUP

GROUP

You can also have *more* valves in the same Group. These valves can be placed in **one** Subgroup., Valves placed in the **SAME** Subgroup is executed in parallel meaning they are activated simultaneously.

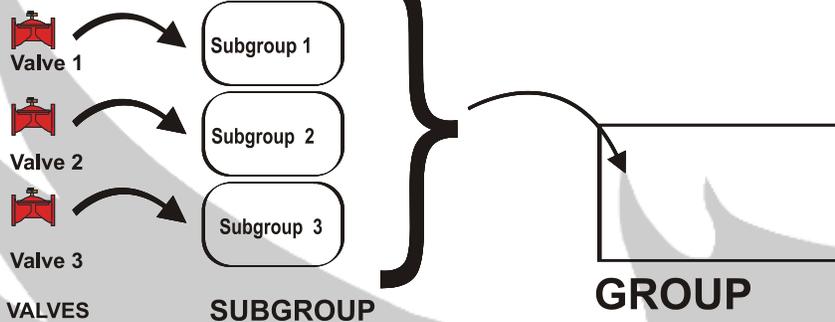
## Valve Control for CDN (2)

ScanGrow A/S

### SET-UP OF VALVE CONTROL

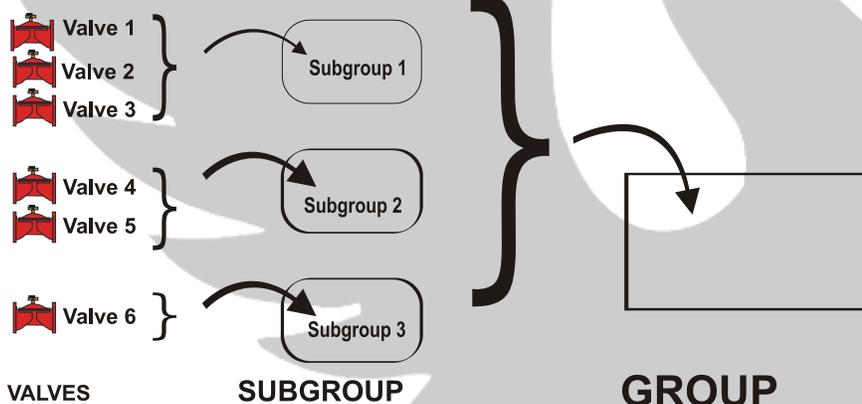


#### EXAMPLE 3



However should you wish to irrigate the valves one by one, then this is achieved by placing **each valve in its own Subgroup**. The valves will then be executed in series - one after another. All the subgroup are automatically placed in the group.

#### EXAMPLE 4



You can also program a different number of valves in each of the Subgroups. In this manner the number of valves that are programmed into each Subgroup is executed simultaneously (at the same time) or if You prefer in parallel.

In our example above the valves 1,2,3 is executed at the same time as these valves is place in the same Subgroup - Subgroup 1.

Valve 4 and 5 i are executed in parallel as these valves are placed in the same Subgroup, namely Subgroup 2. Finally valve 6 is executed last as this is placed in its own Subgroup( 3).

**REMARK: THE CDN IS STANDARD DELIVERED WITH CONTROL OF 16 IRRIGATION VALVES, AND CAN BE EXPANDED WITH MODULES OF EACH 16 VALVES. THE CDN CAN CONTROL A TOTAL OF 320 VALVES.**



If you for example want to combine proportional and dosing via conductivity then you enter for example 5 in the menu for number of fertilisers for EC-control and 2 in the menu for the number of fertilisers for proportional control.

**PROPORTIONAL DOSING (ENTER)**

In order to activate the proportional dosing you need to program the required proportions of each fertilizer and you also need to program any adjustment that you may want in respect to the Solar radiation level.

The initial menu looks like this:

```
***** FERTILIZER DOSING - Group 01 *****
DOSING SET-UP (ENTER)
SOL. RAD. COMPENSATION (ENTER)
```

**Dosing Set-up (ENTER)**

In this menu you program the litres of fertilizers that you want to add from each tank per each m3 of irrigation water.

```
***** FERTILISER DOSING – GROUP 01 *****
Dose from tank 1 00,00 L/ m3
Dose from tank 2 00,00 L/ m3
Dose from tank 3 00,00 L/ m3
Dose from tank 4 00,00 L/ m3
Dose from tank 5 00,00 L/ m3
Dose from tank 6 00,00 L/ m3
Dose from tank 7 00,00 L/ m3
Dose from tank 8 00,00 L/ m3
```

In the menu you will see the same amount of tanks displayed as you have programmed previously to be controlled by proportional dosing. You program the dosis in litres/m3 to two decimal points, which in other words means that you work to the precision of centilitres per m3, very useful in case you are adding pure liquid fertilizers and when you are using pumps of low capacity.

Prior to the programming of the proportional dosing you will need to have programmed the actual flow of each unit of fertilizer and the pulses each m3 on the main flow metre. Adjustments are in the menu of internal Settings. These numbers are of major importance if you want to have precise dosing.

When you have flow metres available for the fertilizer tanks you also need to adjust the pulses/litre in the Internal Settings. In this manner we will get to know the precision of the proportional dosing and thereby make adjustments of either physical kind or through the software. As you can see it is possible to obtain a very high degree of precision as long as the mentioned parameters have been correctly set up.

As you can see it is possible to obtain a very high degree of precision as long as the mentioned parameters have been correctly set up.

**SOL. RAD. COMPENSATION**

With proportional dosing you can reduce or increase the amount of fertilizer dosing in relation to the solar radiation level. By entering a variation percentage this variation will take place gradually within a determined range of solar radiation.

```
***** FERTILIZER DOSING - Group 01 ***
Instant Sol. Rad. Low level 0000 W/m2
Instant Sol. Rad. High level 1000 W/m2
Sol. Rad. Compensation factor +000 %
```

**MIN. SOLAR RADIATION (INSTANT)**

**0450 Wh/m2**

**MAX. SOLAR RADIATION (INSTANT)**

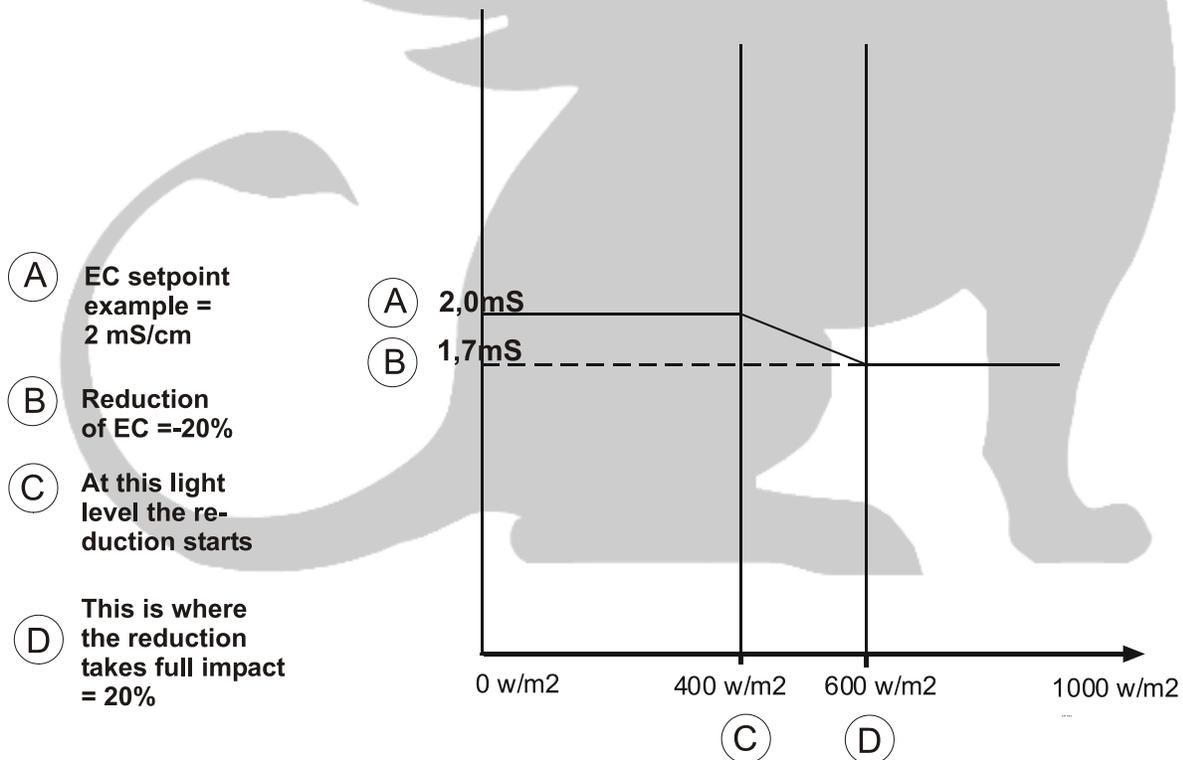
**0600 Wh/m2**

Between these limits you have the range in which the gradual variation of dosing is happening based on the percentage of variation that you have programmed.

**PERCENTAGE OF COMP. OF SOL. RAD.** -20%

By introducing a negative number you achieve a reduction of the programmed percentage and by positive numbers the percentage programmed will produce an increment in the dosing.

Reduction of EC by proportional dosing



**DOSING EC – pH CONTROL (ENTER)**

In order to establish the parameters for control of EC and pH you must always enter settings that are different to zero in order to activate program. With settings at zero the only dosing that will work is proportional dosing.

```

***** FERTILIZER DOSING - Grupo 01 *****
EC control mode      Absolute EC / Relative EC
Selected EC          2,0 mS
Selected pH          5,5 pH
Automatic Init M-Value: YES
Init M-Value: EC:50%-05ss PH:35%-05ss
FERTILIZER PROPORTIONS (ENTER)
Solar Radiation compensation (ENTER)
ALARM SETTINGS      (ENTER)
  
```

**EC CONTROL MODE Absolute EC / Relative EC**

Here you decide if you want to use the CDN for absolute dosing or for relative dosing.

The absolute control controls the amount of nutrients in the water including the salts diluted in the fresh water supply. The relative control works as a fixed increment over the conductivity of the fresh water supply.

If you decide to control the dosing as an increment over the conductivity of the water, it is necessary to have a second EC sensor (EC2) which is installed in the inlet of the fresh water supply. In this case you need to program the value that you want to raise the conductivity. In case that no second EC sensor is available – in other word relative EC control, the settings that you need to program has to be that of Selected EC corresponding to the absolute EC.

In the tables that you have in the following page explains more in details of the form of which the CDN is operating.

# RELATIVE EC DOSING

DOSING CONTROL

## What is Relative EC Control

Relative dosing secures that the CDN adds an equal amount of fertiliser to the irrigation water independent of the raw water conductivity. In order for this to work a second conductivity sensor is needed. This sensor is called EC-2 and is placed in the water stream before the mixer.

EC 2 Sensor Reading	Added Fertilizer	Final Conductivity
0	0,8	0,8
1	0,8	1,8
2	0,8	2,8
2,3	0,8	3,1



## How to programme Relative EC Control

This setting is the increase in conductivity that you want to add to the EC of raw water

Apart from the EC value you also need to set the pH value, this is done in this setting.

\*\*\* FERTILIZER DOSING - GROUP 00 \*\*\*

EC control mode      Relative EC (*Absolute EC*)  
 Increment over EC-2      0,8 mS  
 Selected pH                      5,8 pH  
 FERTILISER PROPORTIONS  
 SOLAR RAD. COMPENSATION  
 ALARM SETTINGS

The EC control mode offers two options, namely Absolute control and Relative control. In this case we choose Relative Control and then the menu will look like this.

In the same display you have an additional three menu that is described in different parts of this booklet. These settings are FERTILISER PROPORTIONS, SOLAR RAD. COMPENSATION and ALARM SETTINGS.

# Dosing based on conductivity & pH

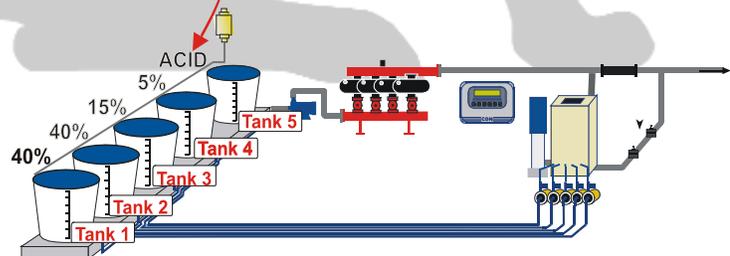
INFO

DOSING CONTROL

## EC and pH controlled Dosing

Dosing fertiliser based on EC and pH control is the standard set-up in the CDN. The fertiliser is added according to programmed EC value and the set proportions for the group. The CDN is controlling the conductivity difference between the EC of the fresh water supply and the Selected EC value (final EC output). In most cases the fresh water is stable, so it is possible to calculate the amount of fertilisers to add. It is important to note that the CDN is controlling according to the final EC output, so if the EC of the fresh water supply does vary a lot, then it is recommended to use RELATIVE DOSING, as this will ensure that an even amount of nutrients is added. REMEMBER THAT THE CDN IS CAPABLE OF CONTROLLING 10 INDEPENDENT GROUPS WITH DIFFERENT EC, Ph, Fertiliser combination and Start Conditions.

<b>Fresh water supply</b>	<b>0,8 mS</b>	<b>TANK</b>	<b>CONTENT</b>
<b>Added fertiliser</b>	<b>1,6 mS</b>	<b>Tank 1</b>	Calcium Nitrate
<b>Selected EC</b>	<b>2,4 mS</b>	<b>Tank 2</b>	Potassium Nitrate
		<b>Tank 3</b>	Magnesium Sulphate
		<b>Tank 4</b>	Microelements
		<b>Tank 5</b>	Nitric Acid



---

**ABSOLUTE CONTROL:**

**Selected EC** **2,0 mS**

In case that you choose to use Absolute EC control this is the code where you programme the desired value for the conductivity of the group.

**RELATIVE CONTROL:**

If you decide to control the dosing as an increment over the conductivity of the water, it is necessary to have a second EC sensor (EC2) which is installed in the inlet of the fresh water supply. In this case you need to program the value that you want to raise the conductivity.

**INCREMENT OVER EC-2** **0,0 MS**

This values is the added EC value over the reading of EC-2. In other words the CDN will add a fixed amount of fertiliser to the instant reading of the EC-2 sensor.

**SELECTED pH** **6,0pH**

Here you programme the wanted pH value for the irrigation group. In most cases this is achieved through dosing of acid dosing pump.

**AUTOMATIC INIT M-VALUE** **YES / NO**

Here we can choose if we prefer having automatic or manual control of fertilizer dosing in the beginning of irrigation. If we choose automatic mode, the controller will start the irrigation with the same value that last irrigation was finished.

**INIT M-VALUE: EC: 50%-05 ss PH: 35%-05ss**

These parameters are available only if we set NO in the previous menu (choosing manual mode).

EC: 50%-05 ss. The fertilizer dosing during first 5 seconds will be 50% of the maximum capacity that mixer has.

PH: 35%-05 ss. The acid dosing during first 5 seconds will be 35% of the maximum capacity that mixer has.

**FERTILIZER PROPORTIONS:**

Here the proportions of the different fertiliser tanks are programmed for the groups.

It is here that you set how you want to compose the nutrient solution for each of the irrigation groups. In other words you programme how many percent to take from each stock tanks in order to make up the concentration programmed in "Selected EC" or in "Increment over EC-2".

<b>** FERTILIZER DOSING - Group 01 **</b>		
Fertilizer from Tank	1	000 %
Fertilizer from Tank	2	000 %
Fertilizer from Tank	3	000 %
Fertilizer from Tank	4	000 %
Fertilizer from Tank	5	000 %
Fertilizer from Tank	6	000 %
Fertilizer from Tank	7	000 %
Fertilizer from Tank	8	000 %

This is not absolute values as in the case of the proportional dosing but it is simply the relation between the different fertilizer tanks. It is the same to program 10-20-30-10 as 1-2-3-1 or 20-40-60-20.

**SOLAR RAD. COMPENSATION (ENTER)**

As explained in the proportional dosing it is possible to reduce or raise the selected EC gradually in relation to the Solar Radiation Level.

<b>** FERTILIZER DOSING - Group 01 **</b>	
Instant Sol.Rad. Low level	0450w/m2
Instant Sol.Rad. High level	0600w/m2
EC compensation band	0,3 ms

By programming the radiation levels you get a band in between which the EC vary. The reduction of the fertiliser concentration will start as the radiation level reach the value programmed in " Instant Sol.Rad. Low level" in this case 450 W/m<sup>2</sup> and will take full effect once the radiation level reach the value programmed in "Instant Sol.Rad. High level" here set at 600 w/m<sup>2</sup> . Please study drawing explaining this further under proportional dosing section.

**ALARM SETTINGS (ENTER)**

Here the alarm levels are introduced for each of the groups. Be aware that the alarm limits have no influence on the precision of the dosing. The limits are simply that protects against errors, malfunctions, inadequate programming or break-down in the fertilizer dosing. The absolute levels stop the irrigation until the cause of the alarm has been found, the error is adjusted by the user and the equipment is started again. The relative limits simply stops the dosing until the correct levels of EC and pH are re-established and the dosing is then re-assumed. The alarm menu can be seen in the following square.

***** FERTILISER DOSING - Group 01 ***	
Max. EC Absolute	5,0 mS
Al. EC High level	1,0 mS
Al. EC Low level	1,0 mS
EC Alarm delay	02:00 mm:ss
Alarm EC Saturation ?	YES/NO
EC Safety sensor?	YES/NO
Al. min. pH - Absolute	4,0 pH
Al. max. pH - Absolute	9,0 pH
Al. pH Low level	1,0 pH
Al. pH High Level	1,0 pH
pH Alarm delay	02:00 mm:ss
Al. pH Saturation ?	YES/NO
pH Safety sensor?	YES/NO

**MAX. EC ABSOLUTE** 5,0 Ms  
 Alarm that controls the absolute maximum EC possible. Once the absolute max. level for the conductivity has been passed and during the time programmed in the EC alarm delay is then the CDN and thereby the irrigation has to be stopped completely until the irrigation has been checked and the eventual error been repaired.

**AL. EC HIGH LEVEL** 1,0 mS  
 If the values in this setting has been passed for more than the time delay in EC alarm delay then the dosing is stopped but the irrigation continues.

**AL. EC LOW LEVEL** 1,0 mS  
 If the values in this setting has been passed for more than the time delay in EC alarm delay then the alarm is activated but the irrigation continues.

**EC ALARM DELAY** 02:00 mm:ss  
 Delay for activating the alarms connected with the fertiliser dosing.

**AL. EC – SATURATION** YES/NO  
 In the event that the duty cycle for the dosing of fertilizers are above 100% or below 0% during the more than the time of Alarm delay this alarm is activated. The aim is to detect the situations like the wrong adjustment of sensors, malfunction of some of the injectors or a incorrect programming of the CDN equipment.  
 This is an important setting which produces an instant control of the fertiliser dosing and we therefore highly recommend this setting to be on all the time.

### **ALARM EC SAFETY SENSOR?**

In order to add an extra sensor to the CDN computer it is necessary to activate this menu to the programme. This is done by setting this menu line to [ **YES** ]. This sensor is always considered as EC-3

**AL.MIN.pH – ABSOLUTE**                      **4,0 pH**

**AL.MAX.pH – ABSOLUTE**                      **9,0 pH**

The settings here decide where the absolute limits are independently of the selected pH. If these limits are past the irrigation is stopped until the cause of the alarm has been found and the irrigation can be started again. The max alarm is particularly important by the situations where the pH control is carried out by the adding of base or acid.

**AL.pH LOW LEVEL**                              **1.0 pH**

**AL.pH HIGH LEVEL**                              **1.0 pH**

These are the limits in relation to the selected pH. When the value of the selected pH less the settings in Low Level are passed the dosing is stopped. When the selected pH plus the setting in the High Level are passed the dosing is stopped as well.

**pH ALARM DELAY**                              **00:00 mm:ss**

This setting decides for how long the pH can be outside the above established alarm limits before the alarm is activated.

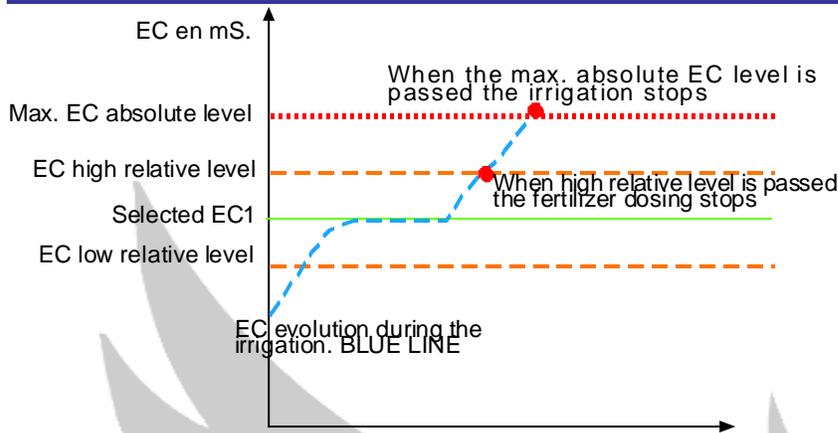
### **ALARM pH SATURATION**

In the event that the duty cycle for the pH control is above 100% or below 0% during the more than the time of the Alarm delay this alarm is activated. The aim is to detect the situations like the wrong adjustment of sensors, malfunction of some of the injectors or a incorrect programming of the CDN machine.

This is an important setting which produces an instant control of the acid dosing and we therefore highly recommend this setting to be switched on all the time.

### **ALARM pH SAFETY SENSOR?**

The safety sensor for the pH sensor is activated by setting the menu line to [ **YES** ] . This sensor is always considered as pH-2.



### **SECURITY SENSORS / DOUBLE SENSOR-SET**

The machine is adapted to function with extra sensors for safety control of the main sensors. It is possible to connect either a EC or a pH sensor or to connect both sensors. A limit between the two sensors is established and in case the readings of the two sensors deviate more than the limit established for the alarm is activated and the machine is brought to a halt.

The deviation between the safety control sensors and the main control sensors is set in the **[Internal settings]** , **[Sensor adjustments]** and then enter into the **[Deviation between EC sensors]** and in the **[Deviation between pH sensors]** .

The calibration is done in the same menu as for the other sensors, **[Internal settings]** , **[Sensor adjustments]** and the enter into **[EC sensor calibration]** and **[pH sensor calibration]**.

### **BASIN CONTROL / MIXING WATER**

Here we can set the recirculation of the water that was collected from previous irrigations, but also we can set the mixing of the water from different sources.

```

**** FERTILIZER DOSING - Group 01      ****
BASIN CONTROL SETUP                    (ENTER)
MIXING WATER SETUP                     (ENTER)
  
```

#### **Basin Control SETUP (ENTER)**

This function allows you to control the recirculation of nutrient solutions – it is possible to control up to 5 different solutions in each of their individual basin.

```

**** FERTILIZER DOSING - Group 01      ****
BASIN CONTROL                          YES/NO
BASIN NUMBER:                           1
Use external start input:                YES/NO
  
```

**Basin Control** YES/NO

By entering a Yes the recirculation mode is activated. The normal inputs for external signals is changed to be inputs for low level in the basins of recirculation. This also makes it necessary to incorporate an extra board for external signal in the equipment.

**Basin Number** 1

Here you assign the basin that you want to employ for each particular group. It is important that you in advance set the outputs for the valves that are to control de recirculation pumps. You also need to set the outputs for the valves dedicated for the return valves. The setting of the valves is done in the BASSIN SETTINGS inside the INTERNAL SETTINGS MENU.

**Use External start Input:** YES/NO

In this point we can choose if we want to use the input at the CDN main board as an input of low level switch in the current basin.

<u>Basin number</u>	<u>Input at the mainboard</u>
1	G1
2	G2
3	G3
4	G4
5	G5

**MIXING WATER SETUP (ENTER)**

CDN offers three options for the reuse of water (recirculation / blending) **None/ Pre-mix / 3 way valve / Tank** . By selecting **None** no basin control is available, however by selecting any of the other options the basin control is activated.

\*\*\*\* FERTILIZER DOSING - Group 01 \*\*\*\*  
 MIXING WATER CONTROL: Switch off/Tank/Premix/3Way Valve

Please study PRINCIPLE DIAGRAM describing the set-up of the recirculation.

CDN offers three options for the reuse of water (recirculation / blending) **None/ Pre-mix / 3 way valve / Tank** . By selecting **None** no basin control is available, however by selecting any of the other options the basin control is activated.

**1) Premix**

The **[Pre-mix]** blends *either* clear water into the return water coming from the basin *or* recirculated water into the clear water supply in accordance with

readings from a second EC sensor. The second sensor is installed before the inlet of the CDN, and the machine regulates the addition of clear water to the recirculated water ( or reverse) and thereby maintaining a set programmed EC value (EC 2), see next paragraph EC-2 required.

*The option of blending two water sources is set in the **[Internal settings]** → **[Mixing Water Control Mode]** and is standard set to **[Direct]** mode. **[Direct]** mode refers to fresh water being dosed into the recirculated water. It is possible to do this in the reverse form by adding recirculated water to the clear water supply, this option is called **[Reverse]**.*

## **2) 3 way valve**

By choosing this option the CDN is able to control a three way valve according the setting of the [ **EC-2 required** ]. In other words the machine will control the blend of recirculated water with fresh water to the value of the EC-2 sensor.

In order to have this option available it is necessary that a three way valve is installed and that the running time of the three way valve is programmed. This is done in the [ **Running time 3 way valve** ], please see following menu.

Furthermore it is necessary that the CDN has been assigned two valves for this operation, one valve for the opening and one valve for the closing of the three valves. This is done in the [ **Valve, open :** ] and in [ **Valve, close:** ]

## **3) Tank**

The third option for the blending of clear water and recirculated water is the [ **Tank** ] option. The blending for this option is taking place directly into the mixing tank of the CDN . The addition of the fresh water is controlled in relation to the conductivity of the recirculated water.

The reading of the EC sensor of the CDN is used to control whether water is added to the mixing tank or not. It is necessary to programme a margin above the required EC reading from which the dosing of fresh water directly into the tank commence. The margin is set in the [ **Increment over Selected EC** ] menu.

The actual adding of clear water is activated through the output for fertiliser 7 . Once the conductivity reach a certain level, the dosing is suspended. If the conductivity reach a higher level clear water is dosed via the fertiliser 7 output.

Remark: Be aware that in the case that the [Tank] option is selected, the inputs for external signal are no longer available as they then change their function to become level switches for the return basins. If you require activation by external signal (ex. activation for hose irrigation) then it is necessary to add a expansion board *CDRCDNT-1* for external signal.

## **EC-2 REQUIRED**

This setting is needed for the control of the **Pre-mix** and the **3 way valve** mode. The value that is programmed here regulated the EC value of the water before this reach the mixer. The result of the control is the same namely water

with the EC programmed in this setting, the only difference is the mode with which the control is done.

### **INCREMENT OVER SELECTED EC**

The value of this setting is added to the value of the [ Selected EC – value ] and once the reading of the EC probe of the CDN reach this value fresh water is directly to the mixing tank.

The process is as follows: Once the reading of the EC probe reach the value of the [ Selected EC-value ] the dosing is stopped. From the value of the [ Selected EC-value ] to the [ Increment over the Selected EC ] no fertiliser is dosed, and once the value reach the level of the selected EC- value plus the value of the Increment over the Selected EC fresh water is added.

### **RUNNING TIME, 3 WAY VALVE**

This is the time that the three way valve require from fully closed to fully open.

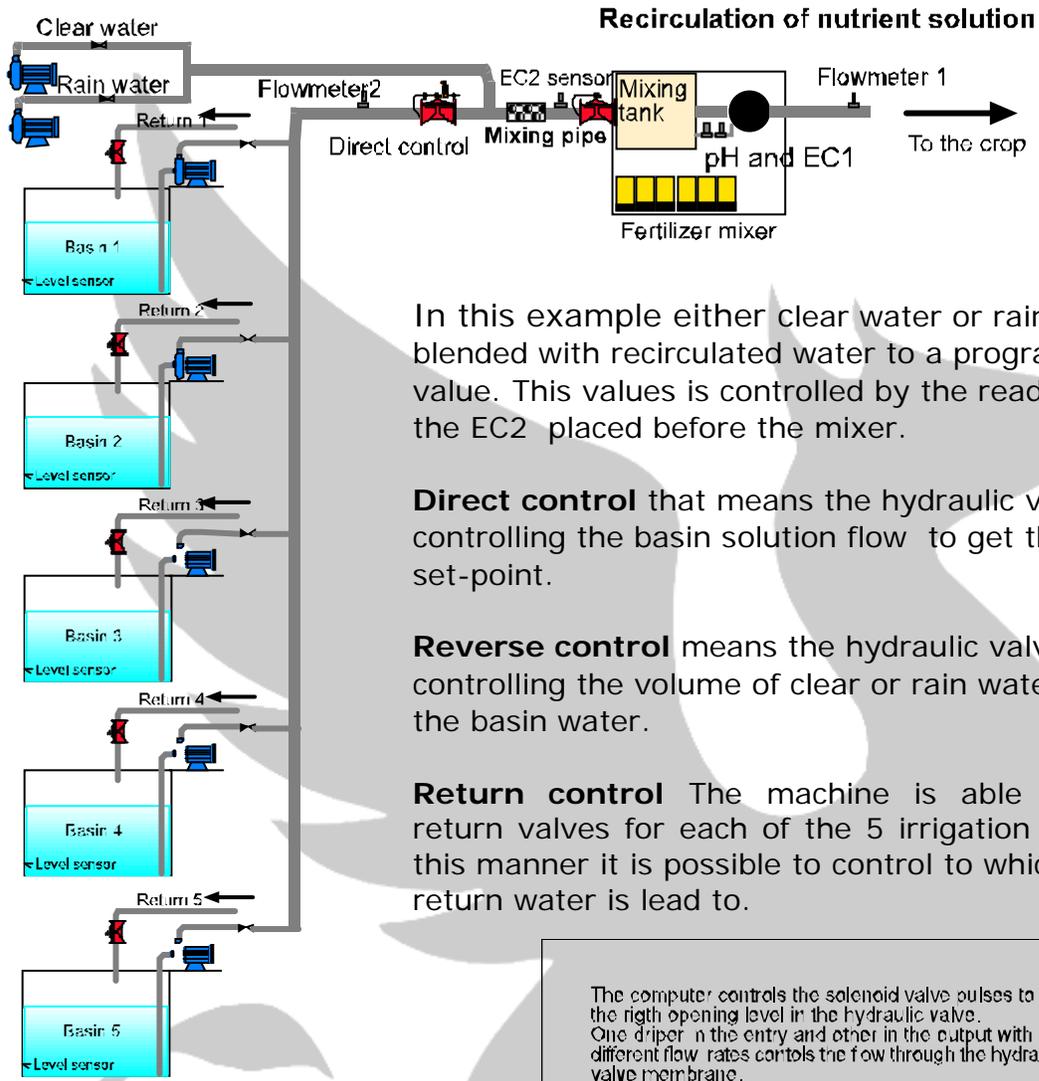
### **VALVE, OPEN : 120**

It is necessary to assign one valve for the opening of the three way valve. The default setting is valve 120.

### **VALVE, CLOSE: 121**

It is also necessary to assign a valve for the closing of the three way valve. The default setting is valve 121.

## PRINCIPLE DIAGRAMME FOR RECIRCULATION



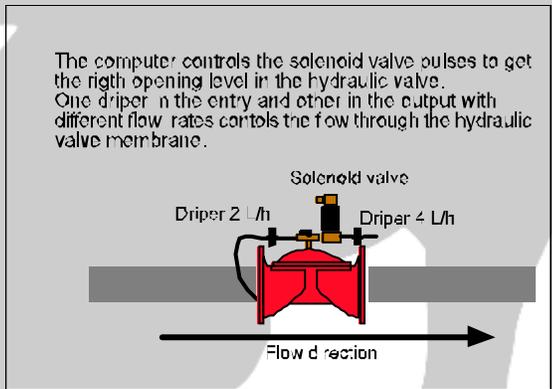
Recirculation of nutrient solution

In this example either clear water or rain Water is blended with recirculated water to a programmed value. This values is controlled by the readings of the EC2 placed before the mixer.

**Direct control** that means the hydraulic valve is controlling the basin solution flow to get the EC2 set-point.

**Reverse control** means the hydraulic valve is controlling the volume of clear or rain water added to the basin water.

**Return control** The machine is able to control return valves for each of the 5 irrigation groups. In this manner it is possible to control to which tank the return water is lead to.

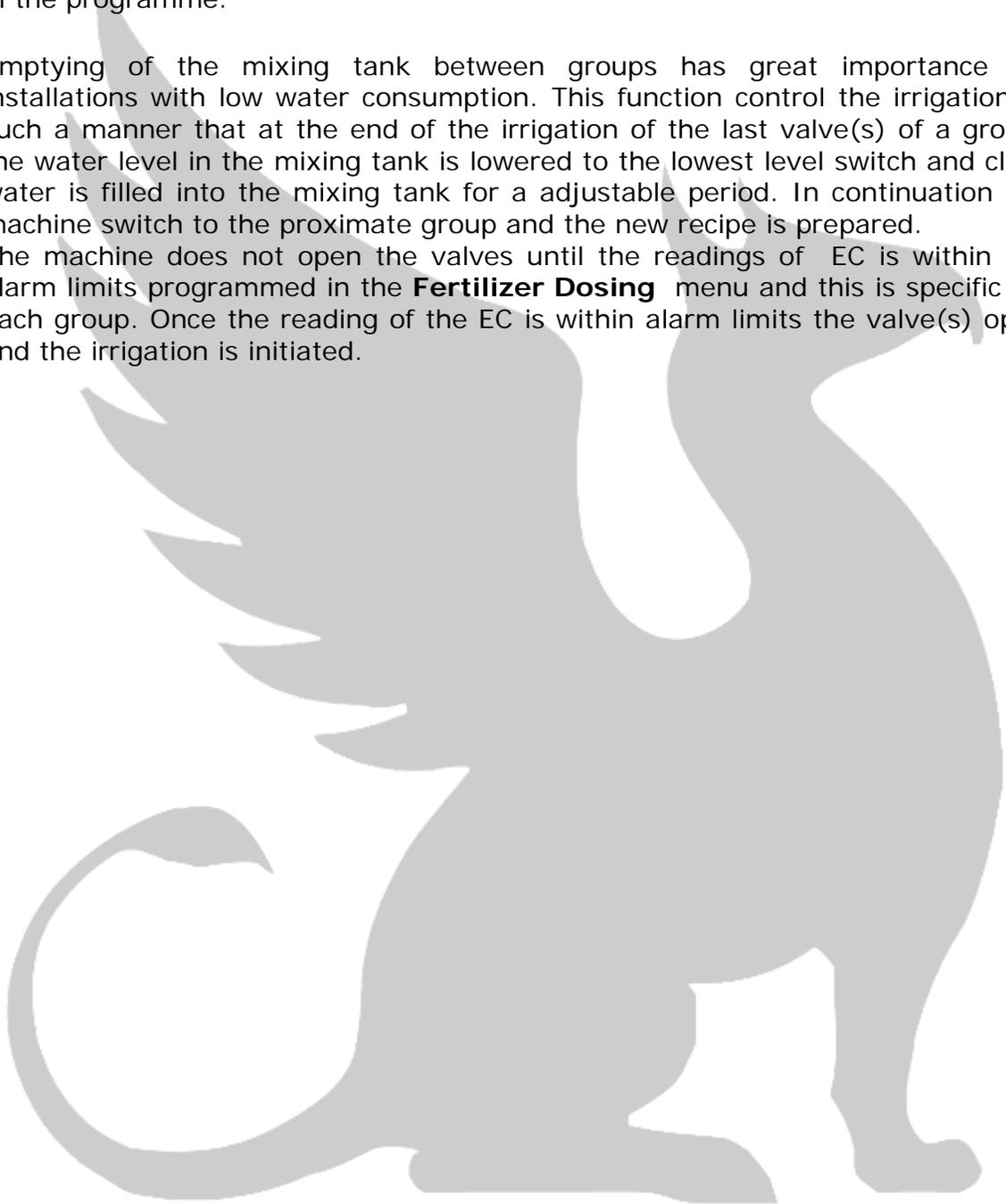


### **EMPTYING / FILLING OF TANK**

In some case when you have small irrigation flow or you crops that have very different demands to the nutrient supply it can be an advantage to program an emptying of the tank between irrigation groups. The CDN offers also this option in the programme.

Emptying of the mixing tank between groups has great importance for installations with low water consumption. This function control the irrigation in such a manner that at the end of the irrigation of the last valve(s) of a group, the water level in the mixing tank is lowered to the lowest level switch and clear water is filled into the mixing tank for a adjustable period. In continuation the machine switch to the proximate group and the new recipe is prepared.

The machine does not open the valves until the readings of EC is within the alarm limits programmed in the **Fertilizer Dosing** menu and this is specific for each group. Once the reading of the EC is within alarm limits the valve(s) open and the irrigation is initiated.





**FILTERS START AT RELAY NUMBER 16**

In that place we can set the number of relay that is connected to the selfcleaning filter. We have to set the number of first filter from the filters we have connected. For example: if we have 5 filters and we set that first one is connected to output 10, second one will have output 11, etc.

**NUMBER OF FILTERS (MAX.8)**                      **0**

Here you enter the number of filters or filter units, in other words solenoid valves for control of filter cleaning.

**CLEANING TIME**    **00:45 MM:SS**

Duration of the cleaning of the filters.

**PAUSE BETWEEN FILTERS**                      **02 secs**

Time that the valve stays active for the cleaning of each filter and the pause between one valve closes and the next one opens.

**ACTIVE PUMP (1,2 or 3)**                      **1**

The pump assigned for the cleaning of the filters.

**INTERRUPT CURRENT IRRIGATION YES/NO**

If we want to interrupt the irrigation that are active once the filter cleaning becomes necessary you enter YES if not enter NO.

**DIFFERENTIAL PRESOSTATE DELAY**                      **05ss**

Minimum time (in seconds), that signal from pressure switch has to be active in case to CDN can detect it. Filter cleaning

## AGITATION CONTROL

The CDN has the option to configure one output for agitation of the content of the fertilizer stock tanks. This output is configurable and independent of any other activity of the machine. This option can be activated in two different manners. Either activation according to intervals or by fixed time of activation.

**** AGITATION SETTINGS *****	
Agitation Control:	YES/NO
Agitation Controlled by Valve n°	000
Agitation by Interval	YES/NO
Start at (HH:MM)	00:00
Stop at (HH:MM)	00:00
Interval(HH:MM)	00:00
Duration (MM:SS)	00:00
Agitation by Fixed Time:	YES/NO
Number of Activations (Max.10)	00
Programming of Agitations	(ENTER)

### AGITATION CONTROL YES/NO

Here you indicate if you want to control the agitation or not.

### AGITATION CONTROLLED BY VALVE NO 000

Here the output for use of agitation control is assigned.

### ACTIVATION BY FIXED INTERVALS YES/NO

This when the mode of activation by fixed intervals is employed.

### START TIME OF THE INTERVAL 00:00

Time at which the activation initiates and in hours and minutes.

### STOP TIME OF THE INTERVAL 00:00

Time at which the agitation control stops.

### INTERVAL 00:00

Time that has to pass in between the activation and the activation in hours and minutes.

### DURATION 00:00

Time that the agitation is active in minutes and seconds.

### ACTIVATION BY FIXED TIME YES/NO

Here the mode of activation via fixed time is activated.

**NUMBER OF ACTIVATIONS (MAX 10)      00**

The number of activations that are going to be programmed on fixed time. It is possible to program up to a maximum of 10 activations.

**MANUAL FUNCTIONS**

This menu allows you to access and activate all the elements of the installation. You can activate an irrigation, clean filters activate a valve or valves, pumps, injectors etc. Or you can interrupt or cancel an irrigation. In order to access this function you enter the following menu:

```

***** MANUAL FUNCTIONS *****
Stop active-group                (ENTER)
Start group manually             (ENTER)
Temporary irrigation pause      (ENTER)
Manual activation of valve (s)  (ENTER)
Modify manual irrigation (s)    (ENTER)
Change pending irrigations      (ENTER)
Start pump (s) manually         (ENTER)
Start recipe manually           (ENTER)
Start valve manually (test)     (ENTER)
Start SSR manually              (ENTER)
Start / stop filter rinsing     (ENTER)
  
```

**STOP ACTIVE GROUP?      (ENTER)**

This function allows you to stop any active irrigation in the groups. This setting stop all programmed irrigations for the group. If no groups are active you will see this message:

***No active group***.....

If a group is active – for example group no. 1 then this message appears:

***Group 01 active. Interrupt?***      (ENTER)

***Group interrupted***.....

**START GROUP MANUALLY      (ENTER)**

Here we can start manually the irrigation of one group. When there are other groups active, the irrigation will be placed in pending irrigations menu awaiting until the previous finished.

**Group no:                      01**

In case that some manual function is active like for example a valve or other manual function the following menu is displayed:

**“Already active”**

The best advice is to go to The Internal Settings menu and in the function Reset of Pending Irrigations press ENTER and in this manner deactivate all the functions that might have influence on the activation of the irrigation.

**TEMPORARY IRRIGATION PAUSE (ENTER)**

A very handy setting in case you need to stop the CDN for a short while. By pressing ENTER this message comes on the screen

**“Continue? YES**

If you want to pause the machine simply change the **YES** to a **NO** and the irrigation is halted.

Once you want to start the machine again simply change the **NO** to a **YES** and the machine carries on from where it was temporary stopped.

**MANUAL ACTIVATION OF ONE VALVE INDEPENDANT OF GROUP**

*The CDN offers the possibility of activating any single valve from any group. This is done in the MANUAL ACTIVATION´s menu. Before going to the programming it is necessary to set-up this function correctly. Please follow these instructions in order for this to work correctly.*

**a)** In order to use the manual activation of individual valves it is a condition that all valves has been programmed in a group with the settings for:

pH  
Conductivity  
Irrigation time

**b)** Also be aware of that the manual activation of a individual valve only allows for activation of one valve at the time. It is therefore not possible to water more than one valve at the time.

**c)** If a manual programmed irrigation is waiting in queue together with a automatic activated irrigation ( solar radiation, external signal, drainage control or time ) then the manual irrigation will always be executed first – providing they have the same group priority. For info regarding Priority please see page 14 in the Set-up and Start Conditions and Priority menu.

d) The manual irrigation's does respect the PRIORITY of the group. An example: a manual irrigation in a group with medium priority will be interrupted if an automatic irrigation from a group with maximum priority is activated

The activation of single valves is done as follows.  
By pressing ENTER this menu is available:

**I: 01 Valve: 000 Time:00:00:00**

**I:** this is the number of manual irrigation that you are about to make.

**Valve:** is the number of the valve that you want to manually start.

**Time:** By pressing ENTER one time the irrigation time for the valve is displayed, should you want a different irrigation time then you can by using the RIGHT ARROW move the cursor and change the irrigation time.

When the numbers in the menu line is to your satisfaction, then press ENTER and the irrigation is

If **no** other valve is active -> executed immediately

If **another** valve is active → placed in the queue , see next set-point MODIFY MANUAL IRRIGATION

### MODIFY MANUAL IRRIGATIONS

The MODIFY MANUAL IRRIGATIONS menu line contains a list of all the manually activated valves that are waiting to be executed. The manual irrigation's that are programmed are default entered in the order of which they were programmed. This menu is giving the user an overview of which valves is waiting in queue but it is also here that it is possible to change the order of which of the valves that are executed. The menu looks like this:

**I: 01 Valve: 000 Time: 00:00:00**

Should you wish to change the order of which the valves are executed then that is possible in two ways. The number next to the I: is the position in the queue that this particular valve have. You can change the position of any of the valves in this menu.

By changing this number to for example 1 this particular irrigation is brought to the front of the queue (position 1) and will be executed as soon as the irrigation that is active is finished. By placing a I:2 the irrigation will be executed as the second irrigation in the queue and so on.

**CHANGE PENDING IRRIGATIONS?**

**(ENTER)**

The screen displays the following information with the number of pending irrigations for each group in which you can make the changes that you find necessary.

Group:	1	2	3	4	5	6	7	8	9	10
Irrig. :	00	00	00	00	00	00	00	00	00	00

Example: By changing the number from example 02 to 00 for group 01, the two pending irrigations for group two are cancelled.

**START PUMP(S) MANUALLY**

**(ENTER)**

Here you can test the function of the pumps activating each of the corresponding relays by entering YES and No in order to deactivate them. You can also test the alarm output by entering YES in order to sound the alarm and NO to stop the alarm.

***** MANUAL FUNCTIONS *****			
Pumps:	(1 Y/N)	(2 Y/N)	(3 Y/N) Alarm: Y/N

**START RECIPE MANUALLY**

**(ENTER)**

As in the previous menu we can test the function of the outputs corresponding to the recipes or auxiliary pumps.

***** MANUAL FUNCTIONS *****				
Recipe	1=Y/N	2= Y/N	3= Y/N	4= Y/N

**START VALVE MANUALLY**

**(ENTER)**

This menu allows you to test all the valves of your installation making sure that the valves have been placed correctly and that all of the valves are working correctly.

***** MANUAL FUNCTIONS *****		
Solenoid valve number 008	Open:	YES/NO

**MANUAL SSR ACTIVATION?**

**(ENTER)**

In order to test the function of the solid state relays used for the control of the dosing you use this menu:

```
***** MANUAL FUNCTIONS *****
```

```
SOLID STATE relays:  ON
```

By changing OFF to ON all the 8 relays for fertiliser dosing is activated. In this manner it is possible to test the functions of all the relays used for fertiliser dosing.

### **ACT/DIS. FILTER RINSING (ENTER)**

Here you can activate the cleaning of the filter or you can deactivate the same function.

```
***** MANUAL FUNCTIONS *****  
Cleaning Filters. Interrupt? (ENTER)  
Cleaning inactive. Start? (ENTER)
```

In all cases if an irrigation is active or another operation is in that is not compatible with a manual action that we are trying to start, the message:

**“Already active”**

is displayed.

In order to continue you need to deactivate the functions that are active. The easiest way to do so is to go to the menu in Internal Settings called “Reset pending irrigations”. Once you have reset the pending irrigations you are able to operate the manual operations that you want to activate.

## INTERNAL SETTINGS

This menu is where so many important settings is programmed and adjusted. So although this is a menu that you do not use everyday it is probably the most important menu of the whole programme as it is the base for the control of the machine. We can also delete all the pending irrigations, settings of the groups as well as the whole system.

```

***** INTERNAL SETTINGS ***V. 04.03.01.

DATE / TIME (ENTER)
Reset programmed irrigations (ENTER)
Reset Fertiliser/ Volume / Energy (ENTER)
Reset Group programming (ENTER)
Reset ALL SETTINGS (ENTER)
EC and pH sensor adjustments (ENTER)
Switch to LOW Volum mode: YES/NO
Flow meter settings (ENTER)
Fertilizer counters (ENTER)
Basin settings (ENTER)
External Signal expansion board? YES/NO
Valves expansion (ENTER)
Standby delay 05 ss. All mixers: YES
Fert. Pumps (ENTER)
Basin control mode DIRECT/INVERSE
Special sensor adjustments (ENTER)
Network test (ENTER)
Fert. Parameters (ENTER)
Display type : NEW / OLD
Software Calibration (ENTER)
Visit our website: www.inta.com.es
  
```

### VERSION NUMBER

In the first line of INTERNAL SETTINGS you can read the number of version of the software you have in your mixer. It is very helpful for the technicians if they have to solve any problems with the programme.

### DATE / TIME (ENTER)

Here you can adjust the actual time and date.

```

Date - Time: WeekDay DDMMYY HHMMSS
Date - Time: Monday 01/01/01 10:00:00
  
```

**RESET PROGRAMMED IRRIGATION** (ENTER)

Here you can delete all the pending irrigations and finalize the execution of the active irrigations. This can be useful if you have lost reference as to what the equipment is doing and you want to start anew.

```
***** INTERNAL SETTINGS ***V. 4.03.01.  
Clear programmed irrigation? YES/NO
```

**RESET FERTILISER/ VOLUME / ENERGY** (ENTER)

In this menu you have the possibility of resetting only part of the values for a programmed irrigation. In particular you can choose to reset the collected values for FERTILISER CONSUMPTION, the IRRIGATION VOLUME and the SOLAR RADIATION. You can reset the values separately and for each individual group.

```
***** INTERNAL SETTINGS ***V. 4.03.01.  
GROUP NUMBER: 01
```

First you choose the group where you want to make changes and then you choose which of the settings you want to reset.

```
***** INTERNAL SETTINGS ***V. 4.03.01.  
Reset readings: Fertiliser / Flow / Energy Group 01
```

**RESET GROUP PROGRAMMING** (ENTER)

In this menu you can clear all the programming in relation to this group without affecting the settings of the rest of the groups.

```
***** INTERNAL SETTINGS ***V. 4.03.01  
Group number? 01
```

After selecting the group where you want to reset the settings and press ENTER this message is displayed informing you about the reset of the programmed values of the chosen group.

\*\*\*\*\* INTERNAL SETTINGS \*\*\*V. 4.03.01.

Group 01. Reset done!

### **RESET ALL SETTINGS?**

**(ENTER)**

Here you can reset all the programmed settings of the equipment. This is employed when you want to start from a fresh and when you get a new software version of the equipment etc. By using this code you start total from the beginning with entering all the data necessary for the irrigation.

\*\*\*\*\* INTERNAL SETTINGS \*\*\*V. 4.03.01.

Clear all settings from program? YES/NO

Here you are prompted to confirm that you really want to delete all programmed settings and in order to be sure you are prompted another time:

\*\*\*\*\* INTERNAL SETTINGS \*\*\*V. 4.03.01

Clear all settings, are you sure? YES/NO

By selecting this function the program asks you to reconfirm twice in order to make sure that you do not delete important information involuntarily.

### **EC AND pH SENSOR ADJUSTMENTS**

In order to adjust the sensors for the CDN this menu is available. PLEASE REMEMBER THAT BY RESET OF THE MACHINE IT IS ALWAYS NECESSARY TO ADJUST THE SENSORS AGAIN!!

In continuation you need to choose if you want to adjust the Conductivity sensor(s) or the pH sensor(s):

\*\*\*\*\* INTERNAL SETTINGS \*\*\*V. 4.03.01

EC sensor adjustments	(ENTER)
pH sensor adjustments	(ENTER)
pH Control Mode:	Acid/Alkali
Max. diff. between EC sensors	0,5
Max. diff. between PH sensors	0,5

## **EC SENSORS ADJUSTMENT:**

By choosing the EC sensor adjustments this menu is available:

```
***** SENSORS ADJUSTMENTS *****  
EC-1 in 0mS      (000/000 p)  
EC-1 adjustment (000/000 p) 00,00 mS  
EC-2 in 0mS      (000/000 p)  
EC-2 adjustment (000/000 p) 00,00 mS  
EC-3 in 0mS      (000/000 p)  
EC-3 adjustment (000/000 p) 00,00 mS
```

1) Place the cursor over the line

```
EC-1 to 0 mS      (000/000 p)
```

Take the EC-1 sensor out of its holder in order to obtain a value corresponding to 0 mS. Press the ENTER button in order to memorize this value in the CDN this is the 0 reference which is the start reference.

2) Place the cursor over the line

```
EC-1 to control liquid (139/125 p) 05,00 mS
```

Introduce the EC sensor in the control liquid like for example an EC of 5.00 mS. Press the ENTER button and with the buttons LEFT and RIGHT and UP and DOWN you enter the value of the control liquid (example: 5mS/cm) in this line and then press ENTER in order to memorize this value in the computer.

NOTE: In case more EC sensors are connected to the machine, this procedure must be made for each of the sensors.

ATTENTION: This operation has to be made by each reset of the program of the computer

The values (xxx/xxxp) is the pulses of the sensor corresponding to the frequency reading xxxp is the value but temperature compensated. This section is for use by the service technician.

**pH SENSORS ADJUSTMENTS:**

***** SENSORS ADJUSTEMENTS *****			
pH-1	(pH 4)	(135 p.)	06,89 pH
pH-1	(pH 7)	(135 p.)	06,89 pH
pH-2	(pH 4)	(135 p.)	06,89 pH
pH-2	(pH 7)	(135 p.)	06,89 pH

1) Place the cursor over the first line in the screen:

pH-1 (pH 4)(000 p.) 00,00pH

Place the pH sensor in the pH=4 solution enter the value 4 and press the ENTER button in order to memorize this value into the computer.

2) Place the cursor over the second line in the screen:

pH-2 (pH 7) (000 p.) 00,00pH

Place the pH sensor in the pH=7 solution adjust the reading to 7 and press ENTER to memorize.

NOTE: This adjustment of the pH sensor should always be done once the program of the computer is reset.

**pH CONTROL MODE:**

**ACID/ALKALI**

This option allows us select if we need to control pH using acid to reduce the pH, or using alkaline in case to have pH higher.

**MAX.DIFF. BETWEEN EC SENSORS:**

**0,5**

Here we can set the maximum difference between primary EC probe and the security EC probe. If the difference is bigger than this parameter, CDN will show the alarm of EC probe.

**MAX.DIFF. BETWEEN pH SENSORS:**

**0,5**

Here we can set the maximum difference between primary pH probe and the security pH probe. If the difference is bigger than this parameter, CDN will show the alarm of pH probe.

**SWITCH TO LOW VOLUME MODE?**

**YES/NO**

This option allows you to set the CDN computer to work with small sectors and low volumes of irrigation. If you have irrigation that are inferior to 9,9 m3/h it is recommended to change to the low volume mode. Once you change to this mode the logging of the consumption of water is changing as is the programming of the solenoid valves using the irrigation mode of Volume. The irrigation mode of volume is automatically changed to litres instead of m3.

NOTE. It is important to bear in mind that switching to low volume mode affect all groups. If you use this mode in larger irrigation sectors it is possible that you will get incorrect readings of the consumption and even worse if you are using proportional dosing in relation to the volume of irrigation water the dosing will most likely be wrong.

**FLOW-METER SETTINGS** (ENTER)

Here you can adjust the pulses per M3 that the flow meter of your installation measures. The data concerning the number of pulse for the flowmeter is information that is supplied by the manufacturer of the flowmeter or the installer of the flowmeter. It is possible to adjust the flow meter to your installation as long as you have a reliable system to measure the instant flow. The system for measurement of flow is of course used to fine calibrate the flow meter.

Time constant:	010 sec.
Main Flow-meter factor	0000 imp/m3

It is also possible to program a theoretical flow for each group (10) which is employed if you do not have a flow meter or when the installed flow meter has a failure and stops transmitting pulses.

Estimated Flow group	1	0000 m3/h
Estimated Flow group	2	0000 m3/h
Estimated Flow group	3	0000 m3/h
Estimated Flow group	4	0000 m3/h
Estimated Flow group	5	0000 m3/h
Estimated Flow group	6	0000 m3/h
Estimated Flow group	7	0000 m3/h

**FERTILIZER COUNTERS** (ENTER)

The fertilizer flow meters needs an adjustment in order to function correctly displaying the correct volume of fertilizer consumed.

Fert-meter factor 1	0107 imp/litre
Fert-meter factor 2	0107 imp/litre
Fert-meter factor 3	0107 imp/litre
Fert-meter factor 4	0107 imp/litre
Fert-meter factor 5	0107 imp/litre
Fert-meter factor 6	0107 imp/litre
Fert-meter factor 7	0107 imp/litre
Fert-meter factor 8	0107 imp/litre

Due to the different density of the different fertilizers it is likely that it will be necessary to calibrate each of the different stock solutions that you are going to use. In case you need very high precision you need to have this very much in mind.

**BASIN SETTINGS** (ENTER)

At this menu it is determined which output controls the recirculation pumps as well as the return valves if such are employed.

Basin No. 1 Controlled by Valve No.	00
Basin No. 1 Return contr. by V. No.	00
Basin No. 2 Controlled by Valve No.	00
Basin No. 2 Return contr. by V. No.	00
Basin No. 3 Controlled by Valve No.	00
Basin No. 3 Return contr. by V. No.	00
Basin No. 4 Controlled by Valve No.	00
Basin No. 4 Return contr. by V. No.	00
Basin No. 5 Controlled by Valve No.	00
Basin No. 5 Return contr. by V. No.	00

The control valve of the return is activated at the same time as the other with the only difference that this valve is active until the irrigation is finished. If you have programmed a pause between groups (in the menu of the Valve Settings) the valve continues active until the pause between groups have finished.

Both the basin control valve as well as the return valve can be programmed with a 0 in which case on output is activated.

**EXTERNAL SIGNAL EXPANSION BOARD** YES/NO

When you have installed a expansion board for external signal due to that you want to use the option of recirculation (Basin control) or that you need more than the normal five inputs for external signal you need to advise the computer about this by programming Yes in this menu. By doing so the inputs for external signal found on the board becomes available to the program.

**VALVE EXPANSION** (ENTER)

In case you have installed one or more boards for expansion of the number of solenoid valves that are available to the computer you can test these in this menu. Here you can make sure that the board have been detected by the computer and that the configuration is correct. It is possible to connect up to 20 boards for each equipment.

\*\*\*\*\*VALVE EXPANSION\*\*\*\*\*  
 Amp: 01=NO 02=NO 03=NO 04=NO 05=NO



**BASIN CONTROL MODE: Direct**

The basin control can be employed in regards to the recirculated water or the source with the highest conductivity in order to reach the level of conductivity selected – EC 2 or the control can be in relation to the fresh water supply. In the first case it is a DIRECT control due to that the EC2 is raised once we dose more and in the second case which is REVERSE as we lower the EC 2 as we dose more fresh water (no or very low conductivity EC).

**SPECIAL SENSOR ADJUSTMENTS (ENTER)**

By choosing the **Start by special sensor in the START CONDITIONS menu** you can active the irrigation by using virtually any analogue sensor. The CDN can activate up to eight groups via signal from special sensors. These sensors can typically be soil moisture sensors or tensiometers.

In order for this to work it is necessary that the special sensors send an analogue signal of 4- 20 mA and that the CDC-SAD1 expansion board has been installed together with the CDN machine.

In this menu you need to set the high and low limits for the special sensors. In this manner you set the range in which the values of the sensor can operate.

Please contact our technical support for instructions on how to calibrate each individual type of sensors.

\*\*\*\*\*SPECIAL SENSORS \*\*\*\*\*

I1: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I2: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I3: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I4: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I5: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I6: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I7: (1188,3578) (±0000 Un,±0000 Un) R: ±0000  
I8: (1188,3578) (±0000 Un,±0000 Un) R: ±0000

Example:

Connect the weight tray 10 – 50kg with output 4-20mA in the input 1:

The input I1 should show:

I1: (1188,3578) (**+0010** Un, **+0050** Un) R: ±0000

Connect the weight tray 10 – 50kg with output 0-20mA in the input 2:

The input I2 should show:

I2: (0000,3578) (**+0010** Un, **+0050** Un) R: ±0000

**IMPORTANT:** The connected sensors can't supply tension to the controllers input because it can make damage.

**NETWORK TEST**

This information is reserved for the technical service. This menu has only to do with the communication between the CDN and the available PC software that can be supplied from INTA. By studying the data available in this menu the service technician can immediately see any communication problems between the CDN and a connected PC.

**FERTILIZER PARAMETRES**

This information is reserved for the technical service. The settings here has influence on how the CDN controls the dosing of fertiliser and acid in regard to the characteristics of the raw water supply.

Do not change any settings in this menu without consulting the installer of the machine or the technical support at INTA.

**DISPLAY TYPE                      NEW/OLD**

This information is reserved for the technical service. This option is for selecting the type of display you have in your mixer. It is because for some languages we had to introduce special characters.

**SOFTWARE CALIBRATION**

Using settings in this menu we can control fertilizer dosing using the readings of fertilizer counters. (Don't use if you don't have fertilizer counters installed.)

This mode of dosing is giving you the total control of the fertilizer quantities that CDN is injecting. With this tool you can be sure that CDN will calculate the real flow of each fertilizer, even if the filters are dirty or the magnetic pumps has got different yields. To do this CDN is reading continuously the flow of each fertilizer and is comparing this with the theoretic flow, and is making corrections if is necessary.

The idea of this system is based on the reading from fertilizer counters, so it is very important to clean every counter regularly.

***** SOFTWARE CALIBRATION *****	
Software Calibration ?	YES/NO
Maximum Error Low Flow:	95 %
Maximum Error Open Valve:	80 %
Max. Accumulated Time:	15 ss
Yield Range (Min-Max) :	(0100-1000) l/h
Software Calibration Alarm :	YES/NO
Software Calibration Alarm Delay :	60 ss

**SOFTWARE CALIBRATION?****YES/NO.**

Here we can make this function Active. (Please remember not to use it if you don't have the fertilizer counters installed).

**MAXIMUM ERROR LOW FLOW:****95%**

This is a level that will activate the "Fertilizer low flow alarm". If the reading of the flow will be less then 95% of the theoretic yield of the pump, the alarm will be activated. If it happens, the user has to find the reason of this state, which can be:

- dirty filter,
- the dosing pump is switched off,
- the fertilizer tank is empty,
- the dosing valve is not working properly.

**MAXIMUM ERROR OPEN VALVE:****80%**

This is a level that will activate the "Open dosing valve alarm". If the reading of the flow will be bigger then 80% of the theoretic yield of the pump, the alarm will be activated. In that case user should check if the dosing valve is opened in a manual mode.

**MAX. ACCUMULATED TIME:****15**

Here we can set the frequency (in seconds) with which CDN will make the new calculations, adjusting the real yield of dosing pumps.

**YIELD RANGE (MIN-MAX)****100-1000 l/h**

This parameter is the yield range of dosing pumps (the minimum and maximum flow of each dosing pump) in which the CDN will adjust the calculated flow. That's mean that calculated flow will never be out of this limits.

**SOFTWARE CALIBRATION ALARM:****YES/NO**

Here we can activate or deactivate the software calibration alarms.

**SOFTWARE CALIBRATION ALARM DELAY 60SS**

This parameter is a time during which CDN has to be under conditions of alarm in case to activate it.