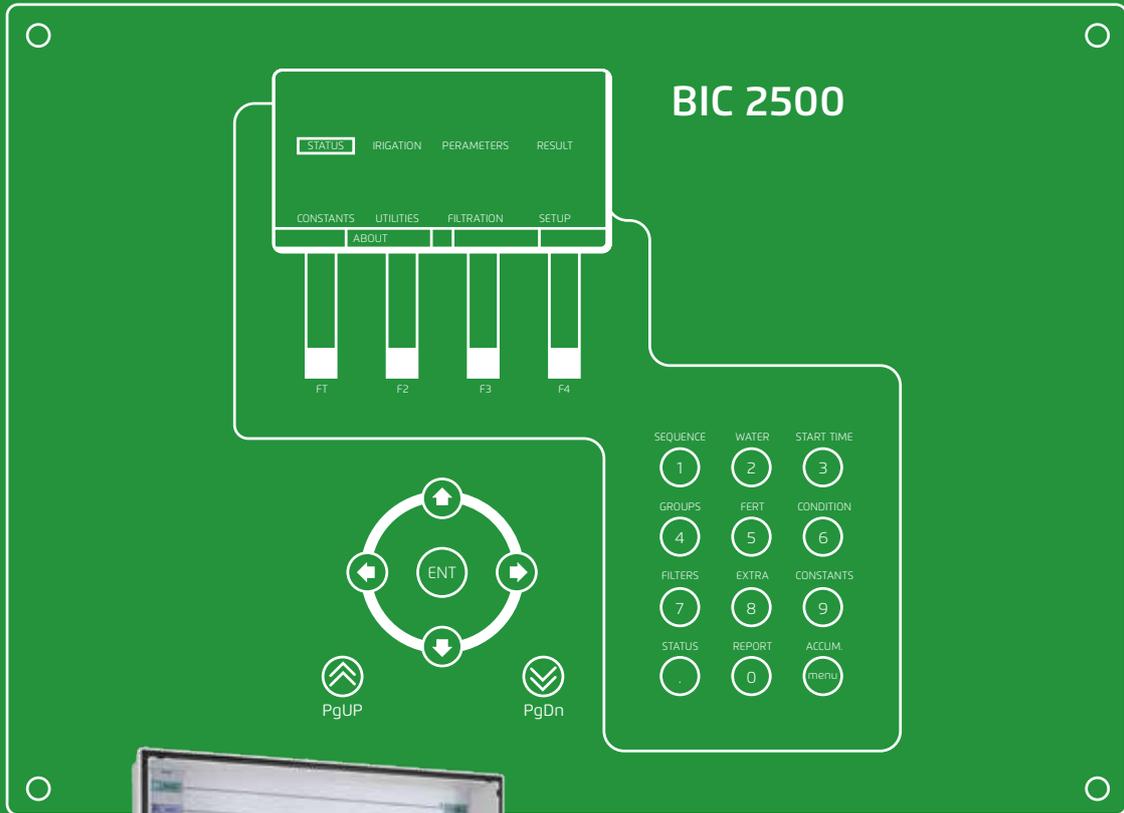


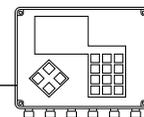
BIC 2500

BERMAD Irrigation Control System



Operation Manual

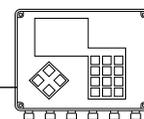




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1. Introduction

BERMAD's BIC 2500 control system offers efficient, economical solutions for management of medium to large irrigation networks. The system uses modern hardware and software technologies with flexible design to control water supply, irrigation, fertilization, and filtering as well as related functions: monitoring, data collection, events reporting, problem detection, and alarm notification.

A control system may be constructed of one or several BIC 2500 controllers. Each unit is equipped with a graphical LCD display and a keyboard, enabling local programming onsite. In addition, the system offers central control via special software running on PCs communicating with the BIC 2500 controllers via various communication channels.

This user guide explains how to program the system via the local control panel. To learn how to use the PC software, see the **BIC 2500 Application User Guide**.

Prior to using BIC 2500 in a specific facility, a configuration procedure must be executed. It is assumed that the configuration procedure has been properly completed prior to implementing procedures in the BIC 2500 Irrigation Control System USER GUIDE. To learn about installation and configuration procedures, see the **BIC 2500 Installation Guide**.

Keyboard Description

Function keys

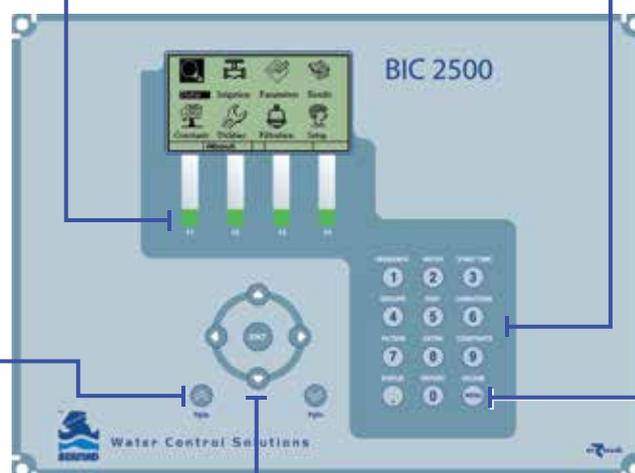
F1,F2,F3,F4 (from left to right) executing position dependent functions. The functions are specified above the keys at the bottom of each screen.

PAGE UP and PAGE DOWN keys

for moving one screen above or below the current screen

Arrows for inside screen movement

moving from one field to another UP, DOWN, LEFT and RIGHT

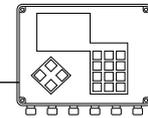


Numeric keys + Short cut keys

While being inside the MAIN MENU, each numeric key serves for direct jumping into the subject whose name is printed above the key

MENU key

Used for bringing up the Main Menu



Finding your way inside the BIC 2500

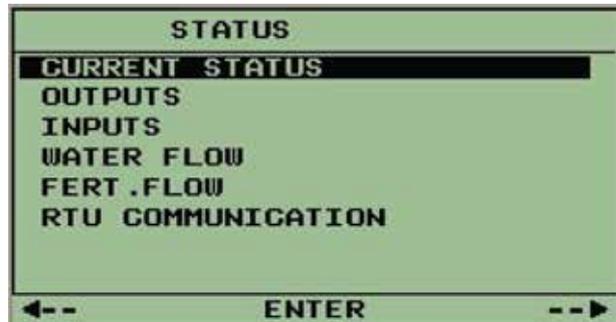
The **MAIN MENU** of the BIC 2500 includes 8 options represented by 8 icons shown in the figure below. To display the **MAIN MENU**, press the key in the lower right corner of the numeric keypad.

Use the arrows $\downarrow \rightarrow \uparrow \leftarrow$ to move on the screen to the relevant option. After selecting an option on the Main Menu, press the **ENT** key. A submenu is displayed.

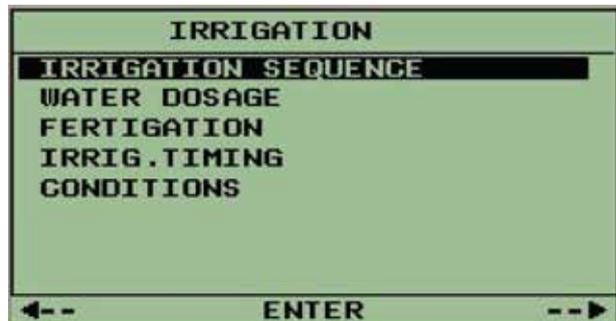


Main Menu Options

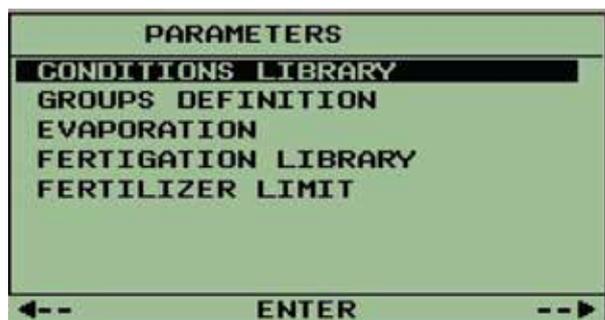
STATUS – shows the status of the system and the system components.

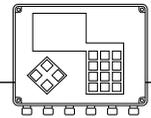


IRRIGATION – defines irrigation programs, including tools for inspection of the irrigation process and tools for intervention as necessary.

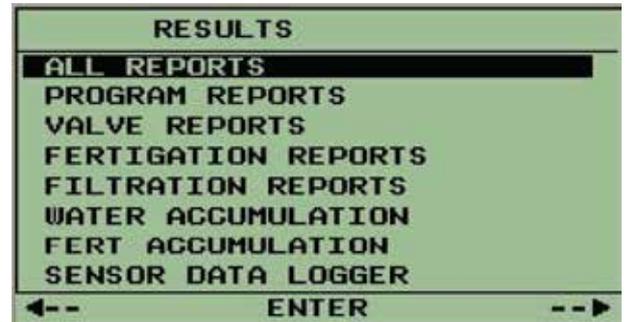


PARAMETERS – defines supplementary parameters related to irrigation and fertigation processes.

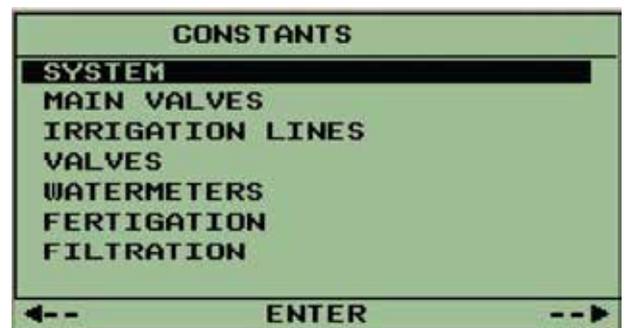




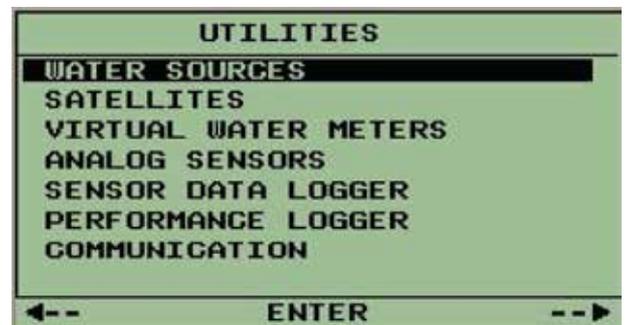
RESULTS – shows reports and accumulations resulting from the system's activity. The reports can be viewed under various categories.



CONSTANTS – sets the constant parameters of all system components.

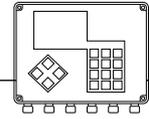


UTILITIES – displays special functions used in various system activities.



FILTRATION – handles filter flushing programs.



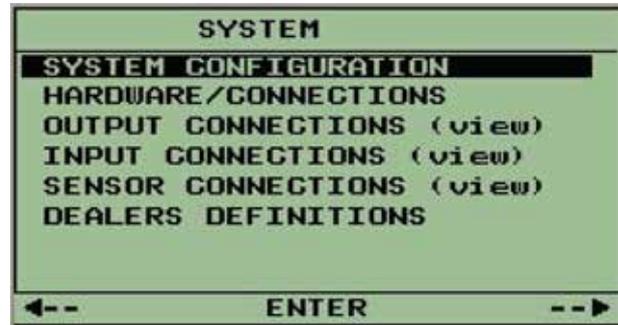


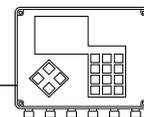
SYSTEM – contains all the necessary activities involved with the system configuration and setup.

The **Main Menu** and **Submenu** options vary as relevant.

For example, if no filters are defined, the **FILTRATION** option does not appear on the **Main Menu**.

Press the numeric key on the **Main Menu** to simplify access to the most commonly used options. The option associated with each key is printed above the numeric key. From the **Submenu**, press the function keys — =  or  =  to move between options listed on the specific submenu.





2. Defining Irrigation Programs

Irrigation programs are defined in 3 steps:

1. Defining the **IRRIGATION SEQUENCE** to specify the sequence of valves to be irrigated by the program.
2. Defining the **WATER DOSAGE** and **FERTILIZER DOSAGE** per each part of the sequence.
3. Defining the **IRRIGATION TIMING** to schedule activation of the irrigation.

After completing the first 2 steps, the program is considered **READY**, but it will work only if manually started. For automatic start, step 3 must be completed.

STEP 1 – Defining the Irrigation Sequence

Defining an irrigation program starts by defining the sequence of valves for irrigation. To define a new program, position the cursor on the program number field.

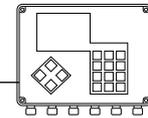
Press function key **F3** = **PROGS** to activate commands related to program editing. Select **NEW** to view the next free number for the new program which can be accepted or changed.



The sequence of valves can now be defined. Press the **ENT** key to terminate the defining the sequence.

If the system contains a single line only, valves are referred to by the ordinal number only, for example, **Line 1**.

When the system contains several water sources (**A, B, C, ... F**), the user selects the relevant water source for each valve by pressing **F4** = **SRC**; otherwise, the system selects the default water source of the specified line.



The sequence may include not only individual valves, but also predefined groups of valves (**G1**, **G2**, and so on).

Group definition is located in the **PARAMETERS** menu.

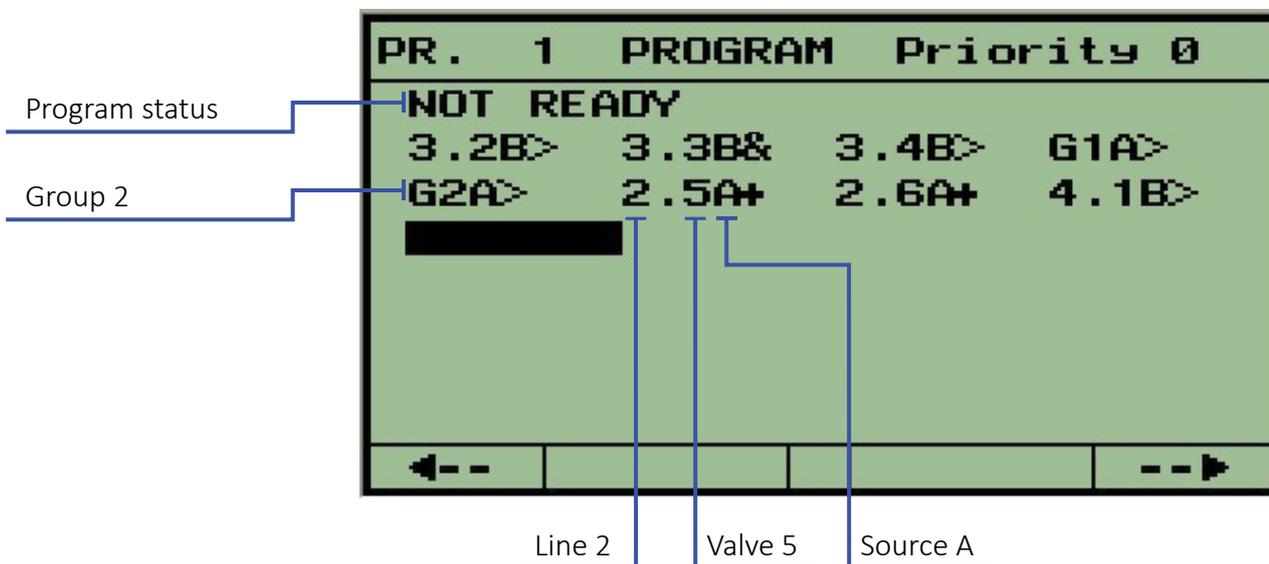
The order in which the valves are operated is defined according to the following 3 symbols:

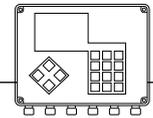
> - SEQUENTIAL OPERATION – one valve after the other.

& - TEMPORARY GROUPS – valves of the same line that irrigate with a common dosage. (must be activated in Dealers Definition)

+ - STARTING TOGETHER – coordinated start of valves with individual dosages (must be activated in Dealers Definition)

The figure below shows an example sequence.





STEP 2 – Defining Water Dosage

Each member of the sequence must have a water dosage defined in order to irrigate. In the dosage definition screen, the sequence members are arranged in vertical order. Press the **PAGE UP** (↑) key or **PAGE DOWN** (↓) key to move between the members of the sequence.

The dosage definition process starts with the selection of the dosage mode. When position the cursor is in the dosage units field to select the dosage mode. The following dosage modes are supported:

- hh:mm:ss – by time

PR. 1 WATER DOSAGE 19:01:48		
VALVE: CLOSED Line 3		
3.2B		
WATER (m3)	Plan	Left
	125.000	00.000
Pre Centr.	25.000	
Pre Local	50.000	
		LastFlow
Water After	10.000	0.00
←--	∨	-->

by volume

PR. 1 WATER DOSAGE 19:06:05		
VALVE: CLOSED Line 3		
3.3& 3.4B		
WATER (h:m:s)	Plan	Left
	01:30:00	00:00:00
Pre Centr.	00:20:00	
Pre Local	00:30:00	
		LastFlow
Water After	00:10:00	0.00
←--	∨	-->

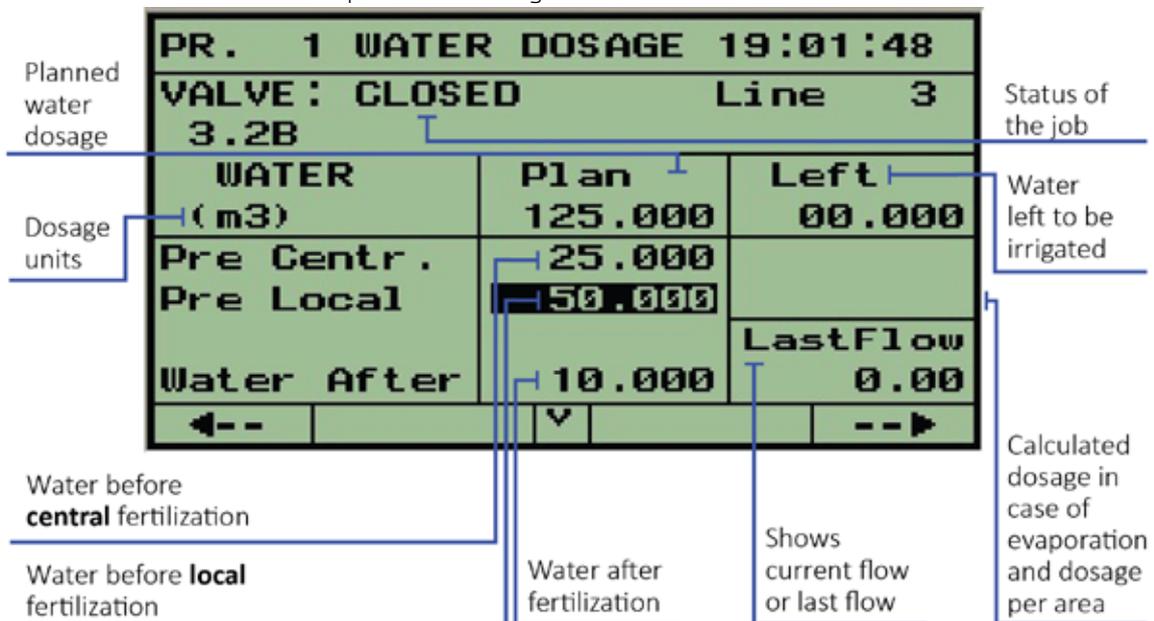
by time

PR. 1 WATER DOSAGE 19:20:18		
VALVE: CLOSED Line 1		
61A		
WATER Evapor.	Plan	Left
		00.000
Pre Centr.	00.000	Calculat
		45.000
		LastFlow
Water After	00.000	0.00
←--	Action	-->

by evaporation

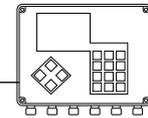
NOTE: When irrigating by evaporation mode, there is no planned value to be inserted. When irrigating by m3/area mode, the planned value actually contains the planned amount per area and not the total amount to be irrigated. However, in both evaporation and m3/area modes, the total amount to be irrigated appears as a calculated value. For a detailed explanation of dosage by evaporation and dosage by volume per area, see appendix A of special dosage modes.

The function of the various fields is explained in the figure below.



An option is available to define a special dosage of **WATER BEFORE** for local fertilizer No 1 to differentiate it from the others. This option must be activated through the **DEALERS DEFINITION**.

Coordinated start of members of a sequence using the **+** sign is meant mainly for coordinating the central fertigation of various valves. In that case, to eliminate contradicting demands, the system does not permit individual central fertigation jobs, but works instead with a common fertilitating job shared by all the coordinated members. As a result, when the option of "starting together" of valves with the **+** sign is activated, the definition of the water before is performed via the **Common Fertilizer Dosage** screen instead of in the **Water Dosage** screen; the appearance of those screens is slightly different.



STEP 2.1 – Local and Central Fertilizer Dosage

The BIC 2500 recognizes central and local fertilization sites. The central fertilization enables a number of irrigation lines to share the same fertilizer site, while the local fertilization is intended to serve individual irrigation lines only. The screens used for defining the local and the central fertilizers dosage appear next to each other and are programmed in the same way.

The following dosage options are available:

- **l/m³** – liters of fertilizer per cubic meter of water
- **sec/min** – seconds of injection per minute of irrigation
- **m:s/m³** – minutes and seconds of injection per cubic meter of water
- **l/min** – liters of fertilizer per minute of irrigation
- **Prop(L)** – the specified fertilizer quantity will be injected proportionally
- **Bulk m:s** – continuous injection of the fertilizer quantity specified by time units
- **Bulk(L)** – continuous injection of the fertilizer quantity specified in liters

Note that the BIC 2500 offers the convenience of a library of predefined **FERTILIZER SETS** to be used by irrigation programs. For a detailed explanation, see **FERT. SET LIBRARY** on the **PARAMETERS** submenu.

The Fert site identity

The number of the fertilizer injector in the "fertilizer site"

The selected dosage mode of fertilizer 3

Default dosage mode

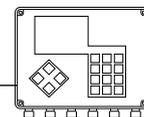
For selecting a set from the fertigation library

Left or actual quantities

The desired quantity

For selecting the desired dosage mode

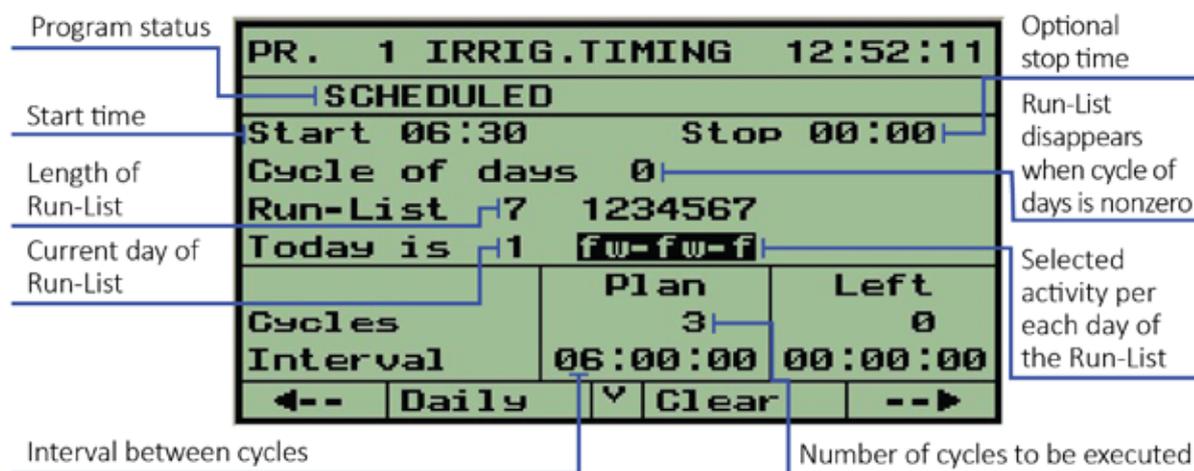
PR. 1	FERT. Centr. 2	SET 0
VALVE: 3.2		
F1	Bulk(L)	55.000
F2	sec/min	30
F3	l/m ³	01.500
←	1/m ³	X Change



Position the cursor at the dosage mode field next to the relevant fertilizer number. Select the dosage mode by using the **F2** function key to select the default mode or the **F3** function key to open dosage options. Define the appropriate fertilizer quantity or appropriate proportion.

STEP 3 – Irrigation Timing

To start a program at the proper time, define a start time and the days of operation. After defining these two parameters, the program is considered **SCHEDULED**. The scheduling is done via the following screen:

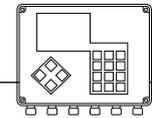


The days of operation can be specified either by defining a nonzero cycle of days or by setting up a **Run-List**. The length of the **Run-List** is up to 16 days; each day, the user must mark required activity per specific day: **(f)** indicates fertigation; **(w)** indicates water only; **(-)** indicates no activity; **(s)** indicates single time activation (but including both irrigation and fertilization).

Notice that only one way of specifying the irrigation days is permitted at any given time; when the cycle of days is nonzero, the **Run-List** is not available.

As an option, a stop time can be defined per program; at the time defined, the program is terminated.

If a program has to be repeated several times a day, the number of cycles and the interval between the cycles must be defined.

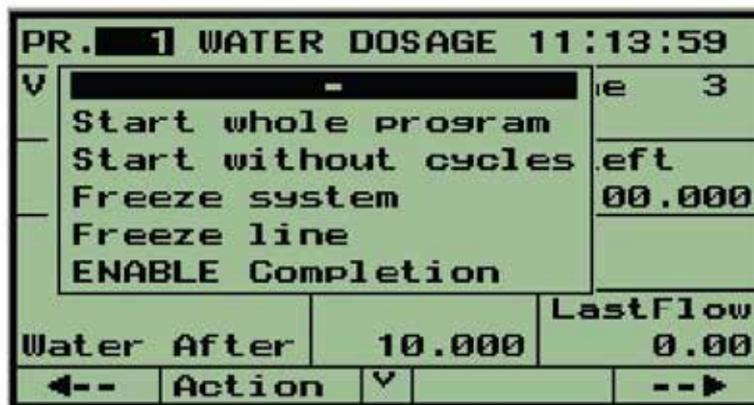


3. Manual Start/Stop and Freeze/Unfreeze

In the screens used for defining irrigation programs, when the cursor is located at the program number, the **F2** function key appears as **Action**, enabling manual **Start/Stop** of programs as well as **Freeze/Unfreeze** operations.

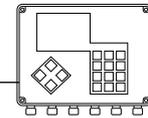
When a program shows **Left** quantities of water, or **Left** cycles to be executed, the user has the option to **Start** with **Left** to complete the left quantities.

Freezing means stopping activity until manually released. One can **Freeze** the whole system or individual lines. Freezing individual lines is permitted only from the **WATER DOSAGE** screen, where the line number is specified.



Action function key

- **ENABLE COMPLETION** – can be activated per each program, individually. After activation, the option remains activated until command is disabled. A program with **ENABLE COMPLETION** checks at the end of the irrigation whether some of the valves included have not completed the entire dosage (probably because of a malfunction). The system attempts to complete the remaining dosage.



5. Checking the Current Status of the System

The **STATUS** submenu contains several options:

The **SYSTEM STATUS** screen provides general information about activities in the system, including existing problems, programs currently irrigating, programs that are waiting, terminated programs and programs that are still scheduled for today.

Existing problems

List of running programs

Programs running with problems

Low Flow

Running: 3

Running+Failure: 1

Waiting: 2

BACK Cancel Zoom + -->

Press F2 to cancel the problems of the selected category.

Press F3 to see detailed information of the programs within the selected category.

List of waiting programs

The next screen, **STATUS OF OUTPUTS**, shows all activated outputs marked with (+) and all the others marked with (-). The **STATUS OF OUTPUTS** screen is used for manual activation of outputs for testing. Press **F2** = **MANUAL** and then position the cursor at the desired output. Press **F2** again to turn the output **ON/OFF**. A manually activated output is marked with .

All pumps of sources A and B are running

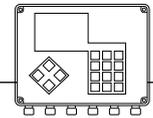
Main valves 1 and 3 are open

Valves 1,2,3 of line 1 are open

STATUS OF OUTPUTS 18:59:08

Source	A	B
	+++	++++
Main Vlv 1-4	1234	
Irr. Vlv L1-3	12345678	12345678 12
	+++-----	----- +
Irr. Vlv L3-4	34567890	1234567890
	-----	-----

← Manual ↓ →



The next two screens display the statuses of the digital and analog inputs. In the digital inputs screen, each closed contact is marked with (+); each open contact with (-).

STATUS OF INPUTS		19:30:43
Src W.M	AB	--
Irr. W.M	L1 L2 L3 L4	- - - -
Free W.M	1234	1-4
1-4		----
Gent F.M	G1 G2	--- ---

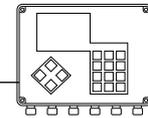
Analog inputs appear with their actual value; (-) indicates that the sensor is disconnected.

ANALOG INPUTS	
1	Temperat . -
2	Pressure -
3	Humidity -

The two following screens show the flow rates of all the water meters and all fertilizer meters in the system.

WATER METERS FLOW	
	(m3/h)
Watermeter Src.A	0000.0
Watermeter Src.B	0000.0
Watermeter Ln.1	0000.0
Watermeter Ln.2	0000.0
Watermeter Ln.3	0000.0
Watermeter Ln.4	0000.0
Free W.meter 1	0000.0

FERTILIZERS FLOW	
Fertilizer	(L/h)
Fert. 1 Cent.1	0000.0
Fert. 2 Cent.1	0000.0
Fert. 3 Cent.1	0000.0
Fert. 1 Cent.2	0000.0
Fert. 2 Cent.2	0000.0
Fert. 3 Cent.2	0000.0
Fert. 1 Ln.3	0000.0



The last status screen supplies information about the status of communication with all the RTUs used by the system. The type of the RTU channel is recognizable by the interface type appearing at the top left corner: **Int2W** is the interface of a 2 wired channel, **IntRF** is the interface for radio channel. The channel address appears at the top right corner.

Interface of 2W channels

The interface address is 2.

List of RTUs

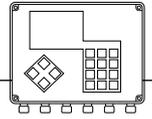
Switching ON/OFF the RTU sound

Switching ON/OFF the error counter

Int2W	2					
Sound OFF						
1	2	3	4	5	6	7
←	Sound	Count	→			

Use the keys to move from one channel to the other.

RTUs that have communication problems are underlined. RF RTUs powered by batteries that might have low battery status are indicated by the letter **B** next to the RTU number.



6. Parameters of Irrigation and Fertigation

The following section describes topics complementary to defining irrigation and fertigation programs.

Conditions Library

Conditions are the tools the user needs to manipulate activities depending on various events.

The conditions defined by the user are stored in the **CONDITIONS LIBRARY**, each condition with its ordinal number. To activate the condition, the condition must be enabled. Subsequently, the condition is continually checked by the system as **TRUE (1)** or **FALSE (0)**.

When needed, irrigation programs can be related with conditions in order to start, stop, wait, or continue (see section 4: **RELATING CONDITIONS WITH PROGRAMS**). When the condition becomes **TRUE** the desired action will be executed.

The following types of conditions can be defined:

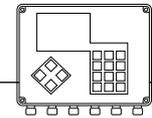
- **CONTACT** – depending on the status of a dry contact input whether it is **OPEN** or **CLOSED**, changing from OPEN to CLOSED (**OP>CL**) or from CLOSED to OPEN (**CL>OP**).
- **SATELLITE** – depending on the status of a satellite output whether it is **ON** or **OFF** or changing from ON to OFF (**ON>OFF**) or from OFF to ON (**OFF>ON**).
- **PROGRAM** – depending on the status of a program whether it is **NOT RUNNING**, **RUNNING**, **ENDING** or **STARTING**.
- **COMBINED** – depending on several conditions combined by **OR/AND** operations.
- **FLOW** – depending on the flow of a real or virtual water meter whether the flow is above or below the set-point.
- **ANALOG** – depending on the value of an analog input.

Ordinal number of the condition	Numb of cond.	When	mm:ss	The value or the status referred to
The item referred to	1 Contact	1 CLOSE	00:30	0 FALSE
Type of condition	2 Satellite	2 OFF>ON	00:00	0 DISABLED
	3 Program	3 End	00:00	-
	4 Combined	TRUE	00:00	-
	5 Flow B	< 0180.0	01:00	1 TRUE
	6 Analog 2	> 0000.0	00:20	0
	7 -			
	8 -			

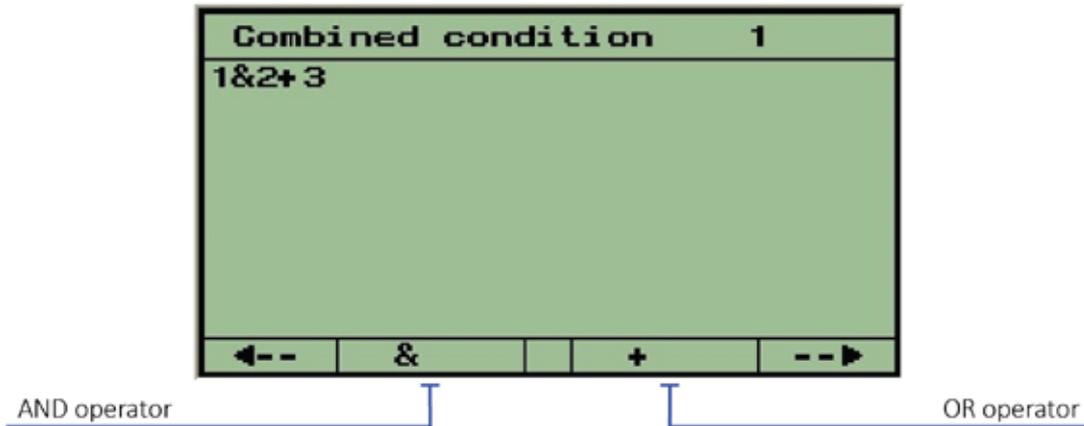
← Enable Change -->

ENABLE/DISABLE key

How long the condition must remain fulfilled in order to be considered TRUE



Whenever a combined condition is defined, an auxiliary screen appears for the user to define the formula of the combination.



The formula **1&2+3** should be interpreted as 1 & (2+3), which means that in order for the combined condition to set TRUE, condition No. 1 must be TRUE, AND conditions No. 2 OR No. 3 must be TRUE.

Whenever a flow condition is being defined, an auxiliary screen appears containing a list of all the water meters from which the user may select the water meter to refer to. The same way when defining conditions on analog sensors an auxiliary screen supplies the list of sensors from which the desired one can be selected.

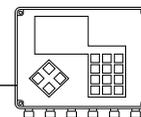
Groups Definition

Valves which are usually irrigated together may be defined as a **GROUP** of valves. Such groups are named **G1**, **G2**, **G3** and are stored in a groups library for later use. The valves included in such a group must belong to the same irrigation line. The maximum number of valves in the group is 30. When larger groups are needed, it is possible to combine 2 groups together.

To create a new group, position the cursor at the group number field, press **F3** = "GROUP" and select **NEW**. The system suggests a free group number which the user can accept or change.

The user must specify the line number of the valves to be included in the group, and then specify the valves one by one. Each valve number is followed by **ENTER**. Next to the **Group No.** the expected total flow of the group is displayed.





Evaporation

For the purpose of dosage by evaporation, the system stores the data of the daily evaporation of the last 16 days as shown in the following table:

LAST 16 DAYS EVAPORATION (mm)			
1	1.2	9	0.7
2	1.3	10	0.6
3	0.8	11	0.7
4	0.7	12	0.8
5	0.7	13	0.6
6	0.9	14	1.2
7	1.1	15	1.1
8	1.3	16	1.5

The evaporation of the last 24 hours must be stored at location 1. Location 2 contains the information of the day before, so that at location 16, there will be the evaporation of 16 days ago. Each day at midnight the whole table is shifted one position, so that the evaporation at location 15 moves to location 16, location 14 moves to location 15, and so on. The evaporation at location 1 is copied to location 2 as well, assuming that the evaporation of the new day is the same as of the day before. This way, the table always contains the evaporation of the past 16 days.

To understand the mode of dosage by evaporation, see the **Appendix A of Special Dosage Modes**.

Fertilizer Sets Library

The **FERT SETS LIBRARY** stores predefined formulas of fertilization to be used by the irrigation programs. Up to 9 formulas can be stored per each fertilization site. To use the Fertilizer Sets Library, the option must first be activated in the **DEALERS DEFINITION**.

When the cursor is positioned at the Fert. Site field, use the (↓) (↑) keys to reach the relevant site, then position the cursor at the Fert. Set number, and use the (↓) (↑) again to reach the relevant set. Now when the cursor is positioned next to the fertilizer injector number, select the appropriate dosage mode per each fertilizer. Finally, insert the appropriate quantity or proper proportion per each fertilizer.

The cursor is located at the Fert site field.

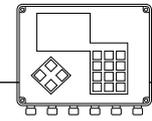
The Fert set number

Selecting the desired dosing mode

The image to the right shows how the Fertilizer Set is used by irrigation programs. The user specifies the relevant Set number in the fertilizer dosage screen; the predefined set immediately appears; this eliminates the need to repeatedly define the same dosages for using the same recipe.

Relevant Fert. set number

PR. 1 FERT. Centr. 1 SET 1		
VALVE: 1.2		
Before: 0.00		
F1 1/m3	00.500	00.000
F2 Bulk L	27.000	00.000
F3 Prop L	25.000	00.000



7. Results of Irrigation Activity

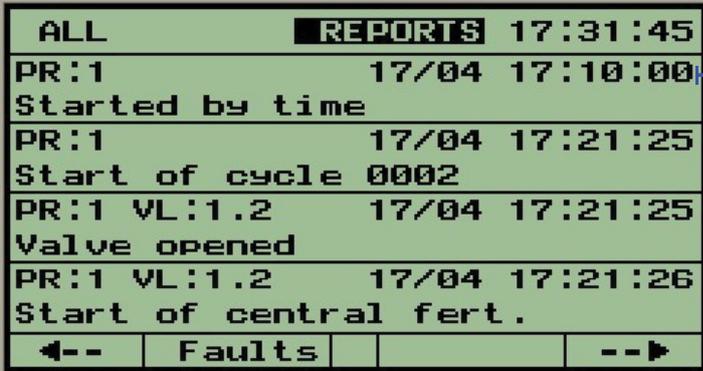
Under **RESULTS**, BIC 2500 supplies information resulting from the activities in the system. Here the user finds the **EVENTS REPORTS**, the **ACCUMULATORS** and the **SENSORS LOG RESULTS**.

Events Reports

Events happening in the system generate reports that are displayed in the following categories:

- All reports
- Reports of a particular program
- Reports of a particular valve
- Reports of fertilization
- Reports of filtration

In each category, there is an option of viewing only the fault reports. The events are arranged in chronological order. When viewing the reports, the 4 most recent events are displayed. Use the  key to view earlier reports. The image below shows an example of a reports screen.



Report of program no. 1

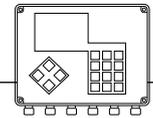
ALL	REPORTS	17:31:45
PR:1	17/04	17:10:00
Started by time		
PR:1	17/04	17:21:25
Start of cycle 0002		
PR:1 VL:1.2	17/04	17:21:25
Valve opened		
PR:1 VL:1.2	17/04	17:21:26
Start of central fert.		
←--	Faults	--▶

Time and date of the event

To view only fault reports, press F2.

When the cursor is positioned at **REPORTS** as shown above, pressing  = **FAULTS** displays only the fault reports.

Using the   arrows positions the cursor on the relevant reports; then pressing  = **DEL ALL** deletes all the messages of the same category, pressing  = **DEL MSG** deletes the selected report only.



Accumulation

The system accumulates water and the fertilizer consumption per each irrigation valve, water meter, and fertilizer meter.

The user can also view the accumulation (for the irrigation valves) of the most recent irrigation separately.

Irrigation valves connected to a water meter accumulate volumetric accumulation as well as time accumulation when irrigating by time.

TOTAL WATER ACCUMULATION/Vlv.			
Line	Vlv.	(m3)	Water(h:m:s)
1	1	000025.0	12:25:00
1	2	000	
1	3	000	
1	4	000	
1	5	000	
1	6	000	
1	7	000	
←- LAST			

ACCUMULATION per water meter	
Wat.meter	Water(m3)
Watermeter Src.A	000539.0
Watermeter Src.B	000422.0
Watermeter Ln.1	
Watermeter Ln.2	
Watermeter Ln.3	
Watermeter Ln.4	
Free W.meter 1	
←- V	

TOTAL FERT ACCUMULATION/Vlv.	
Valve 1 Ln.1	(L)
Centr. 1	
F1	000038.2
F2	000045.0
F3	000024.6
←- LAST	

FERT ACCUMULATION per site	
Fertilizer	Fert(L)
Fert. 1 Cent.1	000024.4
Fert. 2 Cent.1	000091.8
Fert. 3 Cent.1	000091.8
Fert. 1 Cent.2	000000.0
Fert. 2 Cent.2	000000.0
Fert. 3 Cent.2	000000.0
Fert. 1 Ln.3	000000.0
←- V Clear --▶	

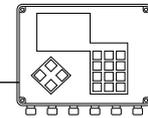
Sensors Logging Results

When analog sensors are used with the BIC 2500 control system, the values of the sensors can be sampled and logged as explained in **Appendix B, LOGGING ANALOG SENSORS**.

The logging results can be inspected by requesting the **SENSORS DATA LOGGER** via the **RESULTS** submenu.

The **F2** function key is used to start and stop the logging process.

SENSORS LOG RESULTS			10:25:54
Temperat. 1	-	18/04	10:22
Pressure 3	-	18/04	10:22
Temperat. 1	-	18/04	10:12
Pressure 3	-	18/04	10:12
Humidity 2	-	18/04	10:02
Temperat. 1	-	18/04	10:02
Pressure 3	-	18/04	10:02
←- Stop X --▶			



8. Constants

The constant parameters that belong to a particular application are divided into categories as explained below:

System Constants

CONSTANT PARAMETERS	
System Reset time(h:m)	00:00
Pressure delay(m:s)	01:00
Fertilizer leakage limit defined in pulses/30 min	10
Water pulse before fert	N
Common scheduling params	Y
Common dosage coef. %	100
←-- --▶	

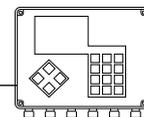
- **System Reset Time** – when set to a nonzero value, all active programs stop at the specified time.
- **Pressure delay** – displays the delay before a change in a pressure sensor is activated.
- **Fertilizer leakage limit** – pulses received from a fertilizer meter while its associated injector is supposed to be closed, are considered illegal and, when exceeding the limit, will indicate a fertilizer leakage that will result in stoppage of the irrigation of the related lines. When the limit is not reached, the illegal pulses counter is cleared every 30 minutes.
- **Water pulses before fert** – the user may request that starting fertilization will never happen before sensing the flow of water.
- **Common Scheduling params** – when set to **YES**, forces all the **RUN LISTS** of all the programs to be the same length and to have the same **Current Day**.
- **Common dosage coefficient** – enables changing all water dosages by percentage.

Main Valves Constants

Defining the way the main valve is operated: without delay, before or after the irrigation valves.

When the main valve opens before, it shuts down after the valves, and vice versa.

MAIN VALVES DELAY	
M.V.	(m:s)
1	Open without delay -
2	Open before vlv 00:10
3	Open after vlv 00:15
←-- --▶	



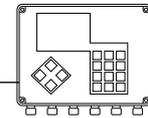
Irrigation Lines Constants

CONSTANTS OF IRRIGATION LINES				
Lin Nmb	Hi/Lo Flow delay mm:ss		leakage limit pls/30m	Line name
	Low	High		
1	05:00	01:00	10	1
2	05:00	01:00	10	2
3	05:00	01:00	10	3

- **High/ Low flow delay** – after line filling delay the system starts checking the flow to be within the specified limits. In case of high flow or low flow violations there will be no reaction before the specified delay.
- **Leakage limit** – pulses received from a water meter while the line is supposed to be closed, are considered illegal and when exceeding the limit will indicate a water leakage. The possible reaction can be selected as shown below. When the limit is not reached the illegal pulses counter is cleared every 30 minutes.
- **Line name** – by default irrigation lines are numerated **1, 2, 3** etc. However, the user can change the line numbers to any number from 1 to 999.

Ln.	ON Low Flow	ON High Flow
1	Skip to next	Skip to next
2	Skip to next	Skip to next
3	Skip to next	next
	Inform only	
	Wait	

The screen to the right complements the LINES' **CONSTANTS**. It enables selection of the relevant reactions to high flow or low flow violations.



Valves Constants

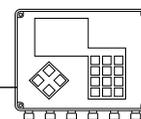
CONSTANTS OF IRRIG. VALVES					
Dosage mode Volume/Time			Filling time (min)		
Valve	V	Flow (m3/hour)			
	T	nom	min	max	
1.1	<input checked="" type="checkbox"/>	100.0	75.0	125.0	15
1.2	<input type="checkbox"/>	100.0	75.0	125.0	15
1.3	<input type="checkbox"/>	100.0	75.0	125.0	15
1.4	<input type="checkbox"/>	100.0	75.0	125.0	15
←-		v		V/T/A/E	

The valves constants include the following information per each valve:

- **Default dosage mode** – appears on the dosage screen when defining a new job of the specific valve. Possible options:
 - » **V** – volumetric
 - » **T** – time based
 - » **A** – volume per area
 - » **E** – evaporation
- **Nominal, Minimal and Maximal flows** –Nominal flow: expected flow of the valve under normal conditions; Minimal flow: limit below which the flow is considered LOW FLOW; Maximal flow: limit above which the flow is considered HIGH FLOW.
- **Filling time** – defines the time during which the line is filled with water. During this period, flow and pressure violations are ignored.

The table to the right is accessible only when dosage per area or dosages by evaporation are activated. It contains the **AREA** covered by each valve and the **FACTOR** that represents in % the specific requirement of the crop irrigated by each valve.

VALVES CONSTANTS		
Valve	Area	Factor %
1.1	1.0	100
1.2	1.0	100
1.3	1.0	100
1.4	1.0	100
2.1	1.0	100
2.2	1.0	100
2.3	1.0	100
←-		v



Water Meter Constants

The **WATER METERS RATIO** – defines the amount of water represented by each pulse of the water meter.

Fertilizer Sites Constants

- **When pulses fail to arrive** – Fertilizer injectors equipped with fertilizer meters are expected to supply pulses when activated. If no pulses arrive within 2 minutes from activation, the system declares a fertilizer failure and reacts according to the selected action:

- » **STOP FAULTY INJECTOR** – continue fertilization with the other fertilizers
- » **STOP FERTIGATION** – stop all fertilizers of the fert. site but continue irrigation
- » **STOP IRRIGATION** – both irrigation and fertilization stops
- » **INFORM ONLY** – informs of the problem but continues as usual

- **Fert. meters' ratio** – defines the amount of fertilizer represented by each pulse of the fertilizer meter.

- **Pulse length** – defines the length of the pulses used when fertilizing proportionally sec/min. For example, if the required proportion is 20 sec/min, the system injects 4 pulses of 5 seconds each minute, with 10 seconds between the pulses.

- **Special case** – when a fertilizer meter is out of order and cannot be used for a period of time, perform the following steps:

WATER METERS RATIO	
Water meter	(m3/pulse)
Watermeter Ln.1	01.000
Watermeter Ln.2	01.000
Watermeter Ln.3	01.000
Fert. M meter 1	01.000

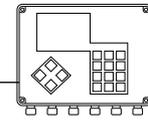
FERTILIZER SITES BEHAVIOR	
When pulses fail to arrive	
Centr. 1	Stop faulty F. pump
Lin	Stop faulty F. pump
	Stop fertis
	Stop irrig.
	Inform only

FERTILIZER SITE - Centr. 1			
	Ratio (L/pulse)	Fert meter	Length of pulse(sec)
F1	00.100	+	5
F2	00.100	+	5
F3	00.100	+	5

STEP 1: Delete the connection point of the fertilizer meter from the connections list.

STEP 2: Set the RATIO in the table equal to the amount of fertilizer injected by the specific injector within the specified pulse length. For example, if the injector's flow is 100 liter/hour then for a pulse of 5 sec, the injection will be $(5/3600) \times 100 = 0.138$ liters/pulse.

After completing steps 1 and 2, the system continues fertilizing as previously, but instead of waiting for pulses from the fertilizer meter, the system generates the pulses based on the injector's flow data, supplied in step 2.



Filter Sites Constants

For each filter site the following parameters can be defined:

DP isn't defined

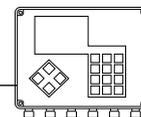
- **DP Delay** – defines the period the DP contact must remain closed until a flushing cycle is started.
- **Looping limit** – defines the number of consecutive flushing cycles caused by the DP indication, after which an "Endless looping" problem is declared.

FILTER SITES CONSTANTS				
Filter	Delay DP(s)	Loop lin.	Irris.	
Gen	Continue	30	5	Continue
Lin	Wait	30	5	Continue
	HLT fert			
←←		Change	→→	

What happens with the irrigation during backflushing?

This question is dependent by the selection made in the column on the right. Options include:

- **CONTINUE** – irrigation will continue
- **WAIT** – irrigation will be waiting
- **HLT FERT** – fertilization will be halted



9. Utilities

Water Sources

Water sources having several pumps are operated by BIC 2500 in various ways:

Use F2 to display the auxiliary screen to define the correct combination for each flow level.

Use F3 to open the mode selection window.

Combination of pumps to use when static mode is selected

WATER SOURCES OPERATION			
Src	MODE	Limit	123456
A	Nom.Flow	600.0	+++
	Static Flow		
	Nom.Flow		
←-- Levels		Change	--▶

- **STATIC** – combination of pumps to be activated is independent of the flow demand; it is always the same static combination as specified in the column on the right.
- **FLOW** – the combination of pumps activated depends on the actual flow demand. During the line filling period, the nominal flow is used instead of the actual flow.
- **NOM. FLOW** – combination of pumps activated depends on the nominal flow of the valves opened under the specific source.

When the selected mode of operation is by **Flow** or by **Nominal flow**, the user must specify the various combinations of pumps to use for each flow range. Each row of the table presents the flow and the combination used up to this flow.

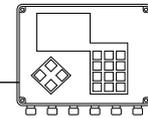
- **Delay Up** – when the flow demand increases, switching to the upper combination occurs after the specified delay.
- **Delay Down** – when the flow demand decreases, switching to the lower combination occurs after the specified delay.

The auxiliary screen for defining the desired combination of pumps per each flow level

SOURCE A		
No.	Flow up to (m3/h)	123456
1	100.00	+--
2	200.00	-+-
3	300.00	--+
4	400.00	+-+
5	500.00	-++
6	600.00	+++
DELAY	Up 00:00	Down 00:00
BACK		

When working by the actual flow (not by the nominal flow), there is only one delay to define. This delay specifies the time during which the flow is expected to remain at the new value before a combination change occurs.

A water source may be associated with a real or virtual water meter measuring the water supplied by the source. The measured water is divided between the valves open under the source. Irrigation valves with no water meters can be measured by the meter of the water source.



Satellites

Satellites of defined outputs

Satellites are outputs that can be logically attached to other outputs so that when any of these outputs is activated the satellite is also activated and remains active as long as at least one of the leading outputs remains active.

SATELLITE OUTPUTS ->	1	2	3
W.pump 1 Src.A	+	-	
W.pump 2 Src.A	+	-	
W.pump 3 Src.A	+	-	
Main valve 1	-	-	
Main valve 2	-	-	
Main valve 3	-	-	
Valve 1 Ln.1	-	+	
Valve 2 Ln.1	-	3	
←- -	+	∨	-
			- ->

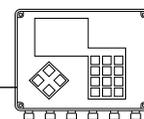
In the table above, satellite No. 1 is defined as the satellite of the pumps 1, 2, and 3 of water source A; satellite No. 1 is active while any of the pumps 1, 2, and 3 are active.

Satellite No. 2 is defined as satellite of valves 1 and 2 of line 1; satellite No. 2 remains active while valves 1 and 2 of line 1 are open. Note that the table displayed could extend beyond one screen; use the (↓) (↑) keys to scroll through the table as necessary.

Conditioned Satellites

CONDITIONED SATEL.->	1	2	3
Condition 1	3	-	-
Condition 2	+	-	-
Condition 3	-	+	-
Condition 4	-	-	-
Condition 5	-	-	-
Condition 6	-	-	-
Condition 7	-	-	-
Condition 8	-	-	-
←- -		∨	
			- ->

Satellites might be condition dependent, so that as long as any of the related conditions is **TRUE**, the satellite will remain active. For relating conditions with satellites, the row of the condition must be marked with **+** in the column of the appropriate satellite. For example, in the table above, satellite **No. 1** depends on conditions **No. 1** and **No. 2**.



Conditions depending on satellites

Among other options, conditions may also be defined concerning the statuses of satellites. See the explanation in the **CONDITIONS LIBRARY**.

Virtual Water Meters

Virtual water meters are calculated water meters, which result from an mathematical combination of real water meters. Prior to using virtual water meters, the number of those meters for the particular unit must be set in the **DEALERS DEFINITION**. The BIC 2500 program recognizes three types of virtual water meters according to their uses:

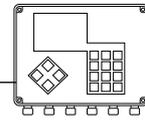
- **For irrigation** – measures the water used by an irrigation line.
- **For network protection** – defines the balance between the water coming into and going out from a particular network.
- **For water sources** – measures the amount of water supplied by a water source.

The first step in the definition of a virtual water meter is the definition of the mathematical formula associated with it. Use **F3 = DEF** to display the screen (see below) listing all the water meters of the system.

VIRTUAL WATER METER No. 2			
Defined as:			
Used for: Protection			
Alarm limit (m3) : 00.000			
-			
←-	X	Def.	->

Any water meter can be included in the formula by marking the meter positive (+) or negative (-). After marking all the required water meters, use **←-** to return to the previous screen to complete the definition.

VIRTUAL W.METERS ->	1	2	3
Watermeter Ln.10	-	x	x
Watermeter Ln.11	-	x	x
Watermeter Ln.12	x	x	x
Free W.meter 1	+	x	x
Free W.meter 2	x	x	x
Free W.meter 3	x	x	x
Free W.meter 4	"	"	"
Free W.meter 5	x	x	x
←-	+	X	-
			->



- The next step is selecting the type of the water meter according to its use.

VIRTUAL WATER METER No. 1						
Defined as: W1 - 2 - 3 - 10 - 11						
<table border="1"> <tr> <td>Protection</td> </tr> <tr> <td>Irrigation</td> </tr> <tr> <td>Source</td> </tr> </table>				Protection	Irrigation	Source
Protection						
Irrigation						
Source						
Used for: Irrigation						
Ratio (m3) : 01.000						
Irr.line No.: 1						
←		Change	→			

Use F3 = "Change" to select the appropriate use of the particular virtual water meter.

The rest of the definition procedure depends on the virtual water meter selected.

Virtual water meter for irrigation

In addition to the formula and the type, a virtual water meter used for irrigation has a definition of its ratio and a definition of the associated irrigation line.

Each water meter included in the formula contributes positively or negatively to the resulting sum.

Only when the resulting sum is greater or equal to the ratio, an amount equal to the ratio is considered as supplied to the irrigation line. The amount is added to the accumulators and deducted from the amount left to be irrigated. To decide about the ratio, the user must consider the ratios of the water meters involved.

VIRTUAL WATER METER No. 1			
Defined as: W1 - 2 - 3 - 10 - 11			
Used for: Irrigation			
Ratio (m3) : 01.000			
Irr.line No.: 1			
←		Def.	→

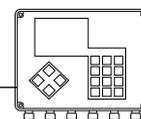
Virtual water meter for network protection

A virtual water meter used for network protection has all the water meters feeding the network on the positive side of its formula, and all the water meters consuming from the network on the negative side. Under normal conditions, the result is zero, since all the water going into the system must equal the water going out of the system.

VIRTUAL WATER METER No. 2			
Defined as: W2 + W3 - 2 - 3 - 4 - 5 - 6 7 - 8 - 9 - 10 - 11 - 12			
Used for: Protection			
Alarm limit (m3) : 10.000			
W.pump 1 CLOSE			
←		Def.	→

Output to be activated in case of alarm

Action taken with the output in case of alarm



If the result is not zero, it indicates leakage in the network. However, since there may be some delay between sensing the water meters feeding the system and sensing the consumer water meters, temporary nonzero values might be displayed, creating false alarm situations. Alarm limits must be set so that network protection is considered only when the limit is exceeded, and the alarm will be activated only if the value remains outside the limit for 4 minutes.

The user may define the preventive action to be taken when the network protection alarm is activated by selecting an output to be **OPENED** or **CLOSED**. The output can be selected from the list of main valves, pumps and satellites defined in the particular unit.

Virtual water meter for water sources

A virtual water meter associated with a water source measures the water supplied by the source. The ratio definition serves the same function as explained above for virtual water meters used for irrigation.

VIRTUAL WATER METER No. 3	
Defined as: W8 + W9 + W10	
Used for!	Source
Ratio (m3) :	10.000
Source	<input checked="" type="checkbox"/>
←	X Change →

Analog Sensors

BIC 2500 reads analog sensors in various ways. Local analog sensors are connected to local I/O boards, and remote analog sensors are read by the two RTU units. The total number of analog sensors recognized by BIC 2500 must be defined during the **SYSTEM CONFIGURATION**. However, the type of each analog sensor and the range of its scale are defined in the following screen:

First select the sensor type and then define the minimal value and the maximum value of its scale in the **4 mA** and **20 mA** columns, respectively.

The analog sensors are used to condition the system's operation and can be logged to analyze system operation.

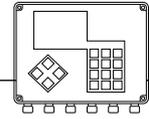
ANALOG SENSORS DEFINITION			
N.	Type	4 ma	20 ma
1	-	0.00	0.00
2	Temperat.	0.00	0.00
3	Humidity	0.00	0.00
4	Tension. Pressure	0.00	0.00
		Change	

Sensors Data Logger

To learn how to define a data logger for logging analog sensors readings, see **Appendix B, LOGGING ANALOG SENSORS**.

Performance Data Logger

To learn how to create and use a performance logger, see **Appendix B, PERFORMANCE LOGGING**.



10. Communication

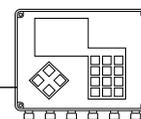
The communication screen defines the unit number, used as the ID number of the particular unit within the system that may contain several units.

The system has a individual ID number that differs from the other systems' ID numbers.

The communication type defines the media of communication used between BIC 2500 and the PC. The baud rate defines the communication speed of that media.

The two rows at the bottom of the screen contain numbers that are not relevant to the user.





11. Filtration

The filtration program is defined independently per each filtration site. Each program contains the interval between the flushing cycles, the flushing time per station, and the pause between the stations.

The system supplies information about the status of the site, the status of the DP and the time left until the next cycle. During operation, the system shows the station currently being flushed, and the time remaining for flushing of that station.

FILTRATION		Line 1	
CLOSED			
DP OFF	Prog	Left	
Fl.Interv(h:m)	01:00	00:00:00	
Fl.time (m:s)	00:30	00:00	
Pause (m:s)	00:05	00:00	
Accumulated No of starts			
by Time:	15	by DP:	235
Consecutive loops by DP: 0			
←-	Start		->

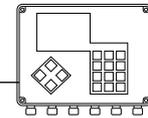
Additional information shows how many flushing cycles have been performed by time, how many by the DP, and how many consecutive loops were done.

Note that the countdown of the interval to next flushing is halted if there is no irrigation in progress.

Note also that the constants of the filter site define what happens with the irrigation during the flushing process.

Execution of any flushing cycle, regardless of cause, resets the **Left** interval to its programmed value.

The settings in the **DEALERS DEFINITION**, define whether to ignore the DP sensor during the line filling delay.



12. System Setup

The setup process consists of several steps:

- **Step 1: Network definition** – defining the hydraulic network to be controlled.
- **Step 2: Hardware definition** – defining the hardware used for the control.
- **Step 3: Connections definition** – defining where each of the network items are physically connected.

These steps are intended to be performed by an authorized technician only. The detailed explanation about system setup is beyond the scope of this guide and can be found in the **INSTALLATION GUIDE**.

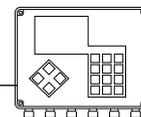
Dealers Definitions

The person responsible for system setup is able to fine-tune the system, hiding unnecessary features and revealing useful ones. This person can dictate global default parameters, decide about system behavior in special cases, and make changes in the memory allocation. Because of the sensitivity of the data, changes are permitted only after inserting a password (**247**) and only when the system is idle.

Although the **DEALERS DEFINITIONS** are intended for the end user, it is useful to know which options can be selected during these definitions.

DEALERS DEFINITIONS			
< 1 >	Cycles per start	(y/n)	<input checked="" type="checkbox"/>
< 2 >	Priority definition	(y/n)	Y
< 3 >	Constant Groups	(y/n)	Y
< 4 >	Temporary Groups	(y/n)	Y
< 5 >	Start together	(y/n)	Y
< 6 >	Conditions	(y/n)	Y
< 7 >	Water before special	(y/n)	N
< 8 >	Full menu	(y/n)	Y
			-->

- **< 1 > Cycles per start** – enables irrigation in cycles, which means repeating the irrigation a specified number of times.
- **< 2 > Priority definition** – enables prioritizing irrigation programs. In case of conflict, the program with the higher priority irrigates and other programs wait. A higher number indicates higher priority.
- **< 3 > Constant Groups** – enables defining groups of valves, **G1**, **G2**, etc. The groups can be used by various programs.
- **< 4 > Temporary Groups** – enable grouping valves together by the **&** sign. The group will have a common dosage and it is recognized only by the program in which it has been defined.
- **< 5 > Start together** – enables synchronizing opening various valves by means of the **+** symbol. Valves can be in different irrigation lines. The purpose of the synchronization is to enable central fertilization by the valves. All the valves separated by the **+** sign, if requiring central fertilization, share the same central fertilization job.
- **< 6 > Conditions** – enables using Conditions.
- **< 7 > Water before special** – enables defining a specific amount of water before fertilization for the first fertilizer of each local fert. site. This specific amount differs from the water before, used by the other fertilizers.



- **< 8 > Full menu** – when full menu is enabled, all the subjects are accessible by the user, otherwise some subjects of the **SETUP** menu are not accessible.

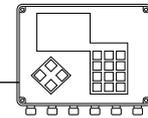
The **FERTILIZERS DOSAGE MODES** screen defines which of the fertilizer dosage modes is revealed to the user. There can be a different definition for local and for central fertilization. The **D** column defines the default mode.

FERTILIZER DOSAGE MODES			
THE MODE	LOCAL	CENTR	D
< 9 > L/m ³	<input checked="" type="checkbox"/>	Y	+
< 10 > sec/min	N	Y	-
< 11 > m:s/m ³	N	Y	-
< 12 > L/min	N	Y	-
< 13 > Volumetric prop	Y	Y	-
< 14 > By time(h:m:s)	Y	Y	-
< 15 > Bulk(L)	Y	Y	-
←--			--→

- **< 9 > L/m³** – liters of fertilizer per each cubic meter of water
- **< 10 > sec/ min** – seconds of injection per each minute of irrigation
- **< 11 > m:s/m³** – minutes and seconds of injection per each cubic meter of water
- **< 12 > L/min** – liters of fertilizer per each minute of irrigation
- **< 13 > Volumetric prop** – the specified fertilizer quantity injected proportionally
- **< 14 > By time(h:m:s)** – continuous injection of the fertilizer quantity specified by time units
- **< 15 > Bulk(L)** – continuous injection of the fertilizer quantity specified in liters

DEALERS DEFINITIONS		
< 16 >	Using fertilizer set	<input checked="" type="checkbox"/>
< 17 >	Global fertilizer limit	Y
< 18 >	Alarm sound	Y
< 19 >	Sensors log records	100
< 20 >	Performance log records	50
< 21 >	Graduated opening(step=4)	8
←--		--→

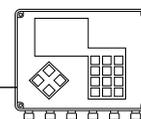
- **< 16 > Using fertilizer sets** – enables using fertilizer sets. The fertilizer sets are predefined formulas of fertilization to be used by the irrigation programs. See **FERTILIZER SETS LIBRARY** in the **PARAMETERS** submenu.
- **< 17 > Global fertilizer limit** – when this option is activated, the system controls the total amount of each type of fertilizer supplied by each valve so that the predefined limits set by the user is not exceeded during the entire season. The seasonal limit setting is performed via **FERTILIZER LIMIT** on the **PARAMETERS** submenu.



- **< 18 > Alarm sound** – enables activating the buzzer in case of problems existing in the system, while being in the screen of the main menu.
- **< 19 > Sensor log records** – when specifying a nonzero value, there is an allocation of memory for the logger of the analog sensors. See **LOGGING ANALOG SENSORS** in **APPENDIX B**.
- **< 20 > Performance log records** – when specifying a nonzero value, there is an allocation of memory for the performance logger. See **PERFORMANCE LOGGING** in **APPENDIX B**.
- **< 21 > Graduated opening** – when irrigating in shifts, each shift may include a large number of valves. If one shift terminates and another shift starts, changes could occur in the pressure and the flow might damage the system. To eliminate this kind of problem, BIC 2500 offers the option of graduated opening/closing of valves. When this option is selected, instead of closing simultaneously all the valves of the terminated shift and opening simultaneously all the valves of the starting shift, the opening/closing is carried out in a graduated mode: one valve is closed and one valve is opened, and after a specified delay, another pair of valves follows. The delay can be specified in increments of 4 seconds up to 60 seconds.

DEFAULT VALUES OF VALVES			
< 22 >	FLOW-nominal	10	(m3/h)
< 23 >	FLOW-minimal	-20	×
< 24 >	FLOW-maximal	+20	×
< 25 >	Filling time	15	(min)
< 26 >	Dosage per area		Y
< 27 >	Dosage by evaporation		Y
< 28 >	Default dosage mode		m3/area
< 29 >	Area units		Dunam
←-- --→			

- **< 22 > Flow nominal** – the value of the nominal flow set by default to all the irrigation valves.
- **< 23 > Flow minimal** – the value of the minimal flow set by default to all the irrigation valves.
- **< 24 > Flow maximal** – the value of the maximal flow set by default to all the irrigation valves.
- **< 25 > Filling time** – the value of the filling time that will be set by default to all the irrigation valves.
- **< 26 > Dosage per area** – enables the option of dosing the water by volume/area. When this option is activated, the valves constants are added to a table in which the area covered by each valve and the crop factor are defined. See **DOSAGE BY VOLUME PER AREA** in **APPENDIX A**.
- **< 27 > Dosage by evaporation** – enables the option of dosing the water by evaporation. When this option is activated, the valves constants are added to a table in which the area covered by each valve and the crop factor are defined. The **EVAPORATION** option is added to the **PARAMETERS** submenu enabling defining the daily evaporation. See **DOSAGE BY EVAPORATION** in **APPENDIX A**.
- **< 28 > Default dosage mode** – defines the dosage mode used as default whenever a new irrigation job is defined.
- **< 29 > Area units** – units used for defining the area covered by each valve.



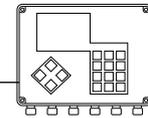
DEALERS DEFINITIONS		
< 30 >	DP act.during fill.delay	<input checked="" type="checkbox"/>
< 31 >	Same valves in seq.	Y
< 32 >	Repeated flow problem halt	N

- **< 30 > DP act. during fill. delay** – this parameter defines whether during filling delay the DP contact will be referred to or ignored.
- **< 31 > Same valves in seq.** – when this parameter is set to **Y**. The same valve can appear several times in the same sequence.
- **< 32 > Repeated flow problem halt** – when this parameter is set to **Y** and the system detects high flow or low flow problems with 3 valves of the same line consecutively, it freezes the line until it is manually released.

MEMORY ALLOCATIONS		max
< 33 >	Num. of Sequences:	63 255
< 34 >	Num. of Groups:	24 99
< 35 >	Water dosage cells:	142 610
< 36 >	Fert. dosage cells:	100 749
< 37 >	Reports cells:	400 2004
< 38 >	Virtual w. meters:	9
	3801	3622

The **MEMORY ALLOCATIONS** screen (see figure above) enables changing the memory allocated by default for various purposes. The column on the right shows the upper limit of each item.

- **<33> Num. of Sequences** – defines the number of sequences that can be defined.
- **<34> Num. of Groups** – defines the number of groups that can be defined, including constant groups and temporary groups.
- **<35> Water dosage cells** – defines the total number of irrigation jobs that can be defined in all the sequences.
- **<36> Fert. dosage cells** – defines the total number of fertilization jobs that can be defined in all the sequences.
- **<37> Report cells** – defines the total number of messages that can be stored.
- **<38> Virtual w. meters** – defines the number of virtual water meters that can be defined.



13. Appendix A: Special Dosage Modes

The **Special Dosage** modes sections explains Dosage By Evaporation and Dosage By Volume Per Area. To use these special dosage modes, they must be activated via the **DEALERS DEFINITION**. These two dosage modes simplify the calculations of how much water to irrigate. Both methods use information about the area covered by each valve, as defined in the **VALVES CONSTANTS**.

MORE VALVES CONSTANTS		
Valve	Area	Factor %
1.1	1.0	100
1.2	1.0	100
1.3	1.0	100
1.4	1.0	100
1.5	1.0	100
1.6	1.0	100
1.7	1.0	100
←	∇	→

The table contains both the area covered by each valve and a factor in % by which the calculated amount is multiplied. The factor represents the specific requirements of the particular crop. The area units are in accordance with the selection made via the **DEALERS DEFINITION**.

Dosage by Evaporation

When irrigating by evaporation, the amount of water to be supplied per each valve is calculated automatically by the system.

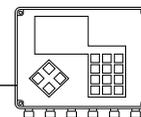
The calculation takes into account the number of days since the last time the specific valve was irrigated.

Summing up the total evaporation during the elapsed days (data taken from the evaporation table of the last 16 days) and multiplying it with the area covered by the specific valve, the result is the total amount of water lost by the specific area during the specified period. The result is then multiplied by the factor in % (taken from the valves constants) that represents the needs of the particular crop. This final result is the amount to be irrigated.

Note that if the irrigation program is a cyclic program of "n" cycles, each cycle irrigates the amount of the final result above divided by "n".

EXAMPLE: let's assume that the specific valve was irrigated 3 days ago. The evaporation of the last 3 days was 1.2, 1.3, 0.8 mm accordingly. The total evaporation is $1.2+1.3+0.8= 3.3$ mm. The area covered by the valve equals 50 dunams; therefore, the amount of evaporated water is $3.3 \times 50 = 165$ m³. If the crop factor is 80% the amount to be irrigated is $165 \times 0.8 = 132$ m³. If there are 2 cycles defined, each cycle irrigates $132/2 = 66$ m³.

Note that the system offers the option of dosage by **EVAPORATION TIME** which uses the same calculation method explained above, but the final result is converted into time units by dividing the volumetric result with the nominal flow of the valve. The irrigation is by time.



Dosage by Volume Per Area

PR. 3 WATER DOSAGE 18:31:42		
VALVE: CLOSED		Line 1
1.2A		
WATER m3/area	Plan 12.000	Left 00.000
		Calc. m3 180.000
Water After	00.000	LastFlow 0.00
←	Actions ^	→

The desired volume per area

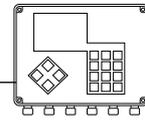
The calculated amount to be irrigated

When irrigation quantities are calculated in terms of volume of water per each unit of area, BIC 2500 offers the option of dosing the water by volume/ area. The volume unit and the area unit are selected in the **DEALERS DEFINITION**. The system calculates the amount of water to be irrigated based on the predefined data of the area covered by the valve (defined at the **VALVES CONSTANTS**) multiplied by the desired volume per area specified by the user. The result is multiplied by the crop factor in % (defined also at the **VALVES CONSTANTS**) that represents the needs of the particular crop. This final result is the amount to be irrigated.

Global Accumulative Fertilizers Limit

There is an option to define Global Fertilizers Limits per each fertilizer type of each valve so that the system guards against fertilizing more than necessary. During each fertigation process, the remaining quantity is reduced and fertigation stops when the remaining quantity reaches zero. The option of using the Global Fertilizers Limits must be activated via the **DEALERS DEFINITION**.

ACCUMULATIVE FERT LIMIT/VLV.	
Valve 4 Ln.1	(L)
Centr. 1	Line 1
F1 010000.0	F1 010000.0
←	X
	→



14. Appendix B: Logging Analog Sensors

The option of logging the readings of analog sensors' can be enabled at the **DEALERS DEFINITION** where it is possible to define the number of records to be stored at the allocated logger storage.

The process of logging the sensors will be executed in a cyclical manner, each sensor will be sampled in a selected rate. The setting of the logging rate per sensor and the starting of the logging process is done from the **UTILITIES** submenu as explained below:

The sampling rate of each sensor can be set to **Short, Medium** or **Long** periods, which, by default, equal 10, 30 and 60 minutes respectively. The default values can be changed through the **BIC 2500 PC Application**.

For **Starting/Stopping** the logging process, press

F2 = START.

When the storage allocated for the logger is full, the new samples replace the oldest ones.

SENSORS LOGGING RATE		
1	Temperat .	Short = 10
2	Humidity	Medium = 30
3	Pressure	Short = 10
←--		Start
		Change
		--▶

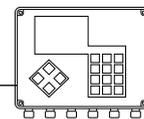
Performance Logging

To use the performance logger, there must be storage allocated for the logger during the **DEALERS DEFINITION**. The allocation is done by specifying the number of records to be stored at the allocated logger storage. When the storage is full, new samples replace the oldest ones.

What kinds of performance information is logged? In general, the possible logging may contain one of the two types of information:

- Recording parameters related with the irrigation performance. The recording occurs at the termination of irrigation program.
- Recording communication problems with RTUs and interfaces. The recording occurs each time there is a change in the status of communication with any RTU and any interface.

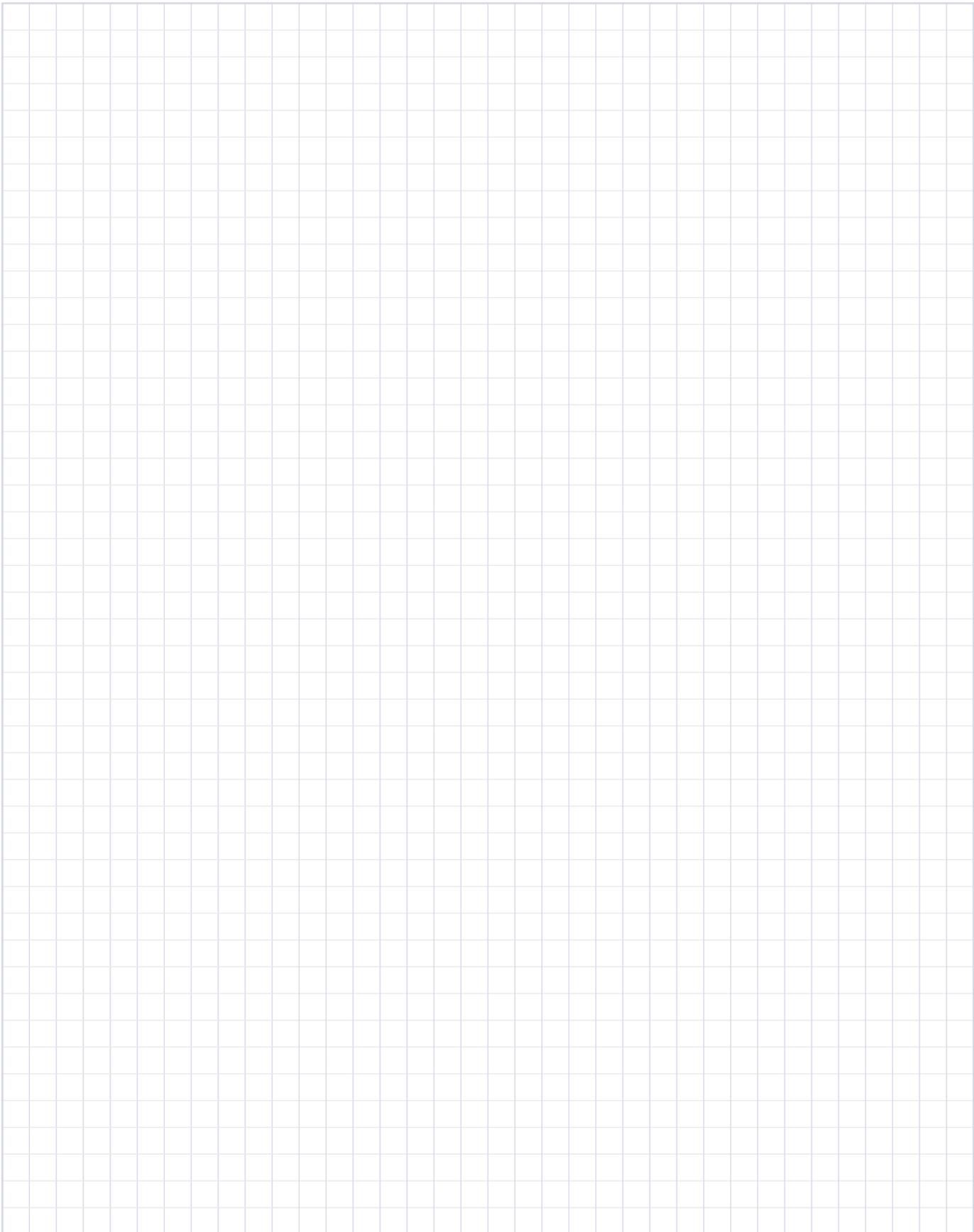
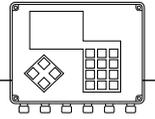
PERFORMANCE DATA LOGGER		
The termination status	Status	Y
	Water	Y
The amount of fertilizer supplied	Fert	Y
	Last flow	Y
The start time of last irrigation	Start time	Y
	Sensor data	N
	pH / EC average	N
The average pH EC reached	Communication status	N
←--		Yes
		No
		--▶

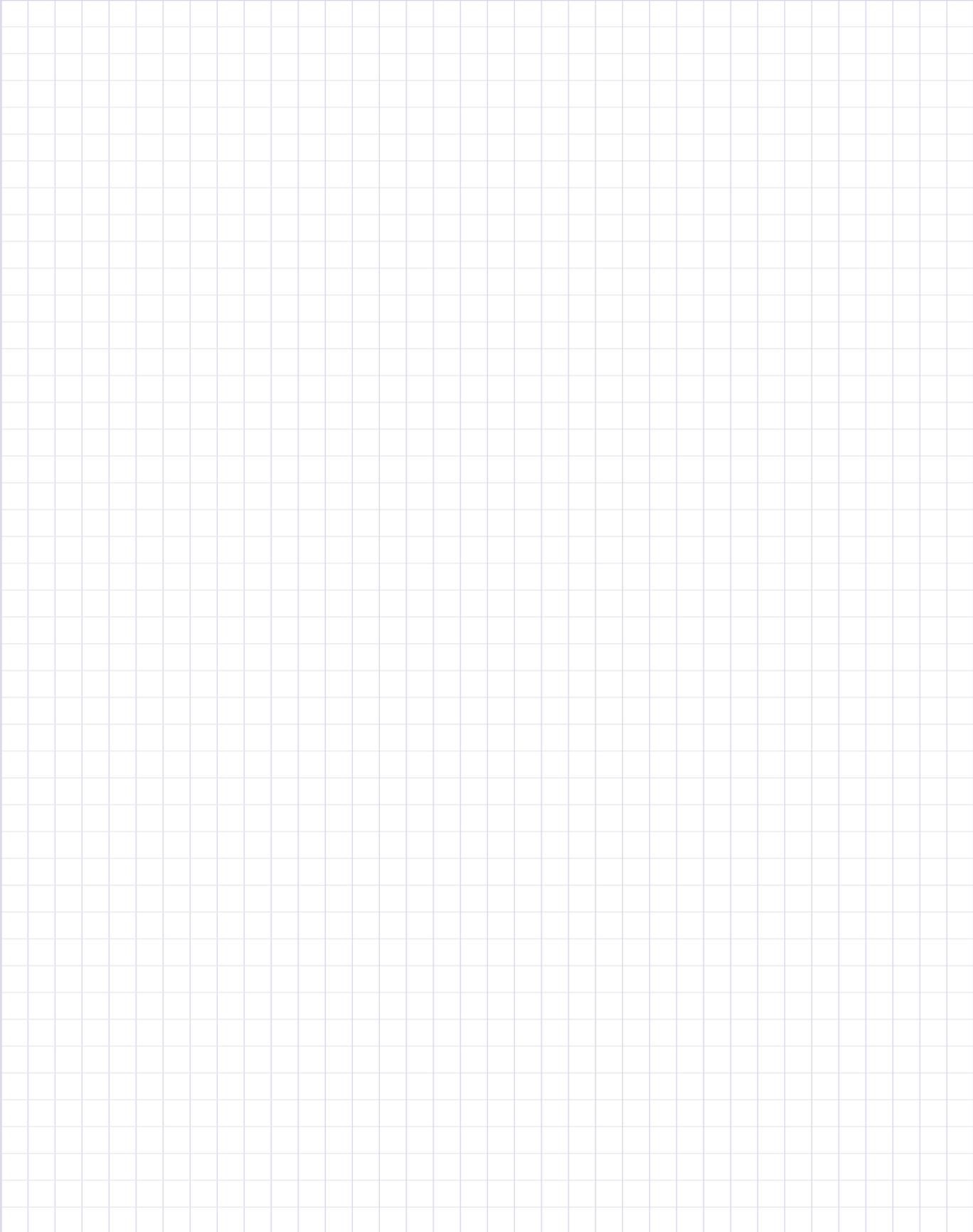
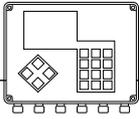


The selections of the information that will be logged, are made by the user within the **UTILITIES** submenu via the following screen:

When the **Communication Status** (last row) is selected, only communication problems are recorded.

The results of the performance logger are viewed only through the **BIC 2500 PC Application software**.





BERMAD Water Control Solutions



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