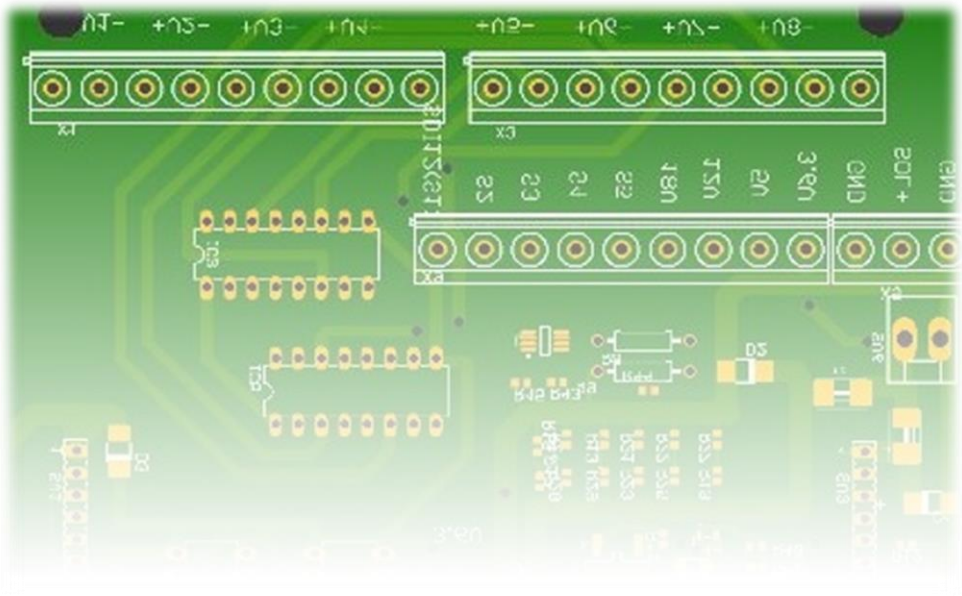
farmsync
Automation Technology



Software Manual

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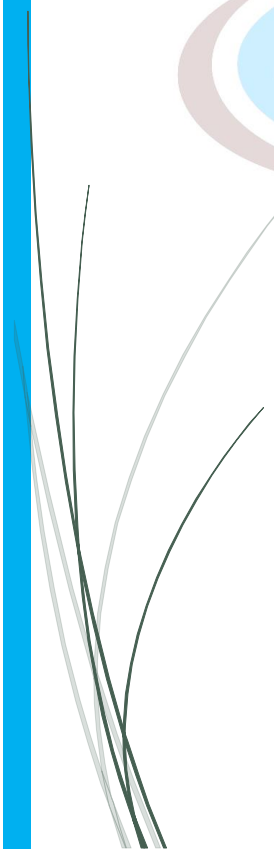
APPROVED BY: ALBERT ENGELBRECHT
FARMSYNC | RIVERSDALE ; WESTERN CAPE

Contents

Main Overview



Warnings:

Farmsync MUST have internet to operate. LTE, 3G, 4G, 5G or Satellite must be present.

It is the Clients responsibility to confirm that the above is the case. Farmsync will not be held liable if this is not confirmed by the Client in **writing**.

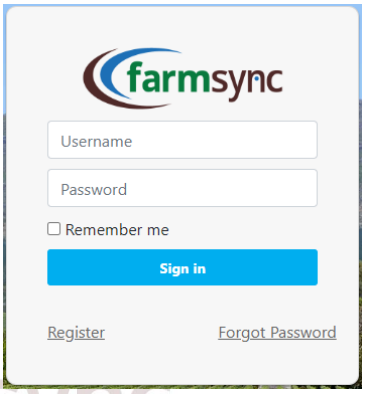
1 Software User Interface Overview

1.1. System Login

Use the next link to access FARMSYNC™:

https://control.FARMSYNC™.co.za/

In order to Login, you must have a predefined Email address and password in the system. If you don't have them, contact the installer / your sales manager / FARMSYNC™ support team.



1.2. General Overview

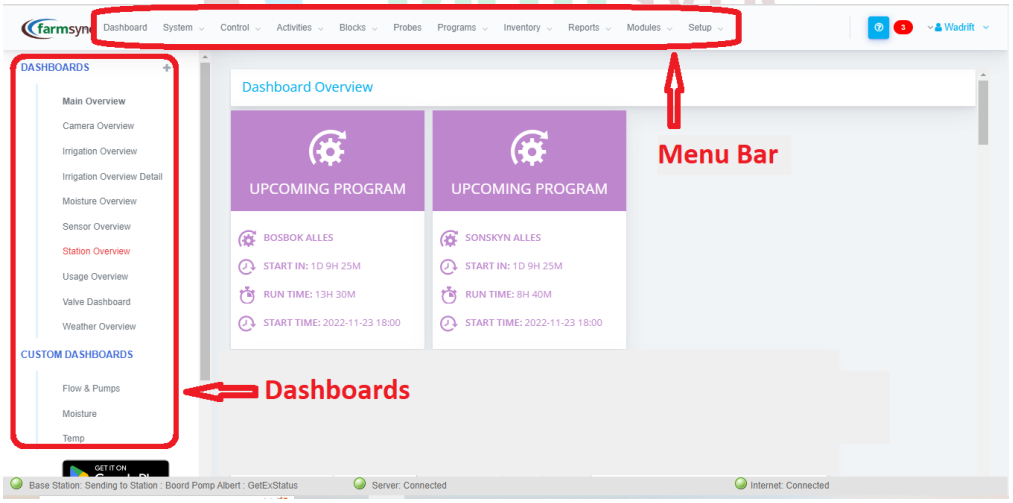
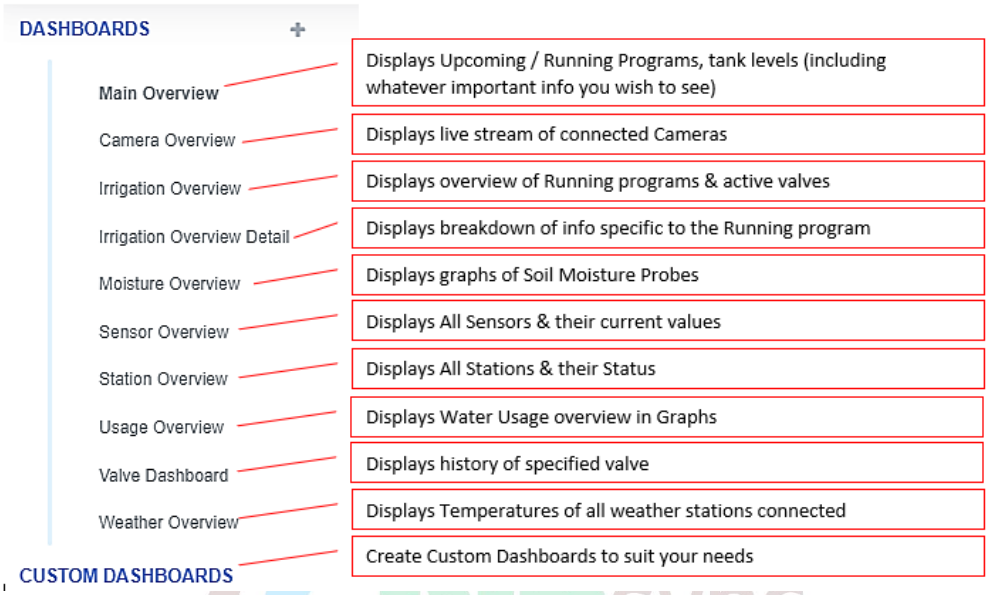


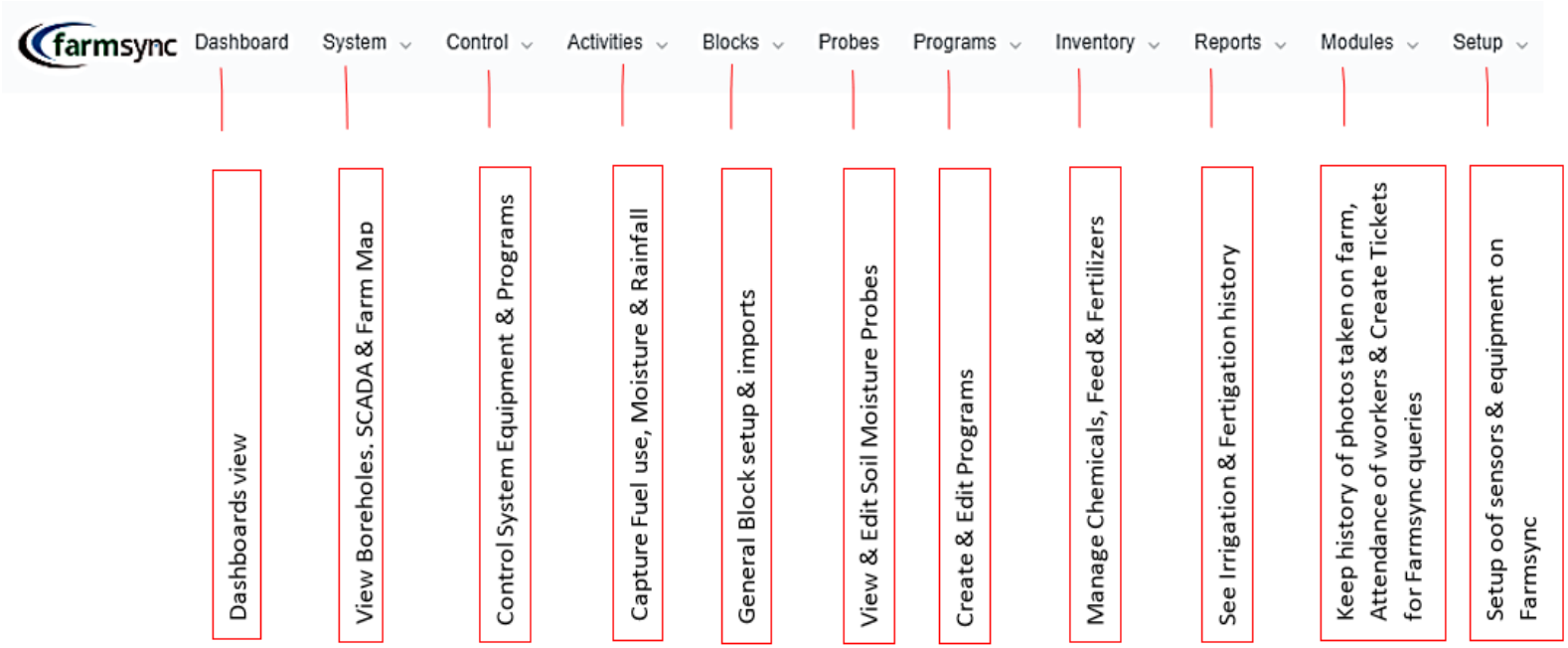
Figure 1 - Main Overview

1.2.1. Dashboard

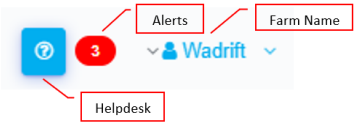
See below for a breakdown of the Dashboards



1.2.2. Menu Bar


farmsync
Dashboard
System
Control
Activities
Blocks
Probes
Programs
Inventory
Reports
Modules
Setup
Dashboards view
View Boreholes, SCADA & Farm Map
Control System Equipment & Programs
Capture Fuel use, Moisture & Rainfall
General Block setup & imports
View & Edit Soil Moisture Probes
Create & Edit Programs
Manage Chemicals, Feed & Fertilizers
See Irrigation & Fertigation history
Keep history of photos taken on farm, Attendance of workers & Create Tickets for Farmsync queries
Setup oof sensors & equipment on Farmsync

1.2.3. Information & Settings Bar

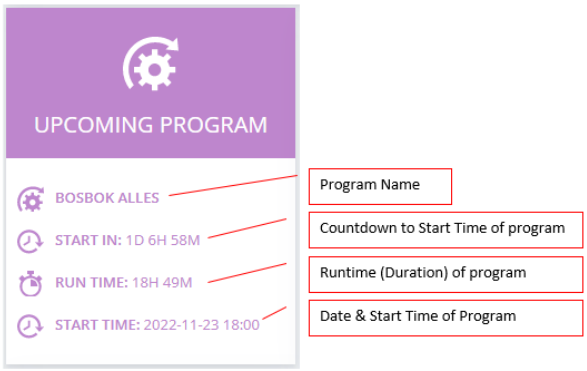


2. Dashboards Breakdown

2.1. Main / Irrigation Overview:

2.1.1. Upcoming Programs:

Upcoming programs will appear on your Dashboard in **purple**.



2.1.2. Running Programs:

Running Programs appear on the Dashboard in **Green.**

A: Summary of program start & end times, total runtime, remaining runtime & progress bar.

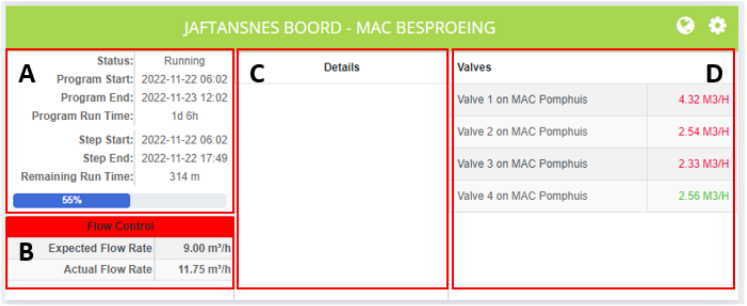
B: Flow Rate indicators in m^3/h.

- Expected Flow rate – Theoretical flow rate based on area, emitter spacing & delivery.
- Actual Flow rate – Practical flow rate based on a water meter reading.

C: Details of running program; name of pump used, running Amps of pump, current injection rate of fert etc.

D: List of valves running with flow rates (m^3/h).

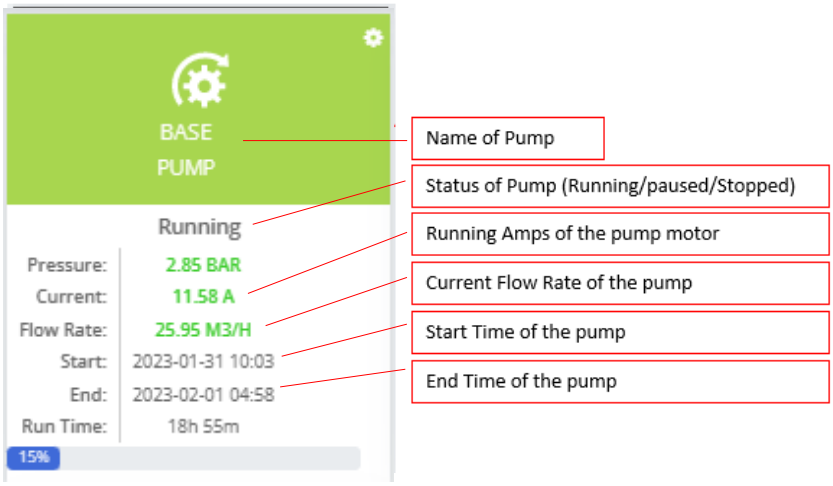
- Should each valve have its own water meter, this reading will be based on the value received.
- Should a group of valves **share** a water meter, a calculation is made to calculate a flow rate for each valve.



2.2. Irrigation Overview Detail:

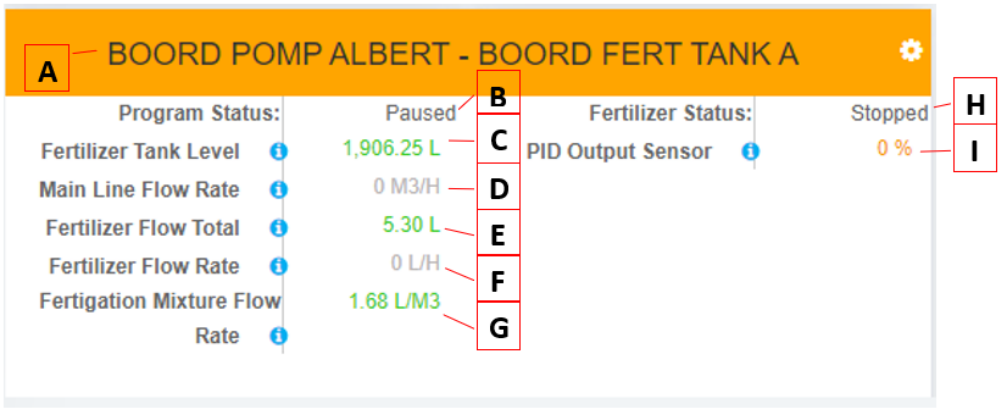
2.2.1. Pumps:

This is a further breakdown of item C discussed on the previous page.



Fertilizer:

This is a further breakdown of item C discussed on the previous page.
A: Fertilizer Tank name
B: **Program** Status (Running/Paused/Stopped/Alarm)
C: Indicates the Level of the fertilizer tank (L)
D: Indicates the current flow rate (m^3/h) of the main line
E: Indicates the current total of fertilizer injected into the system at that moment (L)
F: Displays the current flow rate of the fertilizer (L/h)
G: Displays the current flow rate **(Injection rate)** of the fertilizer mix (L/m^3)
H: **Fertilizer** Status (Running/Paused/Stopped/Alarm)
I: When this sensor is on 0%, the fert valve is closed, when on 100%, the fert valve is open

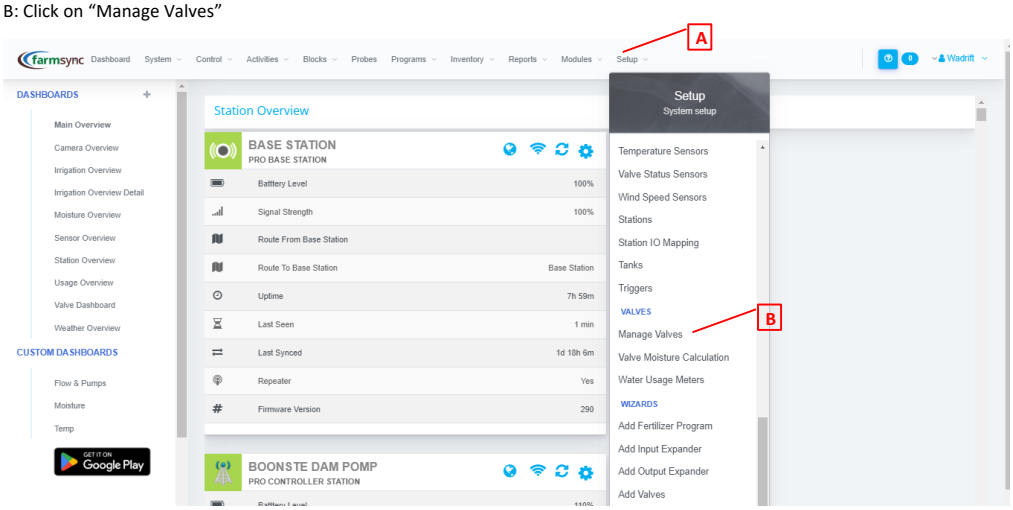


xxxxx

Module 1- Irrigation

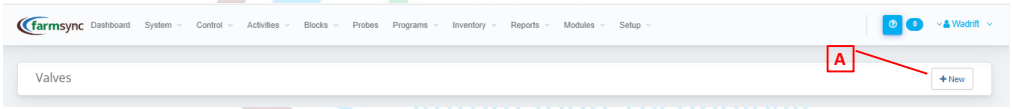
1 Creating a New Valve

A: Click on “Setup”
B: Click on “Manage Valves”



1.1 Valves List

A: Click on “+New”

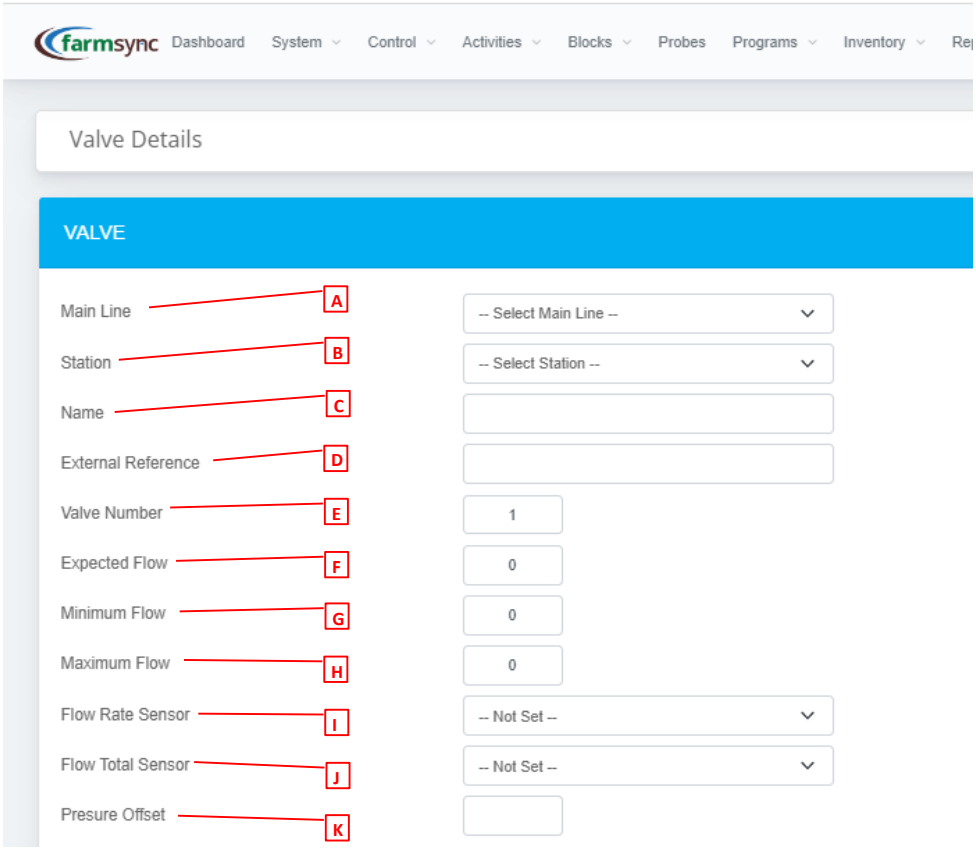


1.2 Valve Details

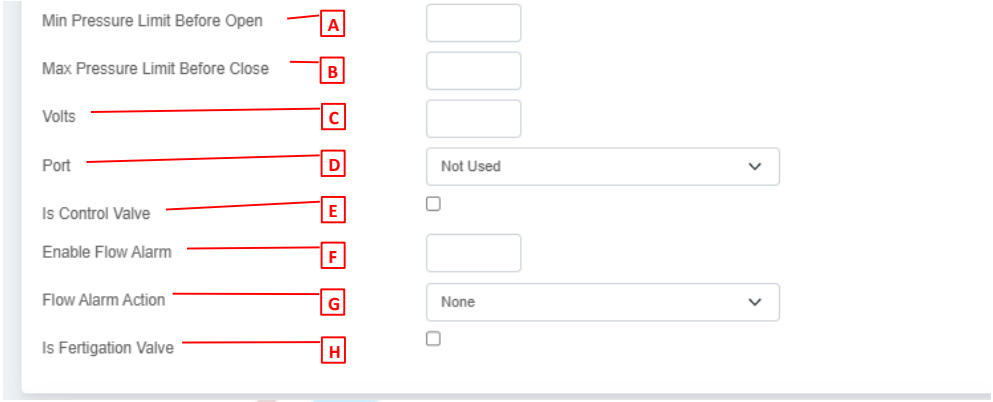
A: “Main Line” – Select the relevant Main Line from the dropdown list
B: “Station” – Select the relevant Station from the dropdown list
C: “Name” – Enter a Name for the valve
D: “External reference” – for FARMSNC™ use only
E: “Valve Number” – This number is generated automatically according to the order in which the valves are added
F: “Expected Flow” – Theoretical flow rate based on area, emitter spacing & delivery.
Practical flow rate must be entered here by the Client after setup by following these steps:

- Run each irrigation valve on its own
- Allow for filling time / flow rate to settle; this may be anything from 2 minutes to 20min or more depending on the distance
- Once the flow has settled, write down the flow rate (m^3/h)
- Enter this flow rate into the “Expected Flow”
- This must be repeated for EACH valve

G: “Minimum Flow” – Based on the Practical flow rate, the Client can now decide on a min flow rate
H: “Maximum Flow” – Based on the Practical flow rate, the Client can now decide on a max flow rate
I: “Flow Rate Sensor” – This sensor is automatically generated by FARMSYNC™
J: “Total Flow Sensor” – This is the water meter connected to the valve / valves
K: “Pressure Offset” – Difference in pressure between position of Pressure Sensor & the irrigation valves



A: “Min Pressure Limit Before Open” – The min Pressure of the system allowed before the valves may open
B: “Max Pressure Limit Before Close” – The max Pressure of the system allowed before the valves close
C: “Volts” – For DC Stations, enter the Voltage of the Battery (usually 12V)
D: “Port” – For DC Stations, select one of DO1-DO8
E: “Is Control Valve” – Note, if this is ticked, this valve will not form part of the irrigation logs (Do not tick if the valve you are creating is an irrigation block valve) The control valves’ logs are NOT kept.
F: “Enable Flow Alarm” – Must be ticked to enable notifications to be sent for Flow Alarm **Die naam moet verander**
G: “Flow Alarm Action” – Pause Program / Send Notification / Pause & Send Notification
H: “Is Fertigation Valve” – Tick this box if the valve is a Fertigation Injection valve & whose logs you want to reflect in the reports



1.3 Soil ETO

Evapotranspiration provides a relatively objective and reliable estimate of the water requirements of actively growing plants in a farm situation. Evapotranspiration information can be used by irrigators to more accurately schedule irrigations to help achieve top yields & improve water productivity.

Evapotranspiration is an estimate of the loss of water from both plants & the soil. The main drivers of evapotranspiration are sunlight, wind, humidity and temperature.

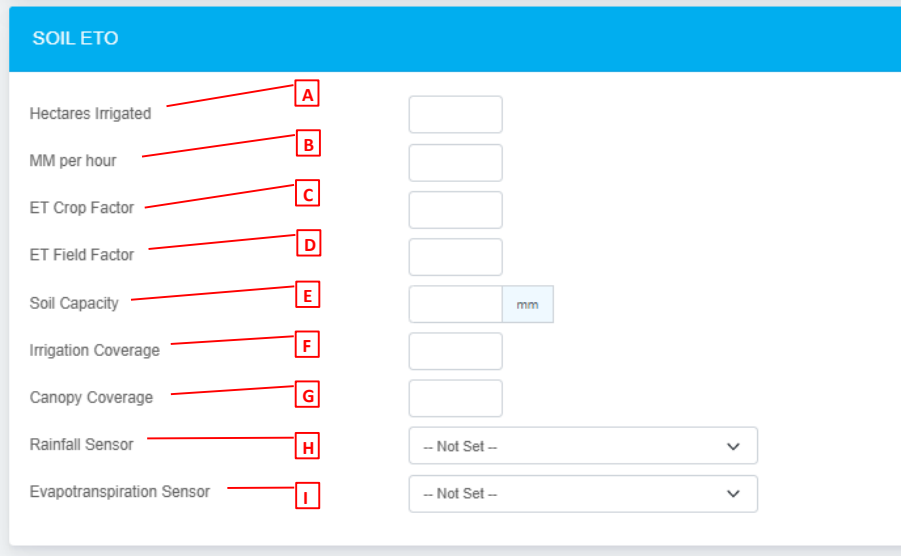
The values for C, D & E can be attained from your Soil Analysis Report.

A: "Hectares Irrigated" – The area of the irrigation block
B: "MM per Hour" – Emitter Delivery (L) / Row Spacing (m) / Emitter Spacing (m)
C: "ET Crop Factor" – The crop water need (ET crop) is defined as the depth (or amount) of water needed to meet the water loss through evapotranspiration. In other words, it is the amount of water needed by the various crops to grow optimally.
D: "ET Field Factor" –
E: "Soil Capacity" – The max volume of water that any certain soil can hold
F: "Irrigation Coverage (%)" – Percentage of area of soil that is covered by the irrigation

Type of water application	% Wetted Area
Overhead Systems (Sprinklers, Centre Pivots, Linear, Traveling Gun, Rotating Boom)	100
Drip / Micro	30-40

Table 1 - SABI Norm Wetted Area

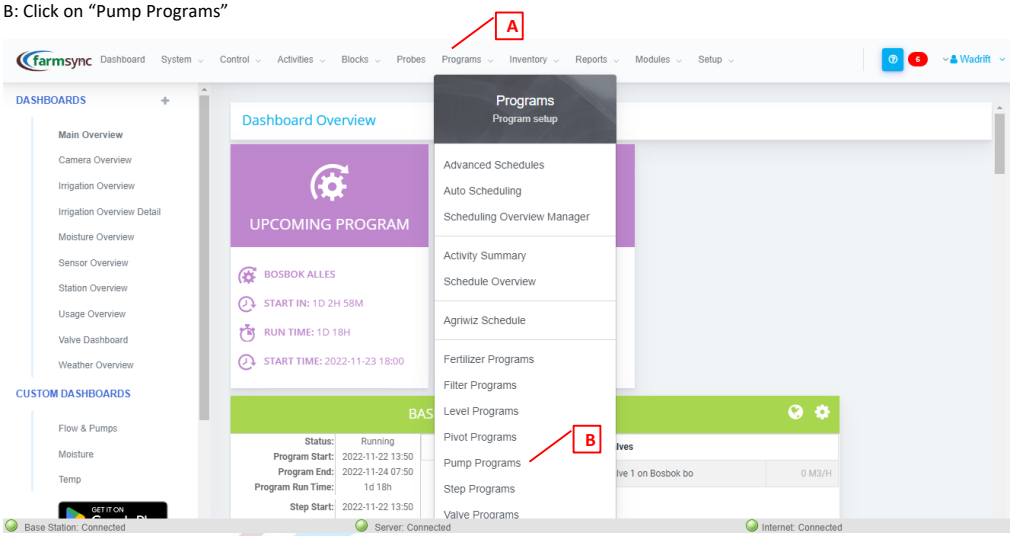
G: "Canopy Coverage (%)" – Percentage area that the crop canopy covers
H: "Rainfall Sensor" – Choose the relevant Rainfall Sensor from the dropdown list
I: "Evapotranspiration Sensor" – Choose the relevant Evapotranspiration Sensor from the dropdown list



2 Create Programs

2.1 Creating a Pump Program

A: Click on “Programs”
B: Click on “Pump Programs”



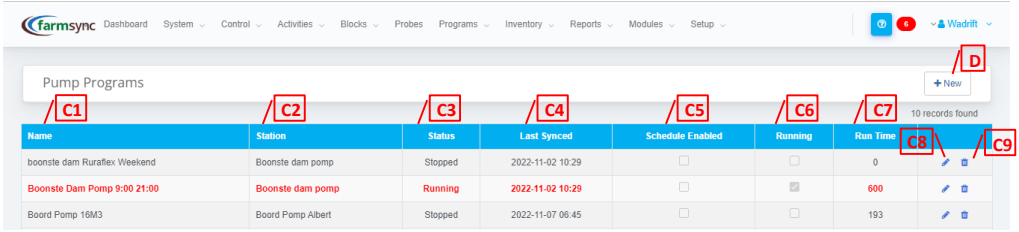
2.1.1 Pump Programs List

C: Below will be a list of all existing “Pump Programs”

- C1 – “Name”: Description of program – chosen by Client
- C2 – “Station”: Station connected to the pump
- C3 – “Status”: “Running” / “Paused” / “Alarm” / “Stopped”
- C4 – “Last Synced”: The Date & Time of the last time the program ran
- C5 – “Running”: When this box is ticked, it means the program is currently running
- C6 – “Runtime”: Shows the runtime (mins) that the program is currently set on
- C7 – “Pencil” Icon: Click it to edit the specified program
- C8 – “Bin” Icon: Click it to delete the specified program

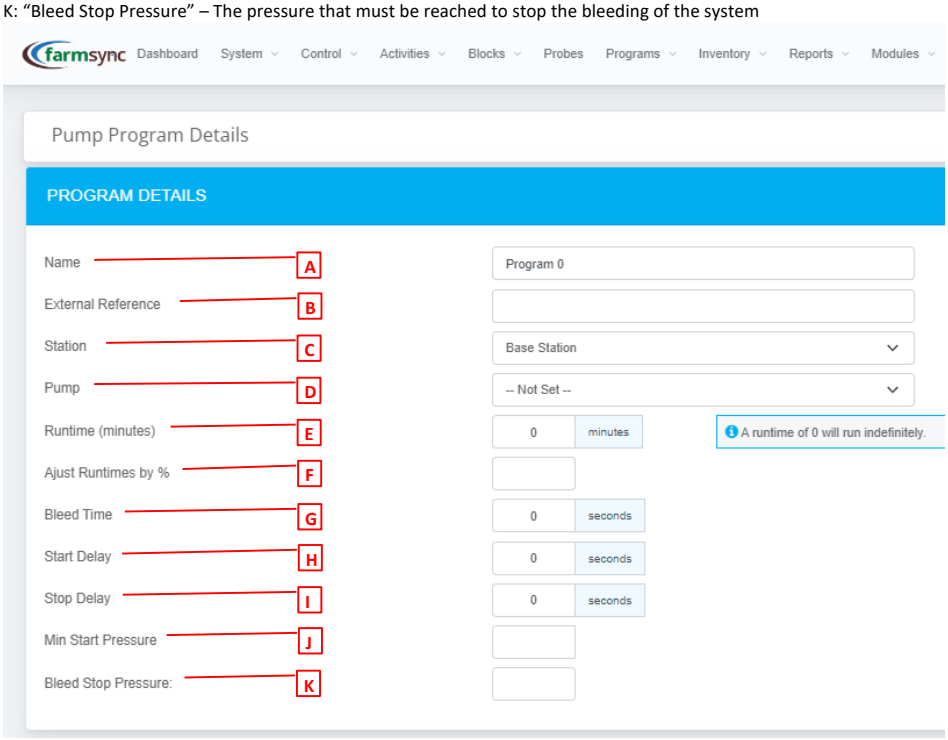
D: Click on “+New” to create a New Program

If the program shows in red, there is a program has not synced correctly.



2.1.2 Program Details

A: “Name” – Enter a Name for your program
B “External Reference” – For FARMSYNC™ internal use only
C: “Station” – Select the relevant Station from the dropdown list
D: “Pump” – Select the relevant Pump from the dropdown list
E: “Runtime” – Enter the Runtime(min) for the program
F: “Adjust Runtime by %” – Enter a % value that the program runtime must be increased by, this is a great function to have should there be a heatwave on its way & you need to prep your soil ahead of time by increasing the runtimes
G: “Bleed Time” – Duration of time allowed for the “Bleeding” of the pump
H: “Start Delay” – Duration of time allowed to pass before the pump is started
I: “Stop Delay” – Keeps the pump on for specified time after runtime has expired
J: “Min Start Pressure” – The min pressure on the pumps suction allowed for the pump to start
K: “Bleed Stop Pressure” – The pressure that must be reached to stop the bleeding of the system



Commented [MB1]: Dieselfde funksie?? JAAAAAAA

2.1.3 Sensor Details

A: “Mainline Control Valve” – Should there be a control valve present, select the relevant one from the dropdown list

B: “Mainline Control Valve Start Delay” – Duration of time (Seconds) that the pump must run before the control valve is opened

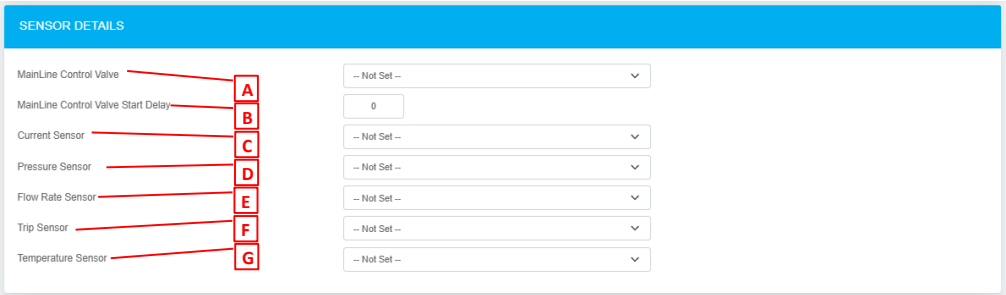
C: “Current Sensor” – Select the sensor that relays the Running Amps of the pump to the FARMYNC™ software from The dropdown menu

D: “Pressure Sensor” – Select the relevant pressure sensor from the dropdown menu

E: “Flow Rate Sensor” – Select the relevant flow rate sensor (water meter) from the dropdown menu

F: “Trip Sensor” – Select the input from the pump connected to the trip relay

G: “Temperature Sensor” – Select the relevant temp sensor from the dropdown menu

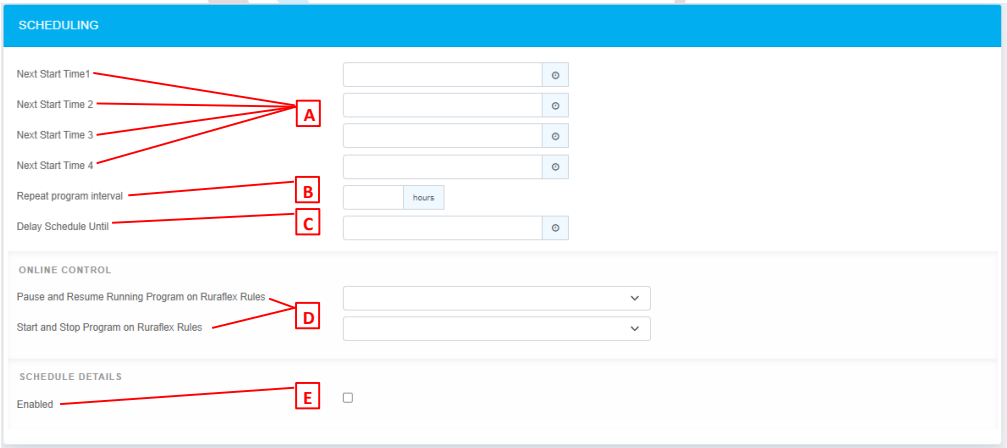


2.1.4 Scheduling

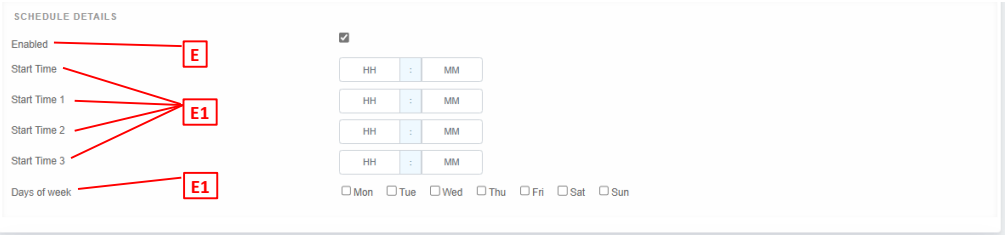
A-C: These values are automatically assigned when “Shcedule Deails” is enabled

D: “Online Control – Ruraflex” – Select the relevant Ruraflex Stages

E: “Schedule Details – Enable” – To set a regular schedule, tick this box, this will open more settings for scheduling As described below



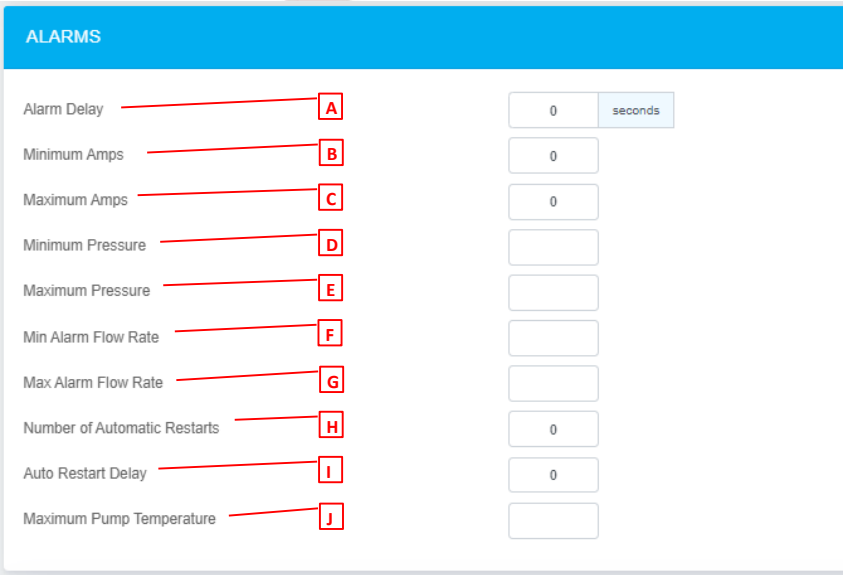
E1: “Start Time 1-4” – Provision has been made for the program to start at least 4 times per day; enter the times here
E2: “Days of week” – Tick the relevant days you would like this program to run on



2.1.5 Alarms

Alarms are one of the most important settings that must be set of any irrigation system, especially the Flow Rate Alarms.

A: “Alarm Delay” – Time duration (seconds) allowed for the program to be above alarm settings before the alarm is triggered.
B: “Minimum Amps” – Enter the min Amps that the pump motor may run on
C: “Maximum Amps” – Enter the max Amps that the pump motor may run on
D: “Minimum Pressure (Bar)” – Enter the min Pressure the pump may run on
E: “Maximum Pressure (Bar)” – Enter the max Pressure the pump may run on
F: “Min Alarm Flow Rate (m^3/h) – Enter the min flow rate the program may run on
This flow alarm may be triggered due to a blockage in the system or a valve that did not open
G: “Max Alarm Flow Rate (m^3/h) – Enter the max flow rate the program may run on
This flow alarm may be triggered due to a leak in the pipeline
H: “Number of Automatic Restarts” – Enter the number of times the program must attempt to restart should the program have failed the first time. This might be due to temporary loss of signal etc.
I: “Auto Restart Delay (seconds)” – Enter the duration of time to pass before Auto Restart is allowed
J: “Maximum Pump Temperature (°C)” – Enter the max temp that the pump may reach before an alarm is triggered



2.1.6 Trigger

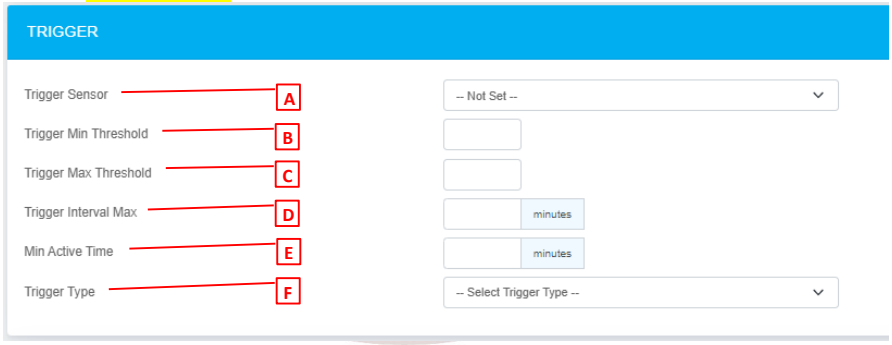
The values entered here are based on the type of sensor selected as a trigger. E.g. if the selected trigger is a pressure sensor, the min / max values would be related to pressures (either in Bar or meters); if the selected trigger is a Current Sensor, the min / max values would be in Amps.

A: "Trigger Sensor" – Choose the Trigger sensor from the dropdown list
- It is advised that the "Eskom Pause" trigger be used

B: "Trigger Min Threshold" – Enter the min value of the trigger sensor allowed
C: "Trigger Max Threshold" – Enter the max value of the trigger sensor allowed
D: "Trigger Interval Max (minutes)" – Enter a max interval
E: "Min Active Time (minutes)" – Enter a min Active time for the trigger
F: "Trigger Type" – Select how the program must respond to the trigger

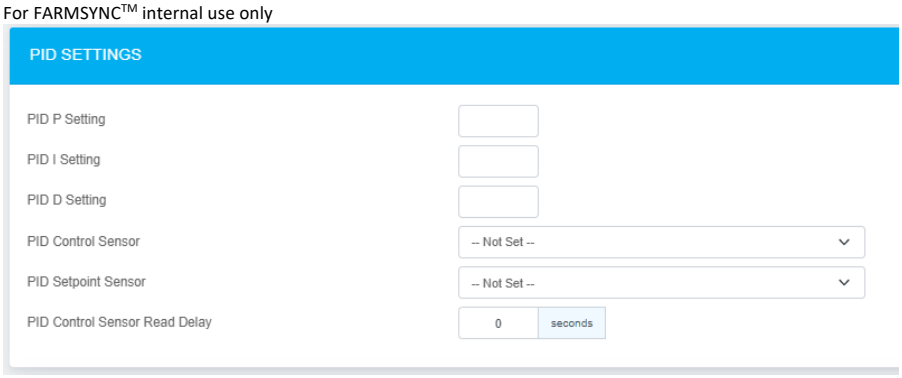
- Disable
- Start & Stop Program
- ~~Start Program~~
- ~~Stop Program~~
- Pause & Resume
- ~~Valve Open & Close~~
- ~~Valve Close~~
- ~~Valve Open~~
- ~~Port~~
- ~~Pause Program~~

Crossed out functions werk nie!!!!!



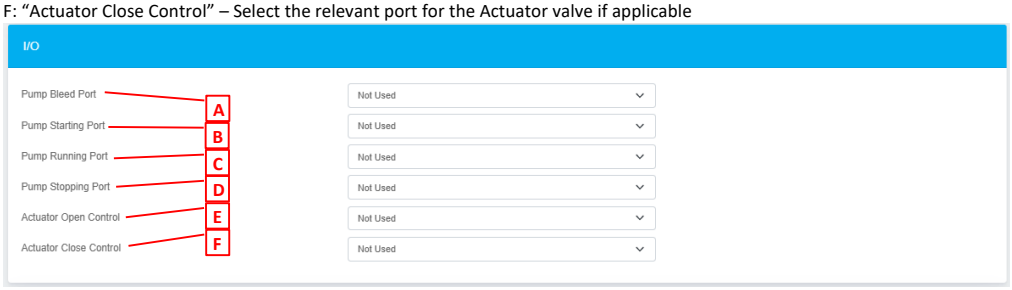
2.1.7 PID Settings

For FARMSYNC™ internal use only



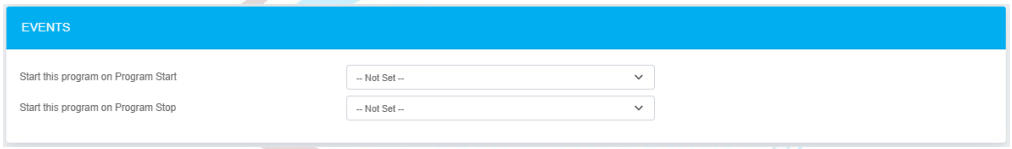
2.1.8 Input / Output

A: “Pump Bleed Port” – Select the relevant port connected to the Bleeding System (Usually a small pump or electric valve or both)
B: “Pump Starting Port” – Select the relevant port connected to the Main Pump (Used when pump use to be started by hand / green button)
C: “Pump Running Port” – Select the relevant port connected to the Main Pump (Should be the “PC” connection on the starterbox)
D: “Pump Stopping Port” – Select the relevant port connected to the Main Pump (Used when pump use to be started by hand / red button)
E: “Actuator Open Control” – Select the relevant port for the Actuator valve if applicable
F: “Actuator Close Control” – Select the relevant port for the Actuator valve if applicable



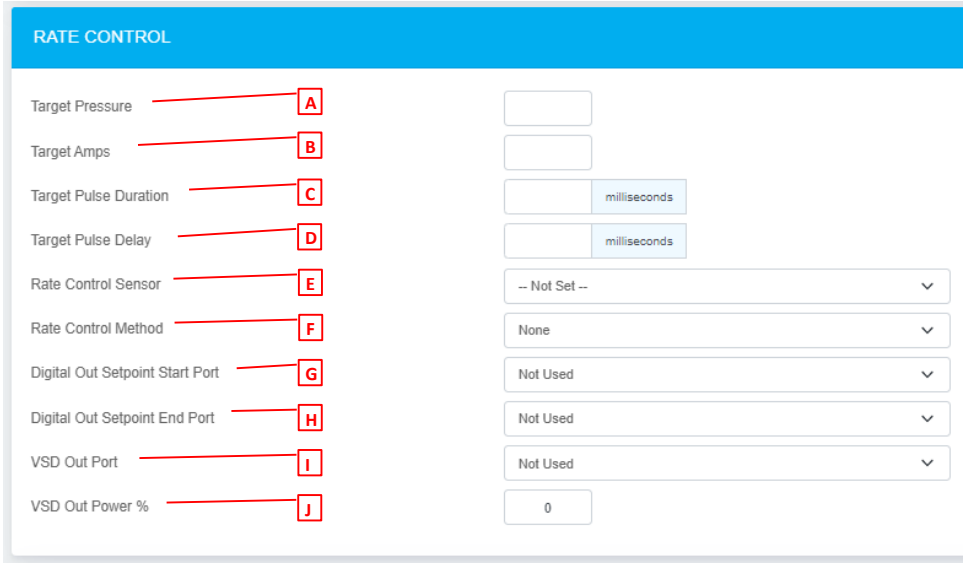
2.1.9 Events

Controls when this program is started or stopped by other programs by selecting the relevant program from the dropdown lists.



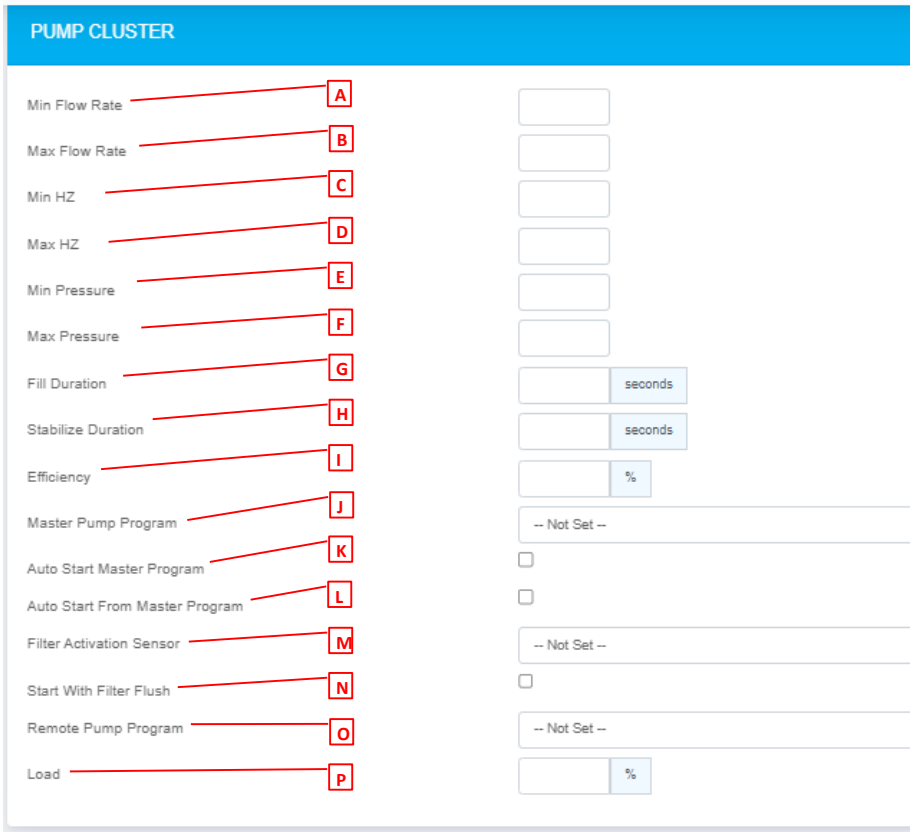
2.1.10 Rate Control / VSD Control

A: “Target Pressure” – Enter the desired pressure the pump must reach (Bar)
B: “Target Amps” – Enter the desired amps the motor must reach
C: “Target Pulse Duration” –
D: “Target Pulse Delay” -
E: “Rate Control Sensor” -
F: “Rate Control Method” -
G: “Digital Out Setpoint Start Port” -
H: “Digital Out Setpoint End Port” -
I: “VSD Out Port” -
J: “VSD Out Power %” -



2.1.11 Pump Cluster

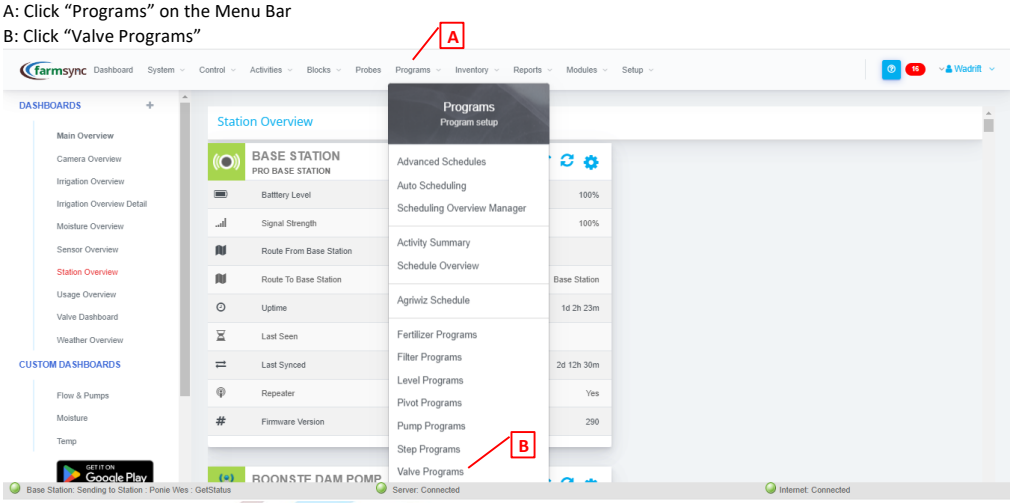
A: “Min Flow Rate” – Enter the min flow rate of the system combined
B: “Max Flow Rate” – Enter the max flow rate of the system combined
C: “Min Hz” – Enter the min Hertz that the motor is allowed to supply
D: “Max Hz” – Enter the max Herts that the motor is allowed to supply
E: “Min Pressure” – Enter the min Pressure allowed for the system
F: “Max Pressure” – Enter the max Pressure allowed for the system
G: “Fill Duration” – Enter the duration of time it takes (seconds) for line fill to occur
H: “Stabilize Duration” -
I: “Efficiency” – Enter the efficiency (%) of the system
J: “Master Pump Program” – Select the Master pump program from the dropdown list
K: “Auto Start Master Program” -
L: “Auto Start from Master Program” -
M: “Filter Activation Sensor” -
N: “Start with Filter Flush” – Allows the filters to flush when Pump Cluster starts
O: “Remote Pump Program” -
P: “Load” -



2.2 Valve Program

Valve programs allow the Farmer to group certain valves together for a specified duration of time (Runtime) & schedule Start Times & days of the week to be irrigated. Provision has also been made to include the Fertigation into the programs, this will be discussed later in the manual.

A: Click “Programs” on the Menu Bar
B: Click “Valve Programs”

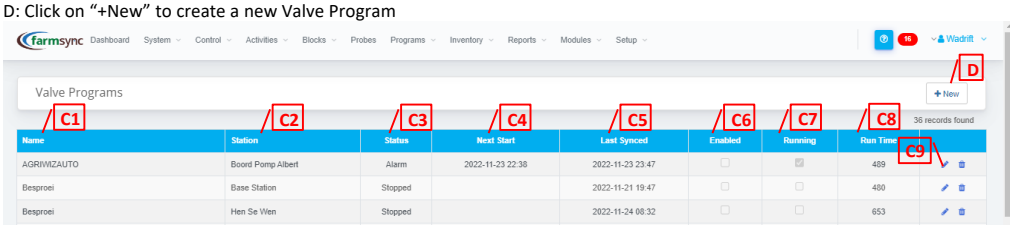


2.2.1 Valve Program List

C: Below will be a list of all existing “Valve Programs”

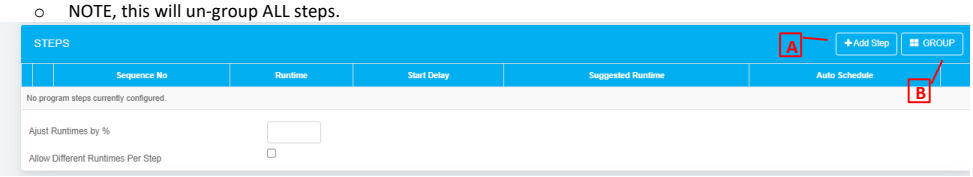
C1 – “Name”: Description of program – chosen by Client
C2 – “Station”: Station connected to the pump
C3 – “Status”: “Running” / “Paused” / “Alarm” / “Stopped”
C4 – “Next Start”: The Date & Time of when the program is scheduled to start again
C5 – “Last Synced”: The Date & Time of the last time the program ran
C6 – “Enabled”:
C7 – “Running”: Indicates if the program is currently running
C8 – “Runtime”: Shows the current Runtime (min) that the program is set on
C9 - “Pencil” Icon: Click it to edit the specified program
C9 - “Bin” Icon: Click it to delete the specified program

D: Click on “+New” to create a new Valve Program



2.2.2 Steps & Groups

- Steps are clusters of valves that run together.
- Each Step can have a max number of 8 valves.
- If more than 8 valves are required to run together, a second Step (A) can be added, make the Runtimes the same and "**Group**" the two steps together by ticking the boxes on the left of each step & clicking on the "Group" (B) button.
- To un-Group steps, simply click on the up or down arrows next to a step.
  - NOTE, this will un-group ALL steps.



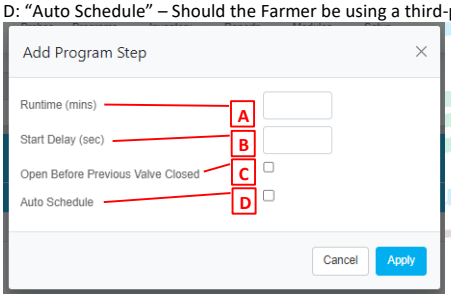
2.2.2.1 Add Program Step

To add a "Step" to the program, click on E as indicated above; the following window will appear:

A: "Runtime (min)" – Enter the desired Runtime (min) for the program
B: "Start Delay (sec)" – Applicable when more than one "Step" is created & "Grouped" together

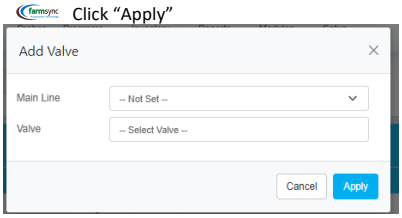
- Should a value be entered here (e.g. 30 seconds), the program will open the first steps' valves, wait 30 seconds & only then open the second steps valves
- This is advantageous as it lowers the initial flow rate of the system & keeps the pumps from running of its curve

C: "Open Before Previous Valve Closed" –
D: "Auto Schedule" – Should the Farmer be using a third-party scheduler (e.g. Agriwiz), tick this box



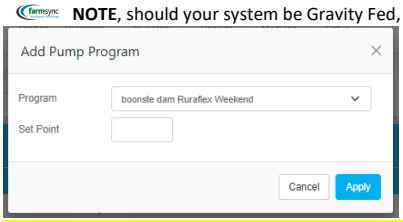
A: "Sequence No" – Indicates the "Step No" in the program
B: "Suggested Runtime" - **?????**
C: Click on the "+" to add valves to the program

- Select the relevant Mainline from the dropdown list
- Select the valve you want to add from the dropdown list
- Click "Apply"



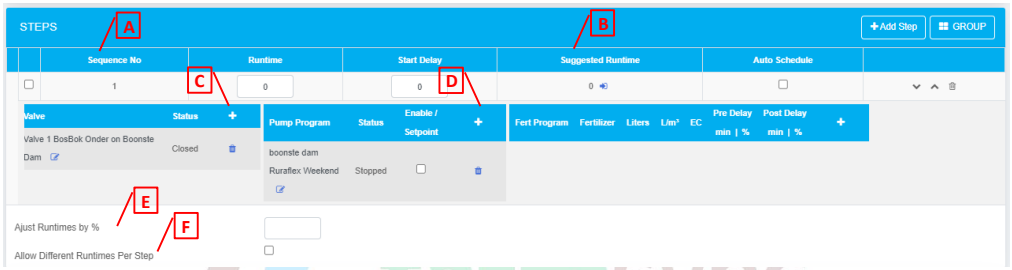
D: Click on the "+" to add a pump to your valve program

- Select the relevant pump program from the dropdown list
- Should the pump be set to a specific setpoint, enter the setpoint here
- Click "Apply"
- **NOTE**, should your system be Gravity Fed, leave the pump section empty



E: "Adjust Runtimes by %" – **under construction**

F: "Allow Different Runtimes per Step" – a function referring to Steps that are Grouped together. Using this function means that all the steps will start simultaneously, but will end on different times according to the various runtimes set



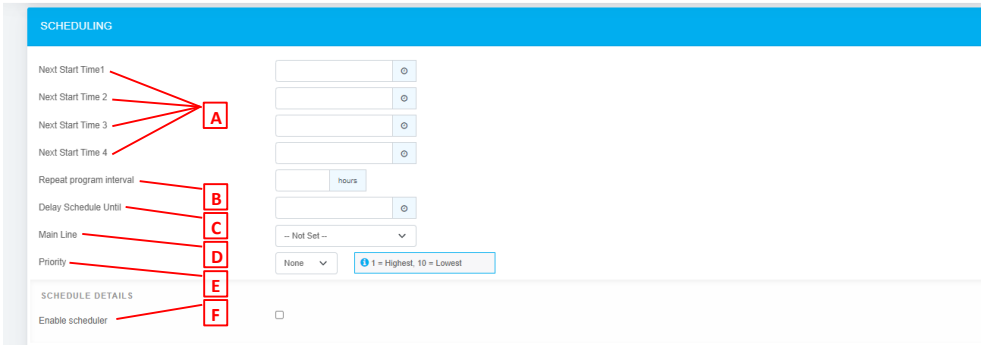
2.2.3 Scheduling

A-C: These values are automatically assigned when "Schedule Details" is enabled

D: "Mainline" – Select the relevant "Mainline" from the dropdown box

E: "Priority" – Should more than one program (on the same Mainline) be scheduled to start, priority will be given to the program with the highest priority rating, the other program will be paused. Once the priority program has finished, it will resume the paused program.

F: "Enable Scheduler" - To set a regular schedule, tick this box, this will open more settings for scheduling As described below



A: “Start Time 1-3” – Provision has been made for the program to start at least 4 times per day; enter the times here

B: “Days of week” – Tick the relevant days you would like this program to run on

2.2.4 Auto Scheduling

A: “Auto Schedule” –

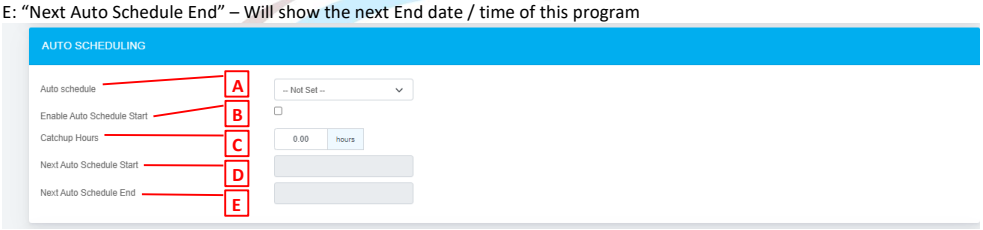
B: “Enable Auto Schedule Start” –

C: “Catchup Hours” – Should the Actual Starting Time scheduled for some reason be prohibited from starting (e.g. due to Loadshedding), the Catchup Hours allows the program to start at another time not specified on the schedule should it still be within the hours specified here: e.g.

- Starting time: 08:00
- Loadshedding prevented the program from running (08:00 - 10:00)
- Catchup Hours: 6 hours
- Since the power is back after just 2 hours (still within the 6-hour margin specified), the program will allocate a new start time of 10:00

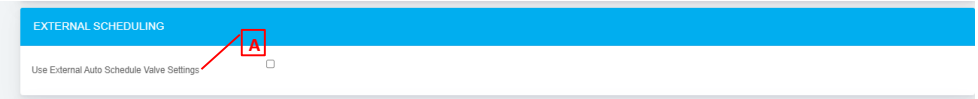
D: “Next auto Schedule Start” – Will show the next Starting date / time of this program

E: “Next Auto Schedule End” – Will show the next End date / time of this program



2.2.5 External Scheduling

A: “Use External Auto Schedule Valve Settings” – Should an external program be used for Scheduling (e.g. Agriwiz), tick this box



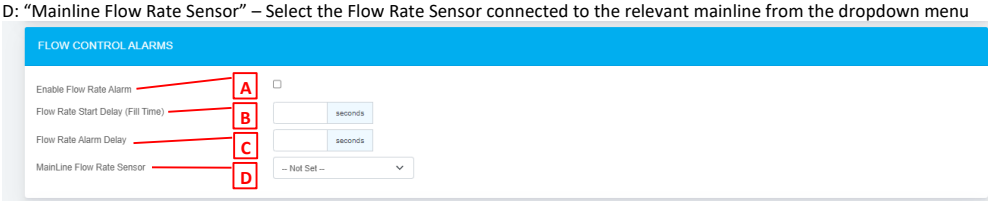
2.2.6 Flow Control Alarms

A: “Enable Flow Rate Alarm” – By checking this box, you enable the alarm based on the settings set below

B: “Flow Rate Start Delay (Fill Time)” – The duration of time that must pass to allow the pipeline to fill with water

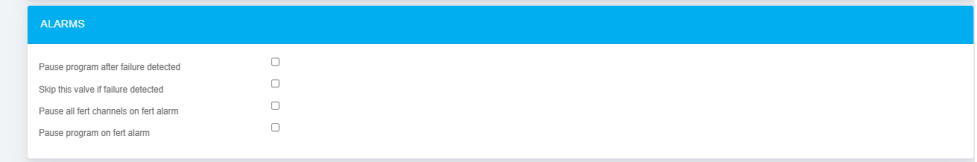
C: “Flow Rate Alarm Delay” – The duration of time allowed for the flow rate to be out of specifications before the alarm is triggered. This delay starts counting down after the Fill Time has passed.

D: “Mainline Flow Rate Sensor” – Select the Flow Rate Sensor connected to the relevant mainline from the dropdown menu



2.2.7 Alarms

Choose how you want the program to react to the Flow Rate Alarm if detected.



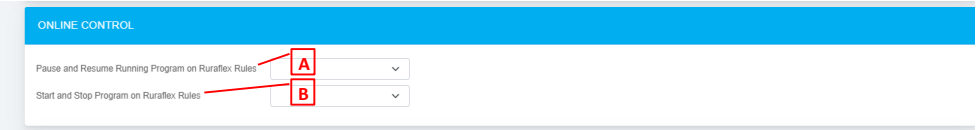
2.2.8 Online Control

A: “Pause & Resume Running Program on Ruraflex Rules” – Choose from the options on the dropdown menu

- Green Only
- Orange Only
- Red Only
- Green & Orange Only

B: “Start & Stop Program on Ruraflex Rules” – Choose from the options on the dropdown menu

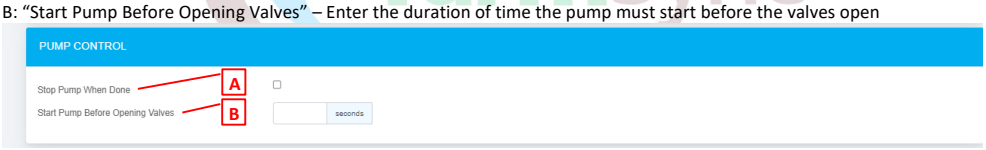
- Green Only
- Orange Only
- Red Only
- Green & Orange Only



2.2.9 Pump Control

A: “Stop Pump When Done” – Tick this box to stop the pump after the program is done

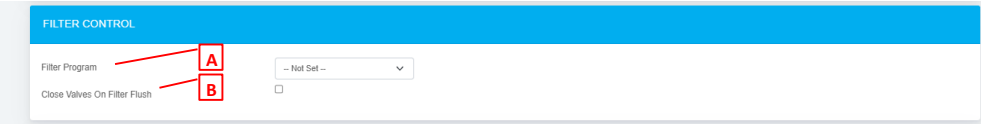
B: “Start Pump Before Opening Valves” – Enter the duration of time the pump must start before the valves open



2.2.10 Filter Control

A: “Filter Program” – Select the relevant filter program

B: “Close Valves on Filter Flush” – Should the pump not have the capacity to irrigate & flush simultaneously, tick this box; the irrigation valves will close during the flush cycle & then continue irrigating thereafter



2.2.11 Trigger

A: “Trigger Sensor” – Choose the Trigger sensor from the dropdown list

It is advised that the “Eskom Pause” trigger be used

B: “Trigger Min Threshold” – Enter the min value of the trigger sensor allowed

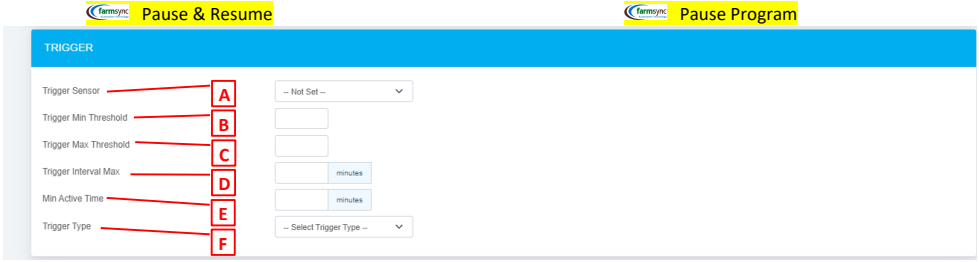
C: “Trigger Max Threshold” – Enter the max value of the trigger sensor allowed

D: “Trigger Interval Max (minutes)” – Enter the Max Interval

E: “Min Active Time (minutes)” – Enter the Min active time

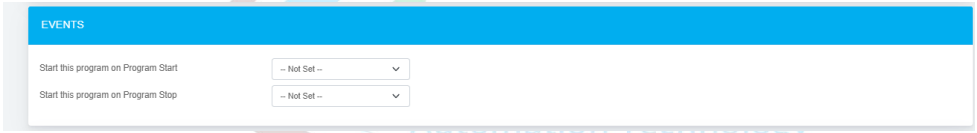
F: “Trigger Type” – Select how the program must respond to the trigger

- Disable
- Start & Stop Program
- Start Program
- Stop Program
- Pause & Resume
- Valve Open & Close
- Valve Close
- Valve Open
- Port
- Pause Program



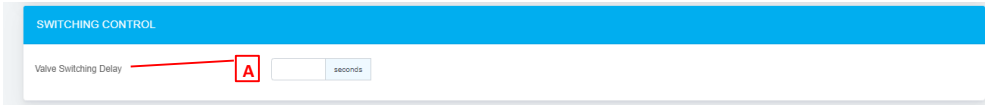
2.2.12 Events

Controls when this program is started or stopped by other programs by selecting the relevant program from the dropdown lists.



2.2.13 Switching Control

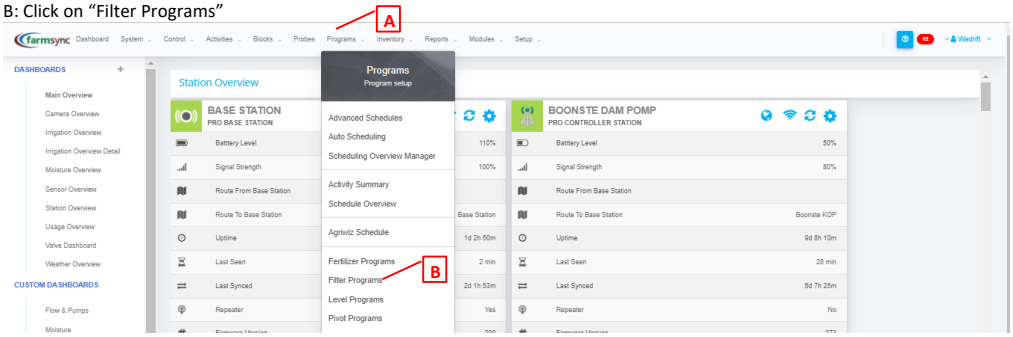
A: “Valve Switching Delay” – the interval between valves to open



2.3 Filter Program

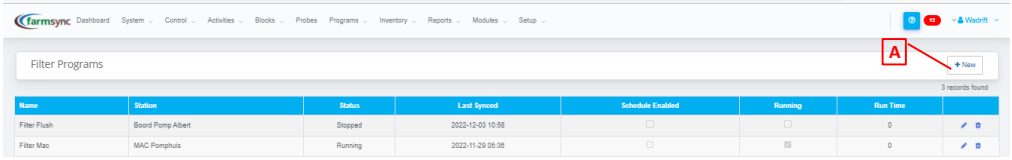
A: Click “Programs” on the Menu Bar

B: Click on “Filter Programs”



2.3.1 Filter Program List

A: Click on “+New” to add a new Filter Program



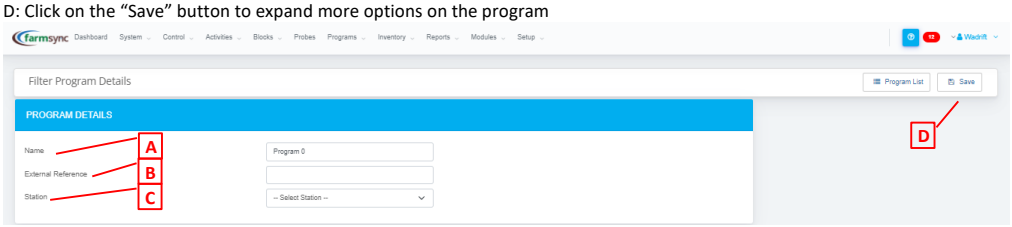
2.3.2 Filter Program Details

A: “Name” – Enter a name for the Filter Program

B: “External Reference” – For Farmsync internal use only

C: “Station” – Select the relevant station from the dropdown list

D: Click on the “Save” button to expand more options on the program



2.3.3 Filter Program Details – Expanded

A: "Enabled Automatic Start" – Runs the filter Flush Program indefinitely. **Should the filter program be enabled in a Valve Program, this function INSIDE the Filter Flush Program must be Disabled.**

B: "Stop Remote Flush program when flushing done" –

C: "Total Program Run Time (minutes)" – Enter the max Runtime (min) for the flush program

D: "Flush Duration (seconds)" – Enter the time duration (sec) allowed for each filter to flush

E: "Flush Time Duration (seconds)" – Enter the time allowed between filters to pass before the next filter flushes

F: "Minimum duration between flush operations (seconds)" – Enter the min time duration between flush cycles

G: "Min Pressure to enable pressure flush (Bar)" – Enter the min pressure difference between in & outlet of filter allowed before filter flushes

H: "Min Pressure to enable time flush (Bar)" – Enter the min pressure the system must supply for flushing to occur (refer to supplier filter specifications)

I: "Pressure Flush Delay (seconds)" – Enter the time (sec) allowed to pass for pressure difference to be higher than min before flush is enabled

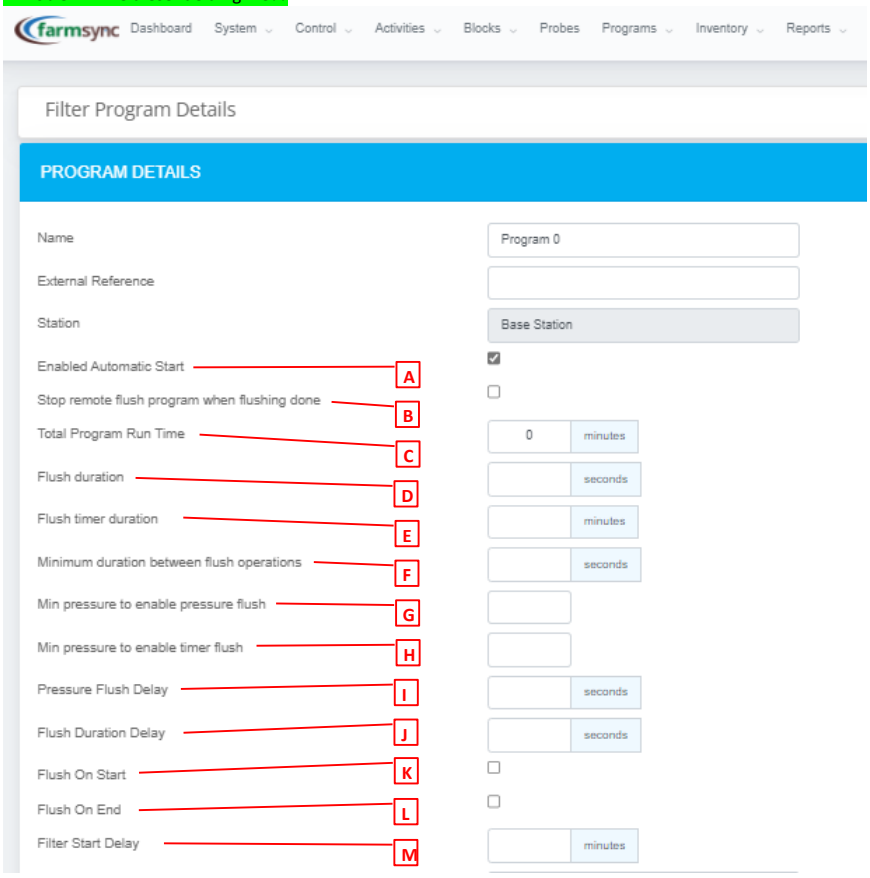
J: "Flush Duration Delay (seconds)" – duration of time allowed to pass before filter valves start flushing – this is to allow time for Main Control Valves to close

K: "Flush on Start" – When enabled, filter will flush when program starts

L: "Flush on End" – When enabled, filter will flush when program stops

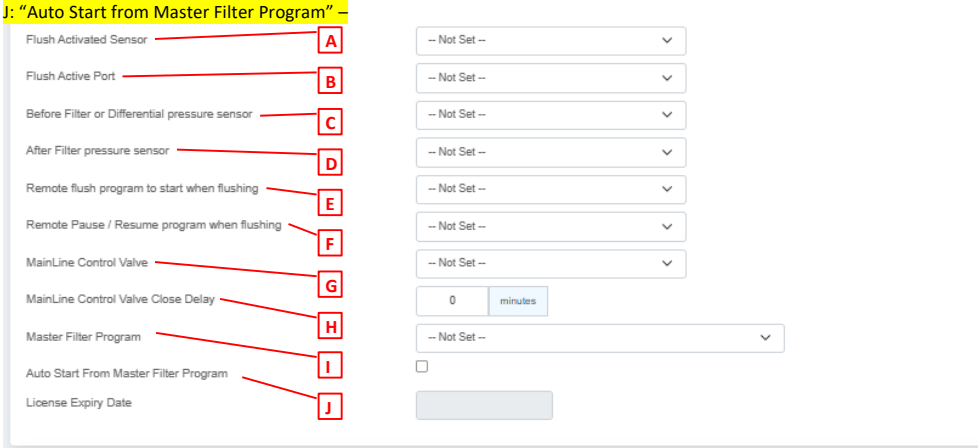
M: "Filter Start Delay (seconds)" – Duration of time allowed to pass after filter program has started before filter flushes

***is J en M nie dieselfde ding nie??



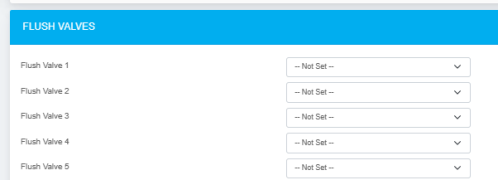
2.3.4 Filter Program Details – Continued

A: "Flush Activated Sensor" –
B: "Flush Active Port" –
C: "Before Filter or Differential Pressure Sensor" – Select the relevant Pressure sensor or DP sensor from the dropdown list
D: "After Filter Pressure Sensor" – Select the relevant Pressure sensor from the dropdown list
E: "Remote Flush Program to Start when Flushing" –
F: "Remote Pause / Resume program when flushing" –
G: "Mainline Control Valve" – Select the relevant Main Control Valve from the dropdown list
H: "Mainline Control Valve Close Delay" – Duration of time allowed to pass since flushing is triggered before the Main Control Valve closes
I: "Master Filter Program" –
J: "Auto Start from Master Filter Program" –



2.3.5 Flush Valves

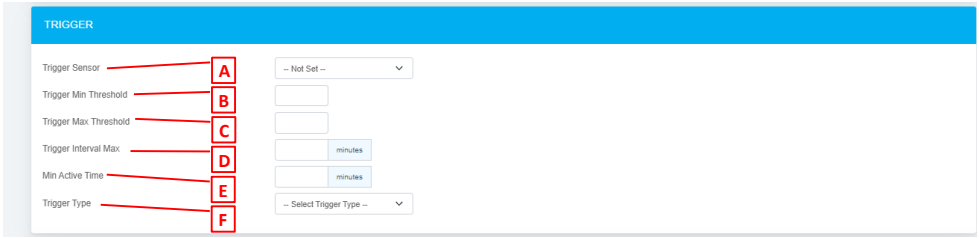
Choose from te dropdown lists below the relevant Flush Valves that were created for the Filter under "Setup_Manage Valves"; Provision has been made for 32 valves in total.



2.3.6 Trigger

A: "Trigger Sensor" – Choose the Trigger sensor from the dropdown list
It is advised that the "Eskom Pause" trigger be used
B: "Trigger Min Threshold" – Enter the min value of the trigger sensor allowed
C: "Trigger Max Threshold" – Enter the max value of the trigger sensor allowed
D: "Trigger Interval Max (minutes)" – Enter the Max Interval
E: "Min Active Time (minutes)" – Enter the Min active time
F: "Trigger Type" – Select how the program must respond to the trigger

- Disable
- Start & Stop Program
- Start Program
- Stop Program
- Pause & Resume
- Valve Open & Close
- Valve Close
- Valve Open
- Port
- Pause Program



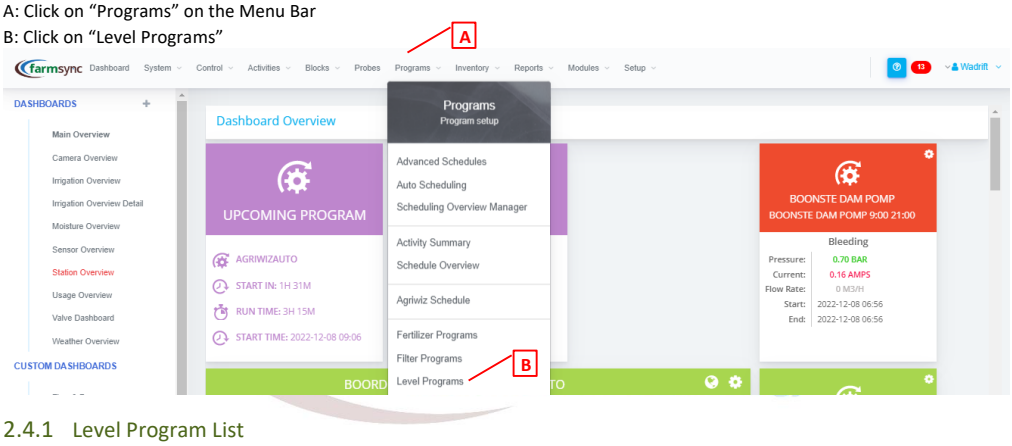
2.4 Level Program

Level Programs can be used for:

- Refilling a tank / dam when it reaches a specified level
- Emptying a tank / dam / river when it reaches a specified level

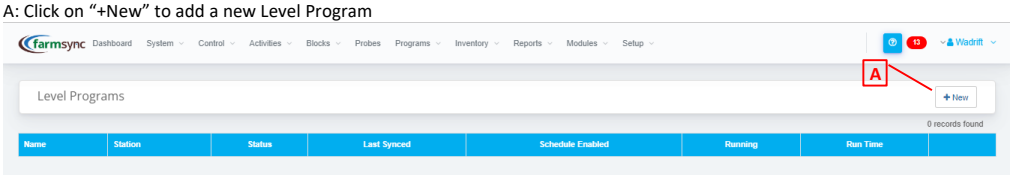
A Level Sensor must be created, review the Sensors Module for the setup

A: Click on “Programs” on the Menu Bar
B: Click on “Level Programs”



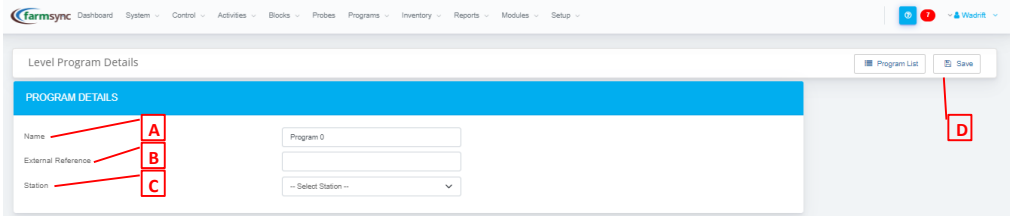
2.4.1 Level Program List

A: Click on “+New” to add a new Level Program



2.4.2 Level Program List

A: “Name” – Enter a Name for the Program
B: “External Reference” – For Farmsync internal use only
C: “Station” – Select the relevant Station that the Level Sensor is connected to from the dropdown list
D: Click on the Save button to expand more options on the program



2.4.3 Level Program Details – Expanded

A: “Auto Start”

To have the program start automatically if the Level Sensor value goes below the “Refill Level” specified below, this box must be ticked

Should the box stay unticked, the program must be started manually under the Control function on the Menu Bar

B: “Stop Remote Empty Program when Emptying Done” – when “Empty Stop Level” is reached, this will signal for the program to Stop

C: “Stop Remote Refill Program when Filling Done” – when “Refill Stop Level” is reached, this will signal for the program to Stop

D: “Total Program Runtime” – N/A as the program works on Levels

Note: The following values (E, F, G & H) must match the Units measured of the relevant sensor (this could be Liters, Bar, Meters etc)

E: “Refill Start Level”

F: “Refill Stop Level”

G: “Empty Start Level”

H: “Empty Stop Level”

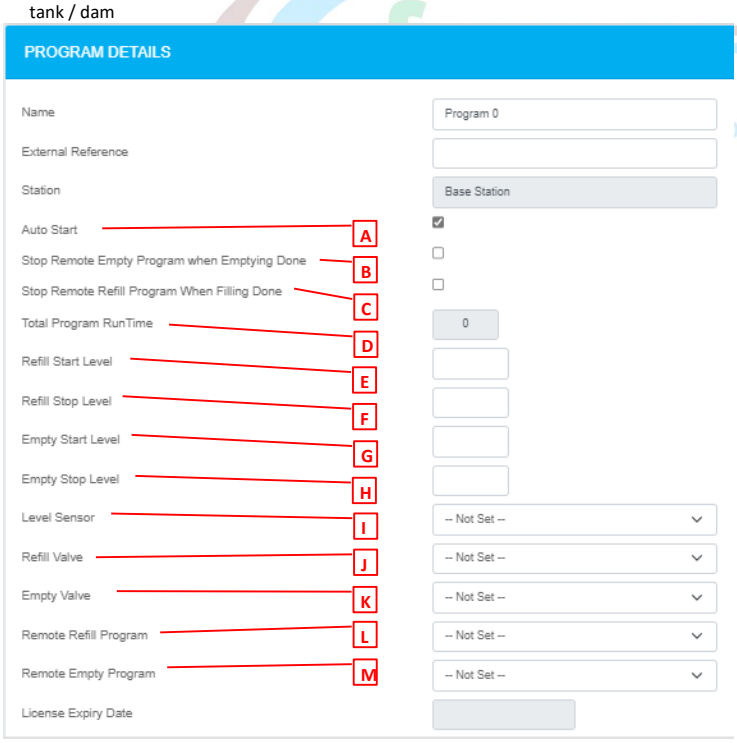
I: “Level Sensor” – Select the relevant Level Sensor from the dropdown list

J: “Refill Valve” – Select a valve from the dropdown list (only if one valve is required & no pump, if the refill requires more, a separate valve / pump program must be written & selected from the “Remote Refill Program” dropdown list below)

K: “Empty Valve” - Select a valve from the dropdown list (only if one valve is required & no pump, if the empty requires more, a separate valve / pump program must be written & selected from the “Remote Empty Program” dropdown list below)

L: “Remote Refill Program” – Select from the dropdown list the relevant Pump / Valve Program that must start to refill the tank / dam

M: “Remote Empty Program” – Select from the dropdown list the relevant Pump / valve Program that must start to Empty the tank / dam



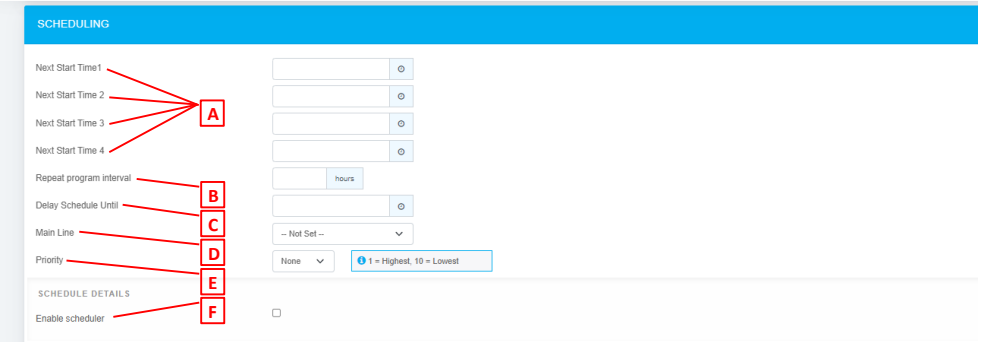
2.4.4 Scheduling

A-C: These values are automatically assigned when “Schedule Details” is enabled

D: “Mainline” – Select the relevant “Mainline” from the dropdown box

E: “Priority” – Should more than one program (on the same Mainline) be scheduled to start, priority will be given to the program with the highest priority rating, the other program will be paused. Once the priority program has finished, it will resume the paused program.

F: “Enable Scheduler” - To set a regular schedule, tick this box, this will open more settings for scheduling As described below



A: “Start Time 1-3” – Provision has been made for the program to start at least 4 times per day; enter the times here

B: “Days of week” – Tick the relevant days you would like this program to run on

2.4.5 Trigger

A: “Trigger Sensor” – Choose the Trigger sensor from the dropdown list

It is advised that the “Eskom Pause” trigger be used

B: “Trigger Min Threshold” – Enter the min value of the trigger sensor allowed

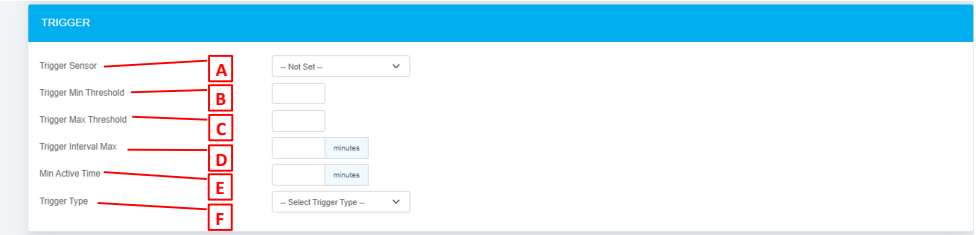
C: “Trigger Max Threshold” – Enter the max value of the trigger sensor allowed

D: “Trigger Interval Max (minutes)” – Enter the max interval

E: “Min Active Time (minutes)” – Enter the min active time

F: “Trigger Type” – Select how the program must respond to the trigger

- Disable
- Start & Stop Program
- Start Program
- Stop Program
- Pause & Resume
- Valve Open & Close
- Valve Close
- Valve Open
- Port
- Pause Program

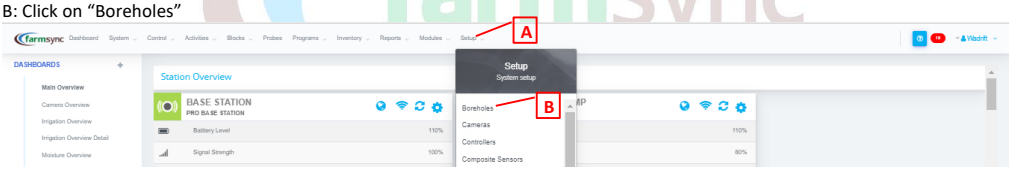


3 Add a Borehole

3.4 Adding a Borehole

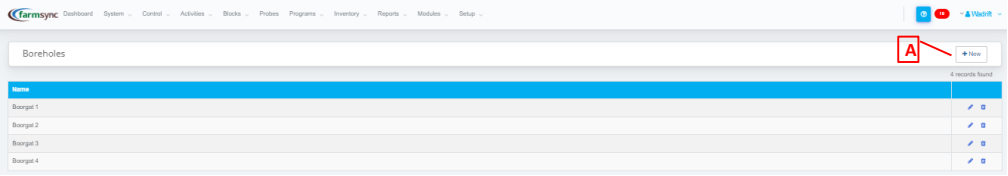
A: Click on “Setup” on the Menu Bar

B: Click on “Boreholes”



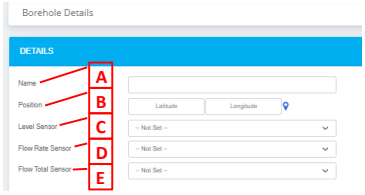
3.4.1 Adding a Borehole

A: Click on the “+New” button to add a borehole



3.4.2 Borehole Details

A: “Name” – Enter a Name for the Borehole
B: “Position” – Enter the location of the Borehole on the farm
C: “Level Sensor” – Select the relevant Level Sensor from the Dropdown list
D: “Flow Rate Sensor” – Select the relevant Flow Rate Sensor from the dropdown list
E: “Flow Total Sensor” – Select the relevant Flow Total Sensor from the dropdown list

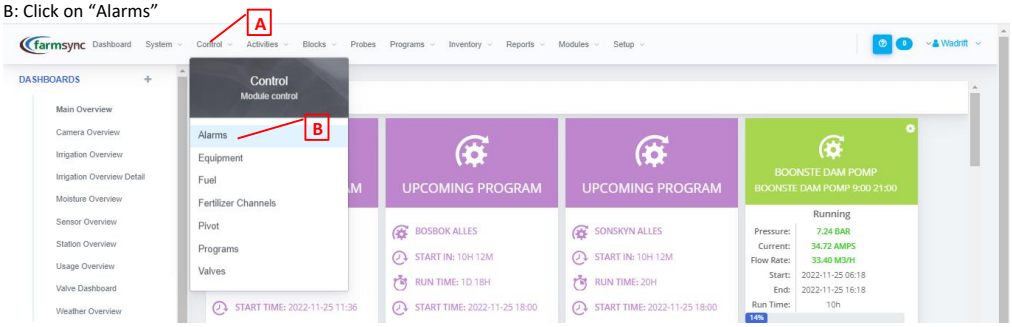


4 Control

FARMSYNC™ strives to make the control of your irrigation system as user friendly as possible.

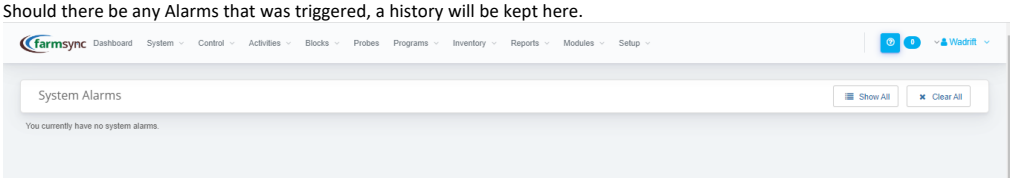
4.1 Alarms

A: Click on “Control” on the Menu Bar
B: Click on “Alarms”



4.1.1 System Alarms

Should there be any Alarms that was triggered, a history will be kept here.



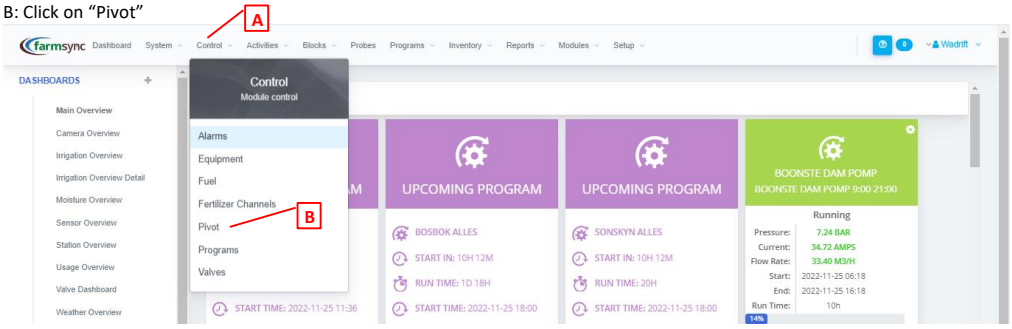
4.2 Safeties

In today's day & age, loadshedding happens nearly daily & 2 – 3 times a day minimum. The Eskom Pause Trigger ensures that your irrigation schedule can stay on track by pausing your irrigation program during loadshedding and once the power returns, the program resumes.

Please note that every controller (Pro Base Controller & Pump Station Controller) must have their own Eskom Pause sensor created. Never select the Eskom Pause Sensor of a station on a program running on a different station.

4.3 Pivot – under construction

A: Click on "Control" on the Menu Bar
B: Click on "Pivot"

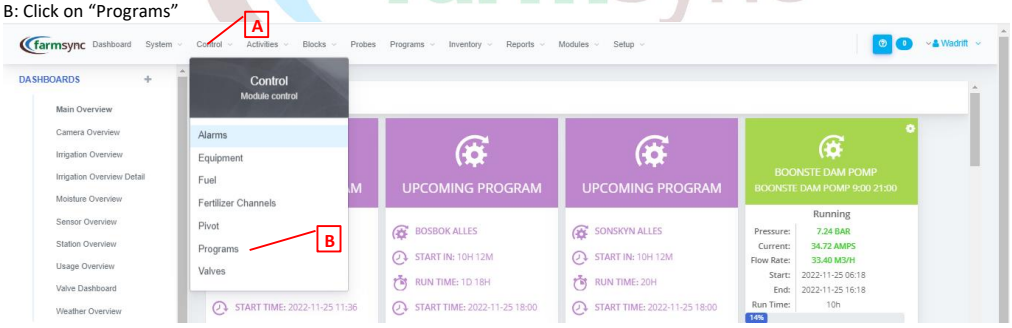


4.3.1 Pivot Control

…Under Construction…

4.4 Programs

A: Click on "Control" on the Menu Bar
B: Click on "Programs"



4.4.1 Program Control

A list of all programs can be found under this section.

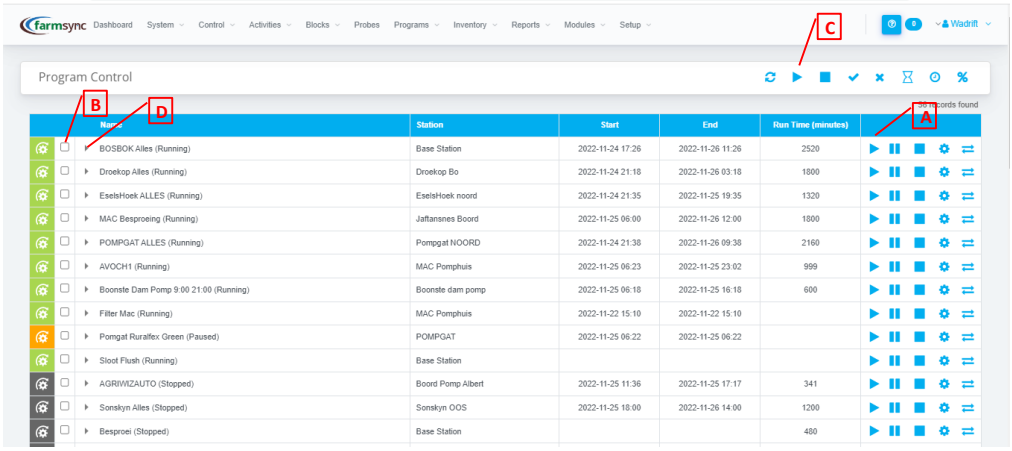
Green: Running Programs
Grey: Not Running
Orange: Paused
Red: Indicates an Alarm

Should you want to start a program manually, simply go here, & press the “Play” icon (A).

The user will be able to have total manual control over the programs (Start / Pause / Stop / Shortcut to program setup / Synchronize Station)

If more than one program is required to start, tick the boxes on the left (B) next to the relevant programs, & click on the top “Play”(C) button.

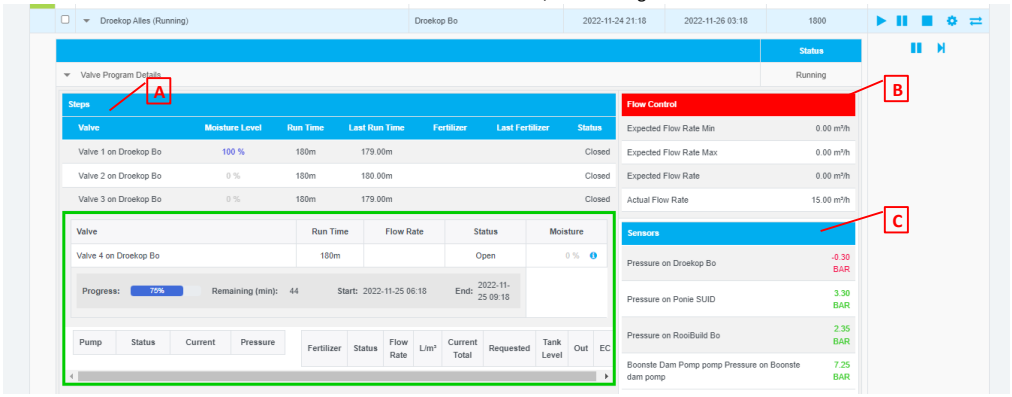
By clicking on the arrow(D) next to the program name, the program can be expanded to show more detail about the irrigation running.



See below an example of how a simple Valve Program will look when the program is expanded:

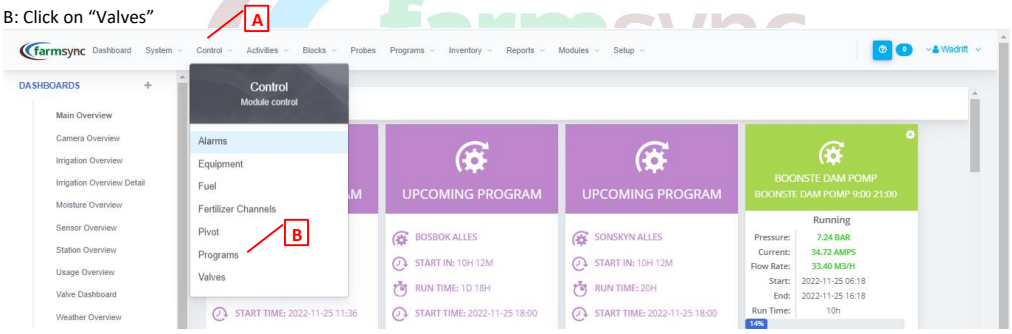
A: “Steps” – a list of the steps on the program will be visible; including Total Runtime, Remaining Runtime, Status etc
B: “Flow Control” – Summary of the total “Expected, Min & Max Flow Rates” & “Actual Flow Rate” of the program can be viewed
C: “Sensors” – a list of all the sensors connected to the program will be visible with their values

- **Green values:** sensor or valve is in specification
- **Orange values:** sensor or valve is nearing its min or max setting
- **Red values:** sensor or valve value is above or below the min / max setting



4.5 Valves

A: Click on “Control” on the Menu Bar
B: Click on “Valves”



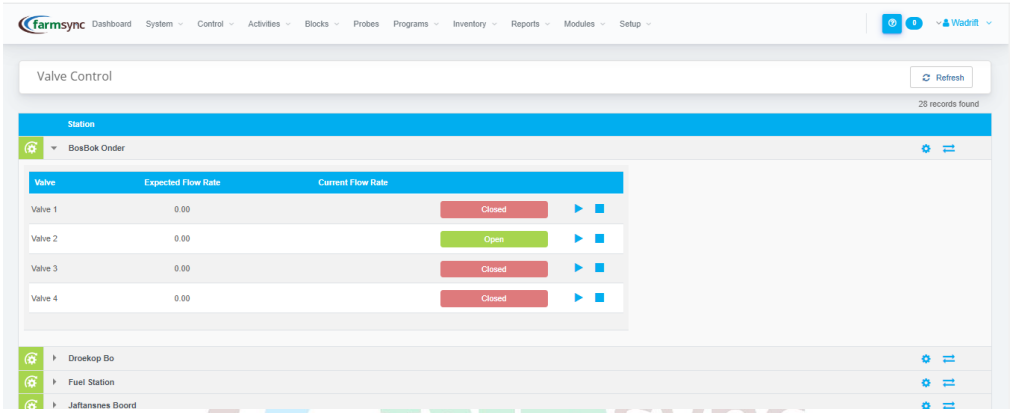
4.5.1 Valve Control

Under this section, you will be able to open & close individual valves connected to the controller.

This function is handy for testing purposes, or if for some reason a certain block was not able to run with its usual program & needs to catch up on irrigation.

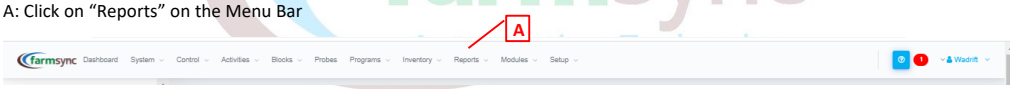
Note that there is no duration connected to this function, & the valve must be closed manually again once the desired Runtime has been reached.

This is also where you can test the valves connected to the DC station; they cannot be tested at the IO Mapping.
Valves connected to the Base station are tested here or at under the IO Mapping.



5 Reports

A: Click on “Reports” on the Menu Bar



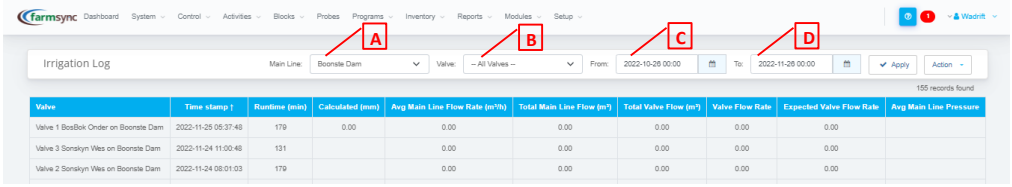
The following Reports for Irrigation are available:

- **Irrigation Log**
- **Irrigation Log Summary**
- **Irrigation Summary**
- **Water Usage**

Each report can be Exported to excel by clicking on the “Actions” Button. From there, the data can be converted to graphs & whatever visual representation the user wishes.

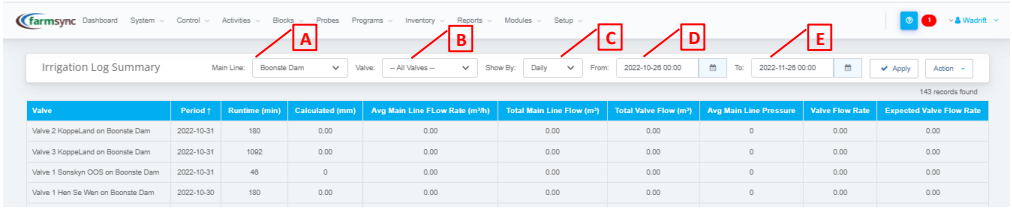
5.1 Irrigation Log

A: “Mainline” – Choose the relevant mainline from the dropdown list
B: “Valve” – Choose either a specific valve or all the valves from the dropdown list
C: “From” – Select a start date & time for the report
D: “To” – Select an end date & time for the report



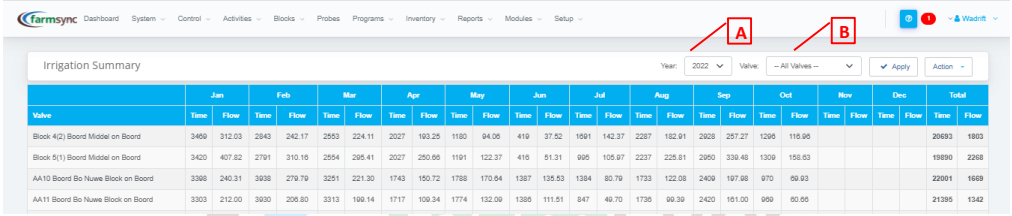
5.2 Irrigation Log Summary

A: “Mainline” – Choose the relevant mainline from the dropdown list
B: “Valve” – Choose either a specific valve or all the valves from the dropdown list
C: “Show By” – Select in what order the report is viewed (Daily, Weekly, Monthly, Yearly)
D: “From” – Select a start date & time for the report
E: “To” – Select an end date & time for the report



5.3 Irrigation Summary

A: “Year” – Choose a year from the dropdown list
B: “Valve” – Choose either a specific valve or all the valves from the dropdown list

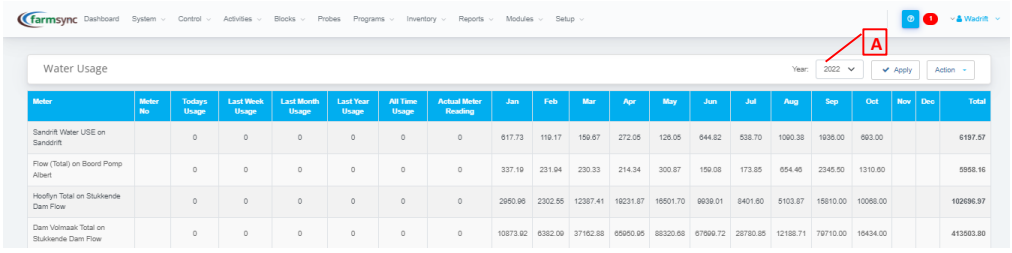


5.4 Water Usage

The Water Usage Report is a monthly summary of each water meter connected to the Controller.

Note: It is advised that the Client keep a monthly manual record of each water meter reading. This will help in trouble shooting should the meter send false pulses to the Controller.

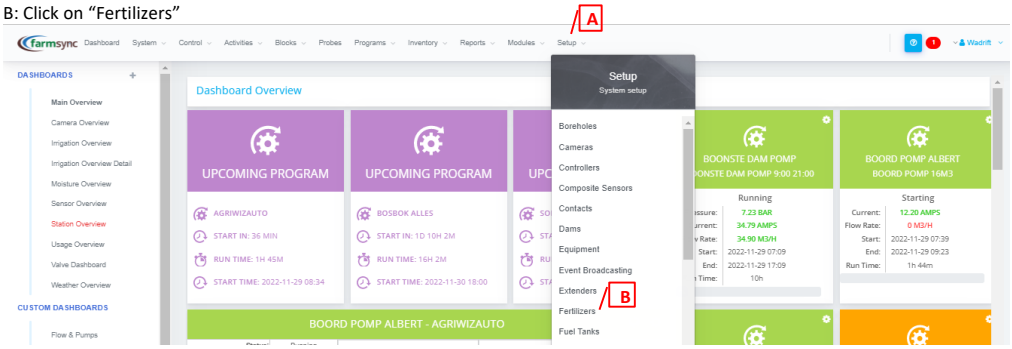
A: “Year” – Select the relevant year from the dropdown list



Module 2 - Fertigation

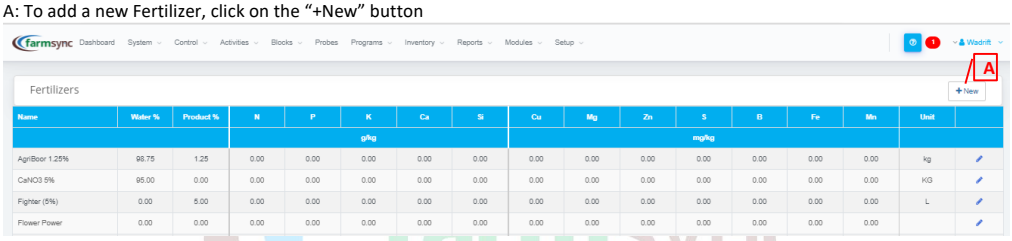
1 Create a Fertilizer

A: Click “Setup” on the Menu Bar
B: Click on “Fertilizers”



1.1 Fertilizer List

A: To add a new Fertilizer, click on the “+New” button

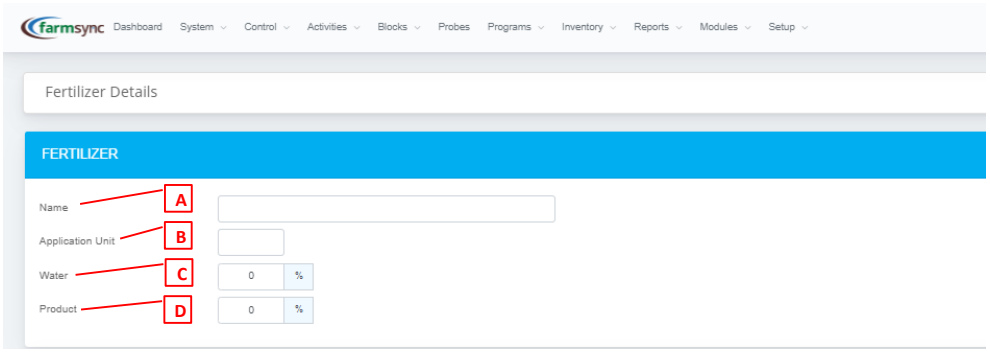


1.2 Fertilizer Detail

1.2.1 Adding a new Fertilizer

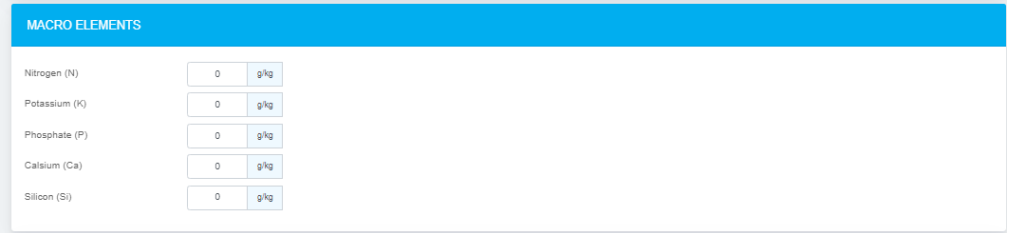
A: “Name” – Enter a Name for the Fertilizer
B: “Application Unit” – Enter the appropriate Application Unit (e.g. Kg/L)
C: “Water (%)” – Enter the percentage of Water recommended to use per unit of Fertilizer
D: “Product (%)” – Enter the percentage of Fertilizer recommended to mix with water

**If the system does not work according to formulas (combination of C & D), the value entered at D – “Product %” can be set to 100%



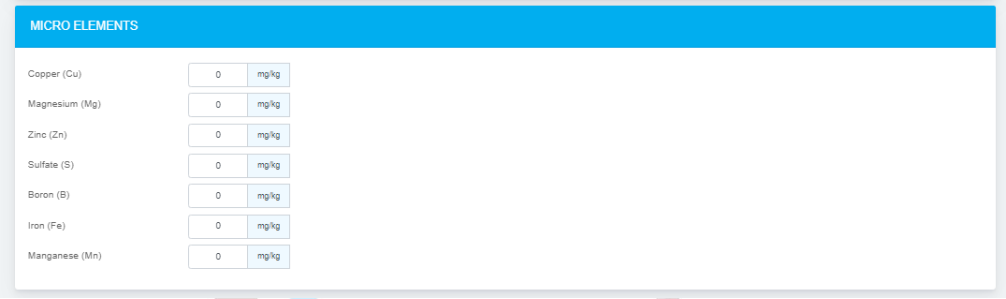
1.1.1 Macro Elements

Enter the ratio of macro elements as specified on the preferred suppliers packaging.
Note that Farmsync cannot assist in these ratios, please consult your Fertigation advisor.



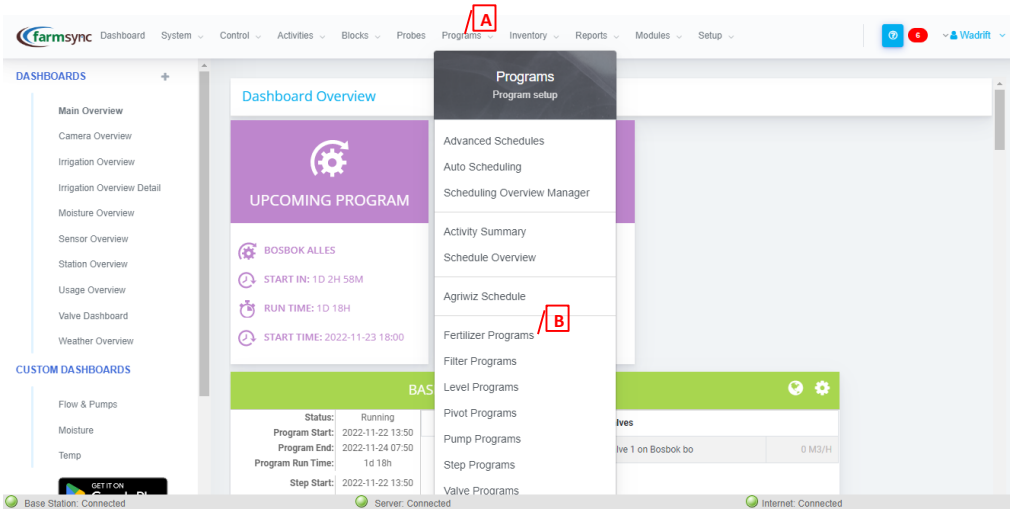
1.1.2 Micro Elements

Enter the ratio of macro elements as specified on the preferred suppliers packaging.
Note that Farmsync cannot assist in these ratios, please consult your Fertigation advisor.



2 Creating a Fertilizer Program

A: Click “Programs” on the Menu Bar
B: Click on “Fertilizer Programs”

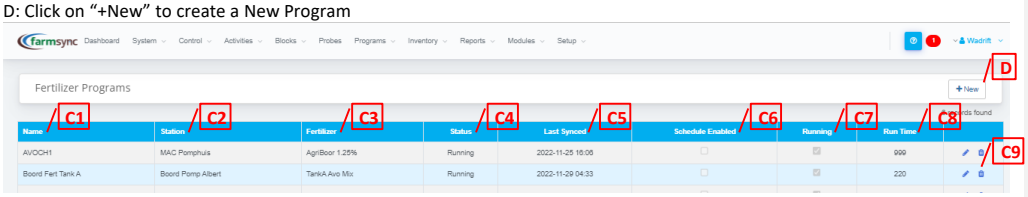


2.1 Fertilizer Program List

C: Below will be a list of all existing "Pump Programs"

- C1 – "Name": Description of program – chosen by Client
- C2 – "Station": Station connected to the specific Fertilizer
- C3 – "Fertilizer": Actual name of the Fertilizer
- C4 – "Status": "Running" / "Paused" / "Alarm" / "Stopped"
- C5 – "Last Synced": The Date & Time of the last time the program ran
- C6 – "Schedule Enabled": *Under Construction, we appreciate your patience*
- C7 – "Running": When this box is ticked, it means the program is currently running
- C8 – "Runtime": Shows the runtime (mins) that the program is currently set on
- C9 – "Pencil" Icon: Click it to edit the specified program
- C9 – "Bin" Icon: Click it to delete the specified program

D: Click on "+New" to create a New Program



2.2 Fertilizer Program Details

*Each Fert Channel must have its own Fertilizer Program

2.2.1 Fertilizer Details

A: "Name" – Enter a Name for your program
B: "External Reference" – For FARMSYNC™ internal use only
C: "Station" – Select the relevant Station from the dropdown list
D: "Fertilizer Control Type" – Select the Fertilizer Control Type from the dropdown list
*If the channel is set up according the one of these, it is the only way that the system can dose, the client cannot change methods on a day-to-day basis

- Time
  - Batching (L) by breaking the specified total volume of fertilizer into batches & inject accordingly over the specified time
- Liters using Tank Level
  - Batching (L) by using the tank level to determine total volume of Fertilizer that has been injected
- Liters using Flow Sensor
  - Batching (L) by using the Flow Sensor to determine the total volume of Fertilizer that has been injected
- Proportional & Liters using Flow Sensor
  - Batching (L) as "Liters using Flow Sensor" but the injection rate is "Capped" to specified L/m^3
- Proportional & Liters using Tank Level
  - Batching (L) as "Liters using Tank Level" but the injection rate is "Capped" to specified L/m^3
- Setpoint
  - ????
- EC with Liters
  - EC control by injecting Fertilizer at a calculated rate to maintain a specified EC value
  - Stops after reaching a specified total volume of Fertilizer injected (L)
- PH
  - PH control by injecting Fertilizer at a calculated rate to maintain a specified PH value
- Proportional Flow Sensor
  - Proportional (L/m^3) by using the Mainline Flow rate, Fertilizer Runtime(min) & specified injection rate (L/m^3)
- EC
  - EC control by injecting Fertilizer at a calculated rate to maintain a specified EC value
  - Stops after reaching a specified Runtime(min)

E: “Fertilizer” – Select the relevant Fertilizer from the dropdown list

F: “Auto Start” – ????

*The following settings will be overwritten by any setting used under Fert in the Valve Program

G: “Total Program Runtime (min)” – Enter the Total Program Runtime (min)

H: “Max Injection Duration (min)” – Enter the Max injection Duration (min) ????

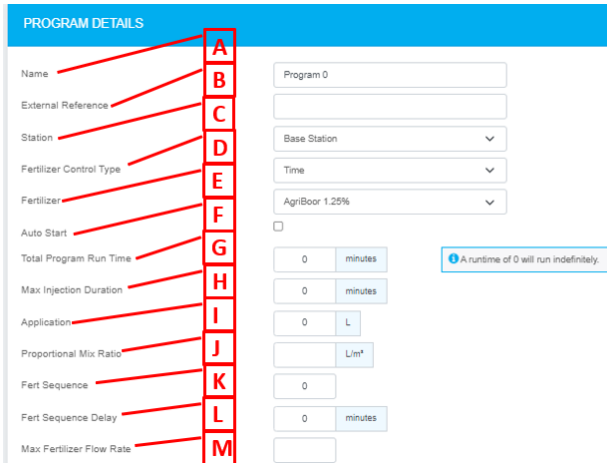
I: “Application (L)” – Batching

J: “Mix Ratio (L/m³)” – Proportional

K: “Fert Sequence” – ????

L: “Fert Sequence Delay (min)” – ????

M: “Max Fertilizer Flow Rate (L/h)” -



2.2.2 Fertilizer Details - continued

A: “Setpoint Sensor Modifier” – ?????

B: “Setpoint” –

C: “Application Modifier (L)” –

D: “Stop to read Tank Sensor” –

E: “Fertilizer Pump Program” –

F: “Fertigation on Port” –

G: “Invert Injection VSD or Pulse Output” –

H: “Injection VSD or Pulse Port” –

I: “Mainline Flow Total Sensor” – Select the relevant water meter sensor from the dropdown list

J: “Mainline Pressure Sensor” – Select the relevant pressure sensor from the dropdown list

K: “Mainline min Pressure (Bar)” – Enter the min pressure required in the Mainline

L: “Fertigation Start from End Duration (Sec)” –

M: “Rinse on Port” –

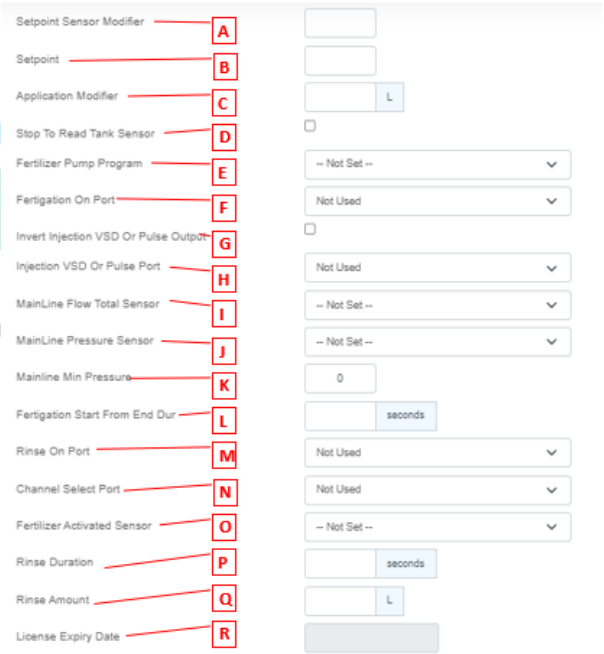
N: “Channel Select Port” – Should there be a pump installed between the Storage Tanks & the channels, providing positive pressure on the channel (in cases where the tanks are not installed at a appropriate height), select that pump from the dropdown list

O: “Fertilizer Activated Sensor” –

P: “Rinse Duration” –

Q: “Rinse Amount” –

R: “License Expiry Date” -

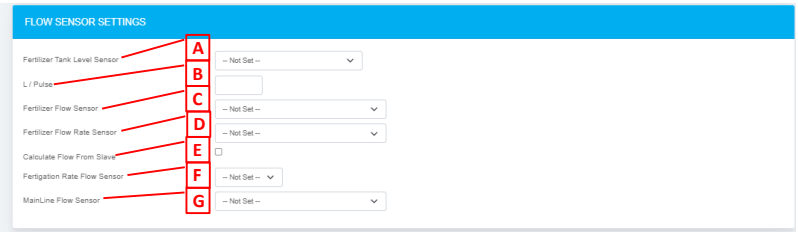


2.2.3 Flow Sensor Settings

A: “Fertilizer Tank Level Sensor” – Select the relevant Tank Level Sensor from the dropdown list
B: “L/Pulse” – Enter the Pulse Rating of the water meter installed
- 0:1 = 1L
- 0:0.1 = 0.1L

C: “Fertilizer Flow Sensor” – Select the relevant Fertilizer water meter sensor from the dropdown list
D: “Fertilizer Flow Rate Sensor” – Select the relevant Flow Rate sensor from the dropdown list
- If Flow Rate Sensor is connected to the Controller, an option from the dropdown list may be chosen
- If Flow Rate Sensor is connected to the Expander, select “Not Set” from the dropdown list

E: “Calculate Flow from Slave” –
F: “Fertigation Rate Flow Sensor” – Select the relevant sensor from the dropdown list
G: “Mainline Flow Sensor” – Select the relevant Mainline Flow Sensor from the dropdown list

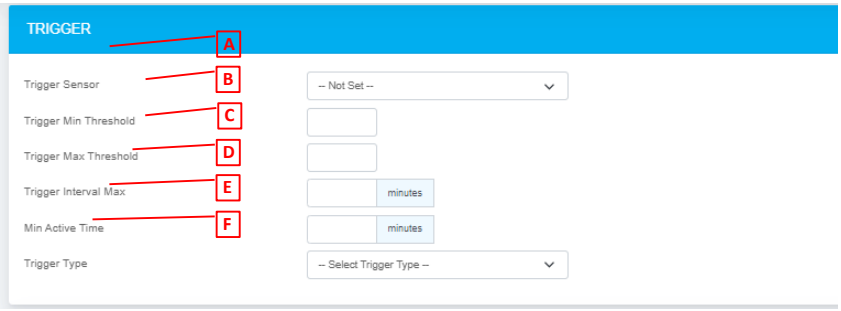


2.2.4 Trigger

A: “Trigger Sensor” – Choose the Trigger sensor from the dropdown list
- It is advised that the “Eskom Pause” trigger be used

B: “Trigger Min Threshold” – Enter the min value of the trigger sensor allowed
C: “Trigger Max Threshold” – Enter the max value of the trigger sensor allowed
D: “Trigger interval Max” – Enter the max interval
E: “Min Active Time” – Enter the min active time
F: “Trigger Type” – Select how the program must respond to the trigger

- Disable
- Start & Stop Program
- Start Program
- Stop Program
- Pause & Resume
- Valve Open & Close
- Valve Close
- Valve Open
- Port
- Pause Program



2.2.5 Agitating

A – D settings are for Agitating DURING Fertigation

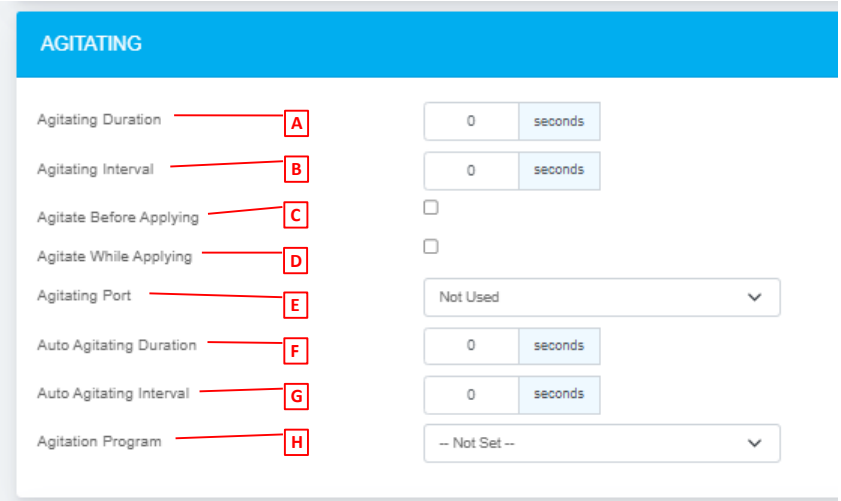
A: “Agitating Duration (sec)” – Enter the duration of Agitation
B: “Agitating Interval (sec)” – Enter the duration of time that must pass before Agitating again

C: “Agitate Before Applying” – Tick this box to Agitate before applying Fertigation
D: “Agitate While Applying” – Tick this box to Agitate while applying Fertigation *Will agitate the entire time fertigation program is active (leave A & B clear)

E: “Agitating Port” – Select the relevant port connected to the Agitator

F – G settings are for Agitating when not Fertigating

F: “Auto Agitating Duration (sec)” – Enter the duration of Agitation
G: “Auto Agitating Interval (sec)” – Enter the duration of time that must pass before Agitating again
H: “Agitation Program” – Select the relevant Agitating program from the dropdown list



2.2.7 EC

Electrical conductivity (EC) is a measure of the ability of water to conduct an electrical current. This ability is a result of the presence of ions in water such as carbonate, bicarbonate, chloride, sulphate, nitrate, sodium, potassium, calcium, and magnesium, all of which carry an electrical charge. Most organic compounds dissolved in water do not dissociate into ions, consequently they do not affect the EC. Irrigation with water containing salt induces salt into the soil profile. When no or little leaching of salt takes place from the soil profile, salt accumulates and a saline soil is formed. Crops are sensitive to soil salinity; yield is reduced if grown on salt-affected soils.

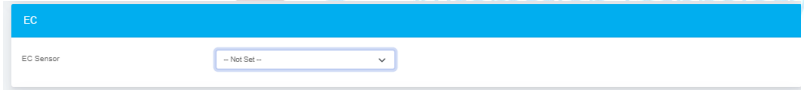
The presence of dissolved salts in soil water reduces the physiological availability of water to plants. When the salt content reaches a concentration where the plant is no longer able to extract sufficient water for its requirements, salinity-induced water stress develops, the growth rate starts to decline and, if it continues for a significant period, crop yield starts to decline. The soil salinity at which plant growth starts to decline is defined as the threshold salinity. It is usually expressed as the EC of the saturated-soil extract, which is the reference water content for the measurement of soil salinity. Crop yield has been found to decrease approximately linearly with salinity increases above the threshold salinity. Both the threshold salinity and the slope of yield decline above this point are specific to a particular crop or cultivar (Chapter 3 Soil: Tables 3.5 and Table 3.6).

The symptoms plants display when affected by salinity are similar in appearance to those of drought, namely stunted growth, wilting (even though the soil may not be dry), a darker, bluish-green colour and in some cases thicker, waxier leaves. Symptoms vary with the growth stage. Usually, symptoms are more obvious when plants are affected during early growth stages. Mild salinity effects may go unnoticed because the effect may be uniform over a field, with no basis for comparison (DWAF, 1996).
**The above is an extract of SABI Irrigation Manual*

Water Quality Constituent	Fitness for use for irrigation water			
	Good	**Fair**	**Marginal**	**Unacceptable**
	Salinity & Sodicity			
Electrical Conductivity (EC, mS/m)	0-40	40-90	90-270	270-540
(EC, µS/cm)	0-400	400-900	900-2700	2700-5400
Sodium Adsorption Ratio (SAR, mmol/ℓ$^{0.5}$)	0-1.5	1.5-3	3-5	5-10

Figure 2 - Extract from Table 2.15; SABI Irrigation Manual

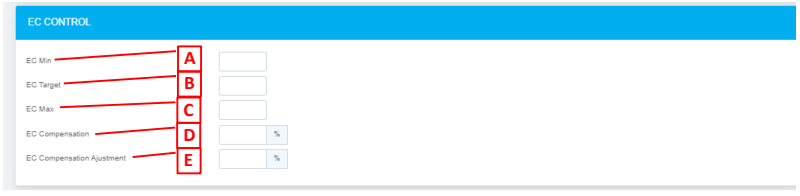
Select the relevant EC Sensor from the dropdown list



3.1.1 EC Control

**The values entered here for EC min & Max are used for the EC Alarms if the Enable Alarm on EC Critical is active*

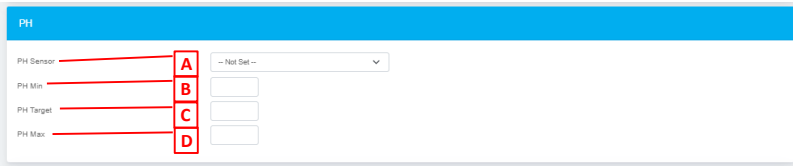
A: "EC Min" – Enter the min EC value allowed
B: "EC Target" – Enter the Target EC value
C: "EC Max" – Enter the max EC value allowed
D: "EC Compensation (%)" – ??????
E: "EC Compensation Adjustment (%)" - ??????



3.1.2 PH

*The values entered here for PH min & Max are used for the PH Alarms if the Enable Alarm on PH Critical is active

A: "PH Sensor" – Select the relevant PH Sensor from the dropdown list
B: "PH Min" – Enter the min PH value
C: "PH Target" – Enter the Target PH value allowed
D: "PH Max" – Enter the max PH value allowed



3.1.3 Alarms

3.1.3.1 Fertilizer Flow Rate Alarms

A: "Alarm on Low Tank Level" – Tick to enable alarm on Low Tank Level
B: "Enable Fertilizer Flow Rate Alarm" – Tick to enable Flow Rate Alarm set on Fertilizer
C: "Flow Fertilizer Rate Error (%)" – Enter percentage Flow Rate allowed to be higher than expected before alarm is triggered

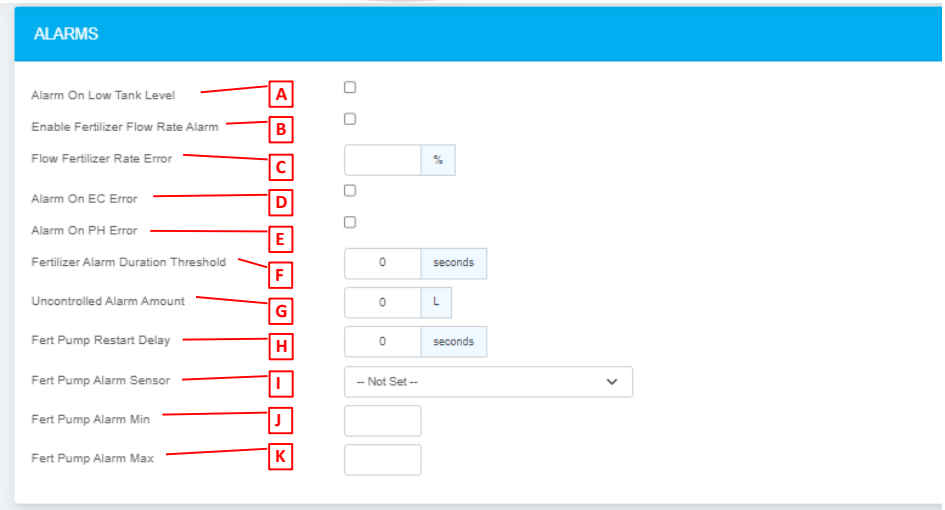
Note: this percentage is the **inverted**; meaning if the expected Flow Rate is 100L/h, & Error is set to 80%, the alarm will be triggered on 100L/h + **20%** = 120L/h

D: "Alarm on EC Error" – Tick this box to enable alarm on EC Error
E: "Alarm on PH Error" – Tick this box to enable alarm on PH Error
F: "Fertilizer Alarm Duration Threshold (sec)" – The duration of time allowed for the Fertilizer programs values to be higher than margins allow before the alarm is triggered
G: "Uncontrolled Alarm Amount (L)" – Max Volume of Fertilizer allowed to pass during one dose before alarm is triggered

This alarm is for when the Fert Valve does not close
Or when there is a leak

1.1.1.1 Fertilizer Pump Alarms

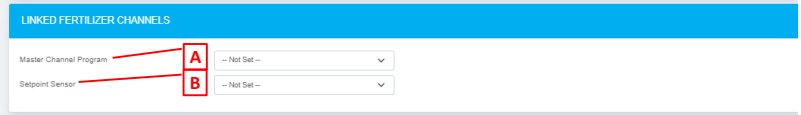
H: "Fert Pump Start Delay (sec)" – Enter the pump start delay here
I: "Fert Pump Alarm Sensor" – Select the relevant sensor from the dropdown list
J: "Fert Pump Alarm Min" – Enter the min value allowed for sensor selected
K: "Fert Pump Alarm Max" – Enter the max value allowed for sensor selected



1.1.2 Linked Fertilizer Channels

Only six Channels can be linked to a Valve Program, creating a Master Fert Channel Program & linking the Channel Programs enables the user to have more channels.

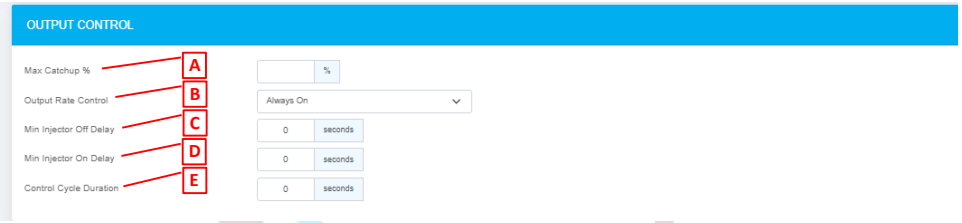
A: “Master Channel Program” – Select the Master Channel Program from the dropdown list
B: “Setpoint Sensor” –



1.1.3 Output Control

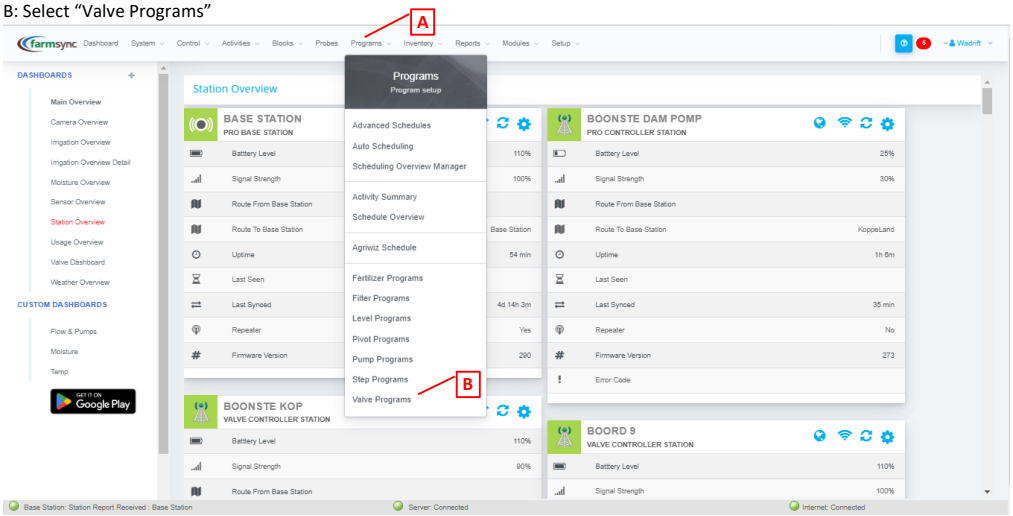
A: “Max Catchup (%)” –
B: “Output Rate Control”
- “Always On” – used during batching, keeps the dosing valve open
- “Analog VSD Output” –
- “Duty Cycle” – used during proportional dosing, opens & closed the dosing valves based on values entered in C – E
- “Pulse Frequency” –
- “On/Off Delay” – used during proportional dosing, opens & closed the dosing valves based on values entered in C - E

C: “Min Injector Off Delay (sec)” –
D: “Min Injector On Delay (sec)” –
E: “Control Cycle Duration (sec)” –



4 Adding Fertilizer to the Valve Program

A: Click “Programs” on the Menu Bar
B: Select “Valve Programs”

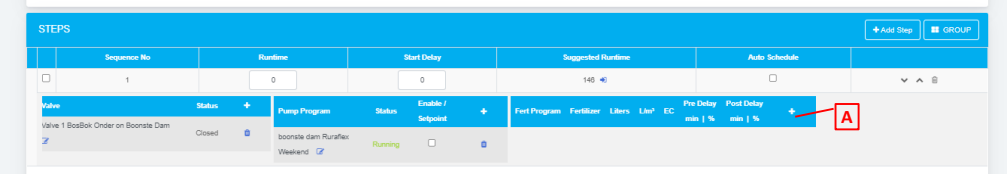


4.1 Valve Program Details

4.1.1 Adding a Fertilizer Program to a Step

Each “Step” has provision to add Fert Programs.

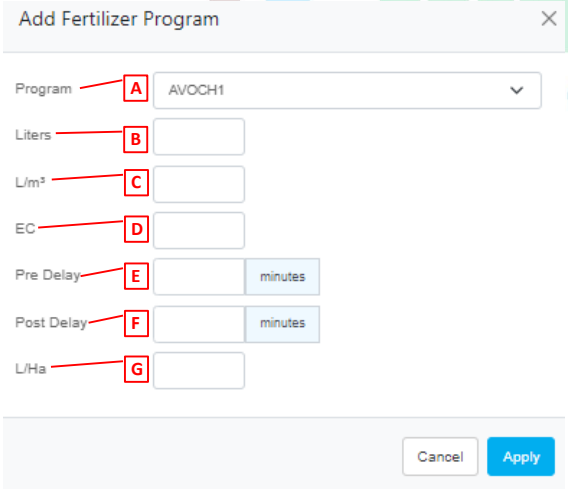
A: To add a Fertilizer program to the Valve Program, click on the “+”



4.1.2. Fert Program Details

Note: Not all these fields must be filled in; A is a required field.
The Client must fill in B, C, D or G depending on his / her method of Fertigation.

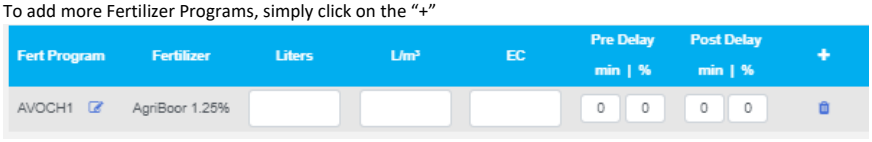
A: “Program” – Select the Fertilizer Program from the dropdown list
B: “Liters” – Enter the volume of Fertilizer required to be applied (only if Client uses the Batching method)
C: “L/m³” – Enter the Dosing Rate required to be applied (only if Client uses the Proportional method)
D: “EC” – Enter the required EC (only if Client uses EC Control)
E: “Pre-Delay” – Enter the duration of time that must pass after the Irrigation starts before the Fertigation Program starts
e.g. If Valve Program Runtime = 60 minutes & Pre-Delay = 10 minutes; after the Valve Program starts, the Fertigation program will wait the specified time (10 minutes) before starting
F: “Post-Delay” – Enter the duration of time that the Fertigation Program must stop before the Valve Program stops
e.g. If Valve Program Runtime = 60 minutes & Pre-Delay = 10 minutes; after the Valve Program starts, the Fertigation program will wait the specified time (10 minutes) before starting
G: “L/ha” – Enter the required ratio (only if Client uses this method of Fertigation)



4.1.3 Fertilizer Program viewed in Steps

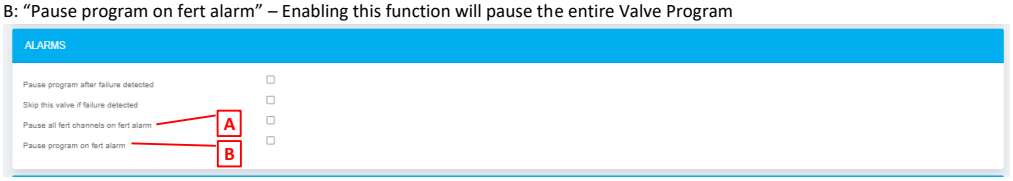
When settings above are “Applied,” the Fert Program will appear as shown below.
All settings can be edited here.

To add more Fertilizer Programs, simply click on the “+”



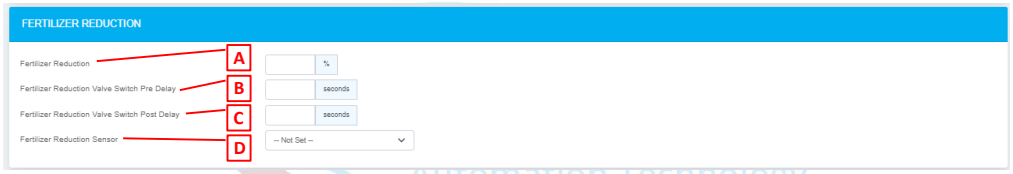
4.1.4 Alarms

A: “Pause all fert channels on fert alarm” – Enabling this function will pause only the Fert Channel that triggered the alarm
B: “Pause program on fert alarm” – Enabling this function will pause the entire Valve Program



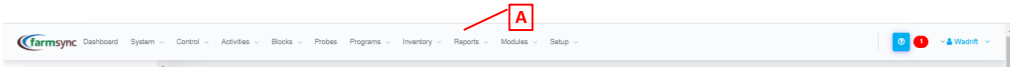
4.1.5 Fertilizer Reduction

A: “Fertilizer Reduction (%)” –
B: “Fertilizer Reduction Valve Switch Pre-Delay (sec)” –
C: “Fertilizer Reduction Valve Switch Post-Delay (sec)” -
D: “Fertilizer Reduction Sensor” – Select the relevant valve sensor from the dropdown list



5 Reports

A: Click on “Reports” on the Menu Bar



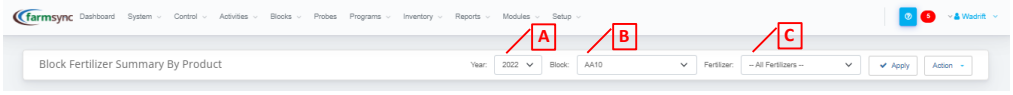
The following Reports for Irrigation are available:

- **Block Fertilizer Summary by Product**
- **Fertilizer Log**
- **Fertilizer Summary**
- **Valve Fertilizer Summary**
- **Valve Fertilizer Log**
- **Valve Fertilizer Summary by Period**
- **Valve Fertilizer Summary by Product**

Each report can be Exported to excel by clicking on the “Actions” Button.

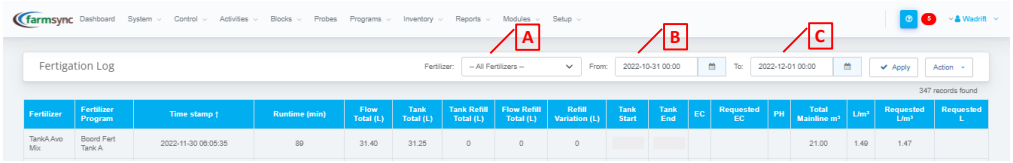
5.1 Block Fertilizer Summary by Product

A: “Year” – Select the year from the dropdown list
B: “Block” – Select a specific block, or select “All Blocks” from the dropdown list
C: “Fertilizer” – Select a specific fertilizer, or select “All Fertilizers” from the dropdown list



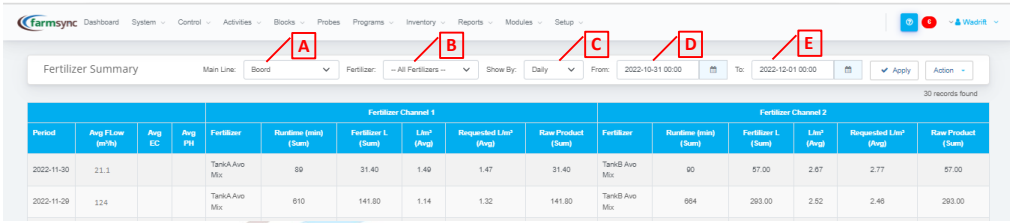
5.2 Fertilizer Log

A: “Fertilizer” – Select a specific Fertilizer or “All Fertilizers” from the dropdown list
B: “From” – Select a start date & time for the report
C: “To” – Select an end date & time for the report



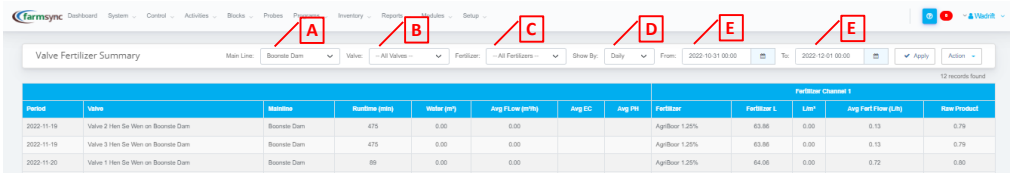
5.3 Fertilizer Summary

A: “Mainline” – Choose the relevant mainline from the dropdown list
B: “Fertilizer” – Choose a specific fertilizer, or “All Fertilizers” from the dropdown list
C: “Show By” – Select in what order the report is viewed (Daily, Weekly, Monthly, Yearly)
D: “From” – Select a start date & time for the report
E: “To” – Select an end date & time for the report



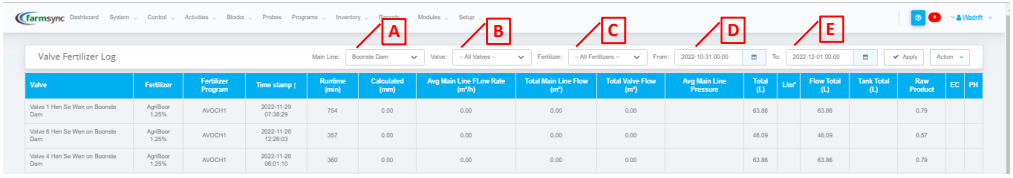
5.4 Valve Fertilizer Summary

A: “Mainline” – Choose the relevant mainline from the dropdown list
B: “Valve” – Choose a specific valve, or “All Valves” from the dropdown list
C: “Fertilizer” – Choose a specific fertilizer, or “All Fertilizers” from the dropdown list
D: “Show By” – Select in what order the report is viewed (Daily, Weekly, Monthly, Yearly)
E: “From” – Select a start date & time for the report
F: “To” – Select an end date & time for the report



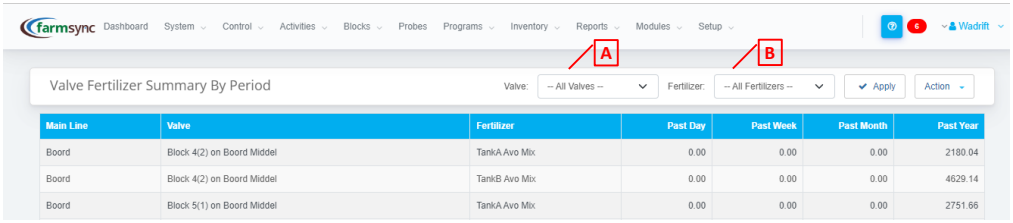
5.5 Valve Fertilizer Log

A: “Mainline” – Choose the relevant mainline from the dropdown list
B: “Valve” – Choose a specific valve, or “All Valves” from the dropdown list
C: “Fertilizer” – Choose a specific fertilizer, or “All Fertilizers” from the dropdown list
D: “From” – Select a start date & time for the report
E: “To” – Select an end date & time for the report



5.6 Valve Fertilizer Summary by Period

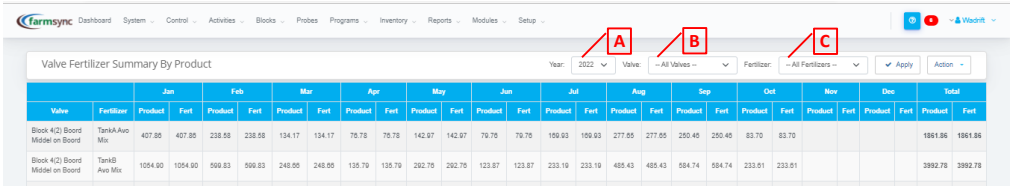
A: “Valve” – Choose a specific valve, or “All Valves” from the dropdown list
B: “Fertilizer” – Choose a specific fertilizer, or “All Fertilizers” from the dropdown list



Main Line	Valve	Fertilizer	Past Day	Past Week	Past Month	Past Year
Boord	Block 4(2) on Boord Middel	TankA Avo Mix	0.00	0.00	0.00	2180.04
Boord	Block 4(2) on Boord Middel	TankB Avo Mix	0.00	0.00	0.00	4629.14
Boord	Block 5(1) on Boord Middel	TankA Avo Mix	0.00	0.00	0.00	2751.66

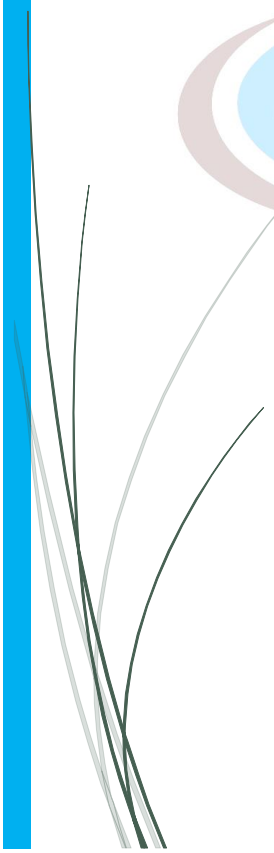
5.7 Valve Fertilizer Summary by Product

A: “Year” – Select the year from the dropdown list
B: “Valve” – Choose a specific valve, or “All Valves” from the dropdown list
C: “Fertilizer” – Choose a specific fertilizer, or “All Fertilizers” from the dropdown list



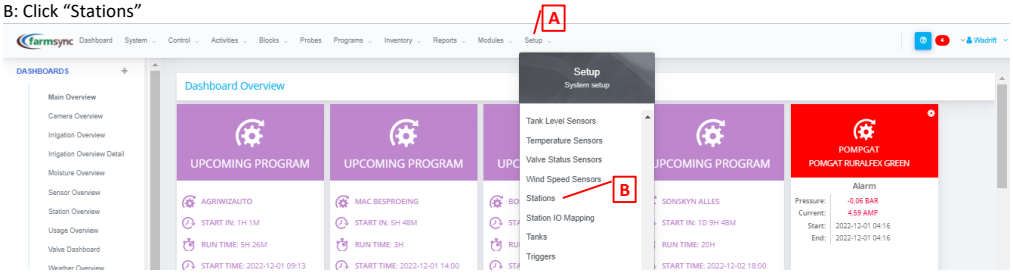
Valve	Fertilizer	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Total	
		Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert	Product	Fert
Block 4(2) Boord Middel on Boord	TankA Avo Mix	407.86	407.86	238.58	238.58	134.17	134.17	76.78	76.78	142.97	142.97	79.76	79.76	169.93	169.93	277.65	277.65	250.46	250.46	83.70	83.70					1851.86	1851.86
Block 4(2) Boord Middel on Boord	TankB Avo Mix	1054.90	1054.90	599.83	599.83	248.66	248.66	135.79	135.79	292.76	292.76	123.87	123.87	233.19	233.19	485.43	485.43	584.74	584.74	233.61	233.61					3992.78	3992.78

Module 3 - Setup



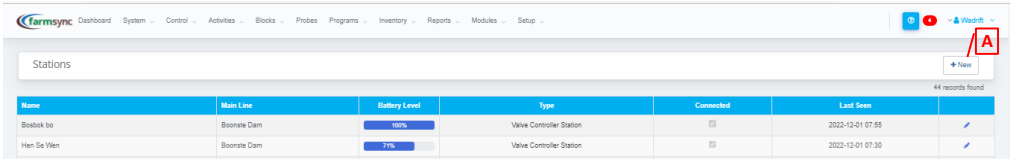
6 Add a Station to Farmsync

A: Click “Setup” on the Menu Bar
B: Click “Stations”



6.1 Stations List

A: Click on “+New” to add a new Station

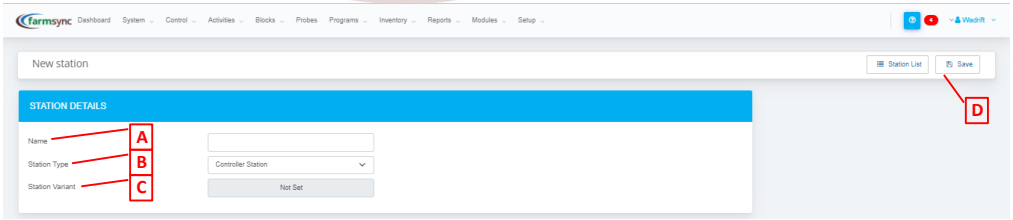


6.2 Station Details

A: “Name” – Enter a Name for the Station
B: “Station Type” – From the dropdown list, select the type of Station that is installed

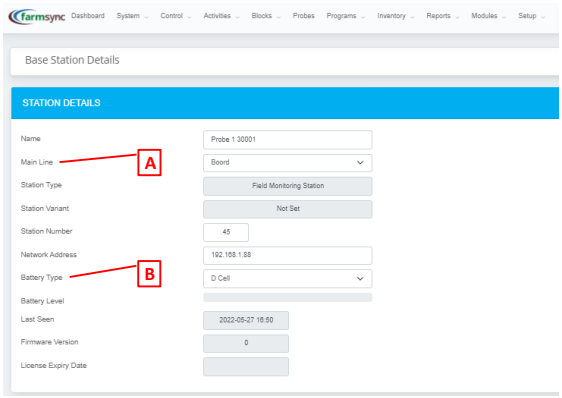
- Controller Station
- Fertilizer Station
- Field Monitoring Station
- Pivot Controller Station
- Pro Controller Station
- Pro DC FM Station
- Pro DC Station
- Pump Station
- Valve Controller Station

C: “Station Variant” – n/a
D: Click “Save”



6.3 Station Details

A: “Mainline” – Select the relevant mainline from the dropdown list
B: “Battery Type” – Select the correct Battery Type from the dropdown list

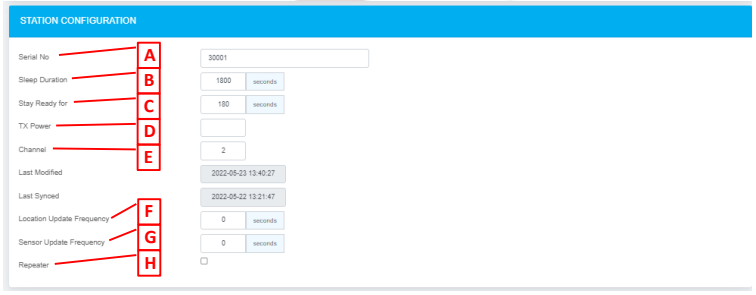


6.4 Station Configuration

A: “Serial No” – Enter the serial number displayed on the Field Station
B: “Sleep Duration (sec)” -
C: “Stay Ready For (sec)” -
D: “TX Power” -
E: “Channel”

- “0” must NEVER be used
- Bases within 15km of each other may not have the same Channel Number
- All Stations on the SAME system must have the same channel in order to communicate
- Think of a Walk-e Talk-e

F: “Location Update Frequency (sec)” -
G: “Sensor Update Frequency (sec)” -
H: “Repeater” -



7 How to add a Sensor

Sensors describe a wide range of components, the most used in irrigation systems, are listed below:

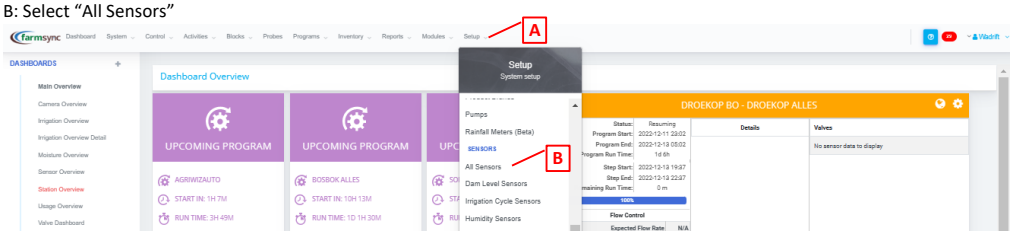
- Flow Rate – These will be your watermeters
- Electrical Conductivity – Probes installed to read the EC of your irrigation system
- Pressure Transducer – These will give a reading of the current pressure in the system at the point of its installation
- Level Probe – Components installed in rivers, dams & tanks that relay the current depth of water / liquid.

The setup screen for all sensors is identical. Depending on what type of sensor is added, simply select the correct port that the sensor is connected to, enter the required units of measure for that sensor & calibrate as required with the assistance of a Farmsync Technician.

7.1 Creating a Sensor:

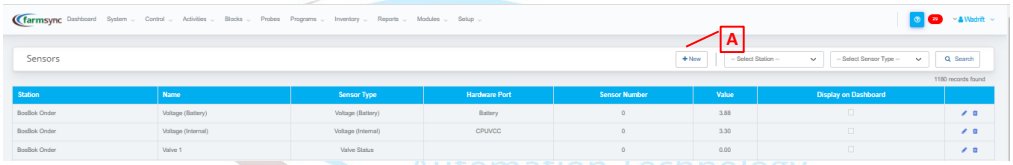
A: Click “Setup” on the Menu Bar

B: Select “All Sensors”



7.2 Sensors List

A: Click on “+New” to add a new Sensor

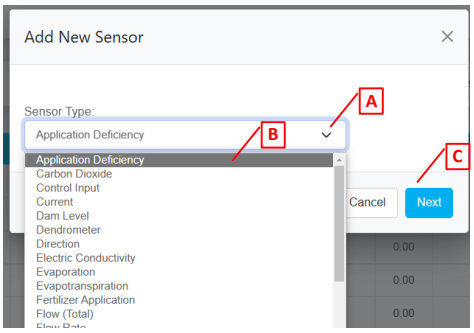


7.3 Selecting a Sensor

A: Click on the Dropdown Arrow

B: Select the required sensor from the dropdown list

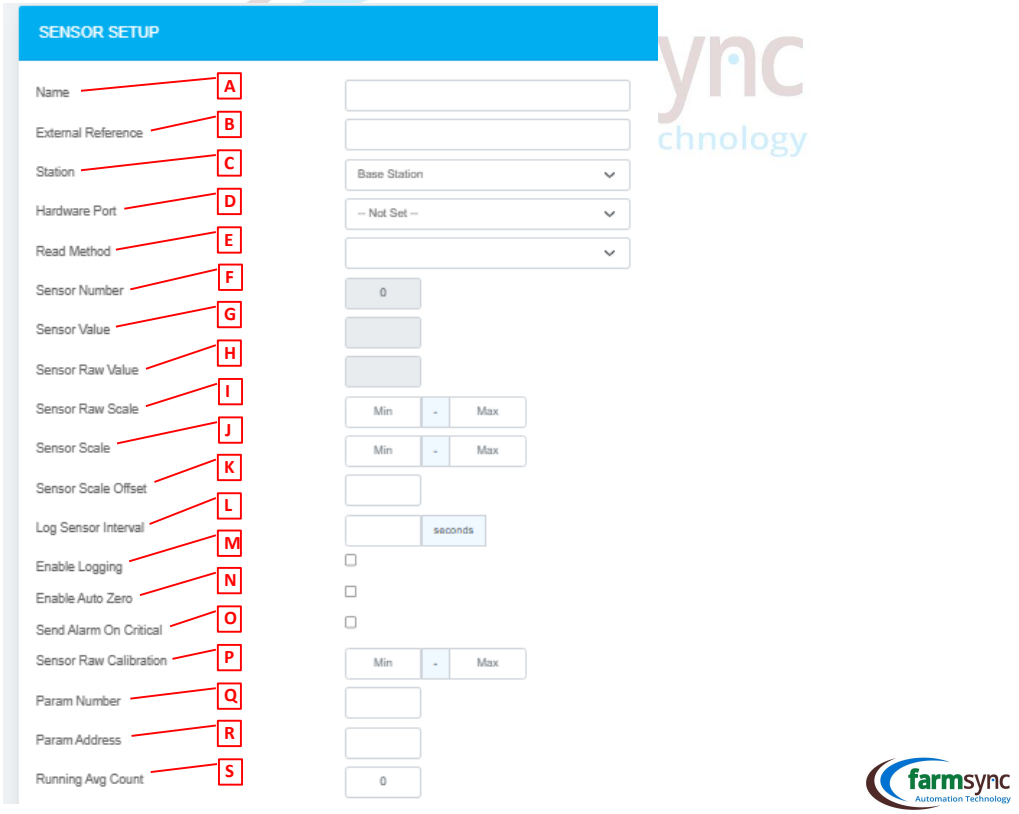
C: Click “Next”



7.4 Sensor Details

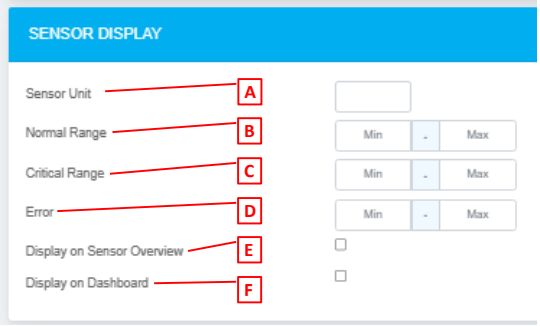
A: “Name” – Enter the name of the Sensor, customise it by using the position of installation
B: “External Reference” – For Farmsync internal use only
C: “Station” – Select the relevant Station from the dropdown list
D: “Hardware Port” – Select the relevant Port connected to the Sensor from the dropdown list
Please Note: The following is true for Controllers vs Expanders
Controller – “Sensor #”
Expander – “Port()Ext()Type()ExtPort()”
E: “Read Method” – This will be based on the type of sensor used, as well as the manufacturers specifications
Please Note: The following is true for Controllers vs Expanders
Controller – a selection MUST be made from the dropdown list
Expander – “Not Set” - always
F: “Sensor number” – a Value assigned automatically
G: “Sensor Value” – The calibrated value read from the sensor
H: “Sensor Raw Value” – The Raw value read from the sensor (uncalibrated)
I: “Sensor Raw Scale” – Used during the calibration process
J: “Sensor Scale” – Used during the calibration process
K: “Sensor Scale Offset” - ???
L: “Log Sensor Interval” – Enter the interval in seconds
M: “Enable Logging” – To keep record of the readings, this box must be ticked
N: “Enable Auto Zero” - ???
O: “Send Alarm on Critical” –
P: “Sensor Raw Calibration” –
Q: “Param Number” –
R: “Param Address” –
S: “Running Avg Count” -

H, I, J: Used to calibrate sensors



7.5 Sensor Display

A: "Sensor Unit" – Enter the units as read from the sensor
B: "Normal Range" – Enter the min & max values
C: "Critical Range" – Enter the min & max values
D: "Error" – Enter the min & max values
E: "Display on Sensor Overview" – Tick this box to see the sensor value on the "Sensor Overview Dashboard"
F: "Display on Dashboard" – Tick this box to see EC value on the "Dashboard Overview"



9.6. Sensor Calibration

9.6.1. Pressure Transducers

Read Methods – Analog 5V

Sensor Raw Scale – 0 : 4095
Sensor Scale – 0 : 10
0-10Bar Pressure Transducer

Sensor Raw Scale – 0 : 4095
Sensor Scale – 0 : 16
0-16Bar Pressure Transducer

Sensor Raw Scale – 0 : 4095
Sensor Scale – 0 : 25
0-25Bar Pressure Transducer

**If displayed in Bar, use settings as shown above; if meters are used, multiply the Sensor Scale with x10.

9.6.2. Level Sensors

There are two types of Level Sensors:

- "Level Sensor" for Tanks
- "Dam Level Sensor" for Tanks & Reservoirs – for this a Dam must be created under setup first

Note: Should a Pressure Transducer be installed on the bottom of a tank in order to provide level readings, ALWAYS install a valve between the transducer & the tank. Reason being that the transducer must be calibrated at a zero value, and if the tank is already filled with no valve present, the transducer cannot be taken out without losing the tank contents.

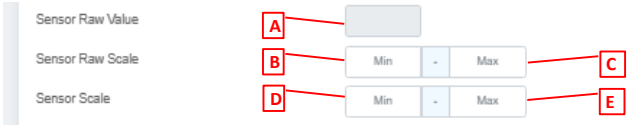
1. In order to calibrate zero (0), the probe / transducer must be outside of the water.
2. Refresh the relevant station on the Dashboard until the value at "A" stabilises.
3. Write down this value to be entered at "B" later.
4. Now insert the Level Probe / Transducer into tank.
5. Refresh the relevant station on the Dashboard until the value at "A" stabilises.
6. Write down this value to be entered at "C" later
7. Now enter the following Values as indicated:
   - B = value in step 3
   - C = value in step 6
   - D = 0
   - E = max rating of Pressure Transducer / 100 if you require a % reading / max tank capacity eg. 5000(L)
8. Click Save
9. Sync the relevant Station & check if levels are displaying correctly

9.6.3. EC / PH Sensors

1. In order to calibrate zero (0), the probe must be outside of the known EC / PH level solution.
2. Refresh the relevant station on the Dashboard until the value at “A” stabilises – it should read zero (0) if dry.
3. Write down this value to be entered at “B” later.
4. Now insert the Probe into the know EC solution.
5. Refresh the relevant station on the Dashboard until the value at “A” stabilises.
6. Write down this value to be entered at “C” later
7. Now enter the following Values as indicated:

- B = value in step 3
- C = value in step 6
- D = 0
- E = reading of the know EC / PH solution

8. Click Save
9. Sync the relevant Station & check if levels are displaying correctly



9.6.4. Flow Sensors

“Hardware Port” – Select the relevant Port connected to the Sensor from the dropdown list

Please Note: The following is true for Controllers vs Expanders

- **Controller –** “Sensor #”
- **Expander –** “Port()Ext()Type()ExtPort()”

E: “Read Method” – This will be based on the type of sensor used, as well as the manufacturers specifications

Please Note: The following is true for Controllers vs Expanders

- **Controller –** a selection MUST be made from the dropdown list
- **Expander –** “Not Set” - always

Sensor Raw Scale – 0 : 100
Sensor Scale – 0 : 1 → 10L Pulse Flow Meter

Sensor Raw Scale – 0 : 10
Sensor Scale – 0 : 1 → 100L Pulse Flow Meter

Sensor Raw Scale – 0 : 1
Sensor Scale – 0 : 1 → 1m3 (1000L) Pulse Flow Meter

Note:
10L Pulse = x0.01 display on flow meter
100L Pulse = x0.1 display on flow meter
1000L (1m3) = x1 display on flow meter

9.6.5. Fert Flow Sensors

“Hardware Port” – Select the relevant Port connected to the Sensor from the dropdown list

Please Note: The following is true for Controllers vs Expanders

- **Controller –** “Sensor #”
- **Expander –** “Port()Ext()Type()ExtPort()”

E: “Read Method” – This will be based on the type of sensor used, as well as the manufacturers specifications

Please Note: The following is true for Controllers vs Expanders

- **Controller –** a selection MUST be made from the dropdown list
- **Expander –** “Not Set” - always

Sensor Raw Scale – 0 : 1
Sensor Scale – 0 : 1 → 1L Pulse Flow Meter

Sensor Raw Scale – 0 : 0.1
Sensor Scale – 0 : 1 → 0.1L Pulse Flow Meter

9.6.6. Filter DP Sensor

Sensor takes a reading of 0 = closed of 1 = open.

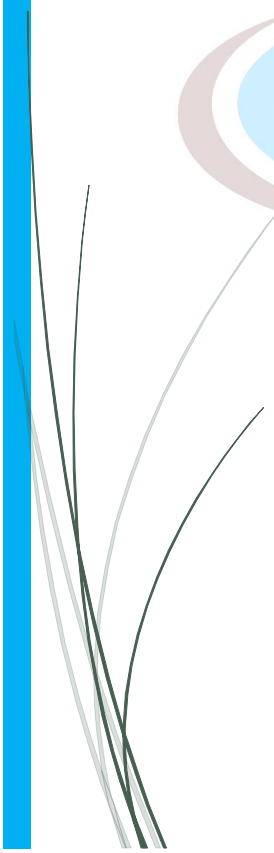
Pressure difference is set on the Murphy Switch itself. When the Switch is triggered, Farmsync will read 0, causing the filter to flush.

Sensor Raw Scale – 0 : 4095
Sensor Scale – 0 : 1

9.6.7. Creating a Peroxide Pulse Splitter / Sensor

1. Create a “Flow rate sensor” @ “All Sensors” named “Peroxide Flow Rate”
   1.1. Hardware Port = Calculated
   1.2. Sensor Raw Scale – 1 : 1
   1.3. Sensor Scale – 1 : 1
   1.4. Units = L/H
2. Create a “Composite Sensor” named “Peroxide”
   2.1. Connect the “Peroxide Flow Rate” sensor
   2.2. Select the hardware DO that the peroxide pump is connected to
   2.3. Add a Child Sensor using the MainLine Flow rate Sensor
3. Refresh the Base Station

Module 5 – Quick Tips

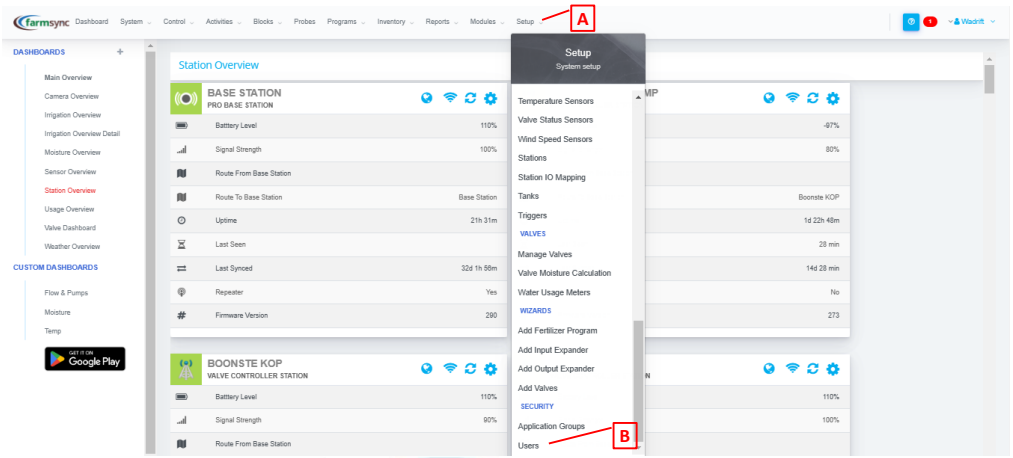


1 User creation

Commented [MB2]: Marilise, sit hier in Farmsync screenshots

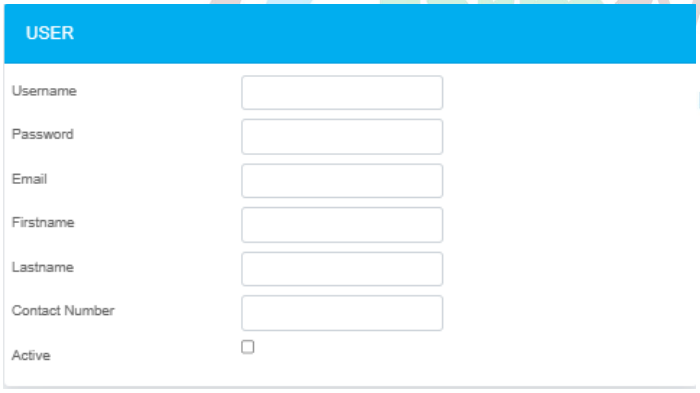
FARMSYNC™ service includes the option to create as many users as you need and grant them access according to their roles.

A: Click “Setup”
B: Scroll down & click “Users”



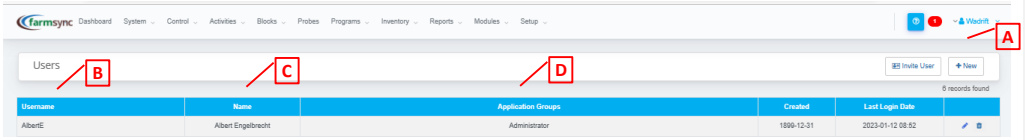
1.1 Create a New User

A: Click on “+New” to create New User, enter the details shown below & Save



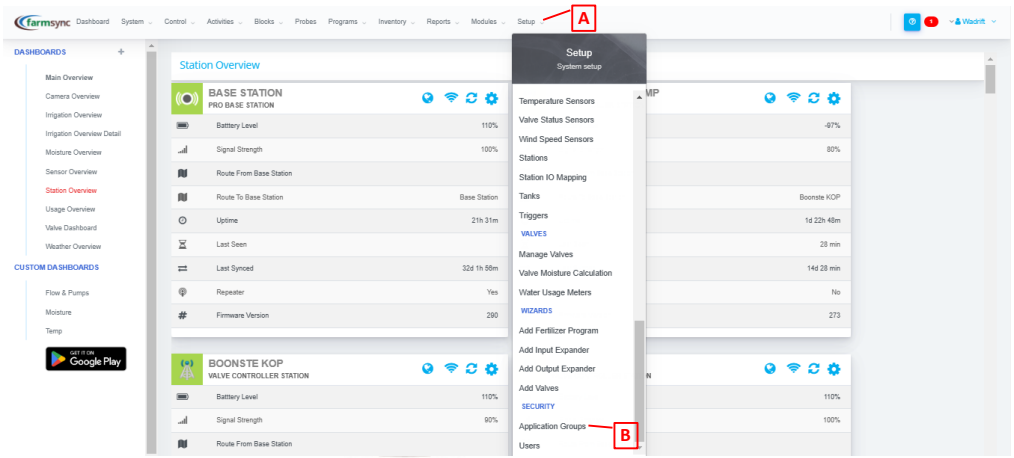
The following fields will be available for entry:

B: “User Name” – Enter a username
C: “Name” – Enter the Full Name of the New User
D: “Application Groups”* – Tick all relevant options applicable to the New User

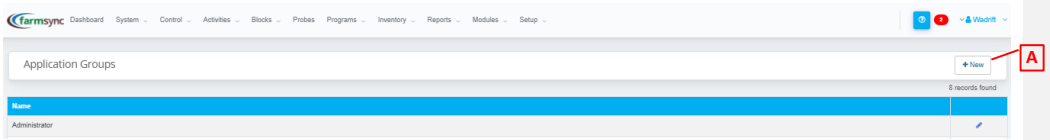


*“Application Groups” are user defined groups that restrict the movements of other users.

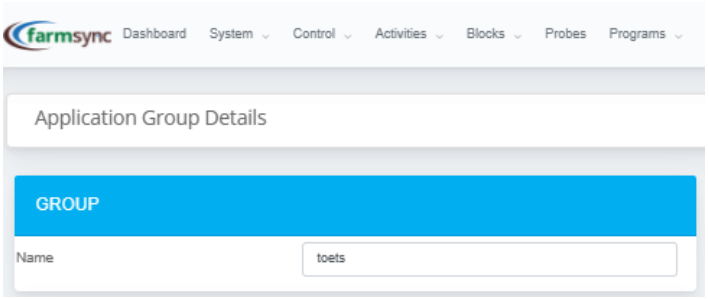
A: Click “Setup”
B: Scroll down & click “Application Groups”



A: Click “+New” to create a new Application Group

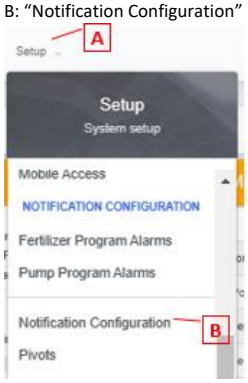


Enter the name of the Group, click “Save,” then edit the group to add permissions



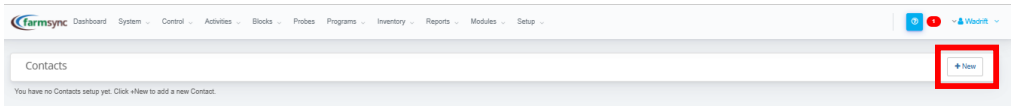
2 Notification Configuration

To add more people to the notifications, simply goo to:
A: “Setup”
B: “Notification Configuration”

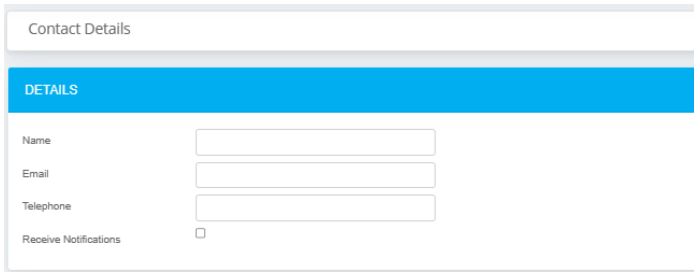


A: Click on the “+Add” Button to add a Contact

If no Contacts have been created on the profile yet, you will be prompted to add. Simply click on the “+New” Button on the Top Right Corner.



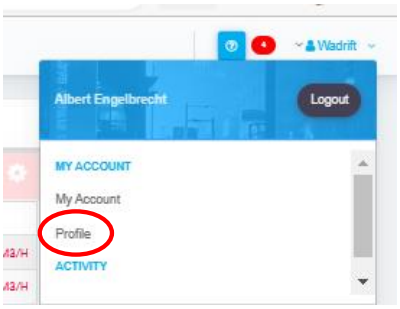
Simply enter the contact persons details, tick the “Receive Notifications” box & press “Save”



3. How to Enable WebPush Notifications

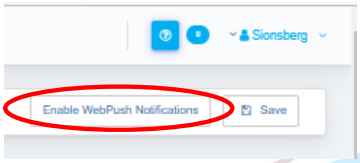
Enter the following in your web browser: https://control.farmsync.co.za/

Go to Profile

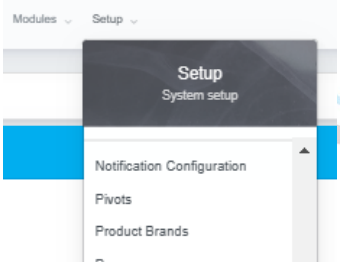


Click on “Enable WebPush Notifications”

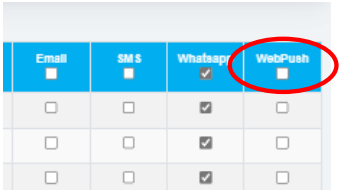
Note that this option will NOT show if you do not use the link provided above



Go to “Setup” / “Notification Configuration”



You will now be able to use the WebPush Notifications



Please Note: This must be done for every device used (cell phone / laptop / desktop computer) in order to receive the WebPush Notification on that specific device.

4 Maintenance

4.1 User responsibility

The following requisites are to be assured by the user:

- Conducting monthly inspection and ensuing Preventive Maintenance procedures.
- Appropriate mains electricity supply.
- Cellular connectivity (if required).
- WiFi connectivity of suitable capacity.

4.2 Preventive Maintenance - monthly inspection

Visually inspect the PRO Controllers and the FARMSYNC™ stations exterior for:

- Appropriate environmental conditions.
- Physical integrity.
- Antennas integrity and connection.

Open the units

- Do not attempt to open the PRO Controllers or the Field Station by hand or with inappropriate tools.
- Open the PRO Controllers with a flatbed screwdriver - Minimum 10mm (3/8"), or a coin.
- Open the PRO Controllers with a 8mm (¼") flatbed screwdriver.

Visually inspect the PRO Controllers and the FARMSYNC™ stations interior for:

- Condensation
  - Light to medium condensation can be addressed using silica gel packets (consult the manufacturer).
  - Heavy condensation - contact your FARMSYNC™™ local representative for support.
- Insect penetration and settlement
- Can be addressed using insecticides (spray or pellets, depending on the type of insect).

WARNING

- Do not spray directly onto electrical components and circuit boards.
- Exposed wires (First time inspection only)

4.3 FSU Battery Replacement

CAUTION

- Open the Field Station with a 8mm (¼") flatbed screwdriver.

ATTENTION

- Do not attempt to open the Field Station by hand or with inappropriate tools.
- Insert x 3 AA size batteries, type – *L91 Lithium batteries by Energizer*. Observe polarity. The Field Station should turn on automatically.
- Make sure the cover gasket is in place.
- Close the Field Station