Galileo
Open Field

Version 2.82
(The numbers in brackets are the access number in the controller)

1) Preface .................................................................................................................................................................... 4
   1.1) Using the manual ........................................................................................................................................... 4
   1.2) The System Structure (software view) ........................................................................................................ 4
   1.3) Operating via the computer ......................................................................................................................... 6
   1.4) Operating via the Controller: ...................................................................................................................... 6

2) Basic operation .................................................................................................................................................... 7
   2.1) Operating via the computer .......................................................................................................................... 7
   2.2) Operating via the Controller ......................................................................................................................... 9

3) Advanced Operation ........................................................................................................................................... 10
   3.1) Irrigation Valves .......................................................................................................................................... 10
   3.2) Irrigation Program ....................................................................................................................................... 11
      3.2.1) Programming the irrigation program: (32) ......................................................................................... 11
         3.2.1.2) Valves in the program: (321 #2-6) ................................................................................................. 12
         3.2.1.3) Irrigation quantities: (321) .............................................................................................................. 12
         3.2.1.4) Fertilizing: (321) .......................................................................................................................... 13
         3.2.1.5) Permanent (cyclic) Start Program (322) ...................................................................................... 17
         3.2.1.6) Next Open Time: (322 #3-5) ......................................................................................................... 18
      3.2.2) Current Status of Irrigation Program (12) ............................................................................................ 19
      3.2.4) Irrigation Program Set Up (34) ................................................................................................................ 21
         3.2.4.1) Water Flow Rate Protection: (3431) .............................................................................................. 22
         3.2.4.2) Pipeline Flow Rate Limit: (343 #6) ................................................................................................. 22
         3.2.4.4) Priorities: (342) .............................................................................................................................. 23
      3.2.5) Irrigation Program Data (12) .................................................................................................................. 24
   3.3) Filtering (53) ................................................................................................................................................... 26
   3.4) Alarms: (8) .................................................................................................................................................... 30
   3.5) Diaries: (2) ................................................................................................................................................... 33
   3.6) Logic Conditions: (5612) ............................................................................................................................. 35
   3.7) Flow rate Limits .......................................................................................................................................... 39
   3.8) Pause Device (563) ..................................................................................................................................... 39
   3.9) Virtual Water Meter: (72322*) .................................................................................................................... 40
   3.10) Burst Protection: (in the controller: 515) ...................................................................................................... 40
   3.11) Water Pumps ............................................................................................................................................ 40
      3.11.1) Single Pump: ...................................................................................................................................... 40
      3.11.2) Pump House: (51422) ......................................................................................................................... 40
Index

3.12) Evaporation (3442) ................................................................. 43
3.13) Auxiliary (General) Outputs: (in the controller: 55) .................. 44
3.14) Valve Groups: (51132) ............................................................. 46

4) Set Up (5) .................................................................................. 47
   4.1) System set up – My Field software: ......................................... 47
   4.2) Element Definitions: ............................................................... 55
       4.2.1) Irrigation valve (511) ......................................................... 57
       4.2.2) Pipelines: (512) ............................................................... 63
       4.2.3) Water Meter: (513) ......................................................... 66
       4.2.4) Fertilizer Pump: (521) ...................................................... 66
       4.2.5) Fertilize Centers: (522) .................................................... 72
       4.2.6) Water Pumps: (7351) ....................................................... 74
       4.2.7) The Plot: (542) ............................................................... 75
       4.2.8) RTU Setup: (724) ............................................................. 76
       4.2.9) Defining Outputs for System Elements: (7231) ............... 76
       4.2.10) Defining Condition Inputs: (72324) .............................. 77
       4.2.11) Sensor Definition: (7233) ................................................. 77
       4.2.12) General Counters: (72325) ............................................. 82
       4.2.13) Operation Time Counters: (572) ..................................... 82
       4.2.14) Water Mixing Junction: (516) ......................................... 82

   4.3) Controller Setup (6) .............................................................. 88

5) Flow chart for operator ............................................................... 91

6) The Menus ................................................................................. 92
1. Preface

1.1 Using the manual

This operating manual is designed to provide basic operating instructions as well as providing definitions for Open Field programming via the software. This manual does not explain the hardware installation of the Galileo controller. For instructions on hardware installation please refer to “Galileo Set Up”. This manual also does not deal with the basic definitions of the Galileo system or the installation of the P.C software. For these instructions please refer to “Galileo PC Center”.

1.2 The System Structure (software view)

The “Open Field Program” was designed to correlate as far as possible between the structure of the software and the physical structure of the hydraulic system. The system is made up of the following objects:

1.2.1 The pipeline

In the software, transfers the operating command from the irrigation valve to the irrigation head and displays the hydraulic activity in a visual form. The system can contain between one single pipeline and up to seventy pipelines. The pipeline’s properties also include the main valve (e.g. the main valve is defined via the pipelines). The pipeline properties contain additional parameters including which pipeline (upstream) it is connected to. Using this programming method it is possible to build a pipeline network with water flow directions. Via the pipelines, the system prevents the operator from making setup mistakes such as defining a water meter for one subsystem whilst it is already defined to serve another subsystem. This setup mistake will result in the definition error “water meter not on route”. The system can limit the water flow rate to a certain point (pipeline) in the system and allows adopting separate fertilizing policies simultaneously in different parts of the system (for example one plot works without fertilization whilst another area works with fertilization). The pipeline has parameters allowing turning on the system progressively and thus prevent opening and closing shocks and avoiding pressure detentions. The pipeline is also for displaying purposes. It can be displayed on the computer screen along with the water/fertilizer flow rates. It is recommended to use as few pipelines as possible. During operation, the system controls the irrigation valves. When the irrigation valve opens (by the program), the valve in turn opens the pipeline that it is connected to, that pipeline next opens the pipeline that it is connected to and so forth in ascending order (upstream). Every pipeline that opens turns on the main valve defined in its properties as well as all other objects connected to it (for example pumps or filter groups).

1.2.2 The irrigation valves:

The virtual object here is a direct representation of the physical object. It can be incorporated in an irrigation program. The valve properties consists of 3 parts: 1. Set up. 2. Information 3. Accumulations. Set up includes definition of the output (connected to the valve’s solenoid), definition of the pipeline that it is connected to, the plot the valve belongs to and the water meter measuring the water. If you
want to set the controller according to volume (as opposed to time) it is essential to define the water meters. Information includes: valve status, the program in which it is programmed, flow rate and date of last irrigation. It also shows periodic and last day accumulations.

1.2.3 The plot:
The plot is an agricultural term that receives virtual meaning in this system. The plot is created in order to allow the division of large systems into smaller subsystems that are easier to control. The plot allows definition of valves and even apportioning pipelines to ease and simplify the controlling of the system. It is possible to work without any plots, several plots (including one plot that is part of another plot). The plots provide “zooming” on the P.C system.

1.2.4 The Water Meter:
The water meter, like the valve, is a direct representation of the physical object. Its properties also consist of 3 parts: 1. Set up. 2. Information 3. Accumulations. As previously explained, the water meter is incorporated in the valve properties. The water meter counts the water of the valves defined to use it. One water meter can serve several valves at the same time. In this case it divides the water between the valves according to the relative flow rates. (For more details see “definitions and settings”).

1.2.5 Fertilizer pump: The fertilizer pump, like the valve, is a direct representation of the physical object. Its properties also consist of 3 parts: 1. Set up. 2. Information 3. Accumulations. The fertilizer pump has many parameters (see “definitions and settings”). The fertilizer pump is incorporated in the irrigation program or in the fertilizer center and operated accordingly.

1.2.6 Fertilizer center:
The fertilizer center allows working simultaneously with a number of fertilizer pumps along with one valve or with a group of valves whilst maintaining constant fertilizing ratios between the fertilizers and in accordance with the water capacity. In addition, the fertilizer center allows control over the EC and pH of the irrigation water. Each fertilizer center consists of 10 fertilizer programs that can afterwards be used in the irrigation program.

1.2.7 Irrigation program:
The irrigation program object is the heart of the system and is the object by which the operator controls the irrigation system. The irrigation program’s properties are divided into three main parts:

1.2.7.1 Which: Which valves are operating in the program.

1.2.7.2 Quantity:
Amounts of: working time, water and fertilizer volume, water and fertilizer work methods.
1. Preface

1.2.7.3 When:
The time the irrigation starts, date, number of cycles etc.
- In addition, the irrigation program contains informative data and definitions (see following sections).
- See more information about the irrigation program in the operating section.

1.3 Operating via the computer:
The computer program is a graphic program and once defined, it is simple to operate (in spite of the system sometimes being very complex) and provides good orientation even to operators that are not totally familiar with hydraulic systems. Whilst operating the computer the user is provided with a map or diagram of the field showing each object in accordance with its geographical position. The operator can easily see both which events are taking place and where they are taking place. By clicking on the object the operator can see the object’s properties (set up, information, accumulations etc.) In addition, when one object is incorporated in another object, clicking on the incorporated object number leads to its properties being displayed and they can even be altered. For example: Clicking on the valve number of a valve that is incorporated in the irrigation program displays the valve’s properties. It is important to know that the memory and operating data (including definitions) are only stored in the controller (not on the P.C). When a new screen opens, the computer program requests the relevant data from the controller in order to create the screen. A key appears on all screens that allow programming (data changes). Click on the key in order to edit data.
This action changes the screen into editing mode whereby it is possible to move between the cells and alter the required data. At the end of editing click on the key again. This action causes the screen data to be sent to the controller.

1.4 Operating Via the Controller:
The data in the controller is organized in tables. Each table consists of rows and columns. The rows represent the various objects and the columns represent the different fields of the object’s properties. For example in the irrigation program operating table, the rows are irrigation programs i.e. row number 1 belongs to program number 1, row number 2 belongs to program number 2 and so forth. The same table’s columns contain the respective program’s properties. For example: amount of water, start time, operating days etc. The controller is organized in menu form allowing access to the tables. Each menu is in fact a list of objects that can in turn be divided into sub menus or contain tables. Moving between the menus is by the use of the up and down arrows and moving inside the tables is by the use of the up, down, right and left arrows. To go down a level click <enter>, in order to go up a level click <exit>. On narrow screened controllers each screen is a single cell in the table or one part of the menu. On the wide screened controllers several figures are displayed: an entire menu or several fields of an object (described as a table row in the data organization section). Tables can also be accessed by entering the table number (shortcut). The table number is shown in the flow chart and in the menu details appearing at the end of this manual.
2. Basic operation

2.1 Operating via the computer:
The simplest operation is by using the operation table. Click on the "operate" button on the main screen.

2.1.1 The following Operation Table screen opens:

![Operation Table Screen]

This table is actually an irrigation program table (each row is an irrigation program and each column is a field in the irrigation program's properties).

2.1.1.1 Program Active and Status:
In order to activate a program, set it to active in the first column from the left. The second left hand column shows (information only) if the program is active or not. An empty cell means that the program is inactive.

2.1.1.2 The next column shows the program status. It shows activity, alarms and programming errors.

2.1.1.3 As previously explained the irrigation program is divided into 3 parts:

2.1.1.3.1 Which
The "which" in this table is the valves' numbers operated by the program. The cell under each valve in the program contains the individual valve number. As can be seen, up to 5 valves can be used in each program. (In fact it is possible to program more valves by using valve groups – see advanced operations).
2. Basic operation

2.1.1.3.2 Quantity – Water unit must be checked first and then the quantity is entered.

2.1.1.3.2.1 Select the water unit under the water heading (pressing the cell shows the different options) the options are:

2.1.1.3.2.1.1 MM.SS - Irrigating by time (minutes.minutes.seconds) i.e. in the water amount the digits before the decimal point are the number of minutes and the digits after the decimal point are the number of seconds.

2.1.1.3.2.1.2 M3 (THG) - irrigating by volume in cubic meters – enter the desired water quantity.

2.1.1.3.2.1.3 M3/Hectare (THG/acre) - enter the desired amount of water per hectare. The controller multiplies this number by the area as defined in the valve definition. The result is placed in the “remain” column and the irrigation is carried out according to this amount.

2.1.1.3.2.1.4 Evaporation - This option allows automatic operation according to evaporation rates if using an evaporation meter or upon entering evaporation rates manually. (See detailed explanation in advanced operation). After selecting the water unit enter the required quantity (according to the selected unit). It is also possible to add fertigation by clicking the Fert Multi Prog button (see more in advanced operation).

2.1.1.3.2.2 Timing

The three columns under the heading next open: hour, days, cycles show when the next irrigation program starts. The “hour” column shows the hour that the next program starts. The “days” column shows how many days until the next program starts (0 means that the next program starts today). The “cycle” column shows how many times (cycles) the program will run. If all of the parameters are 0 the program will not run at all. These data can be manually altered. These data are also automatically updated by the permanent program (see advanced operation). The program can also be run manually (immediately) by checking the option in the manual operation column. (For further details please see advanced operation).

Minimal Programming to Start Irrigation

1. Activate the program
2. Enter valves into the program
3. Enter the water unit and water quantity.
4. Enter the activating factor (next opening or manual operation).
2. Basic operation

2.1.2 Current status display:
Back in the main screen the currently operating programs are displayed on the right side. One can see which program is operating, which valve is operating (the first valve only), irrigation status and time remaining. The first 20 programs are displayed (see the controller general definitions). A screen showing up to 50 programs and more data can be opened by clicking on the header current status.

2.2 Operating Via the Controller

2.2.1 The controller is operated by menus. Please refer to the controller flow chart to be found on the back of the controller and at the end of this manual.

2.2.2 The controller operation is based on the same principle as the operation via the computer, as described above, with a different interface. All actions that can be carried out via the computer can also be carried out via the controller.

2.2.3 During controller operation the controller is in a locked mode. I.E all of the menus that are defined as service menus are locked. The user can only access the operation menus. A password has to be entered in order to access the service menus. Enter the “settings” >> “system security” menu and enter the code “0009”.

2.2.4 The open menus (accessed without password) include:

2.2.4.1 Current operation information on the programs currently running (menu 11).

2.2.4.2 Irrigation programs - programming and information (menu 2).
The irrigation programs are divided into several different parts (tables) in order to make operating easier. In all of these tables each row is a different program (as explained in the preface). The irrigation program tables are divided as follows:

2.2.4.3 Valves and quantities: This table allows programming the valves in the irrigation program, the water units and quantities of water and fertilizer.

2.2.4.4 Timing: This table includes the following operation as described in the computer operation as well as the permanent (cyclic) program (see advanced operation).

Minimal Programming to Start Irrigation
1. Access the valve and amount menu (menu 21)
2. Enter the valve numbers
3. Enter the water units and quantities
4. Exit the valve and amount menu
5. Access the timing menus (menu 22)
6. Enter the hour and days for the next opening (tip: enter an hour that has already passed and 0 days (today) for immediate opening).
7. Manual opening is also possible by accessing menu 62.
3. Advanced Operation

The following different functions and data are explained in accordance with the computer screens. The direct access numbers for programming via the controller can be found in brackets next to the relevant headings. In some cases it is necessary to enter a password in order to access the required data in the controller. In order to program the access password, access menu 74 (system security) and type the code “0009” (do not press Enter). Exit by pressing Return to Start Menu and enter the aforementioned direct access number.

3.1 Irrigation Valves

The properties of this object includes: Set up, information and accumulation. Click on the valve icon in order to open the following valve property screen:

![Valve Property Screen]

3.1.1 Set Up (Valve’s Constant): the valve set up appears on the lower left hand side of the screen. The valve set up is described in detail in the set up chapter.

3.1.2 Information (13): the upper left hand side shows which program is currently using the valve (see the irrigation program) (up to 3 programs are displayed sorted by their numbers although it is possible to program the valve in an unlimited number of programs), in which program the valve is currently irrigating (a valve can only irrigate...
3. Advanced Operation

concurrently in one program apart from when it is a co-valve – see below). The date when the valve last irrigated and the actual flow rate are also displayed.

3.1.3 Accumulation: (151) the right hand side of this screen shows daily and periodical water accumulation and up to 7 different fertilizer pumps (1 local and 6 fertilizer centers). The periodical accumulation also shows the accumulation start date. All of the data can be edited i.e. can be zeroed or changed to a value other than zero for monitoring purposes.

The valve settings are described in detail in the installation chapter. The solenoid can be manually operated on the lower left hand side of the screen, this leads to the valve being manually opened but if there is no water in the system nothing will occur. When a valve is opened by a program the attached pipelines also open leading to the activation of the entire system (as described in the preface). Manually operating the valve’s solenoid is generally used for testing purposes. Seeing that manual operation prevents the valve from being automatically operated (opening or closing) a “valve on manual mode” warning appears.

3.2 Irrigation Program

To open the irrigation program click on the blue number on the operation table or on any irrigation program number in any part of the controller. The following screen appears:

This screen displays programming parameters from the irrigation program and current program operational data.

3.2.1 Programming the irrigation program: (32) In order to program the irrigation program the following data have to be entered:
3. Advanced Operation

3.2.1  **Active program:** (321#1) – the parameter shown next to the program (on the above screen) defines whether the program is active, inactive or paused. Upon leaving the factory all of the programs in the controller are inactive. In order to start a program the program must be made active.

3.2.1.2  **Valves in the program:** (321 #2-6) – the program allows operating a number of valves as described in the preface (up to 50) and controlling the quantities and flow rates flowing through. In order to operate a program it is necessary to define the valves' numbers (up to 5, one in each cell) to be operated (at least one valve must be entered). More than 5 valves can be used by defining valve groups.

3.2.1.2.1  **Valve groups:** (5113) Groups are setup in accessories on the PC.

Enter the numbers of up to 10 valves that will be part of the group. There are up to 10 groups whose numbers are: 1001, 1002,.........1010. After entering the valve numbers into valve groups the valve group number can be entered as a valve number in an irrigation program and all of the valves in the group will open and be controlled as any other valve in the program. *Restrictions apply in defining valves as part of a group in that all of the valves have to be connected to the same irrigation pipeline and to the same water meter.*

3.2.1.3  **Irrigation quantities:** (321) as a rule irrigation time can be defined by time, water quantity (cubic meter) (THG) or by more complicated functions that automatically calculate irrigation duration. The parameter that defines the irrigation measurement is the **irrigation unit** (#9) (see irrigation program screen above). There are several options for this parameter:

3.2.1.3.1  **MM.SS:** Irrigation will be carried out by time. The value entered for the irrigation quantity is in Minute Minute. Seconds Seconds format. For example 25.32 means that irrigation will be carried out for 25 minutes and 32 seconds, 262.56 means that irrigation will be carried out for 4 hours, 22 minutes and 56 seconds.

3.2.1.3.2  **Cubic Meters:** The program runs according to water volume in cubic meters. The number entered is the volume of water in cubic meters measured by the water meters defined in the valves. If the water meters are not defined an undefined water meter alarm will appear. If the irrigation program uses a number of valves using different water meters
3. Advanced Operation

the program counts the total amount of water passing through all of the water meters.

3.2.1.3.3 M3/Hectares (THG/acre): The irrigation is carried out by volume. The program calculates the amount of cubic meters needed to irrigate by multiplying the entered irrigation quantity value (required amount of cubic meters per hectare) with the area defined in the irrigating valves (see valve definition). The resulting calculation appears in the water remaining field (see the following).

3.2.1.3.4 Evaporation: The program calculates the amount of water according to evaporation rate data (see following details).

3.2.1.4 Fertilizing: (321) The system allows a range of operations from the simplest form of one connected fertilizer to fertilizer centers controlling Galcon “fertilizing machines” such as Fertijet and Fertigal. The system allows advanced control by EC and pH levels and a further wide range of options.

3.2.1.4.1 Local Fertilizer: (321#12-14) local fertilizing is the simple action of fertilizer injection by a fertilizer pump serving the program. The local fertilizer is an integral part of the irrigation program (see above irrigation program screen). The following values have to be entered to set up the local fertilizer:

3.2.1.4.1.1 Fertilizer Number: (#12) enter the fertilizer number as defined amongst the 30 possible fertilizers that the system provides.

3.2.1.4.1.2 Fertilizer Units and Amount: (#13) several options are available:

3.2.1.4.1.2.1 Liter: the fertilizing is carried out by the volume of fertilizer in liters. This method necessitates the definition of a fertilizer meter (as part of the fertilizer pump properties – if a fertilizer meter is not defined a fertilizer meter failure alarm will appear). The program will inject fertilizer according to the quantity in the fertilizer amount (see above irrigation program screen).

3.2.1.4.1.2.2 MM.SS: fertilizing by time. The fertilizer pump will be turned on for the amount of time; minutes minutes.seconds seconds as defined in the fertilizer amount. For example: 25.32 – the fertilizer pump will be turned on for 25 minutes and 32 seconds.

3.2.1.4.1.2.3 Liter/Hectare (gallons/acre): fertilizing by volume (necessitates defining a fertilizer meter as described in the liter section). The program calculates the required liters of fertilizer needed to irrigate by multiplying the entered fertilizer amount with the area as defined in the irrigating valves.
3.2.1.4.1.2.4 Liter/Cubic Meter (gallons/THG): relative fertilizing. The program turns the fertilizer pump on and off in accordance with the desired water/fertilizer ratio.

3.2.1.4.1.2.5 Related: relative fertilizing. The program calculates, before it runs, the water/fertilizer ratio. In the fertilizer amount enter the total quantity of fertilizer in liters to be injected. During the fertigation time the program calculates the amount of liters to be injected into each cubic meter and runs accordingly.

3.2.1.4.2 Water Before Fertilizer and Water After Fertilizer: (321 #17-18) water before fertilizer is used as a delay in fertilizing in order to stabilize pressure before fertilizer injection or as a method of determining when the fertilizing should start in the irrigation program. Water after fertilizer is mostly used to flush the fertilizer out of the pipelines. The water units before and after fertilizer are the same as the irrigation units. During all of the above actions, the fertilizing and the fertilizer calculations are carried out during fertilizing time (that is the irrigation time between water before and water after fertilizing. Water before and after fertilizer also applies to the fertilizer program from fertilizer centers as detailed in the following section.

3.2.1.4.3 Fertilizer Centers: (321 #15-16) these are objects consisting of a number of fertilizer pumps (up to 6) that can fertilize simultaneously. The method is first to program the fertilizer program in the center (up to 10 different fertilizer programs can be programmed), then assign the fertilizer program to the irrigation program. In the irrigation program – enter the fertilizer center number first (up to 10 different fertilizer centers can be defined in the system) and then the fertilizer program number in the center (see above irrigation program screen). To access fertilizer Center Programs click on the fertilizer center number. (It can also be accessed by clicking on the fertilizer center icon and then on the fertilizer programs). The following screen appears (in the controller: menu 33, select the fertilizer center number and press Enter):
3. Advanced Operation

Explanation of the screen: Each column represents a different fertilizer program. The first line is for information purposes and shows the program status. The following lines are for set up as follows:

3.2.1.4.3.1 Water Meter Number: (#2) enter the water meter number that the fertilizer center works with. It is obligatory to define this number.

3.2.1.4.3.2 Fertilizer Unit: (#3) see the description of the unit in the local fertilizer (operation is identical). The fertilizer unit is uniform in all of the fertilizer pumps (it is not possible to define different fertilizer units for different fertilizer pumps).

3.2.1.4.3.3 Amount of Fertilizer and Fertilizer Pump Number:
(#4-9) fertilizer pump number here are for information only (it cannot be altered in this menu) and is determined by the definitions of the fertilizer center. The amount in every program is according to the fertilizer unit as described in the previous paragraph.

3.2.1.4.3.4 Required EC and Ph: (#10-11) see details below.

3.2.1.4.3.5 Water Mixing Program Number: (#10-11) a water mixing junction program can be attributed to a fertilizer program. (For further details see Water Mixing in definitions).

3.2.1.4.3.6 In Fertilizing Pump Fault: (#14) actions to be taken in the event of fertilizer pump fault – continue or stop.

3.2.1.4.3.7 Automatic Adjustment to Fertilizer Pumps by EC or pH: the adjustment percentage can be restricted. This value is also part of the fertilizer pump’s properties. Values entered here have priority. The advantage of entering the value here is that it applies to all of the EC fertilizer pumps together. (For further details see fertilizer pumps and fertilizer center definitions).
3. Advanced Operation

3.2.1.4.4 EC and pH Control: this control maintains the conductivity and acidity level of the irrigation water. These levels are maintained by fast reacting fertilizer pumps such as Venturi pumps with mechanical solenoids or electric pumps that can work on very short cycles (single seconds – for further details see fertilizer pump definitions). In order to use this control define a fertilizer center (it is not possible to use this control on local fertilizers). In the fertilizer center enter the desired EC level and the desired pH level **EC required** and **pH required** (see above fertilizer center screen). The program starts to fertilize according to the defined fertilizer/water ratio (the fertilizer unit has to be liter/cubic meter) (gallons/THG) and checks the EC and pH readings. If the actual levels are higher or lower than the required levels the controller alters the water/fertilizer ratio in order to achieve the desired levels. The changes are carried out by percentage. The same adjustment percentage is carried out on all of the fertilizer pumps that are defined as EC. A different adjustment percentage is carried out on all of the fertilizer pumps that are defined as pH. In this fashion the ratio between pumps of the same type is maintained. The maximum adjustment percentage has to be defined (see fertilizer definitions). This setting helps safeguard the system by restricting the allowed adjustments and the system issues an alarm if the required levels and actual levels are too far apart (see alarms section). There are several adjustment methods:

3.2.1.4.4.1 PID – see fertilizer center definition.

3.2.1.4.4.2 Distance from target – see fertilizer center definition.
3.2.1.5 Permanent (cyclic) Start Program: (322) This part of the irrigation program deals with conditions for starting irrigation. This part is not altered by the running program (unless the operator alters it) and is carried out by the program in a cyclic method either by irrigating every number of days or on set days of the week. In addition a number of daily cycles can be defined (see irrigation program table below).

3.2.1.5.1 Operation Mode: (322 #7) there are two possibilities:

3.2.1.5.1.1 Time: The irrigation program works independently according to its opening times irrespective of other programs. I.E. it is possible to run simultaneously as many programs as wanted (unless priorities are defined or conflicts occur – see following explanation).

3.2.1.5.1.2 Follow: The irrigation program runs after its preceding program (order by program number). The program ignores its opening times and will run as soon as the preceding program finishes. By forming chains of first programs by time followed by a number of following programs, an entity known as sequence is created that runs sequentially (program after program without breaks). When a program is defined as part of a sequence the opening conditions are set down by the first program in the series (this also applies to number of cycles and conditions). During manual operation there a number of parameters that are explained in the next section.

3.2.1.5.2 Start Time: (322 #7) the start time for starting the program when working with interval days (not days of the week). The start time is according to the 24 clock. The hour 24:00 is not defined and therefore must not be used.

3.2.1.5.3 Interval Days: (322 #6) Irrigation every certain number of days. 1 = daily, 2 = every other day, 3 = every third day and so on.

3.2.1.5.4 Days Of The Week: (#10-16) If the interval days = 0 then the Days in the week becomes active. The following screen appears after clicking on the Days in the week button.

Enter the desired start time for every day that irrigation will occur.
3. Advanced Operation

Back at the Program Table:

3.2.1.5.5 Cycles: The program can run many cycles for a certain Start Time. Two parameters are involved:

3.2.1.5.5.1 Cycles per Day: (#17) the number of cycles carried out per opening. The program will carry out the defined number of cycles even if it takes several days to accomplish this or up until the end time (explanation follows). The amount of irrigation is for a single cycle.

3.2.1.5.5.2 Cycle Interval: (#18) when programming several cycles enter the cycle time in minutes. For example: if a program is set to run for 40 minutes and the cycle duration is 60 minutes the program will irrigate for 40 minutes and then “rest” for 20 minutes. If the cycle interval is less than the program time then the program will run continuously i.e. as soon as one irrigation cycle finishes the next irrigation cycle will begin. This will also occur if the cycle interval is zero. When working with a sequence (as previously explained) the entire sequence works in cycles and the next start time and cycle interval are for the entire sequence. In this case if the cycle interval is zero the sequence will work continuously, i.e. when the last program finishes the first program will immediately start again.

3.2.1.5.6 End Time: (#19) the end time works in conjunction with the start time (irrespective of whether the start time is by daily cycle or if the start time is by days of the week). The system will only irrigate between the start time and the end time. In the case of a large number of cycles the cycles will be carried out up until the end time when the remaining part of the cycle will be cancelled. The program will wait until its next start time (according to interval days or days of the week). For example: If a number of cycles are to be carried out between 22:00 and 04:00 the start time is set at 22:00, the end time at 04:00. If the cycle interval is longer than six hours the program will only run between 22:00 and 04:00 and the remaining cycles will be cancelled. End time is not obligatory. If a program has a start time and doesn’t have an end time it will first finish the remaining cycle and only then will carry out the next irrigation.

3.2.1.5.6.1 Start Date and End Date: (#20-21) it is not compulsory to enter these values. If they are used then they both have to be entered. If defined, then irrigation will only be carried out between the set dates. If not used, the irrigation is carried out according to the other conditions irrespective of the date.

3.2.1.6 Next Open Time: (322 #3-5) this group of parameters including next open time and days to next open and cycles remaining determine when irrigation will actually start. Days set at 0 = today, days set at 1= tomorrow, days set at 2 =
3. Advanced Operation

the day after tomorrow and so forth. These values are used both for information
and programming. These values are updated by the program and can be altered
manually. If the values are entered manually the irrigation will start (once only)
according to these values (even if the permanent program is empty). If the next
opening time is reset to zero and there is a permanent program, then the next
opening time will be according to the permanent program. When the program
starts irrigating these values are reset and are then updated by the permanent
program. If there are several cycles programmed then only the next opening
hour resets and updates according to the current time + cycle interval. The
next open parameters are very important information as they indicate what
the controller is going to do. All of the programs can be scanned quickly (in the
operation table screen) and an overall picture formed.

Back at the upper right corner of the program table:

3.2.2 Current Status of Irrigation Program: (12) The current status of the irrigation
program is displayed on the right hand side of the irrigation program screen.

3.2.2.1 Operational Status: (12 #3) shows the current status of the program. The
possible states are: inactive, definition error, no start time, active, active +
alarm, delay, fault (delay + alarm), waiting, waiting + alarm, irrigating, fertilizing,
irrigating + alarm, fertilizing + alarm.

3.2.2.2 Programming errors: (12 #3) shows the programming error (if exists), there
is also usually a general alarm. There are 29 causes for warnings – for further
details see the alarms section.

3.2.2.3 Waiting Reason: (12 #4) programs usually wait when there is a conflict
with other programs. If a waiting reason exists, the program that entered the
queue later will wait or the lower priority program will wait (see priorities). If both
programs have the same start hour then the program with the higher number
will wait. Possible waiting reasons are:

3.2.2.3.1 Priority: when two programs belong to the same priority group (see
priority groups in program constants) and a program with higher priority
is currently running.

3.2.2.3.2 Sequence: the program is part of a sequence and is waiting for its turn
to run.

3.2.2.3.3 Water Meter: There are more than five programs using a water meter.

3.2.2.3.4 Fertilizer Pump: The program requests use of a fertilizer pump that is
already being used by another program. In order for two programs to use
the same local fertilizer pump the following conditions have to be met: the
fertilizing is not proportional, their proportions have to be the same and
3. Advanced Operation

the program does not use water before and after fertilizer. In this case both programs will use the same fertilizer pump and the fertilizer will be divided between the programs and valves in the programs by the valve’s nominal flow rates (see following section on water and fertilizer division). Under any other circumstances the program that started first will have priority over the other program which will in turn wait.

3.2.2.3.5 Fertilizer Center: When two or more programs all request to work with a different fertilizer center simultaneously and are using the same pipelines. Different programs can work simultaneously with different fertilizer centers on the condition that they are situated in different areas (as far as the controller is concerned this means separate pipelines).

3.2.2.3.6 Irrigation Valve: If two programs using the same valve attempt to run together the system will suspend one of the programs (according to the aforementioned waiting rules). In the case of a valve being defined as a co-valve (in the valve set up) several programs can work with the same valve (see valve set up).

3.2.2.3.7 Fertilizer Program: When two programs request to work with the same fertilizer center but not with the same fertilizer program. Two programs or more can work with the same fertilizer center on the condition that they all use the same fertilizer program. The fertilizer is divided amongst the valves according to their nominal capacities. Under any other condition the program will be suspended.

3.2.2.3.8 Time Range: When a program exceeds its time range (between start time and end time) whilst waiting.

3.2.2.3.9 Pipeline Flow Rate Limit: When a program requests to start but its nominal flow rate exceeds the pipeline’s flow rate limit (see pipeline set up and program constants).

3.2.2.3.10 Water Mixing: see section on water mixing junction (in set up).

3.2.2.4 Current Irrigation Parameter: these parameters are altered by the program during irrigation:

3.2.2.4.1 Measuring Unit: (331 #9) water – M3 (THG) – measuring by volume, time – mm.ss – working on a time base.

3.2.2.4.2 Water Remaining: (312 #11) the amount of water or time that remains until the end of the irrigation. This is the place to alter water quantities during irrigation. The irrigation can be terminated by altering the amount of water remaining to 1, the program will then subsequently finish. Entering zero here will serve as a code for copying data from the permanent program. Method of operation: An active program (i.e. a program that
3. Advanced Operation

has valves, irrigation quantity and opening time) calculates the water remaining data according to the irrigation amount and units from the irrigation program. If the remaining water is not zero in an active program the value of water remaining is not changed. In normal operation at the end of irrigation the parameter is zero thus the new value is loaded for the next irrigation. This value can be manually altered and thereby bypass the current irrigation amount or bypass the next irrigation amount once.

3.2.2.4.3 Water Delivered: this is purely informative and shows how much water (in the irrigation units) has passed through the system since the beginning of the irrigation.

3.2.2.4.4 Remaining Time: (311 #2) calculated time remaining (in minutes) till the end of the irrigation.

3.2.2.4.5 Current Fert: information about each fertilizer pump (both local pumps and pumps in a center): fertilizer required (according to the fertilizer units) and fertilizer delivered. These values cannot be altered. Alterations to a fertilizer program whilst irrigating must be made in the program itself (either in the local fertilizer pump program or in the fertilizer pump center program).

3.2.2.4.6 Nominal and Actual Flow rate: (3431) the nominal flow rate is the sum of all of the nominal flow rates as defined in the valve set up of the valves running in the program. The actual flow rate is the sum of the flow rates of the water meters feeding the valves used in the program (as defined in the valve set up).

3.2.3 Restricted Delay – minutes (413) Upon entering the pause time in minutes, the program is immediately paused for the time entered.

3.2.4 Program Set Up: (34)
Pressing the set up button opens the following screen:
3. Advanced Operation

3.2.4.1 Water Flow rate Protection: (3431) one of the most important roles of the irrigation control system is to protect the system from unforeseen scenarios that could occur during irrigation. For example a burst water pipe, a disconnected command micro tube, clogs in the system etc. The best way of monitoring this is by monitoring water flow rate. As the nominal flow rate is known it is possible to compare it with the measured flow rate. Thus, if the difference between the two values is too large an alarm can be issued and the irrigation can even be stopped. The nominal flow rate is defined in the valve set up (see valve set up).

Flow rate protection data includes:

3.2.4.1.1 Flow rate Protection Unit: the flow rate deviation of the measured flow rate can be protected by percentage or by M³/Hour (GPM) above or below the nominal flow rate.

3.2.4.1.2 Under and Over Flow rate: the maximum deviation of the measured flow rate above/below the nominal flow rate. The units are as defined in the previous paragraph.

3.2.4.1.3 Pipeline Filling: At the start of irrigation when the pipelines are empty the measured water flow rate is very high (there is still no resistance to the flow rate). Therefore during this period of time, which can be measured in minutes or cubic meters, flow rate protection is ignored.

3.2.4.1.4 Flow rate Protection Delay: in order to avoid false alarms enter a delay time that defines how long to wait from the moment that a fault has been detected until the alarm is issued. Often water flow rate rises for a short period of time but this is not necessarily a fault. If the water flow rate returns to its normal range within the delay time the fault is reset. Flow rate delay can be in minutes or cubic meters (THG). First select the unit and then enter the delay time for under and over flow rate.

3.2.4.2 Pipeline Flow Rate Limit: (343 #6) it is possible to restrict the flow rate on a specific pipeline (on any pipeline – see pipeline set up). In this case the system checks the flow rate limit on the pipeline and the nominal flow rate of the program at a specific time. If the program wants to start irrigating on a pipeline whose flow rate (including the starting program) exceeds the limit, the program will be suspended until there is “room” for the program to fit in. This value defines which pipelines have flow rate limit. Please note: When planning the system make sure all programs working in the same area have flow rate limits on the same pipeline.

3.2.4.3 Irrigating During Fertilizer Fault: (341 #5) (Yes/No) allows the operator to define whether irrigation continues or ceases during a fertilizer fault. Fertilizing will always cease.
3. Advanced Operation

3.2.4.3 **Automatic Alarm Cancellation**: (341 #6) (Yes/No) will alarms be automatically cancelled (see alarm section).

3.2.4.4 **Priorities**: (342) one of the main advantages of the Galileo Open Field program (in comparison with the competition) is the ability to run programs independently i.e. can simultaneously run a large number of programs even when they are in the same area. Sometimes the need arises not to allow a number of programs to run but to restrict the irrigation in a specific area during one program cycle. In addition it is sometimes necessary to give higher priorities to certain programs. For these purposes use the mechanism known as “priorities”. This mechanism contains 10 virtual groups that can be assigned to various programs. The principle is that two programs from the same group will not run at the same time. Furthermore, there are priorities within the group and a program with higher priority will run before a program with lower priority and the program with the lower priority will in fact be suspended. The priorities mechanism is very flexible and does not restrict which programs or the number of programs assigned to a group. This feature makes planning priorities a little confusing because programming data belongs to the irrigation programs and not to the priorities group (the priorities group is a virtual element that cannot be seen – it is only possible to see which programs belong to the same group). In order to set up priorities for certain programs access the program constants (see above screen), enter the number of the group the program belongs to (1-10) and the priority of the program within the group (1-10) whereby the higher the number the higher the priority. I.E. if two programs from the same group should run at the same time the program with the higher priority number will run first. If programs are assigned to a priority group but are not given priority within that group the principle that programs from the same group do not run together is maintained. The programs will run according to the order of conflicting programs – the program that started first will finish first, if two programs are waiting then the one that has been waiting the longest will run first and if two programs should run at exactly the same time then the program with the lowest sequence number will run first. One of the applications derived from the priorities feature is the ability to create series that are not only based on the program’s sequence numbers. In order to make programming priorities easier it can be carried out in the operation screen where the two values (priority: number, group) can be seen and edited. An additional value – cancel (priority) time – minutes is in the Program Set Up screen. This value determines within how much time the program will be given the highest priority and will start to run thus ensuring that the program will run (otherwise under certain circumstances the program may never run).

3.2.4.5 **Number of Logic Conditions**: (323 #1) allows using the same logic condition on a large number of programs (see logic conditions). Enter the number of the logic condition in this cell. The condition will be carried out on the program according to the action defined in the logic conditions set up.
3. Advanced Operation

3.2.4.6 Accumulation Sensor: (323 #2-4) the following three values refer to an element whose role is to accumulate data from a sensor and to run the program in accordance.

3.2.4.6.1 Sensor: if this option is chosen as the type of accumulating element then the mechanism works according to the following principle: Every minute the program will accumulate (under the parameter accumulation element type that can be seen in the program information screen) the value of the sensor (whose number has to set up in “accumulator element number”). When the value reaches the number programmed in “accumulation value above” the program will start to run and the accumulator will be reset for a new count. This feature is mainly used for operating by radiation accumulation when in this case the sensor will be a radiation sensor.

3.2.4.6.2 Counter: This works in the same way as the sensor the difference being that the element accumulation updates according to a general counter (whose number is entered in accumulator element number). This counter on every increment, updates the element accumulation and the program starts in the same way as it works with sensor.

3.2.4.6.3 Evaporation: In order to work automatically according to evaporation enter evaporation and leave element number and accumulation value above empty. (See following evaporation section).

3.2.4.7 Fertilizer Cancelled Today: (341 #3) fertilizer program will not run today even though it has been programmed. This value is cancelled automatically at midnight. If this value is active a message will appear in the main program screen.

3.2.4.8 Permanent Fertilizer Cancellation: (341 #4) the programmed fertilizer program will not run. This value can only be altered manually to – No. If this feature is active a message appears on the main program screen.

3.2.5 Program Data:

![Program Data Screen](image)
3. Advanced Operation

3.2.5.1 **Cycles Done:** (12#30) number of irrigation cycles carried out today (from midnight).

3.2.5.2 **Time Waiting – minutes:** (12 #5) how many minutes the program has been waiting (if the program is currently waiting).

3.2.5.3 **Wait. Reason:** (12 #4) this parameter is identical to the reason for waiting on the program screen (see program screen).

3.2.5.4 **Last Irrigation Data:** (12 #17-28) data from the program’s last irrigation: quantity of water in cubic meters, time in hours and minutes, latest EC and pH values and the date that the irrigation was carried out.

3.2.5.5 **Connected to Pipeline Number:** Which pipelines are the valves in the program connected to. If all of the valves are connected to the same pipeline one pipeline will be shown.

3.2.5.6 **Water Meters in the Program:** which water meters are used in the program – these water meters are defined in the valve set up.

3.2.5.7 **Operate For Plots Number:** in which plots the valves defined in the program are situated.

3.2.5.8 **Program Alarms:** (12 #6-16) the right hand side of the screen is reserved for alarms or conditions that will appear when active. The alarms appear from top to bottom: start conditions, operating conditions, delay conditions, finish conditions, delayed pipeline, water pulse fault, under/over flow fault, fertilizer fault, fertilizer not finished, logic conditions fault, water quantity limits (this refers to water limit definition in the controller general definitions – see definitions), multiplying water quantities (flag that shows that the program multiplies water quantities), fertilizer cancelled. (For further information please refer to the alarms section).

3.2.5.9 **Element Accumulation:** (12 #29) the parameter show the accumulation of the element (as defined in the program set up in paragraph 7).

3.2.6 **Operation Screens of Multiple Programs:** It is possible to choose a display screen that shows many parameters concerning one object or a screen that shows a limited amount of parameters of a large number of objects. Until this point all explanations were based on single programming screens that show all of the data of one object. An example of this type of screen is the operation table that displays all of the important data of one irrigation program. Similar screens are found under the programs button on the main screen. All of these screens list 10 programs and they are: programming programs, last irrigation data, status of all programs (this screen shows the data “program status” of 100 programs) and program constants. As previously described all of these data can be found in other screens.
3. Advanced Operation

3.3 Filtering: (53) the filtering system in the Galileo controller allows defining up to 40 filters that can be divided unequally into up to 10 groups. The system allows a great deal of flexibility in operating the filter groups.

In order to access the filter screen define the filter group in the diagram of the main screen by the use of the My Field software (see explanation in the section describing the My Field software). Click on the filter icon to open the above screen. The screen is divided into 3 parts:

3.3.1 Flushing Programs: (532) the flushing cycle program and each filter’s flushing time. The program includes:

3.3.1.1 Time Interval Between Flushes HH.MM: (#3) the time that will elapse between flushes while the filter system is waiting or flushing. This happens when the pipeline connected to the filter group is open. Please note that when the pipeline is closed the system is active but does not measure the time or flushes. The time is measured in hours and minutes i.e. 2:15 means two hours and fifteen minutes.

3.3.1.2 Quantity During Interval: (#4) the amount of water in cubic meters that passes through the water meter whose number is defined in “water meter for quantity between flushes” (736 #2) between 2 flushes when the filter system is waiting or flushing (see explanation above). When programming both time between flushes as well as quantity between flushes the first flush will operate.

3.3.1.3 Flushing Time For Filter: (#1) time in seconds that each filter flushes.
3. Advanced Operation

3.3.1.4 Delay Between Filters: (#2) time in seconds between the end of one filter flushing and the next filter starting. This data is optional and if not defined the flushes will be continuous with no delays between the filters.

3.3.1.5 Differential Pressure Stat: (736 #3) system element that notifies the controller when the pressure difference before and after the filter exceeds a certain value (preset in the actual element) indicating a clogged up filter system that needs flushing. This element is set up in condition input definition where the condition input number should be defined (see definitions). If a pressure stat is defined as well as time between flushes and/or quantity between flushes only one command can independently start the flush and it will be the first command.

3.3.1.6 Maximum Number of Continuous Flushes: (736 #4) if using a differential pressure stat a situation could arise whereby the system is badly clogged and the flushes do not clean it. In this case the differential pressure stat continuously gives the flush command thus leading to continuous flushes. This is of course not advisable and is considered a fault. Enter here the maximum number of continual flushes before the system faults and irrigation ceases.

3.3.2 Filter Data (173)

3.3.2.1 Status: (173 #1) filter group status. The data are:

3.3.2.1.1 Not Active: filter groups are not active and should be defined as active (see filter definitions).

3.3.2.1.2 Active: the filter group is active but the connecting pipeline is not working and so the filter will not flush and will not count time or water quantity. In addition the differential pressure stat command will not operate it.

3.3.2.1.3 Waiting: the group is properly defined but the connecting pipeline is open and the filter group is waiting for a flush command.

3.3.2.1.4 Flushing: the group is flushing.

3.3.2.1.5 Pressure Sustaining: It is possible to define pressure sustaining to ensure sufficient pressure to create flushing capability. Enter value for delay between the start of pressure sustaining and flushing (in seconds). During the delay filter status is pressure sustaining.

3.3.2.1.6 Fault: continuous flushing fault (due to differential pressure stat – see flushing program).

3.3.2.1.7 Filter Set Up: number of filters (from filter to filter) not in range (1-40).

3.3.2.1.8 Output Set Up: faulty filter output definitions (see filter set up).
3. Advanced Operation

3.3.2.9 Filter Order: filters numbers (from filter to filter) are not defined in the correct order - for example: from 5 to 3.

3.3.2.10 Filter Overlap: when two groups are defined with the same filters.

3.3.2.11 Flushing Time: filter flushing time is incorrect or missing.

3.3.2.12 No Command: no flushing program. Flushing interval, quantity between flushes or differential pressure stat not defined (see flushing program).

3.3.2.13 Faulty Water Meter: definition of water meter for quantity between flushes is incorrect or missing.

3.3.2.14 Quantity Between Flushes: incorrect quantity.

3.3.2.15 Time between Flushes: incorrect time.

3.3.2.16 Conditional Input: conditional input (for differential pressure stat) incorrectly defined.

3.3.2.17 Pipeline Fault: water pipeline incorrectly defined.

3.3.2.2 Number of Flushes Per Day: (173 #2) the number of flushes since midnight. Allows monitoring correct system operation.

3.3.2.3 Quantity From Last Flush: (173 #3) the quantity of water in cubic meters flowed since the start of the last flush. This is particularly important for monitoring purposes when using the quantity between flushes method.

3.3.2.4 Time Since Last Flush: (173 #4) the time in hours and minutes since the last flush. This is particularly important for monitoring purposes when using the time between flushes method.

3.3.2.5 Active Filter: (173 #5) number of currently flushing filter.

3.3.2.6 Number of Continuous Flushes: When working with a differential pressure stat and there are continuous flushes (see differential pressure stat in flushing program above) the number shows the number of continuous flushes up to now.

3.3.2.7 Flush Command (Yes/No): sometimes there is a flush command but flushing does not take place because of some other restriction. In order to help understand the system, this value shows whether there is a flush command.

3.3.2.8 Conditional Input Status: status (ON/OFF) of the differential pressure stat input (see explanation of differential pressure stat in flushing program).

3.3.2.9 Logic Conditions: logic conditions can be programmed to start the flush (see logic conditions below). The three logic condition values show if they are active.
3. Advanced Operation

3.3.2.10 Filling Delay: it is possible to delay flushes during pipeline filling by defining pipeline filling delay (see definitions). This value shows whether the pipelines are currently being filled.

3.3.3 Filter Group Definition: (736)

3.3.3.1 Group Active (YES/NO): main filter group operation control. If inactive the controller ignores the filter even if all other parameters are defined.

3.3.3.2 First Filter and Last Filter: as already mentioned the Galileo Open Field controller can control up to 10 filter groups. Define first and last filter for each group from a bank of 40 filters. The filter group will flush the filters consecutively between the first and last filter. For example: First filter=7 last filter=13 – is a group of 7 filters. During flushing, filter number 7 flushes first followed by filter number 8 and so forth ending with filter number 13. First define the filter outputs (see definitions) and then enter the first filter and last filter numbers.

3.3.3.3 Filter Group Connected to Pipeline Number: enter the number of the pipeline the filter group is connected to. The filter group will be on standby to flush and will flush only when the connecting pipeline is open.

3.3.3.4 Irrigation While Flushing (YES/NO): sometimes in order to guarantee flush pressure irrigation is stopped during flushes. In this case the irrigation valves are closed while the master valves remain open.

3.3.3.5 Fault Reaction: what action to take during alarms (the action to take on the connecting pipeline, the filter group irrespectively goes into alarm mode). The possible reactions are:

3.3.3.5.1 Idle: no reaction (continue as normal).

3.3.3.5.2 Alarm: alarm shown on the pipeline connected to the filter group, irrigation continues.

3.3.3.5.3 Pause: pause on the connecting pipeline (irrigation ceases) with no alarm on the pipeline.

3.3.3.5.4 Fault: fault (pause + alarm) on the pipeline connected to the filter group.

3.3.3.6 Fill Delay For flushing: time in minutes since the start of irrigation that the system does not flush. This time is designed for pipeline filling when the pressure is low and the flushing will not be effective.

3.3.3.7 Manual Override: (45) manual flushing operation. Bypasses all of the above mentioned safeguards and conditions. The system will flush even when the pipeline is closed, during pipeline filling etc.
3. Advanced Operation

3.4 Alarms: (8) the alarm system in the Galileo Open Field program is large and complex. Alarms exist on different levels and in different objects. Sometimes one occurrence can lead to a large number of alarms. Alarms can be turned off on the system level or on individual levels in order to make sure that all of the details are dealt with. Alarms can also be turned off automatically at any given point of time (see details below). Emphasis is placed on finding the fault if there is one. The faulty element turns red on the system diagram. If the faulty element is on an inner screen (plots) the alarm can go up a level (“floated”) (for example: a pipeline that has an alarm will cause an alarm in the plot). Access the plot to locate the alarm. All alarms on the alarm screen are colored red. Clicking on the relevant flag opens the screen where the faulty object can be identified. Flags in the element show the type of alarm. When an alarm appears clicking on the red animated button (bell figure) on the tool bar opens the following alarm screen:

3.4.1 Alarm Information: (81)

All active alarms are colored red.

3.4.1.1 Under Flow and Over Flow: program fault that shows a discrepancy between nominal and actual flow rate (see program set up). Clicking on the flag opens a screen showing 100 programs where the program with the alarm can be identified (colored red). Clicking on the faulty program opens the program screen where the problem can be seen.

3.4.1.2 No Water Pulse: Alarm from one of the water meters. No reading from the water meter for more than the defined time (see water meter set up). Clicking on the flag opens the screen showing the status of 100 water meters. Click on the faulty water meter to see the problem.

3.4.1.3 Uncontrolled Water: water is flowing through the water meter even though no irrigation program is running that uses the water meter. Clicking on the flag opens the water meters screen. (See water meter set up).

3.4.1.4 No Fertilizer Pulse: alarm from one of the fertilizer pumps. No fertilizer reading for more than the defined time (see fertilizer pump set up).

3.4.1.5 Uncontrolled Fertilizer: fertilizer pump is closed but fertilizer is flowing through the fertilizer meter.

3.4.1.6 Fertilizer Over Flow: alarm appears when 10 consecutive readings from the fertilizer meter are 50% higher than the nominal flow.
3. Advanced Operation

3.4.1.7 Fertilizer Pump Definition Error: fault in one of the fertilizer pump definitions. Clicking on the flag opens the fertilizer pumps screen. Click on the faulty pump to identify the fault.

3.4.1.8 EC Alarm: deviant EC reading as defined in the EC and pH set up (see fertilizer center set up).

3.4.1.9 pH Alarm: deviant pH reading as defined in the EC and pH set up (see fertilizer center set up).

3.4.1.10 EC-pH Out Of Range: EC-pH fault that stops the fertilizer center program. The irrigation program stops. If this happens consecutively during two separate irrigation programs the fertilizer program becomes unavailable and all irrigation programs using it will not run but go into “waiting”.

3.4.1.11 Pipeline Alarm: alarm on one of the water pipelines. This alarm could be caused by another alarm.

3.4.1.12 Pipeline Error: one of the water pipes is incorrectly defined. Clicking on the flag opens the screen showing all of the water pipelines. Click on the faulty pipeline to identify the problem.

3.4.1.13 Irrigation Program Error: fault in one of the irrigation programs. Clicking on the flag opens a screen showing 100 irrigation programs whereby the faulty program can be identified.

3.4.1.14 Irrigation Program Error: one of the irrigation programs is incorrectly defined.

3.4.1.15 Irrigation Valve In manual: irrigation valves can be manually operated (see irrigation valve data in advanced operation above). Manual operation (opening or closing) means the valve is not controlled by the controller. This alarm shows that attention should be paid to the fact that the valve is being manually operated.

3.4.1.16 Sensor Fault: one of the sensors is faulty (see sensor set up).

3.4.1.17 Water Pump Fault: faulty water pump (see water pumps).

3.4.1.18 Filter Flush Fault: fault in one of the filter groups. Clicking on the flag opens filter group No. 1 screen from where access to all filter groups and identifying the faulty group is possible.

3.4.1.19 Logic Condition Fault: logic condition programmed to show alarms is active (see logic conditions).

3.4.1.20 Pressure Fault: fault in pause device.
3. Advanced Operation

3.4.1.21 Pressure Element Error: incorrect definitions of pause device.

3.4.1.22 Burst Protection: fault due to water meter comparison (see burst protection).

3.4.1.23 Fertilizer Not Finished: fertilizer program has not finished its dose of fertilizer as programmed in the irrigation program because of faulty fertilizer pump or incorrect fertilizer planning.

3.4.1.24 Irrigation Valve Definition Error: problem in one of the irrigation valves' definitions.

3.4.1.25 Irrigation Valve Fault: incorrect irrigation valve definitions or impossible fertilizer dose (too many fertilizer pumps per session - more than 7).

3.4.1.26 Valve Group Fault: non uniform water meter for valves in the group, non uniform water pipeline for valves in the group or one of the valves is incorrectly defined.

3.4.1.27 Drainage Fault: fault in drainage system – future option.

3.4.1.28 Tensiometer Fault: the tensiometer is in a dangerous range see tensiometer definition.

3.4.1.29 Irrigation Quantity Limit: water quantity exceeds the quantity limit as defined in the controller general definitions (see definitions).

3.4.1.30 Irrigation Time Limit: irrigation time exceeds the time limit as defined in the controller general definitions (see definitions).

3.4.1.31 Mixing Program Fault: incorrect mixing program definition (see explanation on water mixing junction below).

3.4.1.32 Water Source Fault: water source fault at water mixing junction (see explanation on water mixing junction below).

3.4.1.33 Water Junction Fault: fault at the water mixing junction (see explanation on water mixing junction below).

3.4.1.34 Low Battery Fault: active only in the DC controller when the voltage is below 12 V.

3.4.1.35 Low Battery Pause: active only in the DC controller when the voltage is too low to run the system.

3.4.1.36 I/O Card Error: communication fault in one of the input/output cards. Check the card set up and if necessary replace the card.

3.4.1.37 RTU fault: no communication between at least one of the RTU’s and the controller. (See RTU definitions).
3. Advanced Operation

3.4.1.38 **Double Output:** one of the rules in the Galileo is that it is forbidden to define a physical output more than once. This alarm appears when the same output is defined on two different elements (such as 0.0001 or 1.0211).

3.4.1.39 **Alarm Via Communication:** warning from another controller (see communication between controllers in the controller operating manual).

3.4.1.40 **Memory Fault:** momentary disruption in the RAM memory. Usually cancelling the alarm is sufficient but if it continues call the technician to replace the CPU.

3.4.2 **Alarm Settings:** (83) Alarms can be defined to turn on a device such as a siren or a preset pager transmitter. Define alarm outputs (see definitions / system elements). Each type of alarm can be assigned to an output (up to 10) and the time it will be active can be determined. It is important to remember that the alarm outputs work as normally open. When there is no alarm the output is active (i.e. send 24 V), in order to allow the alarm output to function when the controller has no power supply (the alarm system is usually battery powered). The time range is set as a number (1-6) as defined in the left hand side of the screen. First define the time range that the alarm requires and then program the time range number with the type of alarm. Time number 6 is defined as the alarm cancellation.

3.4.2.1 **Alarms Via Communication:** the alarms to be conveyed though communication (from other controllers) can be programmed. Enter the buy number (or the number from common variable table). (See communication between controllers in the center operating manual).

3.4.2.2) **Automatic Alarm Cancel:** alarms can be cancelled according to a set time cycle. Enter the value for this time cycle here. All of the element’s properties (irrigation programs, water meters, fertilizer pumps etc.) contain the parameter auto. Cancel alarm (YES/NO). If the auto. Cancel alarm is set then all of the alarms of the specific object will be cancelled after the set time duration.

3.5 **Diaries:** (2) the diaries are divided into two: event diary and fault diary. Clicking on one of the diaries opens this screen:

3.5.1 The center of the screen contains a list of events/faults in descending chronological order. The left hand column shows the controller number (this screen can show several controllers’ diaries). The second column from the left shows the date and
3. Advanced Operation

The third column from the left shows the number of the system in the controller (in the Open Field controller this number is identical to the number on the left). The right hand column is the message text. The system (PC computer) saves the last 1000 events and last 1000 faults. An integrated report will usually contain 2000 messages (the number of messages on the screen is shown on the left hand side of the screen above the list).

3.5.2 There are several options on the tool bar:

3.5.2.1 The button allows immediate updating of the events – when the table is displayed it does not update and does not show recent events that have occurred since display.

3.5.2.2 The button allows filtering the list. Click on the button opens the following screen:

3.5.2.2.1 Messages between: only messages between the desired date range will be shown. The check box and select the desired dates.

3.5.2.2.2 Messages including the text: only messages including the defined text string will be shown. Tick the check box and type the exact text string.

3.5.2.3 The button opens the following screen:

3.5.2.3.1 A number of controllers can be defined in the top part of the screen (for a system consisting of more than one controller). In the case of a multiple controller system the events/faults listed will be of the selected controllers.

3.5.2.3.2 The center of the screen allows selecting diary type (event diary or fault diary) or a combination of the two (Both). The right hand side of the screen allows selecting whether to show all or a number of messages.

3.5.2.4 The next button (scissors) allows deleting all of the messages in the diary (it is not possible to delete only part of the messages).

3.5.2.5 The save button (disk) and open file button (standard form) allow saving the current display to a text file. Clicking on the save button allows writing the
file name and selecting the directory. Clicking on the open file button allows selecting the saved file name and displaying it as an image (filters can not be carried out on saved files).

3.6 Logic Conditions: (5612) the logic conditions are of great use in carrying out special actions that are otherwise not supported by the software tools. It means that there is a condition instigator (if something happens) and a following action (then something else happens). The logic condition table is built in an if………, then…… format. Clicking on the conditions key on the main screen opens the following screen:

![Logic Condition Programming](image)

3.6.1 The IF Part:

3.6.1.1 Element Type: select the element type that instigates the condition. Possible element types are:

- **3.6.1.1.1 Condition Inputs:** this condition input is a discrete input (On/Off) which can be used to condition the action of other objects according to its state. First the condition input has to be defined (see definitions / condition inputs).

- **3.6.1.1.2 Irrigation Valve:** conditioning by an irrigation valve status (by open or closed – see conditioning options for open / close below).

- **3.6.1.1.3 Water Pipeline:** conditioning by a specific water pipeline (by open or closed – see conditioning options for open / close below).
3. Advanced Operation

3.6.1.4 **Irrigation Program:** conditioning by irrigation program status (by open or closed – see conditioning options for open / close below).

3.6.1.5 **Fertilizer Pump:** conditioning by fertilizer pump status (by open or closed – see conditioning options for open / close below).

3.6.1.6 **Water Pump:** conditioning by water meter status (by open or closed – see conditioning options for open / close below).

3.6.1.7 **Auxiliary Output:** conditioning by Auxiliary output status (by open or closed – see conditioning options for open / close below).

3.6.1.8 **Sensor:** conditioning by sensor value (see conditioning options for values below).

3.6.1.9 **Filter Groups:** conditioning by status of filter group (by open or closed – see conditioning options for open / close below).

3.6.1.10 **Communication:** conditioning by a communication parameter from another controller by buy number (see communication with other controllers in the controller operating manual).

3.6.1.11 **Water Meter:** conditioning by flow rate reading of a specific water meter (see conditioning options).

3.6.1.12 **General Meter:** conditioning by flow rate reading of a specific general meter (see conditioning options for values below).

3.6.1.13 **Tensiometer:** conditioning by tensiometer value (by value – see conditioning options for values below).

3.6.1.2 **Element Number:** number of element selected in element type. For example: water meter No. 3.

3.6.1.3 **Conditioning Type (conditioning options):** there are several conditioning options:

3.6.1.3.1 **On-Off:** conditioning on open close elements (see above) (conditioning by above/below here will cause a program fault).

3.6.1.3.2 **Above – Below:** conditioning on element by value (see above). (Conditioning by On/Off here will cause a program fault).

3.6.1.3.3 **On>Off and Off>On:** option for special requirements. Conditioning by open/closed elements. One of the options may be selected. The condition will be active during the transition (for one second) only.

3.6.1.4 **Operation Value and Stop Value:** data for value type elements (see above). The condition is met when the value exceeds the activation value – in
the direction stipulated in the conditioning type and until the value exceeds the
deactivation value in the opposite direction. For example: if using conditioning on a
water meter whose conditioning type = above, value for turning on = 40, value for
turning off = 35 then the condition is met when the water meter flow rate exceeds 40
M³/_hour (GPM) and will only cease when the water meter flow rate drops below 35
M³/ Hour (GPM). Please note that when the water flow rate is 38 then the condition
is not always met (depends on the direction of the water flow rate).

3.6.2 The “Then” Part: this part deals with program the action taken when the condition is met.

3.6.2.1 Action Type: there are several options:

3.6.2.1.1 Alarms: the controller sets an alarm when the condition is met. The
alarm issued is logic condition fault. When using this option do not
program a conditioned element.

3.6.2.1.2 Pause: the condition element is delayed when the condition is met (see
below).

3.6.2.1.3 Fault: issues a fault on the conditioned element (pause + alarm) when
the condition is met.

3.6.2.1.4 Start: starts the conditioned element but does not stop it. For example:
if the condition is to start an irrigation program, then when the condition
is met the irrigation program will run. When the condition ceases to be met
the program will still continue running and will finish the programmed
irrigation. (See conditional actions).

3.6.2.1.5 Stop: Ends the operation of the conditioned element.

3.6.2.1.6 Operate: Start and stops the operation of the conditioned element (as
opposed to start which starts the elements operation but does not stop
it). For example: if the condition is to start an irrigation program then when
the condition is met the irrigation program will run. When the condition
ceases to be met the program will still stop running even if its programmed
running time has not finished.

3.6.2.2 Element Type and Element Number: Type and number of the conditioned
element. The options are: irrigation valve, pipeline, irrigation program, water
pump, auxiliary output, filter group. It is possible to program logic condition
without a conditioned element (the operation type must be defined). In this case
the logic condition can be set on elements that can be programmed with a logic
condition number (irrigation programs, auxiliary outputs and more).

3.6.3 Time: the conditions can have stipulated timing:

3.6.3.1 Delay in Seconds: in order to stabilize the condition. To avoid fluctuations
when the condition’s status alters during short periods of time, program a delay.
During the delay the condition will not be acknowledged. If its value returns to a
3. Advanced Operation

value whereby the condition is not met the delay will reset. For example: if the condition is to pause an irrigation program because the wind is too strong then it is possible to program the condition with a few seconds delay so that only a stable wind will cause the program to be paused and not momentary gusts.

3.6.3.2 Start Time, End Time: allows setting a condition to work between certain hours. Both parameters (from time and to time) must be entered.

3.6.4 Linked Conditions: conditions can be linked to one another. In this way all of the conditions have to be met. The conditions are always linked to the condition above i.e. if condition number 1 is linked to condition number 3 then condition number 1 is dependent on condition number 3 whilst condition number 3 works independently – irrespective of condition number 1. In this fashion a number of conditions can be linked together. It is recommended to thoroughly work out all of the possibilities before linking conditions and take into consideration all possible scenarios (especially when linking a large number of conditions).

3.6.4.1 Linked Condition Type: the possible link types are:

3.6.4.1.1 Or: if one of the conditions is met then the first condition will be active. For example: if condition number 1 is linked to condition number 3 then using by OR condition number 1 will be active even if it is not met if condition number 3 is met.

3.6.4.1.2 And: The first linked condition will be active only if both of the conditions are met.

3.6.4.2 Linked Condition Number: which condition is linked.

3.6.5 Condition Status: (5611) informative data – possible status are:

3.6.5.1 Off: condition is not active (either the condition is not met or its linked conditions do not allow it).

3.6.5.2 On: the condition is met and will activate the conditioned element.

3.6.5.3 Time: the current time is not within the range of from time to time or the condition is delayed.

3.6.5.4 Element Definition: error in the conditioning element in the if clause.

3.6.5.5 Link: error in linked conditions definition.

3.6.5.6 Timing: error in time defined for starting program (for example: 35:23).

3.6.5.7 Condition Type: error in condition type definition in the if clause.

3.6.5.8 Action Definition: error in action type in the then clause.
3. Advanced Operation

3.6.5.9 Conditioned Element: error in conditioned element in the *then* clause.

3.6.6 Conditioning Element Value: (5611) shows the element value if using value type (see above).

3.7 Flow rate Limits: when two or more programs are running simultaneously a danger exists that due to lack of attention the irrigation program will exceed the flow rate limit somewhere (bottleneck) (for example on a small diameter pipeline or a water pump that is not capable of pumping the required amount of water). The Galileo system allows limiting water flow rate in a specific place by limiting a number of programs that use the same pipeline at a certain time. Operation principle: In the irrigation program constants there is a parameter “flow rate limit by pipeline number” (see program constants above). In the pipeline settings there is a parameter “flow rate limit” (see pipeline definitions). When a program “wants” to run it checks the water pipeline according to the parameter “flow rate limit by pipeline number” and compares its nominal flow rate (sum of all the irrigation valves nominal flow rate) to the remaining flow rate on the pipeline which equals “flow rate limit” minus “required flow rate” (see pipeline definitions). If the program’s nominal flow rate is greater than the calculated remaining flow rate the program will be paused until there is enough remaining flow rate. Please note that in order to correctly program this feature all irrigation programs using the specific place (bottleneck) must have the same pipeline number defined.

3.8 Pause Device: (563). this is an element that under certain conditions pauses the pipeline connected to it. When a pipeline is paused all pipelines below it are also paused. Clicking on the element icon (as defined in the My Field software) opens the following screen: In the controller:

3.8.1 Connected to Line No.: Define the pipeline it is connected to and the conditioning element:

3.8.2 Input Number: Condition input number (see definitions, condition inputs). If the input is ON then the element will operate (in accordance with following conditions).

3.8.3 Sensor Number: Number of sensor for activating the element (see sensor definitions).

3.8.4 Operating Set point Above/Below: values for operating the element according to the sensor defined in the previous paragraph. Operating above means that the sensor reading is higher than the set value.
3. Advanced Operation

3.8.5 Delay Until Operation/Stop – seconds: as previously explained to avoid instability a delay time should be defined whereby the input remains inactive and the counter is reset if the value returns to normal.

3.8.6 Type of Operation: if the element is active what operation will be carried out on the pipeline: idle, alarm, delay (without alarm), fault (delay + alarm).

3.9 Virtual Water Meter: (72322*) this is an element consisting of several real water meters. Define the element by programming the numbers of the water meters to be part of the virtual water meter. Up to 10 water meters can be programmed. The virtual water meter will accumulate the sum of the amount of water passing through each individual water meter and the flow rate will be of these water meters. A plus (+) or minus (-) sign can be assigned to each water meter (a lack of sign means “+”). If there are negative water meters their accumulations and flow rates will be subtracted from the positive water meters. This feature is used in burst protection (see below) and other purposes. The numbers of virtual water meters are from 101 – 120. The virtual water meter’s properties are identical to those of regular water meters apart from the input (virtual water meters do not have any) and the list of water meters (the regular water meters do not have any – see water meter definitions). A virtual water meter can be used as an irrigation valve’s water meter in the same way as a regular water meter. The virtual water meter screen can only be opened via the icon defined in “My Field”.

3.10 Burst Protection: (in the controller: 515) burst protection is an element that protects the main pipeline network. It contains a virtual water meter programmed to compare the amount of water entering the system with the amount of water leaving the system. The system must be built with a main water meter for water entering and with water meters for every plot or irrigation valve for water exiting. The virtual water meter is programmed such that the main water meter is marked positive (+) and the other water meters are marked negative (-). The idea is that all water entering the system must also leave the system and if it doesn’t it means there is a burst!! To define burst protection define the virtual water meter and define the maximum positive flow rate (i.e. that more water enters than leaves). The maximum negative flow rate can also be defined for (system correctly functioning control). The system issues an alarm and even stops the pipeline (similar to a pause) if the virtual water meter deviates from the nominal flow rates by more than max. flow of the burst protection element.

3.11 Water Pumps:

3.11.1 Single Pump: operating a single pump is the same as pipeline operating. The pump starts and stops along with the pipeline it is attached to (see water pump definition).

3.11.2 Pump House: (51422) this element consists of a number of pumps (up to 5) that should work in co-ordination. A number of conditions for operating the various pumps. To open the pump house screen click on the icon in My Field or via definitions/
3. Advanced Operation

Element definitions/pump house. The following is the pump house screen:

3.11.2.1 Pump House Definition: first define the pumps in the pump house by entering the number in the blue cells (in the example: 1, 2, 3).

3.11.2.1.1 Combinations Definitions: The pump house program consists of steps. Under certain circumstances (explained further on) the program is locked at a certain step. Define for every step, the pump working in that step. In the example above during step 1 pump No. 1 operates and during step 4 pumps Nos. 1 and 2 work.

3.11.2.1.2 Method of Operation: Enter the method of operation in the upper left hand side of the screen. Possible methods are:

3.11.2.1.2.1 Nominal Flow rate: (recommended option). In this method enter under the column “flow rate” the flow rate, whereby when the pump house’s nominal flow rate exceeds this rate the pump house will operate at this stage. The nominal flow rate of the pump house is the nominal flow rate of the connecting pipeline. This is the nominal flow rate of all of the irrigation valves operating downstream from the pipeline. (Of course only the highest step meeting the condition will operate).
3. Advanced Operation

3.11.2.1.2.2 Measured Flow Rate: this option also requires defining flow rate for each step however in this case the step will operate when the water meter’s flow rate, defined as water meter for measured flow rate, is higher than the step flow rate. (Of course only the highest step will operate).

3.11.2.1.2.3 Pressure: define the pressure sensor number (see sensor definition) and the low pressure for step up and high pressure for step down. When the system starts to operate and after the delay time (see below) if the conditions exist for going up a step (the reading pressure is lower than the low pressure to step up) the system will go onto the next step. If the conditions exist for going down a step (the reading pressure is higher than the high pressure to step down) the system will go down a step with all of the required delays between the steps. The idea is that if the pressure is too high then the pumping capacity should be lowered (by going down a step) and when the pressure is too low the pumping capacity should be raised (by going up a step).

3.11.2.1.2.4 Logic Condition Number: The steps can be defined by logic conditions. First define the logic conditions (see defining logic conditions above) and then enter the suitable logic condition number for the various steps.

3.11.2.1.3 Step Up Delay and Step Down Delay: define the delay time in seconds for each step up and down. This avoids fluctuations between the steps and stabilizes the system. When working according to pressure programming the delay times is crucial in order to allow the system time to stabilize the measured pressure before deciding whether to go the next step.

3.11.2.1.4 Pump House Pause: the pump house can be paused between times and also paused by a logic condition (see programming logic conditions).

3.11.2.1.5 Connected to Pipeline Number: essential data for pump house operation. Enter the pipeline number of the pipeline connected to the pump house. Please note: pumps defined in the pump house receive definitions such as “connected to pipeline number” via the pump house. (The system ignores the pipeline definition in the pump properties) so there is no need to program the pipeline in the pump.
3. Advanced Operation

3.11.2.2 Pump House Data: (51421) clicking on the Pump House Data key opens the following screen:

The list of common water pumps in the pump house appears on the left hand side of the screen. Next to each pump it is listed whether the operation is required. Operation input and pump in fault are shown (see water pump definitions for information on inputs). In addition information is shown on nominal and required flow rate, the current step No. pressure value and step delays.

3.12 Evaporation: The Galileo controller provides several functions allowing automatic operation according to evaporation:

3.12.1 Fully Automatic: in order to work automatic evaporation carry out the following steps:

3.12.1.1 Defining Evaporation Sensor: the evaporation meter supplied by Galcon is a pipe like element that is filled with water. It sends a pulse to the controller on every amount of water (0.1 mm) that evaporates. Connect this meter to a discrete input (On/Off), define a general meter with this input and define suitable pulse size (see general meters settings).

3.12.1.2 Enter the program settings of every irrigation program that will work by evaporation and change the accumulation sensor type to evaporation (see irrigation program settings).

3.12.1.3 Enter accessories>evaporation and define the operation method as automatic (in the controller 3442 #1).

3.12.1.4 Enter accessories>evaporation and enter in the parameter evaporation – general meter number (in the controller 3442 #2) the general meter number as connected to the evaporation sensor.

3.12.1.5 The system will measure (for each individual program) the evaporation in mm between two starts of a program (the accumulation value is element accum. in the program information). When the program starts the value is reset to zero and starts to accumulate again for the next operation.

3.12.1.6 Enter the irrigation program and enter evaporation in the irrigation units field.
3. Advanced Operation

3.12.1.7 Enter in water quantity the irrigation coefficient for evaporation according to instructions of an expert. For example: young corn 0.4, corn by cobs 0.7 and corn on the cob 1.1 (the numbers are purely for demonstration purposes and should not be seen as a recommendation).

3.12.1.8 The calculation made by the controller is: evaporation in mm (inch) between irrigations * the area irrigated (according to the irrigation valve areas in the program) * evaporation coefficient. The result is displayed (at the start of the irrigation) in the parameter remaining water and the program will irrigate according to this.

3.12.2 Program Start by a General Meter: a program can be started by a standard start of a general meter (see starting by a general meter in irrigation program settings, paragraph 7) that is connected to an evaporation sensor. The program will start when the accumulated evaporation reaches a certain level.

3.12.3 Manual Evaporation: daily evaporation levels, weekly or other periodical of daily averages can be entered manually. In order to do this:

3.12.3.1 Enter accessories>evaporation and set operation method as manual.

3.12.3.2 Enter in the field daily evaporation – mm per day (3442 #3) the daily evaporation in mm (inch)).

3.12.3.3 Follow paragraph (3.12.1.6) and (3.12.1.7) described in part (3.12.1) of this section (leave general number meter number empty).

3.12.3.4 The controller calculates by: daily evaporation * program area (as defined in irrigation valves area) * evaporation coefficient * number of days in cycle / (divided by) number of daily cycles. The result will be displayed under the parameter water remaining and the program will work accordingly.

3.13 Auxiliary (General) Outputs: (in the controller: 55) auxiliary outputs are elements that open and close outputs by a simple program that is not connected to the irrigation system (operates totally independently). Auxiliary outputs can be linked to conditions or by other means (fertilizer pump for example – see fertilizer pump definitions).
3. Advanced Operation

To access auxiliary outputs enter Accessories>Auxiliary Outputs. Clicking on the button opens the following screen:

3.13.1 Defining Outputs for Auxiliary Outputs: click on the blue number at the top of each column, enter the output definitions system elements and define the suitable output (see definitions).

3.13.2 Operation Mode: there are two possibilities: Time and Condition.

3.13.2.1 Time: all of the time settings must be filled in. Conditions other than delay conditions or stop conditions will not work.

3.13.2.2 Condition: times do not have to be defined (not even operating time – in this case the output will be open during the time that the condition is met). If time is defined the output will only open if both the condition is met and it is within the time range.

3.13.3 Start/Stop Time: when operating by time the time range that the system will operate must be defined. Not defining the times will cause a fault. This is optional when working in condition mode.

3.13.4 Operating Time in Seconds: the time in seconds that the output is open.

3.13.5 Delay Time in Seconds: the time in seconds that the output is closed. Usually the auxiliary output works intermittently – works for a few seconds (operating time) and then stops for a few seconds (delay time). If the output is to work continuously then an operating time should be entered (100 for example) and delay time =0. The system will operate continuously when it is within the time range.

3.13.6 Conditional Input to Start and to Pause: conditional inputs can be defined (see conditional input definitions) that will start and/or stop the element operating. The operation will only start when condition is defined in operation mode, the operation will always stop.

3.13.7 Sensor Number, Start Set Point Below/Above and Differential to Stop: the auxiliary output can be operated by a sensor. Enter the sensor number (see sensor definition), the start set point above (when the sensor value is above the programmed value) or below (when the sensor value is below the programmed value) and the differential to stop (the difference in the opposite direction to stop – below when the value is above and above when the value is below). Enter condition in the operation mode field.

3.13.8 Logic Condition: the outputs can be operated by two logic conditions. Enter the logic conditions number (see explanation of logic conditions above). Enter condition in the operation mode field. (If the logic condition is closing it will operate when the operation mode is time as well).
3. Advanced Operation

3.13.9 Sequential Operation (Yes/No): the auxiliary outputs can be restricted to not working simultaneously. Define the auxiliary outputs to work sequentially and how many can work together (see maximum operations together). For example: the auxiliary outputs 1, 2, 3 are defined as working sequentially and the maximum number working together = 1. When outputs 1, 2 or 3 “want” to operate they will check if one of these outputs is operating and if so will be delayed until it ceases. If two outputs are waiting to operate then the one that has been waiting the longest will operate.

3.13.10 Manual Operation in Seconds: immediate operation of auxiliary output for the defined number of seconds.

3.13.11 Maximum Outputs Together: when a number of auxiliary outputs defined to work in sequential operation (see above) the maximum number of outputs working together can be restricted (the rest will wait in turn and then operate).

3.13.12 Auxiliary Output Information: Before accessing the auxiliary programming there is a screen showing auxiliary output data screen whereby data on most of the auxiliary output operations explained above is displayed.

3.14 Valve Groups: (51132) Up to 5 valves can be operated in irrigation programs in the Galileo controller. In fact far more than 5 valves can be operated by an irrigation program by using valve groups. In order to define valve groups access accessories>valve groups. The following screen is displayed:

3.14.1 Up to 20 groups containing up to 10 valves can be set up. Valve numbers are 1001 – 1020. After defining the valves in the required groups the valve group number can be defined as a valve in an irrigation program. When the irrigation program runs, all of the valves of the group will operate along with the other valves which may be directly defined in the irrigation program. Some restrictions exist when defining valves in valve groups:

3.14.1.1 All of the valves defined in a group must be connected to the same irrigating pipeline.

3.14.1.2 All of the valves in a group have to use the same water meter. If these rules are not applied group definition alarm will occur.

3.14.2 Valves Group Data: (51131) screen showing information about the valve group. Shows group status, the water meter connected to the group, which pipeline is connected to the group, sum of nominal flow rates and total area defined to the valves.
4. Set Up

Please note: In order to operate the controller after it has been set up make sure that it is in an active state. (See general controller definitions).

4.1 System set up – My Field software: The simplest way to set up the controller system is to make a diagram of the system (according to the physical hydraulic system) and then define each element as they appear on the diagram. In the Galileo Open Field controller, as previously explained, the system diagram is both an integral and operative part. To create a system diagram open the My Field software installed on the PC along with the Open Field software.

Double click on the My Field icon. The following screen opens:

Enter the controller number and press OK.

Next click on the button to open the following screen:

4.1.1 This screen offers 3 options: Main Screen, Plot Screen and the fertilizer center screen (Fertijet Screen). Enter the plot number or fertilizer center number in the Panel Number box for the plot and Fertijet screen. There is no need to enter a number for the main screen because there is only one. After selecting the desired screen press Open.

In each of these screen it’s possible to design (draw) the required system components. Each of the screens contain a working space and a toolbar from which the components are selected.

4.1.1.1 Main Screen:
The main screen is the screen that will open first at the active program from which all the operation is accessed. Accessing the main screen the following screen opens:
4. Set Up

4.1.1.2 The Plot: the roles of the plot, as described in the preface, are:

4.1.1.2.1 Simplifying display – when operating a large system it is difficult to draw the whole system on one screen. The plot acts as a zoom on part of the system.

4.1.1.2.2 Simplifying control over the large system by dividing the system into sub systems.

4.1.1.2.3 In order to create a plot:

4.1.1.2.3.1 Select the plot element and place it on the main screen.

4.1.1.2.3.2 Create the plot by selecting Plot Screen (see paragraph 5) and entering its number. Clicking on Open will open the following screen: This screen although similar in appearance to the main screen is in fact different (note the margins and the heading). Placing elements is similar to in the main screen. Clicking on the plot icon in an active program will open this screen. Plots can be placed in other plot screens several times in a similar fashion to building folders in Windows. The maximum number of plots is 100.

4.1.1.3 Fertilizer Center: A fertilizer center can be created in a similar fashion to that of the plot. The system allows creating up to 10 separate fertilizer centers. To create a fertilizer center first place a certain fertilizer center on the main screen or in a plot and then open the fertilizer center screen by selecting Fertijet Screen and entering its number (see paragraph 5). Clicking on open will open the following screen:

In this screen the names and numbers of the fertilizer pumps can be changed as well as the ECpH monitor. Please note: the monitor number has to be the same as the fertilizer center number. The drawing should not be altered because it is a dynamic drawing with animation display including some buttons that are not shown here.
4. Set Up

4.1.2 Designing (Drawing) the system components: All of the above screens contain a tool bar consisting of different elements that can be selected and placed on the work area (blue) and thus build the desired system diagram. In order to select an element point at the icon (the element's name appears below the icon), left click on the mouse and then release. Drag the element to the desired position in the work area and left click again. The element definition screen opens, fill in all of the details and then move on to the next element. It is imperative to enter the element number. The element number is the basis of the system. Each element type (valves, fertilizer pumps, pipelines etc.) must be separately numbered. The element will later be identified by this number.

Save the workspace by clicking file>save or close the screen by clicking on the X on the upper right hand side of the screen. The elements available are:

4.1.2.1 Pipelines: click on the pipeline icon and drag it to its upper left position.

Upon releasing the mouse the following screen appears:
4. Set Up

4.1.2.1 Element Number: Enter the pipeline number. Check the show box to display the number next to the pipeline. It is in fact not recommended to display pipeline numbers because the large amount of numbers becomes confusing.

4.1.2.2 Element Name: A name can be entered for the pipeline which can also be displayed. It is not recommended to give names to pipelines.

4.1.2.3 Pipeline Length: The pipeline can be displayed with varying lengths. This is for display purposes only and does not affect the pipeline properties. The lengths are relative (not accurate) and do not indicate actual pipeline length. Tip: in order to enter accurate pipeline lengths in a certain area it is possible to integrate pipelines of the same number that have different lengths and even overlap them.

4.1.2.4 Pipeline Shape: The pipeline can be displayed vertically or horizontally.

4.1.2.5 Pipeline Direction: When the controller program is running the pipelines change colors (real time) and are animated to show flow rate direction with different colors representing water, fertilizer, faults etc. In order to receive a true presentation of flow rate directions enter whether the flow rate direction in horizontal pipelines is from left to right or right to left and in vertical pipeline whether it is ascending or descending.

4.1.2.6 Element Number and Name Place Near the Pipeline: in order to make the display as clear as possible flexibility is provided in positioning the pipeline name and number. In pipelines the position depends on the pipeline shape. If the pipelines are vertical they appear on the right hand or left hand side of the pipelines. If the pipelines are horizontal they appear above or below the pipelines.

4.1.2.7 Show Valve Picture: the main valve is part of the pipeline properties (main valve is defined via the irrigation pipeline). Check this box to display the main valve. A picture of a valve will be displayed at the beginning of the pipeline.

4.1.2.8 Valve Place: define where the main valve will be placed: Top/Left, Middle, Bottom/Right. The position is in accordance with the pipeline shape. The number and name if defined are shown in the same location.

4.1.2.9 Irrigation valves: to define irrigation valves click on the following icon:
Upon releasing the mouse the following screen appears:

As previously described in the pipeline section, enter the element number and/or element name (the number is essential). Check the **Show** box to display the number and/or name. The name and number can be displayed above, below, to the right or to the left of the element as required. It is highly recommended to display irrigation valve numbers and also to give them names.

4.1.2.3 **Additional Elements:** additional elements whose definition is identical to that of the irrigation valve are: fertilizer pump, water pump, pump houses, filter groups, plots, fertilizer center, pause device and RTU.
4. Set Up

4.1.2.4 Elements With Displays: some elements have additional displays and their definitions are somewhat different. For example: Water Meter:

As can be seen these elements have a Show water meter value check box. If this box is checked then the current value of the water meter (in this case water flow rate) will be shown next to the element. The position of this value can be determined by element value position. The additional elements that have similar displays are: sensor, virtual water meter and burst protection.
4. Set Up

4.1.2.5 **Elements With Multiple Displays**: there are additional elements that have multiple element displays: **ECpH monitor**, **meteorological station** and **water mixing junction**. The following is the meteorological station screen:

Check the required values for display.

4.1.3 **Background definition**: a picture can be defined as the background (for example: an AutoCAD map) for all screens: Main Screen, Plot Screen or Fertijet Screen.

4.1.3.1 **Creating a Background Picture**: create a background picture in the BMP format with 256 colors. Please note: a picture with higher color quality will not work and could cause a system crash. It is recommended to paste the background picture on the standard picture. For example: to create a background picture from AutoCAD:

4.1.3.1.1 Open the required AutoCad map in the required zoom.

4.1.3.1.2 Press on the ALT and PrintScrn keys simultaneously. This copies the active window to the clipboard.

4.1.3.1.3 Open the Paint Brush program and click on paste (the picture will appear).

4.1.3.1.4 Fit the picture size to that of the work area in the My Field screen and save the file as a temporary file.

4.1.3.1.5 Open the required My Field screen (Main Screen or Plot Screen) and open the picture file from the picture backgrounds folder (see below). Paste the picture and place it in the work space.

4.1.3.1.6 It is recommended to color the background of the map to the standard background color – light blue.

4.1.3.2 **Saving the Background Picture**: after creating the background picture save it in the BMP format with 256 colors in the folder: `Program Files\Eldar\Elgal\Center\Project\OpenField\BMP`.

4.1.3.3 **Defining the Background Picture**: when the screen is open click on the button in the upper right hand corner of the tool bar. The following screen appears:
4. Set Up

4.1.3.3.1 Enter the required picture file name or click on the key with three dots. The relevant folder will open (see the folder address above), select the picture file previously created. The Paint Brush program can be opened by clicking on **Draw Background Bitmap** in order to edit the picture.

4.1.3.3.2 **Altering Window Size and Position:** The window size and position can be altered by entering the values from the upper left hand corner in pixels and the width and height of the window. For example: when using a screen with 1280*800 resolution, it is recommended to use the above values.
4.2 Element Definitions: as previously stated in order to define the system first place the elements in the My Field software and then define them one by one in turn according to the flow direction. Clicking on each element opens the relevant screen whereby the element can be defined. The possible elements are:

4.2.1 Irrigation valve (511) clicking on the valve icon opens the following screen:

![Irrigation Valve Screen](image)

The lower left hand side of the screen shows the valve’s settings. When defining a irrigation valve enter all of these values:

4.2.1.1 Plot Number: define the plot number of every valve. If the valve is on the main screen assign a plot number and define it. If working without plots use plot number 1.

4.2.1.2 Output Number: (731 #1) when defining outputs use the specific code suited to the Galileo Open Field as shown in the following figure:
4. Set Up

For further information refer to the Galileo Controller Hardware Installation manual.

4.2.1.3 Connected to Pipeline Number: enter the pipeline number that the valve is connected to.

4.2.1.4 Water Meter Number: if working by volume or with flow rate control the water meter number must be defined. When working only by time it is not necessary to define a water meter.

4.2.1.5 Nominal (Programmed) Flow rate: a parameter used by the controller for a number of functions:

4.2.1.5.1 Under/Over flow: when controlling flow rate the controller compares the irrigation program valve’s nominal flow rate with the measured flow rate. If the difference exceeds the value defined in the program constants the program issues an alarm (see program set up).

4.2.1.5.2 Daily Water and Fertilizer: one of the smart features of the Galileo controller is the capability of dividing the water and fertilizer amounts to irrigation valves working simultaneously with the same water meter and the same fertilizer pump. The division is carried out by the valve’s nominal flow rate. For example: if 3 irrigation valves work together with the same water meter (either in the same program or in separate programs) and the first valve has a flow rate of 35 M³/H (GPM), the second 40 M³/H (GPM) and the third 25 M³/H (GPM) each cubic meter of water passing through the water meter will be divided into 35% for the first valve, 40% for the second and 25% for the third. The same applies to the fertilizer meter flow rate.
4. Set Up

4.2.1.5.3 Operating a Pump House by Nominal Flow rate: starts and stops pumps in accordance with flow rate demand (see operating pump houses).

4.2.1.5.4 Pipeline Flow rate Limit: suspends the program if the pipeline flow rate exceeds the defined allowed rate (see explanation on pipeline flow rate limits).

4.2.1.6 Irrigation Area (hectares): if working with units of cubic meters per hectares, fertilizer per hectare or by evaporation, enter the area that the valve irrigates (see irrigation program).

4.2.1.7 Set To Co-valve: the irrigation valve in the Galileo system is an object that can accumulate (including the smart method previously described). One of the restrictions of the valve is that it cannot work simultaneously in two programs (this will lead to one of the programs being suspended). Sometimes it is necessary to run two programs using the same valve for conditioning or as a virtual valve. In order to enable this define the valve as set to co-valve which enables several programs to work with the same valve. This valve will not accumulate water and will only open or close along with the program that it is in. Do not define a single co-valve in the program.

4.2.2 Pipelines: (512) the water pipeline as it appears in the Galileo system is unique to the Galileo. A hierarchic water system can be created that has master valves, water meters and fertilizer pumps on different levels. The software recognizes which element leads to which valve and if necessary will warn that the structure is incorrectly designed. Clicking on the pipeline icon opens the following screen:
4. Set Up

4.2.2.1 Pipeline Settings: (5122)

4.2.2.1.1 Operation Set Up: several parameters can be defined here:

4.2.2.1.1.1 Not Active: the pipeline is not active. All elements connected to the pipeline will be at fault.

4.2.2.1.1.2 Automatic: This is the normal state of an active pipeline. The pipeline status is a derivative of the controller operation.

4.2.2.1.1.3 Closed: the pipeline is closed and not controlled by the program, an alarm is issued by the controller with a fault on the pipeline.

4.2.2.1.1.4 Open: The pipeline is open and not controlled by the program a pipeline alarm is issued. The alarm does not close the pipeline. Red arrows appear above the flow rate animation in the system diagram.

4.2.2.1.1.5 Pause: the pipeline is closed and not controlled by the controller. No alarms are issued and the pipeline status changes to delay. The pipeline is colored pink (delay color) in the system diagram. If the pipeline is to be used it will not open and could issue a water problem or other alarm. This situation is used by the system when there are different operating options which should not lead to alarms.

4.2.2.1.1.6 Open + Protection: the pipeline is open and not controlled by the controller. No alarm is issued but if there are any alarms connected to the pipeline then the pipeline will go into fault. The alarms that are connected are: uncontrolled water, pause device. A permanent open flag appears in the pipeline screen.

4.2.2.1.2 Main Valve Output: the method of defining master valves in the Galileo system is via the pipelines. In order to set up a master valve define the output connected to the master valve (see explanation on setting up outputs in the valve definitions). It is possible to form a hierarchy of master valves, for example: general master valve, master valves for an area and master valves for a plot. Each level is below its previous level and opening and closing is carried out in this order (see the following).

4.2.2.1.3 Connected to Upstream Pipeline: as previously stated pipelines in the Galileo system are not independent elements but can create a network. In order to create networks define for each pipeline which other pipeline it is connected to. The first pipeline in the system will not be connected to any pipeline; the second pipeline will be connected to the first and so forth. The number of the pipelines connected to a downstream pipeline are not restricted because this depends on the downstream pipelines connected to it. Each pipeline can be connected upstream to a maximum
4. Set Up

of two pipelines (two sources). If a pipeline has to be connected to more
than two sources it can be connected to two auxiliary pipelines and each
of these auxiliary pipelines can be connected to two additional pipelines
thus creating a large number of sources. As explained in the preface
irrigation control is by the irrigation valves. When an irrigation program
opens a valve, the valve opens the pipeline it is connected to, which in
turn opens the pipelines connected to it and so on. All other elements
connected to the pipeline will only operate when the pipeline is open.

4.2.2.1.4 Water flow rate Limit: allows limiting water flow rate in a certain place
(pipeline) in the system. (See explanation on flow rate limits in paragraph
(3.7) in advanced operation).

4.2.2.1.5 Uncontrolled Water: Which action to take in the event of an uncontrolled
water situation in a water meter connected to the pipeline (water flow rates
through the water meter whilst not irrigating). The options are:

4.2.2.1.5.1 Idle: no change to water pipeline status.

4.2.2.1.5.2 Message Only: message issued to event diary but pipeline status
is not changed.

4.2.2.1.5.3 Alarm: pipeline status is changed to alarm but the pipeline remains
open.

4.2.2.1.5.4 Fault: pipeline status is changed to alarm and the pipeline is closed
until freed from fault.

4.2.2.1.6 Plot Number for Alarm Display: when a pipeline is graphically
situated in a plot that has an alarm it is not seen in the main screen. When
defining a plot number for alarm the alarm appears (“floats”) in a higher
level (the plot), the plot can then be opened and the pipeline fault seen.

4.2.2.1.7 Order of Opening pipelines and Irrigation valves: when a
pipeline is connected to an irrigation valve the order in which they open/
close should usually be defined as well as a time delay between their
openings. This is in order to avoid shocks and/or to sustain/release pressure.
This action also works between two pipelines when the downstream pipeline
is considered the valve. In this fashion a chain of opening and closing can
be created in order to retain pressure or ensure uniform pressure in the
system. Four parameters are responsible for this action:

4.2.2.1.7.1 Opening Pipelines Versus Irrigation valves: the options
are: pipeline followed by valve or valve followed by valve.

4.2.2.1.7.2 Delay for Opening: delay in seconds between opening the
pipeline or valve.
4. Set Up

4.2.2.1.7.3 Close Pipeline Versus Irrigation valves: the options are: pipeline followed by valve or valve followed by valve.

4.2.2.1.7.4 Delay for Closing: delay in seconds between closing the pipeline or valve.

4.2.2.1.8 Overlap Changing Valves (secs.): when several valves are connected to the same pipeline the valves working sequentially can be overlapped. When overlapping valves the continuing valve opens first and only then its predecessor will close after a certain delay. Enter the number of seconds for the delay.

4.2.2.2 Pipeline Data: (5121) informative purposes (cannot be edited by the operator). The data appear on the right hand side of the screen:

Pipeline Status: the options are:

4.2.2.2.1 Inactive: the pipeline is not defined in operation mode (see operating definitions above)

4.2.2.2.2 Closed: the pipeline is closed by the program (in the event that operation mode = Automatic).

4.2.2.2.3 Fault: pipeline closed + alarm.

4.2.2.2.4 Open: the pipeline has been opened by the program or manually open + protection. In the system diagram the pipeline is animated in blue and white.

4.2.2.2.5 Fertilizing: the pipeline is open by the program and is fertilizing. In the system diagram the pipeline is animated in blue and yellow.

4.2.2.2.6 Pause: the pipeline is paused (closed by a certain factor) either by the program (delay or conditioning element) or by the operation mode = manually closed.

4.2.2.2.7 Open + Alarm: the pipeline issues an alarm but is not closed. In the system diagram the pipeline is animated with red arrows above the blue water flow rate.

4.2.2.2.8 Pause and Alarm: the pipeline is closed but not paused (any program wishing to open the pipeline or manual opening will open the pipeline).

4.2.2.2.9 Fertilizing + Alarm: the pipeline is fertilizing and issues an alarm but does not close the pipeline. In the system diagram the pipeline is animated with red arrows above the blue/yellow water flow rate.

4.2.2.3 Required Flow Rate the nominal flow rate of the open valves downstream of the pipeline is shown.
4. Set Up

4.2.2.4 Upstream/Downstream Delay in Seconds: when the order of opening pipelines and irrigation valves is defined there is a delay between upstream and downstream or downstream and upstream – closing or opening. This data shows time remaining.

4.2.2.5 Water Meter Number: water meters connected directly to the pipeline (see water meter definition).

4.2.2.6 Irrigation Programs: which programs currently irrigating are connected to the pipeline route.

4.2.2.7 Flags: the lower right hand side (empty in the screen example) of the screen display flags that appear when active:

   4.2.2.7.1 Irrigation Request: there is an irrigation request on the pipeline (if it is not open there has to be a reason).

   4.2.2.7.2 Manual Open/Close: manual opening or closing by operation mode.

   4.2.2.7.3 Permanently Open: open + protection in operation mode.

   4.2.2.7.4 Definition Errors: there are several possibilities:

       4.2.2.7.4.1 Upstream Pipeline Inactive

       4.2.2.7.4.2 Connection Out of Range: error in connected to pipeline definitions.

       4.2.2.7.4.3 Self Connection: the pipeline is defined as connected to itself in connected to pipeline number.

       4.2.2.7.4.4 Main Valve Output: error in the master valve output code (see defining main valve output code in valve definition).

   4.2.2.7.5 Uncontrolled Water: uncontrolled water alarm (see explanation on alarms).

   4.2.2.7.6 Water Pump/Pump House Alarm: there are 3 possibilities: water pump alarm, water pump stop cond. or water pump fault. (See explanation in water pump and pump house definitions – action on pipeline during alarm).

   4.2.2.7.7 Logic Condition Alarm: the possibilities are: conditioned alarm (when the condition is defined to issue an alarm), condition stop (when the condition is defined to pause), condition fault (halt + alarm – when the condition is defined as a fault). (See logic conditions definitions).

   4.2.2.7.8 Burst Protect Alarm: the possibilities are: leak protection alarm, leak protection fault. (See explanation in advanced operation chapter).
4. Set Up

4.2.2.7.9 **Logic Condition to Open:** Is there a logic condition for pipeline opening.

4.2.2.7.10 **Pipeline Program:** the pipeline is operated by a pipeline program (see explanation below).

4.2.2.7.11 **Filter Flushing:** the filter group connected to the pipeline is currently flushing.

4.2.2.7.12 **No Water Pulse:** the time between pulses exceeds the definition set in the water meter.

4.2.2.7.13 **Uncontrolled Fertilizer:** fault in fertilizer pump or in fertilizer center connected to the pipeline. (See fertilizer pump definitions).

4.2.2.7.14 **Alarm in Pause Device:** the possibilities are: pause device alarm, pause device stop and pause device fault (see pause device).

4.2.2.7.15 **Flush Alarm:** the possibilities are: filter flush alarm, filter flush stopped and filter flush fault. (See explanation on filter groups).

4.2.2.7.16 **Flow Rate Limit:** there is currently a flow rate limit on the pipeline. (See explanation on flow rate limits – paragraph (3.7) in advanced operation).

4.2.2.8 **Operation Program for Water Pipelines:** (5123) simple program for opening pipelines by time. To open a program click **accessories > pipeline start program.** The following screen will open:

![Pipeline Start by Time and Dates](image)

It is possible to define from date to date and from hour to hour (all parameters must be filled) and to operate up to three pipelines (enter the pipeline numbers...
4. Set Up

to start). The pipelines will open during the defined times independent of other irrigation programs. In order to define continuous irrigation between dates enter an hour in the start time and a minute before that hour in the end time. For example: start time = 06:00, end time = 05:59.

4.2.3 Water Meter: (513) clicking on the water meter icon (as defined in the My Field software) open the following screen:

4.2.3.1 Set Up: (5132 in the controller) enter the following data in the left hand side of the screen:

4.2.3.1.1 Water Meter Input; enter the input number in the controller that the water meter is connected to. (See explanation on input/output definitions in valve definitions).

4.2.3.1.2 Water Meter Pulse Size – M3 (THG): As previously explained the water meter is connected to a discrete input (On/Off). Enter the quantity of water per pulse. This data is provided by the water meter manufacturer and is usually written on the water meter.

4.2.3.1.3 Connected to Pipeline Number: enter the number of the pipeline connected to the water meter. The system checks the soundness of the connection and carries out various calculations in accordance with this definition.
4. Set Up

4.2.3.1.4 No Water Delay – Seconds: In order to monitor the soundness of the irrigation the controller checks whether there is water flowing through the water meter (is it receiving water pulses) when a program using the water meter is irrigating. In order to receive alarms about no water flowing it is essential to define the maximum period of time between pulses. If the time between pulses is greater than the time defined a **no water pulse** alarm is issued. This alarm can be the result of a faulty water meter or of a lack of irrigation (valve not open, pump not started, main valve etc.).

4.2.3.1.5 Uncontrolled Water (M3) (THG): the technical meaning of uncontrolled water is that there is water flowing through the water meter but no valves/programs are open under this water meter. Sometimes there are tiny leaks or small amounts of water outputs for instance when filling a sprayer and an alarm is not actually required. Because of this a certain amount of water is defined and an alarm will only be issued when a greater amount passes through the water meter. The data **uncontrolled water** in the program under **information** (lower left hand side) is compared to the **uncontrolled water** in the settings. If the value in the information is greater than that in the settings an uncontrolled water fault will occur. The pipeline connected to the water meter will fault (see pipeline definition) and irrigation will cease (if there is a master valve it will of course close). (Please note that that uncontrolled water always occurs when there is no irrigation). The uncontrolled water data in information resets when the alarm is cancelled, at the start of irrigation using the water meter and at midnight (unless there is an alarm at midnight – then it does not reset).

4.2.3.1.6 Reset Flow rate Time: the water meter resets whenever the flow rate reduces or ceases. This is substantiated by measuring and saving the time between two pulses. If the measured time between the next two pulses is larger than the former measurement it means that the flow rate is descending and the water meter starts to lower the flow rate reading gradually. When the pulse is received the water flow rate is locked on the last (descending) reading and this will be latest measured flow rate. If no more pulses are received the flow rate descends until it reaches 25% of the last reading (before the rate started to descend) or until the time between pulses is 4 times greater than the time between the last two measured pulses. In this case the reading resets. For example: if in a water meter whose pulse is 1 M³ (GPM) and the measured flow rate is 360 M³H (GPM) a pulse of more than 10 seconds is measured the flow rate will descend and after 12 seconds will be 300 M³H (GPM), after 20 seconds will be 180 M³H (GPM), after 40 seconds it will be 90 M³H and will then reset. Sometimes the flow rate is very low which means that the time between pulses is very large and it takes a long time till the flow rate descends to 25% and resets. It is therefore possible to define
4. Set Up

a maximum time after which the water meter always resets. Make sure that the time is not less than the time between pulses in the lowest flow rate programmed to flow rate through the water meter. For example: In a water meter whose pulse is 1 M³ and its flow rate is 10 M³/H (GPM) the time of the pulse will be 360 seconds i.e. 6 minutes. If a time of less than 6 minutes is entered in the reset flow rate time (e.g. 5 minutes) the flow rate will remain at 0 because the meter will rest every 5 minutes and not wait to receive the pulse.

4.2.3.1.7 In Water Pulse Fault: the action to be performed by the pipeline upon water pulse fault. The possibilities are: idle (no action on water pipeline), alarm (alarm issued without fault on the pipeline), fault (alarm issued and pipeline fault – irrigation ceases).

4.2.3.1.8 Programs Currently Using the Water Meter: on the lower left hand side of the screen the programs currently using the water meter are displayed. The water meter is restricted to working with 5 pipelines (more than this will cause a fault). The program number and nominal flow rate are displayed.

4.2.3.2 Water Meter Data: (5131) the following information is shown on the right hand side of the screen:

4.2.3.2.1 Water Meter Status: shows water meter status (information only), the possibilities are:

4.2.3.2.1.1 Inactive: no water meter input defined and is therefore not active. Colored white in the system diagram.

4.2.3.2.1.2 Active: essential definitions defined (see water meter definitions) and the water meter is ready for operation. Colored gray in the system diagram.

4.2.3.2.1.3 Water Flowing: water is flowing through the water meter (there is a flow rate reading). Colored blue in the system diagram.

4.2.3.2.1.4 Uncontrolled Water: uncontrolled water fault (see water meter definitions). Colored red in the system diagram.

4.2.3.2.1.5 Water Pulse Alarm: water meter alarm, when the time of no water delay (as described in the water meter set up) has passed. Two consecutive alarms of this type will also stop the pipeline. Any program attempting to use the pipeline will be suspended.

4.2.3.2.1.6 Water Pulse Fault: after two water pulse alarms (programs trying to use the water meter twice) the water meter stops the pipeline and further programs will not be able to open it.
4. Set Up

4.2.3.2.1.7 Input Number: error in input number definition (see explanation on defining input/output in irrigation valve definition).

4.2.3.2.1.8 Pulse Size: error in water meter pulse size definition. Number not in range or no number defined.

4.2.3.2.2 Current Flow rate: currently measured water flow rate in water meter.

4.2.3.2.3 Nominal (Programmed) Flow rate: sum of all of the nominal flow rates of the irrigation valves using the water meter.

4.2.3.3 Accumulations: The water meter has several parameters of accumulation as follow:

4.2.3.3.1 Daily Water: total amount of water in cubic meters passed through the water meter since midnight.

4.2.3.3.2 Seasonal Accumulation: total amount of water in cubic meters passed through the water meter since the accumulation start date (see below). This value can be reset or given any required value.

4.2.3.3.3 Accumulation Start Date: the date on which accumulation has started in the previous paragraph. This date is set automatically according to the date on the computer upon receiving the first pulse (when the value is reset). It can be reset manually at any time or set to any date. If seasonal accumulation is reset then accumulation start date is reset too and then receives the computer date with the first pulse.

4.2.3.3.4 Accumulation by Time Tariff: the Galileo system can divide the day into three parts known as time tariffs (see controller general definitions). This parameter shows the amount of water in cubic meters that have passed through the water meter since the start of the current time tariff. In addition the current time tariff is shown in the headings (1, 2 or 3 which are peak, mid rate and off peak).

4.2.3.4 Cancel Alarms: local alarm cancel key (only for the water meter). Does not cancel alarms not connected with the water meter.

4.2.3.5 Automatic Alarm Cancel (Yes/No): define whether to automatically cancel alarms. (See explanation on automatic alarm cancel in alarm settings).

4.2.4 Fertilizer Pump: 521 the fertilizer pump in the Galileo system is a complex element. Clicking on the fertilizer icon opens the following screen:

4.2.4.1 Fertilizer Pump Set Up: (5212) define the settings on the left hand side of the screen as follows:
4.2.4.1.1 Fertilizer Pump Type: several types of fertilizer pumps can be defined:

4.2.4.1.1.1 Inactive: the fertilizer pump is inactive.

4.2.4.1.1.2 Electronic: electronic pump whereby the controller operates and controls all of the pump’s strokes.

4.2.4.1.1.3 Electric: electric fertilizer pump.

4.2.4.1.1.4 Venturi: Venturi fertilizer pump controlled by an electric valve that opens or closes fertilizer flow rate (see explanation in Fertijet manual).

4.2.4.1.1.5 By Pulse: fertilizer pump that creates pulses (fertilizer meter). The amount of fertilizer injected is calculated according the fertilizer pump pulses.
4. Set Up

4.2.4.1.2 Fertilizer Type: type of fertilizer for ECpH control (see ECpH control in Fertilizer Center definitions) the options are:

4.2.4.1.2.1 Not Defined: the pump is not using ECpH control.

4.2.4.1.2.2 EC: fertilizer whose concentration can be measured by electrical conductivity (injecting more fertilizer raises the EC reading). Most fertilizers belong to this type.

4.2.4.1.2.3 pH: substance whose concentration can be measured by acidity test – acidic substance. (Injecting more fertilizer lowers the pH reading).

4.2.4.1.2.4 oH: alkaline substance that affects the pH readings (injecting more fertilizer raises the pH reading).

4.2.4.1.3 Fertilizer Name: parameter used when in the Galileo Data Collection software. By selecting a fertilizer type reports about different types of fertilizer can be made (see explanation on Galileo Data software).

4.2.4.1.4 Fertilizer Flow Rate (L/H): the nominal flow rate of the fertilizer pump. The fertilizer can operate by calculating the fertilizer pump operation time by the nominal flow rate of the pump and the flow rate of the water meter (see following explanation on operating by water flow rate). This parameter is also used in fertilizer over flow protection (see alarms).

4.2.4.1.5 Pulse Duration - Seconds: fertilizer operation pulse duration in seconds. In an electronic pump the pulse duration is the stroke time. In an electric pump the duration is the duration of the motor working. In a Venturi pump the duration is the opening time of the electric valve. (See more on fertilizer pump operating in the explanation on operating by fertilizer pump flow below).

4.2.4.1.6 Continuous Operation: when working with proportional fertilizing it is possible to inject all of the fertilizer in bulk between two water pulses or to divide the amount of fertilizer into several doses. For example: If the required relative fertilizing is 2 L/M³ (gallons/THG), then 2 liters (gallons) can be injected continuously on every water pulse (on the assumption that the pulse is 1 M³ (THG)) – (continuous) or the 2 liters (gallons) can be divided into a number of ½ liter (gallons) dosages (non-continuous).

4.2.4.1.7 Water Meter Number; as a rule the water meter for fertilizing (relative fertilizing) is automatically assigned by the water meters defined in the irrigation valves using the fertilizer pumps at any given time. This
mechanism also works when there are several water meters in the same program or several programs irrigating with the same fertilizer pump. Therefore there is no need to define the water meter. This option is available in the case that the fertilizer pump is required to work with a water meter that has not been automatically assigned.

4.2.4.1.8 Connected to Pipeline Number: enter the number of the water pipeline connected to the fertilizer pump unless the fertilizer pump is part of a fertilizer center (in this case the fertilizer center determines the pipeline numbers and there is, therefore, no need to define the pipeline).

4.2.4.1.9 Fertilizer Pump Output: enter the output number connected to operate the fertilizer pump (see explanation on defining inputs/outputs in irrigation valve definitions).

4.2.4.1.10 Fertilizer Meter Input: if the fertilizer pump has a meter (not essential but highly recommended) then enter here the input number connected to the meter.

4.2.4.1.11 Fertilizer Pulse Size (Liter) (gallons): if the fertilizer pump has a meter, enter the pulse size in liters (gallons). Each pulse received by the controller from the fertilizer pump will raise the accumulated amount by the defined pulse size. Pulse size is also used for fertilizer flow rate calculations.

4.2.4.1.12 Electronic Fertilizer Stroke Size (Liter) (gallons): as previously explained the electronic fertilizer pump is a pump that is operated and controlled by the controller. The stroke size is the same as the pulse size in this type of pump.

4.2.4.1.13 Auxiliary Output Number: occasionally it is necessary to inject fertilizer into several points by the same fertilizer pump. The method of doing this is to define (in the controller) a separate fertilizer pump for every point (including fertilizer meter), to connect the fertilizer pump’s outputs to fertilizer valves placed at the injection points. Define a specific auxiliary output and assign it to all the fertilizer pumps defined previously, then connect the real pump to the auxiliary output. Set the auxiliary output operation type as by condition (see operating auxiliary outputs). Every time one of the fertilizer pumps works (the local injection valve opens) the general output connected to the “real” fertilizer pump will be turned on.

4.2.4.1.14 Uncontrolled Fertilizer – Pulses: this means that the fertilizer pump is closed but fertilizer is flowing through the fertilizer meter (the controller is receiving pulses). In order to avoid false alarms define here the number of pulses allowed before an alarm is issued.
4. Set Up

4.2.4.1.15 No Fertilizer Pulse – Seconds: the maximum time in seconds allowed between two pulses of fertilizer.

4.2.4.1.16 Automatic Alarm Cancel (Yes/No): Define whether to automatically cancel alarms. (See explanation on automatic alarm cancel in alarms).

4.2.4.1.17 Operation by Fertilizer Flow rate(programmed, nominal): there are two methods of working with fertilizer pumps that are not of the pulse type:

4.2.4.1.17.1 Programmed: calculation for the pump operating time is carried out according to the programmed value of fertilizer flow rate (see fertilizer flow rate definitions). By this method it is even possible to work without a fertilizer meter at all. The fertilizer accumulation will be the calculation of the total operation time of the fertilizer pump multiplied by the fertilizer nominal flow rate.

4.2.4.1.17.2 Measured: Calculation for operating the fertilizer pump is carried out according to the measured flow rate whose value can be seen on the right hand side of the screen fertilizer pump data in the field fertilizer flow rate – L/H (GPH). In this unique calculation the controller monitors the fertilizer and water flow rates and the pulse duration in seconds and only calculates the wait time at any given time (operating time will always be the duration of the fertilizer pulse).

4.2.4.1.18 ECpH Set Up: maximum adjustment percentage for increasing or decreasing fertilizer dose. The Galcon method of ECpH control is based upon a basic water/fertilizer ratio that is used at the start of operations. After measurement, the system, in accordance with the ECpH sensor readings, alters the fertilizer injection rate. The system increases or decreases the fertilizer dosage of all the fertilizer pumps of the same type of material (EC or pH) by the same percentage (thus the ratio between the fertilizer pumps remains constant). By limiting the percentage of change it is possible to monitor the soundness of the sensors. If a sensor is faulty the system will only alter the dosage by the maximum percentage and will not therefore inject huge quantities of fertilizer. It will also cause the system to fault because the reading will remain far from the target reading. Because of this feature when using the Galcon system there is no need to keep two sets of sensors (as is with the competition) although it is an option. In addition this percentage restriction aids in reducing under and over shoot.

4.2.4.2 Fertilizer Pump Data: (5211)

4.2.4.2.1 Fertilizer Pump Status: the parameter is displayed next to the heading and fertilizer pump number. The possibilities are:

4.2.4.2.1.1 Inactive: the fertilizer pump is not active.
4.2.4.2.1.2 **Active:** the fertilizer pump is set up correctly and is ready for operation (is not currently fertilizing).

4.2.4.2.1.3 **Running:** the fertilizer pump is operating (injecting fertilizer).

4.2.4.2.1.4 **Operation Fault:** no fert. pulse or uncontrolled fertilizer.

4.2.4.2.1.5 **Pump Type:** error in fertilizer pump type definition (memory error).

4.2.4.2.1.6 **Output Number:** error in output number definition (see input/output definitions in irrigation valve definitions).

4.2.4.2.1.7 **Water Pipeline Number:** error in water pipeline definition.

4.2.4.2.1.8 **Fertilizer Meter Number:** error in fertilizer meter definition (out of range).

4.2.4.2.1.9 **Pulse Size:** error in pulse volume definition (out of range or not defined).

4.2.4.2.1.10 **Fertilizer Flow Rate:** error in fertilizer flow rate definition (out of range).

4.2.4.2.1.11 **Fertilizer Pulse Duration:** error in fertilizer pulse definition (out of range).

4.2.4.2.1.12 **Double Center:** fertilizer pump defined in two fertilizer centers.

4.2.4.2.1.13 **Water Meter Number:** error in water meter number for fertilizer pump definition (out of range).

4.2.4.2.1.14 **Water Meter Definition:** error in water meter definition – check water meter definitions.

4.2.4.2.1.15 **Auxiliary Output Definition:** error in auxiliary output definition (out of range).

4.2.4.2.2 **In Fertilizer Center:** fertilizer center in which the fertilizer pump works.

4.2.4.2.3 **Fertilizing Unit:** according to which unit the fertilizer pump works (as defined in the fertilizer program).

4.2.4.2.4 **Programmed Fertilizer:** fertilizer dosage assigned to the fertilizer pump before ECpH adjustment.

4.2.4.2.5 **Adjusted Fertilizer:** fertilizer dosage required after ECpH adjustment.

4.2.4.2.6 **Connected by Sensors:** the sensor number (connected to the EC or pH sensors) making the adjustments.

4.2.4.2.7 **Connected to Pipeline Number:** pipeline number that the fertilizer
4. Set Up

pump is connected to. If the fertilizer pump is part of a fertilizer center the pipeline will be the pipeline defined in the fertilizer center.

4.2.4.2.8 Water Meter Number: the water meter working with the fertilizer pump. Please remember that fertilizer pumps can work with different water meters depending on the fertilizer and irrigation programs.

4.2.4.2.9 Fertilizer Pump Flow Rate - L/H (GPH): when operating – the current flow rate of the fertilizer pump. If the pump is not operating – the last measured flow rate.

4.2.4.2.10 Uncontrolled Fertilizer Pulses: number of pulses of uncontrolled fertilizer (see uncontrolled fertilizer definitions) since the last reset. This counter resets under the following circumstances: uncontrolled fertilizer alarm cancelled, fertilizer program starts, at midnight (if there is no fault).

4.2.4.2.11 Daily Fertilizer – liters (gallons): amount of fertilizer in liters (gallons) that have passed through the pump since midnight.

4.2.4.2.12 Seasonal Accumulation – liters (gallons): amount of fertilizer in liters (gallons) accumulated since the accumulation start date (below). (See water meters seasonal accumulation).

4.2.4.2.13 Cancel Alarms: cancel local alarms (only fertilizer pump alarms and connected elements).

4.2.4.2.14 Programs Using: the irrigation programs currently using the fertilizer pump.

4.2.5 Fertilize Centers: (522) as far as the controller is concerned the fertilizer center is a group of fertilizer pumps that can be assigned a common program and can be run simultaneously by an irrigation program whilst using ECpH control. Up to 10 separate fertilizer centers can be defined. In order to define a fertilizer center click on the definition key in the fertilizer center screen. The following screen
4. Set Up

appears (the values shown are recommended start values in the absence of other information):

4.2.5.1 Fertilizer Center Set Up: (5223) upper left hand side of the screen.

4.2.5.1.1 Fertilizer Pumps in Center: define the number of fertilizer pumps in the center. Up to 6 pumps can be defined for each center.

4.2.5.1.2 Connection to Pipeline Number: the pipeline that the fertilizer center is connected to.

4.2.5.1.3 Connection to Water Mixing Junction Number: the water mixing junction connected to the fertilizer center (see water mixing junctions).

4.2.5.1.4 EC Sensor Number: sensor number measuring the EC level in the fertilizer center (see sensor definition).

4.2.5.1.5 pH Sensor Number: sensor number measuring the pH level in the fertilizer center.

4.2.5.1.6 Start Delay After Pipe Opening – Seconds: upon opening the pipeline to which the center is connected, the fertilizer center will only start to operate after this period of time.

4.2.5.1.7 Automatic Alarm Cancel: define whether to automatically cancel alarms. (See explanation on automatic alarm cancel in alarms settings).

4.2.5.2 EC-pH Control Automation Setup: (7323) ECpH control is carried out by EC and pH sensors defined in the fertilizer center. The target value which is entered in the fertilizer program (see fertilizer center programs in advanced operations), has to be reached and maintained. In principle the controller checks the EC and pH readings and compares them to the target value. If the reading is below the target value the controller increases the fertilizer dosage in all of the fertilizer pumps belonging to the same type (EC or pH). There are several methods of calculating the adjustments necessary. The Galileo controller uses two of them:

4.2.5.2.1 PID: (Proportional, Integral, Derivative) – model for calculating target attaining. In this method the program evaluates its relative position to the target, how much has been carried out and the speed in which it is approaching the target. The necessary adjustment is calculated accordingly. (For further information visit the internet site: www.engin.umich.edu/group/ctm/PID/PID.html). Select PID in control method and enter the recommended proportion coefficients. The proportion coefficients can be adjusted whilst operating for fine tuning.

4.2.5.2.2 Differential: In this method the program makes adjustments according to the difference between the actual value and the target. After defining
4. Set Up

this method in control method access the Automation “by Difference” Setup (press the key on the lower right hand side of the screen) and enter adjustment size in percentage of difference from target. The system will make adjustments of the percentage described above, every few seconds according to Fertilizer Automation Segment – in seconds.

4.2.5.2.3 Delay Before ECpH Measurements – Seconds: (7322) it is advisable to enter a delay time between the start of irrigation and start measuring the ECpH because it takes time for the fertilizer to reach the measuring cell.

4.2.5.2.4 Fertilizer Automation Segment – in seconds: (52231) system reaction time after adjustment to help stabilize the system. After adjustment the system waits for this time before making a new reading and further adjustments.

4.2.5.2.5 ECpH Alarm Setup: In the upper right hand side there are two sets of 5 parameters, one for fertilizer fault and one for irrigation stop. When there is a deviation in the conductivity or acidity reading the system tries to make the necessary adjustments. If the system does not make required adjustments after a specified period of time (either due to lack of fertilizer injection capability or due to a faulty sensor etc.) an alarm is issued or a fault (operation stops). There are two levels (sets) of alarm severity:

4.2.5.2.5.1 Fertilizer Fault: (52232) in this fault EC fertilizers that have deviated above will stop (EC fertilizers deviating below will not stop), pH fertilizers that have deviated below will stop (pH fertilizers deviating above will not stop). Irrigation will continue and the alarm issued (in general alarms) will be “EC alarm” or “pH alarm”. High and low deviation from the target for EC and pH (4 parameters) must be defined as well as the delay before alarms (in seconds) (the deviant reading must continue for the duration of this delay. If the reading returns to normal then the alarm will not be issued).

4.2.5.2.5.2 Irrigation Stop: (52233) in this case the irrigation program will fault (stop + alarm). If two consecutive programs using the same fertilizer program have this problem the fertilizer program (in the fertilizer center) will itself go into fault and any irrigation program that tries to use it will be suspended. The delay reason will be fertilizer center. This state will continue until the ECpH fault is released. The alarm issued in the general alarms will be “ECpH out of range”. It should be noted that the parameter irrigation at Fert. fault (in irrigation program setup) is irrelevant in this case.

4.2.6 Water Pumps: (7351) Access the water pump setup screen (by clicking on the pump icon). Define:
4. Set Up

4.2.6.1 Water pump output: (see explanation on input/output in irrigation valve definitions).

4.2.6.2 Connected to pipeline No.: the pipeline that the water pump is connected to.

4.2.6.3 Operating and fault inputs: These inputs come from the pump and should be connected to conditional inputs. In order to define these inputs, first setup the conditional inputs and then define the inputs here. The operating input (if defined) will issue an alarm if the pump has been started but no operating command has been sent (the input is set to Off). The fault input will always issue an alarm.

4.2.7 The Plot: (542) The plot’s properties include definitions and informative data.

4.2.7.1 The plot button (on the upper left hand side of the plot screen) is also a flag showing the plot status. The possibilities are:

4.2.7.1.1 Inactive: no valves are setup in this plot (the valve drawing in My Field has not as yet been defined). An irrigation valve is by definition assigned to a plot when the plot number is entered in the valve’s properties.

4.2.7.1.2 Active: correctly setup.

4.2.7.1.3 No Time: there are elements in the plot but there are no start times defined in the programs working in the plot (programs working in the plot are programs using irrigation valves assigned to the plot (see inactive above).

4.2.7.1.4 Pause: a specific plot can be paused allowing the controller to continue working in all other areas.

4.2.7.1.5 Irrigating: at least one of the irrigation valves is irrigating.

4.2.7.1.6 Fertilizing: at least one of the valves in the plot is fertilizing. If one valve is irrigating and another valve is fertilizing the status will be fertilizing.

4.2.7.1.7 Fault: there is a fault in the plot. Sometimes the fault is due to another element such as a faulty pipeline, if Plot Number for Alarm Display (in the pipeline properties) is set, then the fault will be seen in the plot (see pipeline setup).

4.2.7.2 Clicking on the plot button opens the following screen: (542)
4. Set Up

4.2.7.2.1 Send Alarm to Plot: as explained in pipeline setup it is possible to transfer an alarm to a higher plot (if the plot is part of another plot – see explanation of My Field software). Enter the plot number that the plot is a part of.

4.2.7.2.2 Water Multiply - % (0-1000): Sometimes it is necessary to increase or decrease the water quantities in multiple programs at the same time (for example in the case of a very hot day). It is possible to define a permanent multiplying factor or a factor just for today (which resets at midnight). The water quantity in all of the irrigation programs working in this plot will increase (100-1000) or decrease (0-100) according to the percentage defined here). For example: If the water quantity is 45 M3 (THG) and the water multiplier is 250% the water quantity will alter to 45*2.5=112.5 (the new quantity will be shown in water remaining). If the water multiplier is 75% the water quantity will alter to 25*0.75=33.75.

4.2.7.2.3 Cancel Fertilization: as in the fertilization program it is possible to cancel fertilization even though there is a fertilization program. Canceling fertilization means that fertilization is canceled in all of the programs assigned to the plot. As in the fertilization program it is possible to cancel fertilization for today only or permanently.

4.2.7.2.4 Pause: it is possible to pause a plot permanently (until manually released) or for a limited number of minutes after which the plot will return to normal operation.

4.2.7.3 Plots Information: this button opens the information screen (that cannot be edited) showing plot status – programs, alarms, faults etc.

4.2.8 RTU Setup: (724) the numbers (address) of RTU are defined in the hardware (see hardware definitions for Galileo controller manual). Define the existing RTU in the system by accessing services and selecting RTU. From this screen access RTU. Define the existing RTU by turning the number blue. A RTU that is defined but not communicating will appear red in the RTU status screen.
4. Set Up

4.2.9 Defining Outputs for System Elements: (7231) some elements in the system that do not have icons or are part of another element. In order to define outputs for them press setup>connections>outputs and select system elements. The following outputs can be defined: water pumps, filters, auxiliary outputs, water mixing junction outputs, alarm outputs and filter pressure sustention outputs.

4.2.10 Defining Condition Inputs: (72324) the condition input is an element that is connected to a discrete input (see input/output definitions in irrigation valve definition) and has two possible states (On/Off). Conditions can be set for condition inputs (see logic conditions) or be used for other elements that allow doing so. In order to define condition inputs press setup>connections>inputs>conditional inputs. Define the input number and delay time.

4.2.11 Sensor Definition: (7233) sensor definition in the Galileo controller involves a number of elements some of whom are found in other elements’ properties. Every element using a sensor (data sensor, meteorological station, fertilizer center etc.) can use an element of sensor type from the following group:

```
 "Connection Table" (1 - 100)
 "Sens. Groups" (101 - 110)
 "Comm. Table" (201 - 250)
 Tensiometers (301 - 330)
```

Each element using a sensor (for instance the sensor elements shown below) can be assigned one of the elements in the list in accordance with the above number range.

4.2.11.1 Basic Sensors (connection table): in the Galileo controller sensors are elements connected to analog inputs (see hardware installation manual). In order to define a sensor two parameters must be defined: a) Number of analog input that the sensor is connected to. b) Type of sensor and its reading range.

4.2.11.1.1 In order to define the connection access the sensor connection table by pressing definitions>element definition>sensors>sensor inputs. Enter the input number (see explanation on input/output definition in irrigation valve definitions) for every sensor number (blue). This number (blue) is the basic sensor number.

4.2.11.2 From the previous screen it is possible to access the following sensor definition screen:
The sensor number in this screen (sensor’s index number) is determined by the analog input number in accordance with the order of the cards inside the controller from left to right. Determining this number is relatively simple when the analog inputs are all local but becomes more complicated when using RTU. In order to safely determine the number use the I/O coding table found in the services menu:

4.2.11.1.3 By using this table you can enter the connection number of any 5 I/O type elements (for example 1.0051) and receive the controller index number under the No. heading. The sensor definition will be carried out according to this number.
4. Set Up

4.2.11.1 Define the following in the sensor setup table: sensor type, working range \(\text{min value, max value}\) \(\text{(data from manufacturer)}, \text{calibration value (optional)}\) and values for alarm \(\text{min, max}\) \(\text{(optional)}\). In any case an alarm will be issued if the sensor deviates from its range (because it means the sensor has a hardware fault (see hardware definition)). There are setup instructions for Galcon sensors on the lower part of the sensor setup screen that can be copied for the desired sensors.

4.2.11.2 Sensor Groups: it is sometimes necessary to define a group of sensors in order to receive a single reading (integrated). Such a group can be defined as a data sensor for example. To define a sensor group press setup>element definition>sensors>sensor groups. The following screen opens:

![Sensor Group Setup Screen]

20 groups of sensors can be defined whose numbers are 101-120. Each group can contain 4 sensors – enter the sensor’s basic number (A-D). Integrated readings can be received according to the type stated in Group Type. The possibilities are:

4.2.11.2.1 Average: calculated average of all of the group sensor readings.

4.2.11.2.2 Highest: the highest reading from all of the group sensors.

4.2.11.2.3 Lowest: the lowest reading from all of the group sensors.

4.2.11.2.4 Differential: the largest difference between any two sensor readings in the group.

4.2.11.2.5 A-B: the first sensor reading minus the second sensor reading (the result can be negative). Sensors C and D (if defined) are not applied.

4.2.11.3 Sensors from Communication: when using a number of Galileo controllers connected to a central computer, data can be relayed between the controllers.
4. Set Up

(see communication between controllers in the PC installation and operation manual). A sensor group can be assigned anywhere that a basic sensor can.

4.2.11.4 **Tensiometers:** it has been proved technically that it is not accurate to measure plant water availability only by tensiometer readings (it measures the soil’s water contention – in fact it measures the negative pressure at which water can be taken from the soil), rather adjustments should be made according to soil temperature. When defining the tensiometer enter the sensor (tensiometer) number and the soil temperature sensor number. Up to 30 tensiometers can be defined and then assigned to different sensor elements. Access the tensiometer screen by clicking on data on the main screen then **tensiometers setup**. The following screen appears:

Define as follows:

4.2.11.4.1 **Tensiometer – Sensor Number:** basic sensor number connected to the tensiometer (see basic sensors definition).

4.2.11.4.2 **Solution Temperature – Sensor Number:** basic sensor number connected to soil temperature sensor (see basic sensors definition).

4.2.11.4.3 **Middle Temperature Setup- No Compensation:** temperature, at that specific temperature no compensation will be carried out on the tensiometer reading.

4.2.11.4.4 **Compensation Above/Below - 1 millibar per degree:** for every degree above/below middle temperature the tensiometer reading is increased/decreased by one millibar.

4.2.11.4.5 **Measure Cycle – minutes:** how often (in minutes) to carry out compensation calculations and adjust the readings.

4.2.11.4.6 **Tensiometer Value For Alarm – Low/High:** alarms can be issued and sent to the plot (show alarm in plot number – see explanation in plot definitions).

4.2.11.4.7 **Tensiometer Data:** screen showing tensiometer information.

4.2.11.5 **Sensor Elements:** these are elements that use sensors that have an added value. Sensor elements can include fertilizer center, pause device or even auxiliary outputs and more. These elements are explained in advanced operating.

4.2.11.6 **Data Sensors:** these elements are data collection and for display purposes. They include basic sensors, communication sensors and sensor groups.
4. Set Up

It is possible to display the sensor and its value by defining the element in My Field. Data collection reports can be made according to data sensors. (See explanation on the data collection software Galileo Data). Clicking on the sensor icon opens the following screen:

4.2.11.6.1 Sensor Definition: enter the sensor number (see sensor definition). The basic sensor can be directly defined here instead of as explained in the basic sensor definition section. After entering the basic sensor number 1-100 (make sure that the number is available), click on the sensor number (the editing key should be closed). The following screen appears:

4.2.11.6.2 Click on the key and then enter the analog input number (in the above example 0.0001). Close the key and wait until the number appears below the heading No.. Next click on the number that appears (in the above example 1). The following screen opens:

4.2.11.6.3 Define the basic sensor data (see sensor definition above). The sensor number in this screen is the index number obtained automatically from the previous screen. Enter recommended values (as explained in sensor definition above).

4.2.11.7 Meteorological Station: This is a certain sensor group (that belong to the meteorological station) and can be seen in the screens designed for this purpose. To define a meteorological station access setup-element definition-sensors-meteorology. The screen that opens is for defining the meteorology sensors. Enter a sensor number for each sensor (for example wind speed - sensor number 2). Please note: The rain meter in the meteorological station has to have its digital input number and not sensor number. Clicking on the meteorological station in the system diagram opens a screen showing readings from all of the sensors and various accumulation data.
4. Set Up

4.2.11.8 Temperature humidity Sensors (breathing cell): Galcon temperature and humidity sensors are usually supplied in what is know as breathing cell form. It contains two thermometers – one dry (standard) and one that is wrapped in a special bag soaked in soft water (see hardware definition). The controller calculates the relative humidity by the temperature difference between the two and shows the humidity reading as the value of the second sensor. It is important to take particular care when defining these sensors. They must be numbered consecutively. The first will always be the dry thermometer defined as a standard 4-20mA sensor. The second will be the moist thermometer and defined as – Wet 4-20mA.

4.2.12 General Counters: these general counters count pulses (like a water meter) that are not connected to irrigation (for example: electricity meter). To define a general counter access definitions>connections>inputs and select general counters. Define the input (see explanation on defining input/output in irrigation valve definition) and pulse size. To access general meter data click on the data button in the main screen and select general meters. Current information is displayed – capacity, daily and seasonal accumulation.

4.2.13 Operation Time Counters: time counters are elements that can have other elements assigned to them for monitoring purposes. Click on the data button in the main screen and then on time counters. The following screen opens:

Define the element type on the left hand side of the screen – click on the cell (when the editing key is open). A list of possible elements will appear and the number of the monitoring element. The right hand side of the screen shows data of daily hours and seasonal hours of the element being monitored. This enables creating a graph of the element’s operation.

4.2.14 Water Mixing Junction: the water junction controls two motored irrigation valves that can be opened by stages. The aim is to mix two water sources according to a certain ratio, to EC readings or other (as described in the following). Up to 5 different water junctions can be defined. The following diagram shows the hardware installation:
4.2.14.1 In order to define a water junction first define one in the My Field software.

4.2.14.2 Define the inputs and outputs of the water junction (see input/output definitions in irrigation valve definitions). To define the outputs access setup>connections>outputs and select system element. The part of the screen concerning water junctions appears as follows:

<table>
<thead>
<tr>
<th>Water Mixing Junctions</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Fresh</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Close Fresh</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Main Fresh</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Open Saline</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Close Saline</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Main Saline</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Bypass</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

4.2.14.3 Define the connections for closing, opening and main outputs for freshwater and saline source.

4.2.14.4 To define the inputs of the water junction access setup>connections>inputs and select water junctions. The following screen opens:
4. Set Up

Enter the water meter inputs, water meter pulse size and value for fault (optional).
If operation is by EC it is not necessary to define a water meter.

4.2.14.5 Click on the icon in the main screen. The following screen opens:
4.2.14.6 The above screen displays information of the water junction actions whilst operating. The four buttons on the lower part of the screen allow accessing properties and settings.

4.2.14.7 To define the water junction press on water mixing setup, the following screen opens:

In this screen define general data of the mechanism:

4.2.14.7.1 Mixing Junction Definition: define whether the mixing junction is active or inactive.

4.2.14.7.2 Connection to Pipeline Number: define the number of the pipeline that the water junction is connected to.

4.2.14.7.3 Valves Control Method: (by PID or differential). It is possible to work with both methods for EC adjustment as explained further on.

4.2.14.7.4 General Sensor for EC Control: Enter the sensor number connected after the mixing.

4.2.14.7.5 Control Precision: (low, medium, high) sensitivity level of the controlling system.

4.2.14.7.6 Stability Check Time – seconds: time between adjustments in seconds.

4.2.14.7.7 EC Deviation Alarm (±): percentage deviation from target EC value allowed before an alarm is issued.

4.2.14.7.8 EC Alarm Delay - seconds: if the mechanism does not succeed in reaching the target during the EC alarm delay in seconds an alarm is issued.
4. Set Up

4.2.14.7.9 Default Mixing Program: select one of six programs as the default mixing program that will run if no other program is programmed (see below).

4.2.14.7.10 System Bypass During Water Source Fault: several actions are possible (see water source constants below). This parameter safeguards the system and has to be active in order for this mechanism to work.

4.2.14.8 Clicking on the water sources setup key opens the following screen:

In this screen define the two water sources as follows:

4.2.14.8.1 Action Full Way Time - seconds: time in seconds that the motored valve takes to go from full opening to full closing.

4.2.14.8.2 Action Number of Stages: into how many stages to divide full opening. Operating motored valves is by opening stages. Each time the controller wants to open the valve the controller opens one stage and in this way reaches the required opening stage. The time for opening each stage is the full opening time divided by the number of stages.

4.2.14.8.3 Maximum Water Flow rate – M³/H (GPM): the water flow rate when the valve is fully open.

4.2.14.8.4 Water Source Pulse Volume – liters (gallons): water meter pulse size as defined in the inputs (see above).

4.2.14.8.5 Water Source Pulse Fail Delay – seconds: the maximum time between two pulses above which it will be considered a fault. This is also the time waited before the first pulse upon starting operation.
4.2.14.8.6 **Water Source Uncontrolled Pulses:** when the water source is closed, water flow rate means there is a fault. In order to avoid false alarms define how many pulses can pass without the alarm **uncontrolled water** being issued.

4.2.14.8.7 **Action at Source Fail:** when one of the sources is faulty it is possible to fully open the second source. Define here whether to do this or not. In order for this action to occur enter **bypass system during water source fault** in the water mixing constant’s screen.

4.2.14.8.8 **Water Source Stage While Mixing/Irrigation Off:** these two parameters determine to what stage the valves will open when there is no mixing or irrigating.

4.2.14.8.9 **Differential Source Control:** it is possible to use two methods for controlling (PID and differential). In the differential method the controller makes adjustments according to the difference between the measured and target value. For example: if required EC is set as 1.8 and the measured EC is 1.3 the difference is 0.5.

4.2.14.8.9.1 **Maximum Stage Change - %:** the maximum number of stages in one correction. (It is defined as the percentage of the total number of stages. For example if the number of stages (as defined in paragraph 8) is 50, 10% means 5 stages).

4.2.14.8.9.2 **EC Change and Flow Change at Maximum Stage:** these two parameters determine the level of adjustment in accordance with the previous parameter. The change of flow rate and EC for one step of the maximum is entered. For example: the **EC Change At Max** is 20%, the **Flow Change At Max** is 30%, the current EC reading is 1.3 and the flow rate is 50 m3/h. For a **Maximum Stage Change** of 10% (as in the previous example 5 steps), the new EC reading will be $1.3 + 20\% = 1.56$ and the new flow rate will be $50 + 30\% = 65$ m3/h.

4.2.14.8.10 **PID Source Control:** valve adjustments upon reaching the target are carried out by PID. It is recommended to enter the values shown in the above table. (See more about PID adjustments in the section describing **ECpH control** in the fertilizer center).

4.2.14.9 **Water Mixing Programs:** every water junction can be programmed with up to 6 programs. Clicking on the water mixing programs key on the main water mixing screen opens the following screen:

4.2.14.9.1 **Mixing Methods:** there are 4 options:
4. Set Up

4.2.14.9.1.1 **Inactive**: program not active.

4.2.14.9.1.2 **Manual**: the valves will open according to percentage from full opening as programmed by the next two parameters.

4.2.14.9.1.3 **EC**: the valves will open to maintain the required EC as defined below. In this case the controller ignores the fresh water and saline required % parameters.

4.2.14.9.1.4 **Percentage**: the valves will operate according to percentages of the general flow rate (of both the fresh and pipeline water). For example: when programming 30% pipeline water and 70% freshwater the valves will maintain these percentages.

4.2.14.9.2 **Freshwater/Saline Water Required - %**: (two parameters) percentage of opening or the ratio between freshwater source and pipeline source (see above).

4.2.14.9.3 **Required EC**: EC value to be maintained (target). All other data in this table are purely informative and cannot be edited.

4.3 **Controller Setup**: (6) these settings define the general data of the controller. To access the controller setup screen click **setup>general controller**. The following screen appears:
4.3.1 Controller Status: (61) there are 3 options:

4.3.1.1 Reset: the controller is not active. **Warning:** the transition from active status to reset resets all the accumulated data in the controller.

4.3.1.2 Active: the controller is active and operates according to the operating program – normal situation.

4.3.1.3 Paused: all activities are suspended (including auxiliary outputs and general elements). Readings are carried out as normal.

4.3.2 Data Collection Setup: (631) setup the resolution for graph type data collection (flow rates, sensor readings, general meters and time meters). In graphs (see data collection software manual), a graph point is generated at the frequency determined by the time specified here.

4.3.3 Load Management Times: (632) there are some places where the electricity rate is not uniform throughout the day. The different time tariffs can be defined here and a report can be generated by the data collection software in accordance with the different times. (See data collection software manual). This feature can be used for applications other than electricity rates. Accumulation reports in the data collection are defined as being from midnight to midnight. In order to alter the beginning of the day enter in the off peak start time the time required for the reading and in the off peak end time enter the same time minus one minute.
4. Set Up

4.3.4 Display: (61) The right hand side of the main screen in the computer program displays all of the programs currently operating. If the definition is full display then all of the programs with the status irrigating, fertilizing, waiting and fault will be displayed. Sometimes there are a large amount of programs and some do not appear on the screen (up to 20 programs can be shown at the same time). This is particularly bothersome when working with sequence when all of the programs from the sequence will be displayed. In order to limit the number of programs appearing define reduced display and then only the programs with the status irrigating, fertilizing and fault will be displayed (far less programs).

4.3.5 Limiting Water for Cycle: (346) in order to safeguard against programming errors in irrigation programs particularly when water quantities are altered (upon water multiplying, when the irrigation unit is cubic meters per hectares (THG/acre) or when using evaporation), the amount of water that it is possible to program can be limited. An attempt to program an amount greater than this will cause an alarm and a fault in the system.

4.3.6 Limiting Irrigation Time Per Cycle: (346) similar to limiting water for cycle, but in this case the limitation is by time in minutes. Both parameters can be entered and they will both issue alarms. Limiting time per cycle does not work when irrigating by volume.

4.3.7 Diary Messages Definitions; (231) it is possible to define which type of messages will be logged in the diary and filter out unwanted data.
5. Flow Chart for Operator
6. The Menus

0 Main Menu
1 Information
2 Logbooks
3 Irrig. Programs
4 Manual Overriding
5 System Components
6 System Constants
7 Setup and Service
8 Alarms

1 Information
11 Current Status
12 Programs Info
13 Valves Info.
14 Fertilize Info
15 Water&Fert. Accum
16 Plots Info
17 Other Elements
18 More Informations

2 Logbooks
21 Event Logbook
22 Alarm Logbook
23 Logbook Setup

3 Irrig. Programs
31 Programs Info.
32 Prog.Programing
33 Fert.Programing
34 Programs Setup

4 Manual Overriding
41 Pause
42 Manual - Programs
43 Manual - Valves
44 Manual - Lines
45 Manual - Flushing
46 Man.-Auxiliaries

5 System Components
51 Water System
52 Fert. System
53 Filter Flushing
54 Plots

55 Auxiliaries
56 Conditions
57 General Counters
58 Sensors

6 System Constants
61 Controller Setup
62 Clock Adjust
63 PC Messages

7 Setup and Service
71 System Data
72 General Setup
73 Elements Setup
74 System Security
75 Connection Check

8 Alarms
81 Alarm Information
82 Cancel Alarms
83 Alarm Setup
84 Low Battery Fault

11 Current Status
#1 Program No.
#2 Valve Number
#3 Program Status
#4 Time Left Mnt
#5 Curr. Flow
#6 Water Done
#7 Frt.Done A
#8 Frt.Done B
#9 Frt.Done C
#10 Frt.Done D
#11 Frt.Done E
#12 Frt.Done F
#13 Frt.Done G

12 Programs Info
#1 Prog. Status
#2 Time Left Mnt
#3 Programming Stat.
#4 Wait Reason
#5 Wait Time Mnt

#6 Start Condition
#7 Oper. Condition
#8 Pause Condition
#9 Stop Condition
#10 Pipe line Paused
#11 No Water Pulse
#12 Flow Rate Alarm
#13 Fert. Alarm
#14 Frt.Not Finished
#15 Fault Fr.Log.Cond
#16 Quantity Limited
#17 Last Irr. Date
#18 Last Ir M3
#19 Lst Ir Mnt
#20 Frt.Done A
#21 Frt.Done B
#22 Frt.Done C
#23 Frt.Done D
#24 Frt.Done E
#25 Frt.Done F
#26 Frt.Done G
#27 EC-Last Irr.
#28 pH-Last Irr.
#29 Acc.Elmnt
#30 Cycles Done

13 Valves Info.
#1 Valve Status
#2 Last Irr. Date
#3 Last Flow
#4 Operated By Prog.
#5 Programm.In Prog.
#6 Programm.In Prog.
#7 Programm.In Prog.
#8 Log. Cond. Type
#9 Log. Cond. Exist
#10 Fert. Accum. Err.

14 Fertilize Info
141 Fert.Pumps Info.
142 Fert.Centers Info

15 Water&Fert. Accum
151 Valves Accum
152 Fert.Pumps Accum.

16 Plots Info
#1 Plot Status
#2 Irrig. Status
#3 Plot In Pause
#4 Permanent Pause*
#5 Pause Minutes
#6 Cancel Pause *

17 Other Elements
171 Pipe Lines Info.
172 Water Meters Info
173 Flush Groups Info
174 Water Pumps Info.
175 Pump Houses Info.
176 Burst protect Inf

18 More Informations
181 Sens. Informations
182 Logical Cond.Info
183 Gen.Counters Info
184 Auxillary Out Inf
185 System Informat

23 Logbook Setup
231 Logbook Messages
232 Logbook Erase

31 Programs Info.
311 Program Status
312 Last Irrig. Info.

32 Prog.Programing
321 Valves and Amount
322 Program Timing
323 Prog. Conditions

33 Fert.Programing
#1 Fert.Prog.Status
#2 Water Meter No.
#3 Fert. Unit *
#4 Frt.Qnt.A
6. The Menus

- #5 Frt.Qnt.B
- #6 Frt.Qnt.C
- #7 Frt.Qnt.D
- #8 Frt.Qnt.E
- #9 Frt.Qnt.F
- #10 EC Require
- #11 pH Require
- #12 Water Mixing No.
- #13 Fert. Selector
- #14 Fert.fail.reac.*

### 34 Programs Setup
- 341 Prg.Gen.Constants
- 342 Program Priority
- 343 Program Flow Rate
- 344 Daily Evaporation
- 345 Restart Programs
- 346 Irrig.Quant.Limit

### 41 Pause
- 411 General Pause
- 412 Plot Pause
- 413 Program Pause

### 42 Manual - Programs
- #1 Manual Overid. *
- #2 Water Unit *
- #3 Water Amount
- #4 Water Left

### 43 Manual - Valves
- #1 Valve- Man.Oper.

### 44 Manual - Lines
- #1 Manual Overid. *

### 45 Manual - Flushing
- #1 Manual Overide *

### 46 Man.-Auxillaries
- #1 Manual Oper. Sec.

### 51 Water System
- 511 Irrigation Valves
- 512 Pipe Lines

### 52 Fert. System
- 521 Fert. Pumps
- 522 Fert. Centers

### 53 Filter Flushing
- 531 Flushing Status
- 532 Flush. Programm.

### 54 Plots
- 541 Plot Info
- 542 Plot Constants

### 55 Auxillaries
- 551 Aux. Output Info.
- 552 Aux. Output Prog.
- 553 Aux.Out.Sequence

### 56 Conditions
- 561 Logic Conditions
- 562 Condition Inputs
- 563 Pause Elements

### 57 General Counters
- 571 Gen. Counters
- 572 Time Counters

### 58 Sensors
- 581 Sensor Conn.Info.
- 582 Data Sensors
- 583 Sensor Groups
- 584 Tensiometers
- 585 Meteorology
- 586 Sensors by Comm.

### 61 Controller Setup
- #1 Controller Activ.
- #2 No.For Messages
- #3 Programs Disp. *
- #4 System Speed *

### 63 PC Messages
- 631 DBase.Mesg.Cycles
- 632 Load Manag. Setup

### 71 System Data
- 711 I/O Status Info.
- 712 Variable values
- 713 Versions

### 72 General Setup
- 721 Communicat. Setup
- 722 I/O Cards Setup
- 723 Connections
- 724 Cable RTU Setup
- 725 General Reset

### 73 Elements Setup
- 731 Valves Setup
- 732 Fertilizing Setup
- 733 Pipe Lines Setup
- 734 Water Meter Setup
- 735 Water Pumps Setup
- 736 Flush Group Setup
- 737 Element Copy

### 75 Connection Check
- #1 Connect. Check *

### 81 Alarm Information
- 811 Controller Alarms
- 812 Plot Alarms
- 813 Double Outputs

### 82 Cancel Alarms
- 821 General Cancel
- 822 Prog.Alarm Cancel
- 823 W.Meter Al.Cancel
- 824 Frt. Alarm Cancel
- 825 Pipe Alarm Cancel
- 826 Aux.Out.Al.Cancel

### 83 Alarm Setup
- 831 Alarm Time Range
- 832 Alarm Outputs No
- 833 Alarm Time

### 84 Low Battery Fault
- 841 Low Battery Info
- 842 Low Battery Setup

### 141 Fert.Pumps Info.
- #1 Fert Pump Status
- #2 Fert. Requ.
- #3 Correc.Frt.
- #4 Daily Fert.
- #5 Acc. Fert.
- #6 Fert. Flow Ltr/H
- #7 Uncontrol. Fert.
- #8 No Fert. Pulse
- #9 Fert. Flow Fail.
- #10 Uncont.Fert.Puls.
- #11 Frt.Plgs.Size Ltr
- #12 Prop. by W.Meter
- #13 Conn. to Line No.
- #14 Fert. Center No.
- #15 Fert. Unit
- #16 Start Accum.Date
- #17 Auto Fert.
- #18 Program Using A
- #19 Program Using B
- #20 Program Using C
- #21 Program Using D
- #22 Program Using E

### 142 Fert.Centers Info
- #1 F.Center Status
- #2 Running Program
- #3 EC - Actual
- #4 pH - Actual
- #5 EC-Moment.Averag.
- #7 EC - Alarm
- #8 pH - Alarm
- #9 Uncontroll. Fert.
- #10 No Fert. Pulse
- #11 Fert. Flow Fail.
6. The Menus

#12 ECpH - Extreme
#13 Auto Corr. EC %
#14 Auto Corr. pH %
#15 Main Fert.Status
#16 Fert. Selector
#17 Irr. Program A
#18 Irr. Program B
#19 Irr. Program C
#20 Irr. Program D
#21 Irr. Program E

151 Valves Accum
1511 Valves Daily Acc.
1512 Valves Seas. Acc.

152 Fert.Pumps Accum.
#1 Fert Pump Status
#2 Daily Fert.
#3 Acc. Fert.
#4 Start Accum.Date
#5 Reset Accumul.

171 Pipe Lines Info.
#1 Pipe Line Status
#2 Curr. Flow
#3 Nomin.Flow
#4 Upstream Dly-sec
#5 Upstream Dly-sec
#6 Irrigation Req.
#7 Log. Cond. Start
#8 Manual Overiding
#9 Line Prog. Req.
#10 Stabil Opening
#11 Filter Flushing
#12 Connection Error
#13 No Water Pulse
#14 Uncontrol Water
#15 Uncontrol. Fert.
#16 W.Pmp.Hous.Pause
#17 Element Pause
#18 Log. Cond. Pause
#19 Filter Grp.Pause
#20 Burst Protection
#21 Flow Limit
#22 Water Meter “A”
#23 Water Meter “B”

172 Water Meters Info
#1 W.Meter Status
#2 Measur.Flow
#3 Nomin.Flow
#4 Daily W. M3
#5 Accum.W. M3
#6 Start Accum.Date
#7 Uncont.Wat.
#8 Period.Acc.
#9 Pulse Size M3
#10 Uncontrol. Water
#11 No Water Pulse
#12 Conn. to Line No.
#13 Program Using
#14 Program Using
#15 Program Using
#16 Program Using
#17 Program Using
#18 Pulse Fault Delay
#19 Cancel Alarm

173 Flush Groups Info
#2 Daily Flushes
#3 Since Flush - M3
#4 Since Flush- H:M
#5 Filter Flushing
#6 Contin. Flushes
#7 Flush Require
#8 P.D Switch Stat.
#9 Oper. Log Cond.
#10 Pause Log. Cond.
#11 Fault Log. Cond.
#12 Line Fill Delay

174 Water Pumps Info.
#1 Pump Status
#2 Operation Input
#3 Fault Inputs
#4 Pump Failure
#5 House oper. Cond.
#6 Line Oper. Cond.
#7 Work.In House No.
#8 Double-House Pmp.
#9 Log.Cond. Exist

175 Pump Houses Info.
#1 Pump House Stat.
#2 Actual Flw
#3 Req. Flow
#4 Current Step
#5 Pressure Value
#6 Step Up Delay
#7 Step Down Delay
#8 Oper. Require A
#9 Oper. Require B
#10 Oper. Require C
#11 Oper. Require D
#12 Oper. Require E
#13 Operat. Input A
#14 Operat. Input B
#15 Operat. Input C
#16 Operat. Input D
#17 Operat. Input E
#18 Pump Fault A
#19 Pump Fault B
#20 Pump Fault C
#21 Pump Fault D
#22 Pump Fault E

176 Burst protect Inf
#1 Burst Prot.Status
#2 Act. Flow
#3 Positiv. Flow Flt.
#4 Negativ. Flow Flt.

181 Sens.Informations
1811 Data Sensors Info
1812 Meteorologic Info

182 Logical Cond.Info
#1 Log.Cond. Status
#2 Elmnt.Value
#3 Log. Cond. Delay

183 Gen.Counters Info
1831 Pulses Count.Info
1832 Time Counters Inf

184 Auxiliary Out Inf
#1 Aux. Out. Status
#2 Manual Oper. Sec.
#3 Sec.To End Pulse
#4 Sec.To Next Open
#5 Cycles Today
#6 Total Time Today
#7 Start Cond.Input
#8 Paus.Cond.Input
#9 Start Log. Cond.
#10 Pause Log. Cond.
#11 Fault Log. Cond.
#12 Sensor Value
#13 Low Setpoint
#14 High Setpoint
#15 Start By Time
#16 Operat. By Fert.
#17 Operation Hours
#18 Alarm Cancel

185 System Informat.
1851 System Version
1852 Outputs Status
1853 Inputs Status
1854 Sensor Values
1855 I/O Cards Status
1856 Cables RTU Status

231 Logbook Messages
#1 Pause Elements
#2 Sensor Alarms
#3 Burst Protect.
#4 Cable RTU
#5 Water Alarms
#6 Flow Alarms
#7 Fert. Alarms
#8 ECpH Alarms
#9 Irrig. Starts
#10 Irrig. Ends
#11 Fert. Message
#12 Flush Message
#13 Log.Conditions

6. The Menus
6. The Menus

311 Program Status
#1 Prog. Status
#2 Time Left Mnt
#3 Programming Stat.
#4 Wait Reason
#5 Wait Time Mnt
#6 Start Condition
#7 Oper. Condition
#8 Pause Condition
#9 Stop Condition
#10 Pipe line Paused
#11 No Water Pulse
#12 Flow Rate Alarm
#13 Fert. Alarm
#14 Acc.Elmnt
#15 Cycles Done
#16 Cancel Alarms

322 Program Timing
#1 Program Defin. *
#2 Operation Mode
#3 Next Open Time
#4 Days T.Next Open
#5 Cycles To Do
#6 Interval (Days)
#7 Start Time hh:mm
#8 Priority Group No.
#9 Prior.Inside Grp.
#10 S. Time Sunday
#11 S. Time Monday
#12 S. Time Tuesday
#13 S.Time Wednesday
#14 S. Time Thursday
#15 S. Time Friday
#16 S. Time Saturday
#17 Cycles Per Day
#18 Cyc.Interval Mnt
#19 End Time (hh:mm)
#20 Start Date dd/mm

323 Prog. Conditions
#1 Log.Condition No.
#2 Accum. Element *
#3 Accum.Element No.
#4 Accum. S.P

341 Prg.Gen.Constants
#1 Program Defin. *
#2 Amount Change %
#3 Cancell Fert. *
#4 Cncl.Frt.Today *
#5 In Fert. Fail *
#6 Auto Can.Alarm *

342 Program Priority
3421 Priority in Group
3422 Priority Groups

343 Program Flow Rate
3431 Flow Fault Setup
3432 Flow Fault Delay

344 Daily Evaporation
3441 Evaporation Data
3442 Evaporation Setup

345 Restart Programs
#1 Restart Program

346 Irrig.Quant.Limit
#1 MAX.Qnt.m3
#2 MAX.Time Mnt

411 General Pause
#1 Fix Pause *
#2 Cancel Pause *
#3 Pause - Minutes

412 Plot Pause
#1 Fix Pause *
#2 Pause - Minutes
#3 Cancel Pause *

413 Program Pause
#1 Pause - Minutes

414 Water Pumps
5141 Independent Pumps
5142 Pump Houses

515 Burst Protection
5151 Burst prot. Info.
5152 Burst prot. Setup

516 Wtr.Mix. Junction
5161 Water Nixing Info
5162 Wtr.Mix. Programs
5163 Wtr.Src.Accum.Rst
5164 Water Mix. Const.

521 Fert. Pumps
5211 Fert. Pump Info.
5212 Fert Pump Const.
5213 Fert.Pump Service

522 Fert. Centers
5221 Fert.Center Info.
5222 Fert.Center Prog.
5223 Fert.Center Const
5224 Fert. PID Inform.

531 Flushing Status
#1 Group Status
#2 Daily Flushes
#3 Since Flush - M3
#4 Since Flush- H:M
#5 Filter Flushing
#6 Contin. Flushes
#7 Flush Require
#8 P.D Switch Stat.
#9 Oper. Log Cond.
#10 Pause Log. Cond.
#11 Fault Log. Cond.
#12 Line Fill Delay

532 Flush. Programm.
#1 Flushing Time Sc
#2 Between Filtrs Sc
#3 Interval HH:MM
#4 Interval M3

541 Plot Info
6. The Menus

#1 Plot Status
#2 Fault- Plot No.
#3 Fault- Valve No.
#4 Fault- Prog. No.
#5 Fault- Line No.
#6 Tens. Fault
#7 Fert. Fault
#8 Irrig. Status
#9 Plot In Pause
#10 Permanent Pause*
#11 Pause Minutes
#12 Cancel Pause *

542 Plot Constants
#1 Prmnnt Wtr.Mul.%
#2 Today  Wtr.Mul.%
#3 Cancell Frt *
#4 Cancl.Frt.Today*

551 Aux. Output Info.
#1 Aux. Out. Status
#2 Manual Oper. Sec.
#3 Sec.To End Pulse
#4 Sec.To Next Open
#5 Cycles Today
#6 Total Time Today
#7 Start Cond.Input
#8 Paus.Cond.Input
#9 Start Log. Cond.
#10 Pause Log. Cond.
#11 Fault Log. Cond.
#12 Sensor Value
#13 Low Setpoint
#14 High Setpoint
#15 Start By Time
#16 Operat. By Fert.
#17 Operation Hours
#18 Alarms Cancel *

552 Aux. Output Prog.
#1 Operation Mode *
#2 Start Time
#3 End Time
#4 Operation Time S
#5 Delay Time Sec.
#6 Start Cond.Input
#7 Pause Cond.Input
#8 Cond. Sensor no.
#9 Below Setpoint
#10 Above Setpoint
#11 Stop Differential
#12 Log. Condition A
#13 Log. CCondition B
#14 Oper.In Sequence
#15 Conn. Output No.

553 Aux.Out.Sequence
#1 Max.Aux.Together

561 Logic Conditions
5612 Log.Cond. Prog.

562 Condition Inputs
5621 Cond.Input Status
5622 Cond. Input Prog.

563 Pause Elements
5631 Pause Elem.Info.
5632 Pause Elem.Setup

571 Gen. Counters
5711 Gen.Counter Info.
5712 Gen.Counter Setup

572 Time Counters
5721 Time Count. Info.
5722 Time Count. Setup

581 Sensor Conn.Info.
#1 Sensor Number
#2 Sensor Value

582 Data Sensors
5821 Data Sensor Info.
5822 Data Sensor Setup

583 Sensor Groups
5831 Sensor Grp.Info.
5832 Sensor Grp.Setup

584 Tensiometers
5841 Tensiometers Data
5842 Tensiometers Prog

585 Meteorology
5851 Current Meteor.
5852 Daily Meteorology
5853 Seasonal Meteor.

586 Sensors by Comm.
#1 Com.Sensor Value

631 DBase.Mesg.Cycles
#0 Sensors (Min.)
#1 Water Flows Mnt
#2 Gen. Count. Mnt
#3 Time Count. Mnt

632 Load Manag. Setup
#1 Start Peak Time
#2 End Peak Time
#3 Start Midrate
#4 End Midrate Time
#5 Start Off Peak
#6 End Off Peak Tim.

711 I/O Status Info.
7111 Out&Inputs Status
7112 Sensor Values
7113 I/O Card Status
7114 Cable RTU Status

712 Variable values
7121 RAM Var. Values
7122 Prog. Var. Values
7123 Flag Var. Values

721 Communicat. Setup
7211 Comm. Definitions
7212 Modern Restart

722 I/O Cards Setup
#1 Card Type *
#2 Card Type *
#3 Card Type *
#4 Card Type *
#5 Card Type *
#6 Card Type *
#7 Card Type *
#8 Card Type *
#9 Card Type *
#10 Card Type *
#11 Card Type *
#12 Card Type *

731 Valves Setup
#1 Output Def.
#2 Conn. To Line No.
#3 Plot No.
#4 Water Meter No.
#5 Flow M3/H
#6 Area Hectar
#7 Valve Type *

732 Fertilizing Setup
7321 Fert Pumps Setup
7322 Fert.Center Setup
7323 Auto Fert Method

733 Pipe Lines Setup
7331 Pipe Line Setup
7332 Valve/Lines Order

734 Water Meter Setup
#1 Input Def.
#2 Pulse Size M3
#3 Conn. to Line No.

735 Water Pumps Setup
7351 Water Pump Setup
7352 Pump House Setup

736 Flush Group Setup
#1 Group Active *
#2 Water Meter No.
#3 P.D Sw. Input No.
#4 Max. Contin. Fl.
#5 First Filt. 1-40
### 6. The Menus

<table>
<thead>
<tr>
<th>#6</th>
<th>Last Filter 1-40</th>
</tr>
</thead>
<tbody>
<tr>
<td>#7</td>
<td>Conn. to Line No.</td>
</tr>
<tr>
<td>#8</td>
<td>Flush Pauses Irr.</td>
</tr>
<tr>
<td>#9</td>
<td>Flush Fail.React.</td>
</tr>
<tr>
<td>#10</td>
<td>Line Fill Delay</td>
</tr>
<tr>
<td>#11</td>
<td>Sustain Vlv. Out</td>
</tr>
<tr>
<td>#12</td>
<td>Sust.Pced. Sec.</td>
</tr>
</tbody>
</table>

#### 737 Element Copy
- #1 Element Type *
- #2 Element No.
- #3 From Element No.
- #4 To Element No.
- #5 Copy Process *

#### 811 Controller Alarms
- #1 Control. Alarms
- #2 Under Flow
- #3 Over Flow
- #4 Under Pressure
- #5 No Water Pulse
- #6 Uncontrol.Water
- #7 No Fert. Pulse
- #8 Uncontrol. Fert.
- #9 Fert. Flow Rate
- #10 Fert. Pump Def.
- #11 EC
- #12 pH
- #13 ECpH Extreme
- #14 Pipe Line Oper.
- #15 Pipe Line Def.
- #16 Irr.Prog.Oper.
- #17 Irr.Prog.Def.
- #18 Irr.Valve Manual
- #19 Sensor
- #20 Water Pump
- #21 Filt.Flush Fault
- #22 Logic Condition
- #23 Logic Cond. Def.
- #24 Pause Element
- #25 Pause Elem. Def.
- #26 Burst Protection
- #27 Fert. Not Finish.
- #28 Irr.Valve Defin.
- #29 Irr.Valve Oper.
- #30 Valve Group Def.

#### 812 Plot Alarms
- #1 Plot Alarm
- #2 Alarm - Plot No.
- #3 Alarm - Valve No.
- #4 Alarm - Prog. No.
- #5 Alarm - Line No.
- #6 Fert. Alarm

#### 813 Double Outputs
- #1 Double Output No.
- #2 Double Output No.
- #3 Double Output No.
- #4 Double Output No.
- #5 Double Output No.
- #6 Double Output No.
- #7 Double Output No.
- #8 Double Output No.
- #9 Double Output No.
- #10 Double Output No.

#### 821 General Cancel
- #1 Alarm Cancel *

#### 822 Prog.Alarm Cancel
- #1 Cancel Alarm *

#### 823 W.Meter Al.Cancel
- #1 Cancel Alarm *

#### 824 Frt. Alarm Cancel
- #1 Cancel Alarm *

#### 825 Pipe Alarm Cancel
- #1 Alarm Cancel *

#### 826 Aux.Out.Al.Cancel
- #1 Alarm Cancel *

#### 831 Alarm Time Range
- #1 Start Time
- #2 End Time

#### 832 Alarm Outputs No
- #1 Under Flow Out.
- #2 Over Flow Output
- #3 Underpress. Out.
- #4 No Water Pulse
- #5 Uncontrol.Water
- #6 No Fert. Pulse
- #7 Uncontrol. Fert.
- #8 Fert. Flow Fail.
- #9 Fert. Pump Def.
- #10 EC Fail.
- #11 pH Fail.
- #12 ECpH Extreme
- #13 Pipe Line Fail.
- #14 Pipe Line Def.
- #15 Irr. Prog. Fail.
- #16 Irr. Prog. Def.
- #17 Valve In Manual
- #18 Sensor Fail.
- #19 Water Pump Fail.
- #20 Filt.Flush Fault
- #21 Log. Cond. Fail.
- #22 Log. Cond. Def.
- #23 Pause Elem. Fail.
- #24 Pause Elem. Def.
- #25 Burst Protection
- #26 Fert Not Finish.
- #27 Valve Def
- #28 Valve Fail.
- #29 Valve Group
- #30 Drain Fail.
- #31 Tensiometer Fail
- #32 Irr. Quant. Limit
- #33 Irr. Time Limit
- #34 Low Battery Fault
- #35 Low Battery Pause
- #36 I/O Card Fail.
- #37 RTU Fail.
- #38 Double Output
- #39 Comm. Alarm
- #40 Control. Memory

#### 833 Alarm Time
- #1 Under Flow
- #2 Over Flow
- #3 Under Pressure
- #4 No Water Pulse
- #5 Uncontrol.Water
- #6 No Fert. Pulse
- #7 Uncontrol.Fert.
- #8 Fert. Flow Fail.
- #9 Fert. Pump Def.
- #10 EC Fail.
- #11 pH Fail.
- #12 ECpH Extreme
- #13 Pipe Line Fail.
- #14 Pipe Line Def.
- #15 Irr.Prog.Fail.
- #16 Irr.Prog.Def.
- #17 Valve In Manual
- #18 Sensor Fail.
- #19 Water Pump Fail.
- #20 Filt.Flush Fault
- #21 Log. Cond. Fail.
- #22 Log. Cond. Def.
- #23 Pause Elem. Fail.
- #24 Pause Elem. Def.
- #25 Burst Protection
- #26 Fert Not Finish.
- #27 Valve Def
- #28 Valve Fail.
- #29 Valve Group
- #30 Drain Fail.
- #31 Tensiometer Fail
- #32 Irr. Quant. Limit
- #33 Irr. Time Limit
- #34 Low Battery Fault
- #35 Low Battery Pause
- #36 I/O Card Fail.
- #37 RTU Fail.
- #38 Double Output
- #39 Comm. Alarm
- #40 Control. Memory

#### 834 Alarm From Comm.
6. The Menus

#1 Buy Var. No.
#2 35 Auto Cancel Alarm
#1 3 Cycle-Cancel Alarm
#1 41 Low Battery Info
#1 4 Low Battery Fault
#2 4 Low Battery Pause
#1 42 Low Battery Setup
#1 Fault-Cond. Input
#2 Pause-Cond. Input
#1 511 Valves Daily Acc.
#1 Valve Status
#2 Wte.Acc.M3
#3 Time today - Mnt.
#4 Fert. Pump A No.
#5 F.A.Acc.Ltr
#6 Fert. Pump B No.
#7 F.B.Acc.Ltr
#8 Fert. Pump C No.
#9 F.C.Acc.Ltr
#10 Fert. Pump D No.
#11 F.D.Acc.Ltr
#12 Fert. Pump E No.
#13 F.E.Acc.Ltr
#14 Fert. Pump F No.
#15 F.F.Acc.Ltr
#16 Fert. Pump G No.
#17 F.G.Acc.Ltr
#18 Fert. Accum.Denide.
#21 Accur. Reset *
#1 1811 Data Sensors Info
#1 Sensor Status
#2 Sensor Value
#3 Minimum Value
#4 Average Value
#5 Maximum value
#6 Reset Values *
#1 1812 Meteorologic Info
#1 Curr. Meteorologic
#2 Daily Meteorologic
#3 Seas.Meteorologic
#1 1831 Pulses Count.Info
#1 Gen.Count.Status
#2 Flow Rate
#3 Daily Accum
#4 Seas. Accum
#5 Accum.Start Date
#1 1832 Time Counters Inf
#1 Daily Accumulat.
#2 Seas.accum
#3 Accum.Start Date
#1 1853 Inputs Status
#1 Input Status
#1 1854 Sensor Values
#1 Sensor Value
#1 1855 I/O Cards Status
#1 Card Type
#2 Card Status
#1 1856 Cables RTU Status
#1 RTU Status
#1 3421 Priority in Group
#1 Priorty Group No.
#2 Prior.Inside Grp.
#3 Prior.Cancel-Mnt
#1 3422 Priority Groups
#1 Running Program
#2 Current Priority
#3 Next Program
#4 Next Priority
#5 Change Prog. Req.
#6 Cut Into A Prog*
#1 3432 Flow Fault Delay
#1 Fill Delay Mnt
#2 Fill Delay M3
#3 Flow Delay Unit
#4 Und.Fl.Delay Mnt.
#5 Ovr.Fl.Delay Mnt.
#6 Und.Fl.Delay M3
#7 Ovr.Fl.Delay M3
#1 3441 Evaporation Data
#1 Today M"M
#2 Yesterday M"M
#1 3442 Evaporation Setup
#1 Operation Mode *
#2 Gen. Counter No.
#3 Evaporat. M"M/D
#1 5111 Irrig.Valve Info.
#11 Irrig.Valve Status
#11 Irrig.Valve Daily
#11 Irrig.Valve Season
#1 5112 Irrig.Valve Const
#1 Conn. To Line No.
#2 Plot No.
#3 Water Meter No.
#4 Flow M3/H
#5 Area Hectar
#6 Valve Type *
#1 5113 Valve Groups
#1 Valves Groups
#1 Valves Group Info.
#1 Valves Group Setup
#1 5121 Pipe Line Info.
#1 Pipe Line Status
#2 Curr. Flow
#3 Nomin.Flow
#4 Upstream Dly-sec
#5 Upstream Dly-sec
#6 Irrigation Req.
#7 Log. Cond. Start
#8 Manual Overiding
#9 Line Prog. Req.
#10 Stabil Opening
#11 Filter Flushing
#12 Connection Error
#13 No Water Pulse
#14 Uncontrol Water
#15 Uncontrol. Fert.
#16 W.Pmp.Hous.Pause
#17 Element Pause
#18 Log. Cond. Pause
#19 Filter Grp.Pause
#20 Burst Protection
#21 Flow Limit
#22 Water Meter “A”
#23 Water Meter “B”
#24 Water Meter “C”
#25 Water Meter “D”
#26 Water Meter “E”
#27 Alarms Cancel *
#1 5122 Pipe Lines Const.
#1 Pipe Line Const.
#2 Uncnt.Water Case
#3 Alarm Disp. Plot
#4 Limit Flow
6. The Menus

5123 Line Start Prog.
#1 Current Status
#2 Start Date MM/DD
#3 End Date (MM/DD)
#4 Start Time HH:MM
#5 End Time (HH:MM)
#6 Open Pipe Line
#7 Open Pipe Line
#8 Open Pipe Line

5141 Independent Pumps
#1 Pump Status
#2 Operation Input
#3 Fault Inputs
#4 Pump Failure
#5 House oper. Cond.
#6 Line Oper. Cond.
#7 Work In House No.
#8 Double-House Pmp.
#9 Log.Cond. Exist

5142 Pump Houses
51421 Pump House Info.
51422 Pump House Prog.

5151 Burst prot. Info.
#1 Burst Prot.Status
#2 Act. Flow
#3 Positiv. Flow Flt.
#4 Negativ. Flow Flt.
#5 Cancel Alarm *

5152 Burst prot. Setup
51521 Burst Prot.Const.
51522 Posit.Burst Prot.
51523 Negat.Burst Prot.

5161 Water Nixing Info
51611 Mix.Junction Info
51612 Mix.Programs Info
51613 Water Source Info

5162 Wtr.Mix. Programs
#1 Wtr.Mix.Method *
#2 Fresh Water Req.
#3 Saline Water Req.
#4 Required EC

5163 Wtr.Src.Accum.Rest
#1 Reset Accumulate *

5164 Water Mix. Const.
51641 Mix. Junction Stp
51642 Wtr.Sources Setup
51643 Auto Src.Control

5211 Fert. Pump Info.
#1 Fert Pump Status
#2 Fert. Req.
#3 Correc.Frt.
#4 Daily Fert.
#5 Acc. Fert.
#6 Fert. Flow Ltr/H
#7 Uncontrol. Fert.
#8 No Fert. Pulse
#9 Fert. Flow Fail.
#10 Uncont.Fert.Puls.
#11 Frt.Pls.Size Ltr
#12 Prop. by W.Meter
#13 Conn. to Line No.
#14 Fert. Center No.
#15 Fert. Unit
#16 Start Accum.Date
#17 Reset Accumul. *
#18 Auto Fert.
#19 Cancel Alarm *
#20 Program Using A
#21 Program Using B
#22 Program Using C
#23 Program Using D
#24 Program Using E

5212 Fert Pump Const.
#1 Fert.Pump Type *
#2 Fert. Type *
#3 Fert Name *
#4 Fert. Flow Ltr/h
#5 Pulse Duration S
#6 Contin. Operat.
#7 Uncont Fert. Pls.
#8 No Fert. Pulse S
#9 Max F.Increase %
#10 Max F.decrease %
#11 Auto Cancel Alrm
#12 Aux. Output No.
#13 Flow Chk.Time-Sec
#14 Oper.by Fert.Flow *

5213 Fert.Pump Service
#1 Pulse Durat. Sec.
#2 Wat.To.Frt.Ratio
#3 Frt.To.Wtr.Ratio
#4 Pulses To Do
#5 Wtr.For.Frt.Metr.

5219 Fert Center Info.
#1 F.Center Status
#2 Running Program
#3 EC - Actual
#4 pH - Actual

5221 Fert.Center Info.
#1 F.Center Status
#2 Running Program
#3 EC - Actual
#4 pH - Actual

5223 Fert.Center Const
52231 EC-pH Automation
52232 EC-pH Alarms
52233 EC-pH Stop Irrig.

5224 Fert. PID Inform.
#1 PID EC Prop. Out
#2 PID EC Intg. Out
#3 PID EC Deriv. Out
#4 PID EC Output
#5 PID pH Prop. Out
#6 PID pH Intg. Out

5222 Fert.Center Prog.
#1 Fert.Prog.Status
#2 Water Meter No.
#3 Fert. Unit *
#4 Frt.Qnt.A
#5 Frt.Qnt.B
#6 Frt.Qnt.C
#7 Frt.Qnt.D
#8 Frt.Qnt.E
#9 Frt.Qnt.F
#10 EC Require
#11 pH Require
#12 Water Mixing No.
#13 Fert. Selector
#14 Fert fail.reac.*

5223 Fert.Center Const
52231 EC-pH Automation
52232 EC-pH Alarms
52233 EC-pH Stop Irrig.

5224 Fert. PID Inform.
#1 PID EC Prop. Out
#2 PID EC Intg. Out
#3 PID EC Deriv. Out
#4 PID EC Output
#5 PID pH Prop. Out
#6 PID pH Intg. Out
6. The Menus

#7 PID pH Deriv.Out
#8 PID pH Output

#1 Log.Cond. Status
#2 Elmnt.Value
#3 Log. Cond. Delay

5612 Log.Cond. Prog.
#1 Start Time HH:MM
#2 End Time HH:MM
#3 Cond. Element
#4 Element No.
#5 Condition Type *
#6 Oper.Value
#7 Stop Value
#8 Link Type
#9 Linked Cond. No.
#10 ON Delay-Seconds
#11 Off Delay-Seconds
#12 Type Of Operat.*
#13 Oper. Element
#14 Oper. Element No.

5621 Cond.Input Status
#1 Cond.Inpt Status

5622 Cond. Input Prog.
#1 Delay - Seconds

5631 Pause Elem.Info.
#1 PausElem.Status
#2 Paus.Sensor Valu.
#4 Paus.Inpt Status

5632 Pause Elem.Setup
#1 Cond. Input No.
#2 Cond. Sensor No.
#3 Pause Below
#4 Pause Above
#5 Star.Pause Delay
#6 Stop Pause Delay
#7 Pause reaction *
#8 Pause Line No.

5711 Gen.Counter Info.
#1 Gen.Count.Status
#2 Flow Rate
#3 Daily Accum
#4 Seas. Accum
#5 Accum.Start Date

5712 Gen.Counter Setup
#1 Pulse Size

5721 Time Count. Info.
#1 Daily Accumulat.
#2 Seasonal accum.
#3 Accum.Start Date

5722 Time Count. Setup
#1 Ctrl.Elements *
#2 Element No.

5821 Data Sensor Info.
#1 Sensor Status
#2 Sensor Value
#3 Minimum Value
#4 Average Value
#5 Maximum value
#6 Reset Values *

5822 Data Sensor Setup
#1 Sensor No.
#2 Low Alarm Setpoi.
#3 Hi Alarm Setpoi.
#4 Alarm Delay Sec.
#5 Read.Cond.Aux.No.

5831 Sensor Grup.Info.
#1 Current Reading

5832 Sensor Grup.Setup
#1 Sens.Group type*
#2 1st Sensor No.
#3 2nd Sensor No.
#4 3rd Sensor No.
#5 4th Sensor no.

5841 Tensiometers Data
#1 Sensor Value
#2 Solution Temp.
#3 Effective Value

5842 Tensiometers Prog
#1 Tens. Sensor No.
#2 Soil.Temp Sns.No.
#3 Middle Temp.
#4 Compens. bw mb/1ø
#5 Compens. Abv mb/1ø
#6 Measure Cycle-Mnt
#7 Low Tens. Alarm
#8 High Tens. Alarm
#9 Alarm at Plot No.

5851 Current Meteor.
#1 Temperature
#2 Humidity
#3 Radiation
#4 Wind Speed
#5 Wind Direction

5852 Daily Meteorology
#1 Rain (mm)
#2 Max. Wind Speed
#3 Max. Wind Direct.
#4 Max. Wind Time
#5 Today M"M
#6 Yesterday M"M

5853 Seasonal Meteor.
#1 Rain (mm)
#2 Max. Wind Speed
#3 Max. Wind Direct.
#4 Max. Wind Time
#5 Max. Wind Date
#6 Last Reset Date
#7 Reset Data *

7111 Out&Inputs Status.
71111 Multi. I/O Status
71112 Output Status
71113 Input Status
71114 Output Translat.
71115 Input Translation

7112 Sensor Values
#1 Sensor Value

7113 I/O Card Status
#1 Card Type
#2 Card Status

7114 Cable RTU Status
#1 RTU Status

7121 RAM Var. Values
71211 RAM Values
71212 Long RAM Values

7122 Prog. Var. Values
71221 FLASH Var. Values
71222 Long FLASH Vlaues

7123 Flag Var. Values
#1 Flag Value

7211 Comm. Definitions
#1 Controller No.
#2 Baud Rate *
#3 Comm. Methode *
#4 RADIO RTU Sys.No.

7231 Outputs Setup
72311 Irrig. Valves
72312 Main Valves
72313 Fert.Pump Outputs
72314 Water.Pmp Outputs
72315 Filter Outputs
72316 Addional Outputs

7232 Inputs Setup
72321 Water Meter Input
72322 Virtual W.Meters
72323 Fert.Meter Inputs
72324 Cond Inputs Setup
72325 Gen.Counters
72326 Water Mix. Inputs

7233 Sensors Setup
72331 Sens.Input Conn.
72332 Sensors Type Def.
72333 Meteorolog. Setup
72334 Comm.Sensor Setup
6. The Menus

7321 Fert Pumps Setup.
#1 Fert Pump Type *
#2 Fert. Type   *
#3 Fert Name  *
#4 Fert. Flow Ltr/h
#5 Pulse Duration S
#6 Contin. Operat.
#7 Prop. By W.Meter
#8 Conn. to Line No.
#9 Conn. to Output
#10 Conn. to Input
#11 Frt.Pl. Size Ltr
#12 Elctrn.Stroke-Ltr
#13 Uncont Fert. Pls.
#14 No Fert. Pulse S
#15 Max F.Increase %
#16 Max F.decrease %
#17 Auto Cancel Alrm
#18 Aux. Output No.
#19 Flow Chk.Time-sec
#20 Oper.by Fert Flow *

7322 Fert.Center Setup
#1 F.Pump A In Cntr.
#2 F.Pump B In Cntr.
#3 F.Pump C In Cntr.
#4 F.Pump D In Cntr.
#5 F.Pump E In Cntr.
#6 F.Pump F In Cntr.
#7 Conn. To Line No.
#8 Water Junction No.
#9 EC Sensor No.
#10 pH Sensor No.
#11 Start Delay-sec.
#12 Auto Cancel Alrm

7323 Auto Fert Method
73231 Auto Method Def.
73232 Auto ECPh by PID
73233 Auto ECPh-No PID

7331 Pipe Line Setup
#1 Pipe Line Setup *
#2 Output No.
#3 Conn. To Line No.
#4 Conn. To Line No.
#5 Uncnt.Water Case
#6 Alarm Disp. Plot
#7 Limit Flow

7332 Valve Line Order
#1 Open Main Viv. *
#2 Delay Open (Sec)
#3 Close Main Viv *
#4 Delay Close Sec
#5 Valve Overlap Sc.

7351 Water Pump Setup
#1 Output No.
#2 Oper. Input No.
#3 Alarm Input No.
#4 Conn. To Line No.

7352 Pump House Setup
#1 Pump A In House
#2 Pump B In House
#3 Pump C In House
#4 Pump D In House
#5 Pump E In House
#6 Conn. to Line No.
#7 Water Meter No.
#8 Press. Sensor No.

18121 Curr. Meteorologic
#1 Temperature
#2 Humidity
#3 Radiation
#4 Wind Speed
#5 Wind Direction

18122 Daily Meteorologic
#1 Rain (mm)
#2 Max. Wind Speed
#3 Max. Wind Direct.
#4 Max. Wind Time
#5 Today M'M
#6 Yesterday M'M

18123 Seas. Meteorologic
#1 Rain (mm)
#2 Max. Wind Speed
#3 Max. Wind Direct.
#4 Max. Wind Time
#5 Today M'M
#6 Yesterday M'M

51111 Irr. Valve Status
#1 Valve Status
#2 Last Irr. Date
#3 Last Flow
#4 Operated By Prog.
#5 Programm.In Prog.
#6 Programm.In Prog.
#7 Programm.In Prog.
#8 Log. Cond. Type
#9 Log. Cond. Exist
#10 Fert. Accum. Err.

51112 Irr. Valve Daily
#1 Valve Status
#2 W.te.Acc.M3
#3 Time today - Mnt.
#4 Fert. Pump A No.
#5 F.A.Acc.Ltr
#6 Fert. Pump B No.
#7 F.B.Acc.Ltr
#8 Fert. Pump C No.
#9 F.C.Acc.Ltr
#10 Fert. Pump D No.
#11 F.D.Acc.Ltr
#12 Fert. Pump E No.
#13 F.E.Acc.Ltr
#14 Fert. Pump F No.
#15 F.F.Acc.Ltr

51113 Irr. Valve Season
#1 Valve Status
#2 Last Irr. Date
#3 W.Accum.M3
#4 T.Accum.H:m
#5 Fert. Pump A No.
#6 F.A.Acc.Ltr
#7 Fert. Pump B No.

51131 Valve Group Info.
#1 Group Status
#2 Valve A Status
#3 Valve B Status
#4 Valve C Status
#5 Valve D Status
#6 Valve E Status
#7 Valve F Status
#8 Valve G Status
#9 Valve H Status
#10 Valve I Status
#11 Valve J Status
#12 Water Meter No.
#13 Pipe Line No.

51132 Valve Group Setup
#1 Valve A In Group
#2 Valve B In Group
#3 Valve C In Group
#4 Valve D In Group
#5 Valve E In Group
#6 Valve F In Group
#7 Valve G In Group
#8 Valve H In Group
#9 Valve I In Group
#10 Valve J In Group

51421 Pump House Info.
#1 Pump House Stat.
#2 Actual Flw
#3 Req. Flw
#4 Current Step
6. The Menus

51422 Pump House Prog.
514221 Operation Steps
514222 Pump House Const.
51521 Burst Prot.Const.
#1 Water Meter No.
#2 Conn. to Line No.
#3 Auto Cancel Al.*
51522 Posit.Burst Prot.
#1 Max. Posit. Flow
#2 Fail. Delay Mnt
#3 Burst case *
51523 Negat.Burst Prot.
#1 Max.Negat. Flow
#2 Fail. Delay Mnt
#3 Burst case *
51611 Mix.Junction Info
#1 Process Status
#2 Mix. Program No.
#3 Saline Water %
#4 Req.Flow
#5 Wtr.Mix.Method *
51612 Mix.Programs Info
#1 Prog.Status Def.
#2 Last EC Value
#3 Fresh Wtr.Preset
#4 Saline Wtr P preserves
51613 Water Source Info
#1 Source Status
#2 Curr.Flow
#3 Water Request
#4 Curr. m3
#5 Daily m3
#6 Seas. m3
#7 Wtr.Src.Delay-Sec
#8 Water Pulse Fail
#9 Uncont.Wr. Fail
#10 Uncontrol Pulses
#11 Current Stage
#12 Required Stage
#13 Auto Corr. Stage
#14 Wtr.Source Setup
51641 Mix. Junction Stp
#1 Mix. Junction *
#2 Conn. To Line No.
#3 Activate PID *
#4 EC Gen.Sensor No.
#5 Precision
#6 Grade Delay-Sec.
#7 EC Dev. Alarm -+
#8 EC Alarm Dly.Sec.
#9 Default Mix.Prog.
#10 At.Mix.Junc Flt.*
51642 Wtr.Sources Setup
#1 Act.Full Way Sec.
#2 Act.Num.of Stages
#3 Nom.Flow M3
#4 Pulse Volume-Ltr.
#5 Puls.Fail Dly-Sec
#6 Uncontrol Pulses
#7 Src.Fail React. *
#8 Stage at Mix.Off
#9 Stage at Irr.Off
51643 Auto Src.Control
516431 Diff.Src.Control
516432 PID. Src.Control
52231 EC-pH
Automation
#1 Measur. Delay Sc.
52232 EC-pH Alarms
#1 EC Low Deviation
#2 EC High Deviat.
#3 pH Low Deviation
#4 pH High Deviat.
#5 Alarm Delay Sec.
52233 EC-pH Stop Irrig.
#1 EC Low Deviation
#2 EC High Deviat.
#3 pH Low Deviation
#4 pH High Deviat.
#5 Stop Delay Sec.
71112 Output Status
#1 Output Status *
71113 Input Status
#1 Input Status
71114 Output Translat.
#1 Output Definit.
#2 Control.Index No.
#3 Output Status
71115 Input Translation
#1 Input Definit.
#2 Control.Index No.
#3 Input Status
71211 RAM Values
#1 Variable Value
71212 Long RAM Values
#1 Var.Value
71221 FLASH Var. Values
#1 Variable Value
71222 Long FLASH
Vlaues
#1 Var.Value
72311 Irrig. Valves
#1 Output Def.
#2 Output Status
72312 Main Valves
#1 Output Def.
72313 Fert.Pump Outputs
#1 Output Def.
72314 Water.Pmp Outputs
#1 Output Def.
72315 Filter Outputs
723151 Filter Units Outp
723152 Sustain Vhv. Outp
72316 Adicional Outputs
723161 Alarm Outputs
723162 Auxiliary Outputs
723163 Main Fert.Outputs
723164 Fert.Selectors
723165 Water Mix.Outputs
72321 Water Meter Input
#1 Input Def.
#2 Pulse Size M3
72322 Virtual W.Meters
#1 + Water Meter No.
#2 + Water Meter No.
#3 + Water Meter No.
6. The Menus

#4 +-Water Meter No.  #6 Alarm Max. Value
#5 +-Water Meter No.  #7 Start Pause Time
#7 +-Water Meter No.  #5 Stop Pause Time
#8 +-Water Meter No.  #6 Pause Log.Condit.
#9 +-Water Meter No.  #7 In Pause *
#10 +-Water Meter No.  #4 Start Pause Time
#11 +-Water Meter No.  #5 Stop Pause Time
#12 +-Water Meter No.  #6 Pause Log.Condit.
#13 +-Water Meter No.  #7 In Pause *
#14 +-Water Meter No.  #4 Start Pause Time
#15 +-Water Meter No.  #5 Stop Pause Time
#16 +-Water Meter No.  #6 Pause Log.Condit.
#17 +-Water Meter No.  #7 In Pause *
#18 +-Water Meter No.  #4 Start Pause Time
#19 +-Water Meter No.  #5 Stop Pause Time
#20 +-Water Meter No.  #6 Pause Log.Condit.

72323 Auto Method Def.  #1 Activate PID *
#2 Change Time of *

72324 Auto ECpH by PID  #0 Activate PID *
#1 Propor. EC Coeff.  
#2 Integr.EC Coeff.  
#3 Derivat.EC Coeff.  
#4 Propor. pH Coeff.  
#5 Integr.pH Coeff.  
#6 Derivat.pH Coeff.  

72326 Water Mix. Inputs  72331 EC Correction
#1 Input Def.  #1 Deviation A
#2 Fert. Pulse Size  #2 Correction A %

72324 Cond.Inputs Setup  #3 Deviation B
#1 Input Def.  #4 Correction B %
#2 Delay - Seconds  #5 Deviation C

72325 Gen.Counters  #6 Correction C %
#1 Input Def.  #7 Deviation D
#2 Pulse Size  #8 Correction D %

72326 Water Mix. Inputs  #9 Deviation E
723261 Fresh Water Inp.  #10 Correction E %
723262 Saline Water Inp.  #11 Radical Correc.

72333 Meteorolog. Setup  72332 EC Correction
#1 Temp. Sensor No.  #1 Deviation A
#2 Humid.Sensor No.  #2 Correction A %
#3 Radiat.Sensor No.  #3 Deviation B
#4 Wind Spd.Sens.No.  #4 Correction B %
#5 Wind Dir.Sens.No.  #5 Deviation C
#6 Rain Input No.  #6 Correction C %
#7 Rain Pulse Size  #7 Deviation D

72333 Auto ECpH-no PID  #8 Correction D %

72331 EC Correction  #9 Deviation E
#1 Output Def.  #10 Correction E %

72332 Auto ECpH by PID  #11 Radical Correc.%
#0 Activate PID *
#1 Propor. EC Coeff.  
#2 Integr.EC Coeff.  
#3 Derivat.EC Coeff.  
#4 Propor. pH Coeff.  
#5 Integr.pH Coeff.  
#6 Derivat.pH Coeff.  

72333 Auto ECpH-no PID  723165 Fresh Water Outp.
723331 EC Correction  #1 Open Valve Out No
723332 pH Correction  #2 CLOS.Valve Out No
723331 EC Correction  #3 Maim Valve Out No
723332 pH Correction  723165 Saline Water Outp.
72332 Operation Steps  #1 Open Valve Out No
#1 Flow Setpoint +  #2 CLOS.Valve Out No
#2 Log. Condition  #3 Maim Valve Out No
#3 Stepup Delay-Sec.  7231653 Water Mix. Bypass
#4 Stepdown Delay  7231651 Fresh Water Outp.
#5 Pump A *  7231652 Saline Water Outp
#6 Pump B *  7231653 Water Mix.
#7 Pump C *  Bypass
#8 Pump D *  723261 Fresh Water Inp.
#9 Pump E *  #1 Wtr.Cnt.Input No.

514221 Operation Steps  #2 Pulse Volume-Ltr.
#1 Flow Setpoint +  #3 Wtr.Flt.Input No.
#2 Log. Condition  723262 Saline Water Inp.
#3 Stepup Delay-Sec.  #1 Wtr.Cnt.Input No.
#4 Stepdown Delay  #2 Pulse Volume-Ltr.
#5 Pump A *  723262 Saline Water Inp.
LIMITED WARRANTY CERTIFICATE

1. Galcon shall, for a limited period of 12 months from the retail purchase date of the original (first) purchaser ("the Warranty Period"), provide limited warranty for the Products, as provided for and subject to the provisions and limitations of this Limited Warranty Certificate.

2. Galcon’s Warranty for the Product only extends to the original purchaser of the Product ("the Customer") who, upon requesting warranty service, must present Galcon with a valid and dully signed contract with Galcon (or any of its authorized dealers) together with a valid purchase receipt. Failure to produce the said documentation will result in the request for warranty being null and void.

3. GALCON warrants to the Customer that the Product shall materially conform to the description in Galcon’s documentation and shall be free from defects in material and workmanship. Accordingly, Customer’s sole and exclusive remedy under this warranty is the repair or – to Galcon’s sole discretion – the replacement of the Product or any part/s according to the terms of this Warranty, and no other remedy shall be available. Therefore, if - within the Warranty Period - the Product is proven to be defective by reason of faulty workmanship or materials by Galcon, Galcon undertakes, with reasonable promptness, to have the defective Product (or any part/s thereof) repaired, or at Galcon’s discretion, replaced; All subject to the terms and conditions of this Limited Warranty Certificate.

4. Galcon’s warranty for the Product or otherwise shall not apply to any of the following: (i) any conduct (by act or omission) not by Galcon, including any misuse/abuse of any Product (or part/s thereof), and/or any failure to install and/or use any Product in full compliance with Galcon's instructions; (ii) other systems/components/devices/technologies and/or the integration/interface thereof with any Product; (iii) any part/component which has been included/installed in any Product not at Galcon’s approval and/or other than by Galcon; (iv) any actual or attempted change/repair interference of/with any Product (including any use/handling of, and/or interference/dealing with, any code of any software included/used in the Product) other than by Galcon; (v) any data/information/content which has been inserted/included in a Product; (vi) malfunction or damage resulting from accidents, which occur during transit and/or handling, and/or malfunction or damage due to fire, earthquake, flood, lightning and/or any other external disaster; (vii) unforeseen accidents, wear and tear, or any other external factors beyond Galcon’s reasonable control, or to any Product installed, repaired, adjusted, rebuilt, modified, changed or converted by any person (including the Customer) other than Galcon.

5. In addition and without derogating from the provisions of this Warranty, Galcon’s warranty is conditioned upon the all of the following taking place: (i) Customer’s operating and maintaining the Product in accordance with Galcon’s instructions; (ii) Customer’s not being in default of any payment obligation to the Galcon (or its authorized dealer, as relevant).

6. Galcon does not give any warranty or guarantee whatsoever in respect of any Product (or any part/s thereof) which has not been manufactured and distributed by the Galcon and which has not been purchased from the Galcon or any of its authorized dealers, whether such products are branded with any trademarks similar to any trademark belonging to or used by Galcon.

7. After replacement or repair of the Product, the Warranty for the new or repaired Product shall be valid only for the non-expired period of the original Warranty Period. Any defective Products or part/s, which has been replaced, shall become Galcon’s property.

8. Galcon reserves the right to charge the Customer if any warranty service is requested and carried out but no fault is found in the Product or if such defect/fault is not under Galcon’s Warranty.

9. Notwithstanding anything to the contrary, Galcon shall not be responsible and/or liable, under any circumstances and in any way, for any loss, damage, costs, expenses, expenditures, responsibility and/or liability (including of Customer and/or any third party) – including (without limitation) direct and/or indirect (including incidental and/or special and/or consequential), however arising, including in respect of damages to or loss of property and/or equipment, loss of profit, loss of use, loss of revenue or damages to business or reputation, whether or not based on breach of contract, tort (including negligence), product liability or otherwise - arising from the performance or non-performance of any aspect of the Product or any part thereof; All of the above, whether or not Galcon and/or the Customer shall have been made aware of the possibility of such loss.

10. In any event, any liability which Galcon may have in connection with the Product and/or this Warranty, including (without limitation) in connection with and/or resulting from the Product (or any part thereof) and the use thereof, shall be limited to a total amount (for all damages, claims and causes of action in the aggregate) equal to the consideration actually received by Galcon from the Customer for the Product. The limitations shall apply whether the liability is based on contract, tort, strict liability or any other theory.

11. This Warranty and the remedies set forth herein are exclusive and in lieu of all other warranties, remedies and conditions, whether oral, written, statutory, express or implied.

Galcon specifically disclaims any and all statutory or implied warranties, including, without limitation, warranties of merchantability and fitness for a particular purpose and warranties against hidden or latent defects.

12. The Customer shall be solely responsible for the selection, use, efficiency and suitability of the Product(s).

13. The provisions of this Limited Warranty Certificate shall be interpreted and governed, solely and exclusively, pursuant to the laws of the State of Israel, and no other law shall apply. Any and all legal actions shall be litigated within the jurisdiction of the courts of Israel, and no other jurisdiction shall apply.