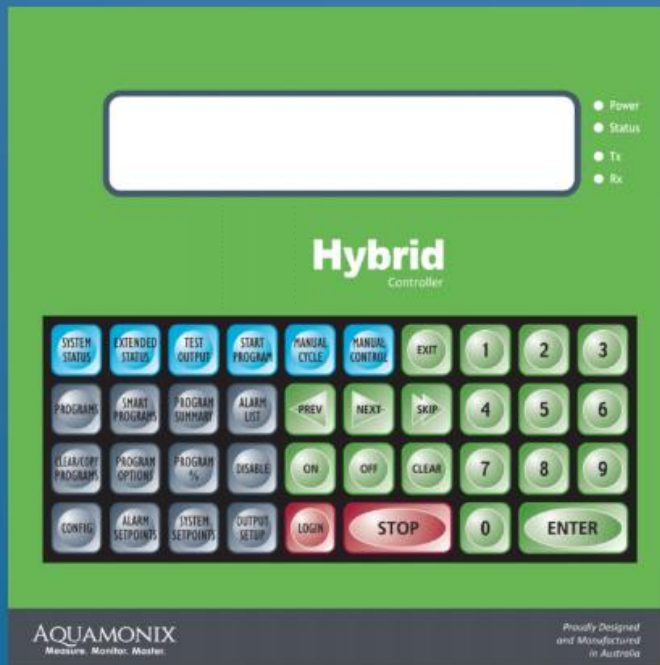




**AQUAMONIX**  
Measure. Monitor. Master.

# OPERATION AND CONFIGURATION MANUAL



## HYBRID MpG CONTROLLER

## Document Revisions

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1.1	22/10/25	SB	1. Flow profile Program 2. Temp Alarms 3. Selective Program group Start 4. Selective Program Stop.	v250217
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## 1.0 QUICK START

### 1.1 QUICK TIPS ABOUT KEYS

If you are familiar with computers and irrigation controllers, or you are just keen to get started, here are a few tips about the keys to get you started.

- First you need to press the LOGIN key before you can enter a password.
- The SYSTEM STATUS key changes only the left hand side of the display and does not affect the screen that you are currently using.
- The EXIT key takes you back to the default status screen **but does not undo changes** you have confirmed with the ENTER key.
- Function keys will jump you straight to the function that they select. Pressing the same function key again allows you to navigate through a function.
- You can also navigate using the NEXT, PREV and SKIP keys in most cases.
- ENTER is required to confirm everything you type.
- Use the CLEAR key if you make a mistake. (will only remove the last action)
- The STOP key is an emergency stop button that turns off all stations and pumps.
- To minimise the possibility of error, all times are in 24-hour format.
- The SKIP key is used to go to the next step on multiple entry screens.

### 1.2 CONTROLLER SETUP

To setup the controller quickly:

1. Press the LOGIN key and enter a technician level password.
2. Press the CONFIG key and then press the ENTER key, this will take you to the Quick Setup menu.
3. Set the time and date using the number keys, press the ENTER key to confirm each entry.
4. Set the number of local, TWIN and RIC stations if available, press the ENTER key to confirm each entry.
5. Set the number of irrigation pumps, press the ENTER key to confirm each entry.
6. Press the EXIT key to exit the menu.
7. The controller will save settings and will be ready to use.

## 2.0 THE BASICS

### 2.1 THE DISPLAY

The display is split into two parts as shown below.

```
12:00:00 | System Idle
01/01/15 |
Thu      |
Week 2   |
```

System status display – the left hand side of the screen is used for system status and operated by the SYSTEM STATUS Key (see 2.2 SYSTEM STATUS).

Main display – the right-hand side of the display operates with all other keys. It is used for showing user input and program status

### 2.2 SYSTEM STATUS DISPLAY

The SYSTEM STATUS key allows the operator to select different aspects of the system status. It starts at the time and date then cycles through all the sensor inputs. It only displays sensors that have been configured so the list of sensors shown may vary from controller to controller.

To select the next system status item, press the SYSTEM STATUS key.



#### 2.2.1 TIME AND DATE

Time and date is the initial state that is shown below.

```
12:00:00
01/01/15
Thu
Week 2
```

Time – 12:00:00 is the time current time in 24-hour format.

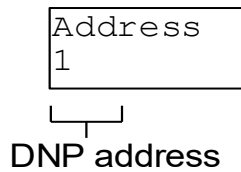
Date – 01/01/15 is the current date in the format DD/MM/YY so the date is the 1 January 2015.

Day of week – Thu is the day of the week so the day is Thursday.

Week number – Week 2 is the week number. All programs run on a 2-week (14-day) cycle

### 2.2.2 ADDRESS

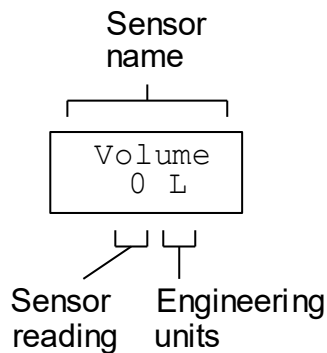
The DNP address is shown as follows:



The DNP address is the unique address used by the central computer to communicate with this controller.

### 2.2.3 SENSOR DISPLAY (CURRENT, MOISTURE, FLOW, PRESSURE, CURRENT SENSE, VOLUME, TEMPERATURE, LEVEL ETC.)

The sensor display shows the state of different sensors:



Sensor name – Volume indicates the amount of water that has passed through the flow meter.

Sensor reading – 0 indicates that the water volume is currently 0.

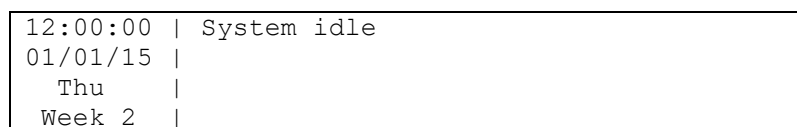
Engineering units – Volume is measured in Litres.

## 2.3 MAIN DISPLAY

The EXIT key takes you out of any other function and brings you to status screen. If there are multiple status screens to display, the controller will rotate through them with each one shown for 3 seconds.

### 2.3.1 IDLE STATUS

When no programs are running the display will look similar to the display below.



Status indicator – System Idle shows that no programs are running.

### 2.3.2 IRRIGATION DISABLE STATUS

The following is displayed when the irrigation is disabled.

12:00:00		Irrigation disabled -	
01/01/15		Timer 1 hour 0 minutes	
Thu			
Week 2			

Status indicator – Irrigation disabled indicates that the rain switch function is activated.

Disable state – 1 hour 0 minutes indicates that irrigation has been manually disabled and will remain disabled for a further 1 hour. The irrigation disable state can display any of the following.

- Rain Switch On – the rain sensor switch has disabled irrigation
- Manual On – irrigation has been manually disabled indefinitely
- Timer – irrigation will remain manually disabled for the number of hours and minutes displayed.

(see 4.2 IRRIGATION DISABLE for more information on disabling irrigation).

### 2.3.3 PROGRAM STATUS

The following is displayed when a program is running.

12:00:00		Program 1	
01/01/15		Group 1	00:05:00
Thu		Stations 1,2	
Week 2		Pumps 1	

Program name – Program 1 indicates that program 1 is running. The status indicator may also display Test to indicate valve test operation or Manual to indicate manual station on operation.

Group number – Group 1 indicates that the program is currently running group 1.

Group minutes remaining – 00:05:00 indicates that there is five minutes remaining on the current group (group 1).

Stations – Stations 1,2 indicates that stations number 1 and 2 are active due to this Program.

Pumps – Pumps 1 indicates that pump 1 is active due to this Program.

## 2.4 ALARM LIST

The alarm list shows a list of events which may indicate a problem with the irrigation system. The alarm list records:

- the power on and off times
- events that cause the irrigation system to skip to the next station,
- events that cause irrigation to stop immediately and
- other events that may indicate a potential problem.

There are up to 10 alarms numbered 1 through 10. Alarm 1 is the most recent alarm and alarm 10 is the least recent alarm

Pressing the ALARM LIST key at any time will jump you straight to the alarm list screen from any other screen.



```
12:00:00 | Alarm 1
01/01/15 | 11:00:00 01/01/15
  Thu    | Rain switch sensor on
Week 2  |
```

Alarm number – Alarm 1 indicates the most recent alarm.

Alarm time – 11:00:00 indicates that the alarm occurred at 11:00:00 am. The time is shown in 24-hour format.

Alarm date – 01/01/15 indicates that the alarm occurred on 1 January 2015.

Alarm description – Rain switch sensor on indicates that the alarm has been triggered by the rain sensor activating.

To see the next alarm, use the ALARM LIST key as shown.



You can also use the prev and next keys to navigate through the alarms.

## 2.5 RESTRICTED ACCESS

The controller uses multi-level password security to prevent unauthorised access. Until you have gained access to the controller the display backlight will turn on for only five seconds after each key press.

To get to the password screen press the LOGIN key as shown.



The password entry screen is shown below.

```
12:00:00 | Login
01/01/15 | Enter password _
  Thu    |
Week 2   |
```

**Password entry** – as the password is entered a \* will appear for each number key that is pressed. If you make a mistake you can press the CLEAR key and start again.

If, for example, the password is **1234**, press the following keys.



When you have been granted access the display back light will remain on. Once you stop using the controller for more than 10 minutes it will automatically turn the display back light off and you will require a password to gain access again.

## 3.0 MANUAL OPERATION

### 3.1 TEST OUTPUTS

The Test Outputs function turns on a station without turning on the pump. This is used for testing valves. To run a valve test press the TEST OUTPUTS key shown below.



The Test Outputs screen is shown below.

```
12:00:00 | Valve test
01/01/15 | Station number 1
  Thu    |
Week 2   |
```

Station number – 1 indicate that the default station to test is station 1.

If you want to test station number 1 simply press ENTER as shown.



If for example you want to test station number 2 then, press the keys shown.



After pressing ENTER, it will confirm the station you have selected with a display similar to the one below.

```
12:00:00 | Valve test
01/01/15 | Valve 1 On
  Thu    |
Week 2   |
```

Station number – 1 indicates that the station 1 valves have been opened.

After a short delay it will return to the status screen (see 2.3 MAIN DISPLAY).

Once the valve test has started the NEXT and PREV keys can be used to scroll through the valves.

### 3.2 MANUAL CONTROL GROUP

The Manual Control function turns on a group of stations (it also turns on pumps if applicable). To turn a station on, press the MANUAL CONTROL key shown below.



The station on screen is shown below.

```
12:00:00 | Manual Control
01/01/15 | Run for 0 hrs 5 mins
Thu      | Stations 1,2
Week 2   | (ON/OFF to add/remove)
```

Run hours – Run for 0 hrs 5 mins indicates that the manual control will run for 5 mins. Use the number keys followed by the ENTER key to set the number of hours and minutes to run the group.

Station Numbers – Stations 1,2 This is a list of the stations which are currently selected to run.

To add stations to run, enter the station number followed by the ON key. Once the ON key is pressed the station will appear in the station numbers list.

For example, to add station 5 press the following:



To remove a station enter the station number and press the OFF key. Once the OFF key is pressed the station will disappear from the station numbers list.

For example, to remove station 5 press the following:



Once you have entered the stations you require press the ENTER key.

The pump selection screen will only be available if pumps have been configured on the controller. A screen similar to the display below will be displayed.

```
12:00:00 | Manual Control
01/01/15 | Pumps 1,2
Thu      |
Week 2   | (ON/OFF to add/remove)
```

Pump List – Pumps 1, 2 is a list of the pumps which are currently selected to run with this manual control.

To add pumps to the list enter the pump number followed by the ON key. Once the ON key is pressed the pump will appear in the pump list.

For example, to add pump 2 press the following:



To remove a pump, enter the pump number and press the OFF key. Once the OFF key is pressed the pump will disappear from the pump list.

For example, to remove pump 2 press the following:



Once you have entered the pumps you require press the ENTER key

Once all the required pumps have been entered press the ENTER key and the manual control will start immediately. When the manual control has finished the controller will revert to an idle state.

### 3.3 START/STOP PROGRAM

The Start or Stop Program function is used to manually start a program, start groups from a program and to stop a Program. To start/stop a program manually, press the START PROGRAM key shown below.



#### 3.3.1 START PROGRAM

When button is pressed once the display navigates to start a program, so a program can be started including all its configured groups and stations, screen is shown below.

```
12:00:00 | Start program now
01/01/15 | Enter program number to
  Thu    | start 1 (1-27)
Week 2   |
```

#### 3.3.2 START PROGRAM FROM PARTICULAR GROUP

When button is pressed twice the display navigates to screen where you can select the group number to start within a program, screen is shown below.

```
12:00:00 | Start program now
01/01/15 | Enter program number to
  Thu    | start 1 (1-27)
Week 2   | start form group 1
```

#### 3.3.3 STOP PROGRAM

When button is pressed trice, the display navigates to stop a program, so a program can be stopped including all its configured groups and stations, screen is shown below.

```
12:00:00 | Stop program now
01/01/15 | Enter program number to
  Thu    | stop 1 (1-27)
Week 2   |
```

Example:

After pushing the START PROGRAM a number of time, the Program number – 1 indicates that the default program to start is program 1.

To start program number 1 simply press ENTER as shown.



After pressing ENTER, it will confirm the program you have selected with a display similar to the one below:

```
12:00:00 | Start program now
01/01/15 | Enter program number to
  Thu    | start 1 (1-17)
Week 2   | Program 1 started
```

To stop program number 2, then press the keys shown.



After pressing ENTER, it will confirm the program you have selected with a display similar to the one below:

```
12:00:00 | Stop program now
01/01/15 | Enter program number to
  Thu    | stop 2 (1-17)
Week 2   | Program 2 stopped
```

After a short delay the display will return to the status screen, It works the same way for the start from group mode and stop mode, (see 2.3 MAIN DISPLAY).

If a program or group already started or is started it displays Program \_ Already started.

## 3.4 PROGRAM CONTROL

Programs can be controlled when the main display is showing the status

### 3.4.1 NEXT - SKIP FORWARDS

To skip to the next group in all running programs (or next station in a valve test) press the NEXT key.



### 3.4.2 PREV - SKIP BACKWARDS

To move back to the previous group in all running program (or station on a valve test) press the PREV key.



### 3.4.3 PAUSE

To temporarily turn off all stations and pumps (pause operation) press the OFF key. This works even if no programs are running.



### 3.4.4 RESUME

To resume after a pause operation (or to update the program display) press the ON key.



### 3.4.5 STOP

To stop ALL programs immediately, press the STOP key. This works regardless of what is screen is currently displayed, however a password may need to be entered first.



## 4.0 SETTINGS

### 4.1 PROGRAM % WATER BOOST

The Program % acts as a scale factor to change the amount of water used when running a program. The program scale factor can be any value from 0% to 999%.

Pressing the PROGRAM % key will scroll you through each program and allow you to change the scale factor.



The Program % screen will be similar to the display below.

12:00:00		1 Program 1 run time
01/01/15		Normal run: 05:00:00
Thu		Scale factor 200%
Week 2		Scaled run: 10:00:00

Program Number – indicates which program you are looking at, use the NEXT and PREV keys to scroll through the programs.

Scale factor – 200% indicates that the current scale factor for Program 1 is 200%.

If for example you wish to change the scale factor to 50% press the following keys.



## 4.2 IRRIGATION DISABLE

The irrigation disable option prevents any programs from automatically starting for a specified number of hours or can stop all programs until told otherwise.

Pressing the DISABLE key at any time will jump you straight to the irrigation disable screen from any other screen.



The irrigation disable screen will be similar to the display below.

```
12:00:00 | Irrigation Disable
01/01/15 | Program starts are disabled
  Thu    | indefinitely
Week 2   |
```

Disable setting – “disable for 1 hour” indicates the number of hours that the programs will remain disabled. “disable indefinitely” indicates that programs starts are disabled until manually enabled again. “allowed to start as scheduled” indicates that programs will start normally.

If you want disable programs starts until you manually enable them again, press the following keys.



If you want to manually re-enable program starts then press the following keys.



If for example you wish to disable program starts for 24 hours (i.e. until the same time the following day) then press the following keys.



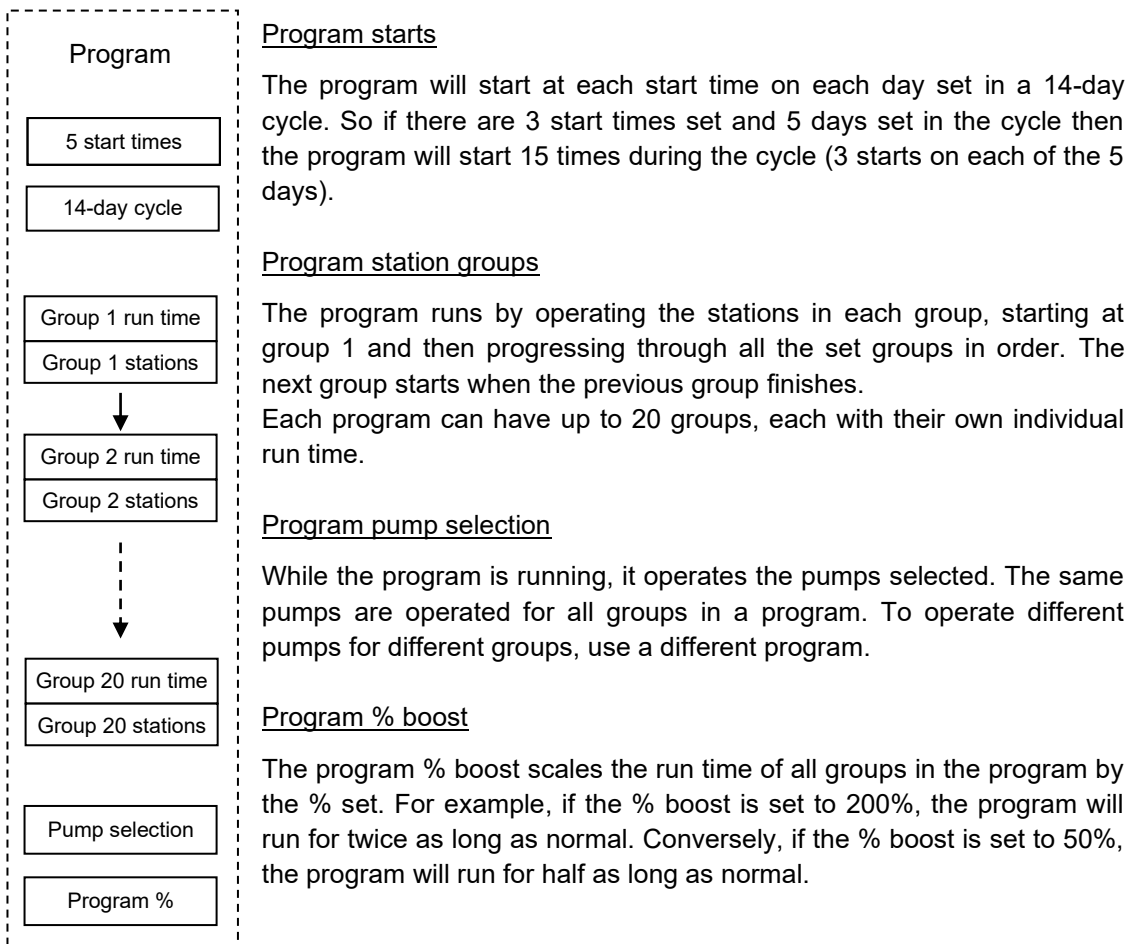
Press EXIT to return to the status screen (see 2.3 MAIN DISPLAY). The status will show that the disable has been activated. The status will show the number of hours and minutes of disable period remaining.

## 5.0 PROGRAMS

There are fifteen standard programs and nine smart programs(Ref 5.2 Smart Programs). A standard program consists of 5 start times and is capable of activating up to 20 groups. Each standard program has a 14-day cycle and a % boost facility. If the current day is active and the current time is equal to any one of the five start times the program will commence.

All stations in Group 1 will run for the run time in Group 1 scaled by the % boost. Once Group 1 has finished Group 2 will commence in the same manner. All groups (with run times greater than zero) will operate sequentially right through to Group 20 and once finished will return to an idle status.

NOTE: All programs have the ability to overlap therefore care must be taken when setting up programs not to overload the system.



## 5.1 STANDARD PROGRAMS

Standard programs are accessed through the PROGRAMS key. There are fifteen standard programs numbered 1 through 15. Each program has 5 start times, a 14-day cycle, 20 groups, a pump selection and a % boost.

Pressing the PROGRAMS key at any time (except when you are already in the programs function) will jump you straight to the programs function from any other screen.



The programs screen is shown below.

```
12:00:00 | Programs
01/01/15 | Enter program number to
  Thu    | edit  1 (1-15)
Week 2   |
```

Program number – 1 indicates that pressing ENTER will allow you to edit program number 1 of the currently selected library.

### 5.1.1 SELECTING A PROGRAM

If for example you want to view or change program number 2, then press the following keys.



To select program 2 using the NEXT key, press the following keys.



You can press the NEXT key several times to select other programs. You can also use the PREV key to assist with selecting in this way.

### 5.1.2 START TIME

After you have chosen the program to view or change you will see the start time screen which looks similar to the display below.

12:00:00		Program 1	Times to start	
01/01/15		Start 1	Off	Start 4 Off
Thu		Start 2	Off	Start 5 Off
Week 2		Start 3	Off	(24hr time)

Program name – Program 1 indicates that you are accessing program number 1.

Start time – There are 5 start times per program, to navigate through the start times use the NEXT and PREV keys. For each start time, the Off indicates that the start time is not used (set by pressing the OFF key). If all start times are OFF, the program may still be started by the Semi Auto Start function (see 3.3 START/STOP program).

The start time is in 24-hour format.

If for example you want to start the program at 1:30am you would press the following keys.



All times are in 24-hour format so if you wish to start a program at 11:15pm then you would press the following keys.



Once all the start times you require are set up press the DONE key to progress to the next step.

### 5.1.3 DAY CYCLE

After you have set up the start times (or pressed the SKIP key) you will see the Days cycle screen which looks similar to the display below.

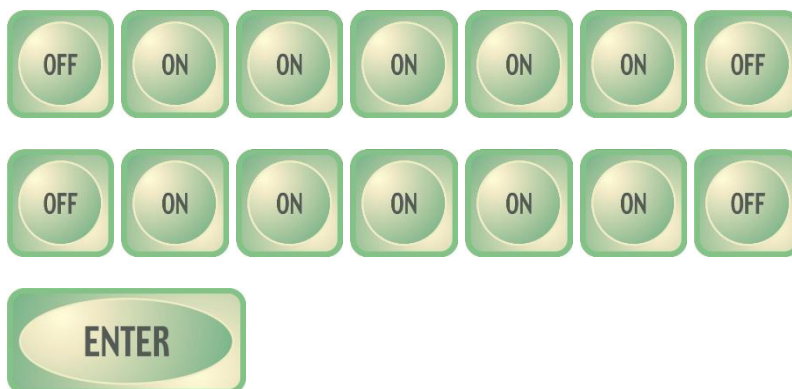
```
12:00:00 | Program 1 Days to start
01/01/15 | Week 1 Su __ Tu __ Th __ Sa
    Thu   | Week 2 __ Mo __ We __ Fr __
Week 2   | (Set days: 1 All, 2 None, 3
```

Program name – Program 1 indicates that you are accessing program number 1.

Day cycle – Week 1 Su \_\_ Tu \_\_ Th \_\_ Sa and Week 2 \_\_ Mo \_\_ We \_\_ Fr \_\_ indicate which days the program will run. The flashing day is the current day.

Set up the Day Cycle using the NEXT, PREV, ON, OFF or numeric keys. You can also use the NEXT and PREV keys to navigate across. Once finished press the ENTER key to save the changes.

If for example you want run a program from Monday to Friday every week then you press the following keys.



This would show a display as follows.

```
12:00:00 | Program 1 Days to start
01/01/15 | Week 1 __ Mo Tu We Th Fr __
    Thu   | Week 2 __ Mo Tu We Th Fr __
Week 2   | (Set days: 1 All, 2 None, 3
```

### 5.1.4 GROUPS

After you have selected the days to start (or pressed the SKIP key) you will see the group screen which looks similar to the display below.

```
12:00:00 | Program 1 Group 1
01/01/15 | Run for 0 hrs 5 mins
    Thu   | Stations 1,2
Week 2   | (ON/OFF to add/remove)
```

Program name – Program 1 indicates that you are accessing program number 1.

Group number – Group 1 indicates that you are accessing group 1 of program 1.

To select a group, use the NEXT and PREV key until the group number you wish to edit is displayed or use the numeric keys to enter the group number. Then press the ENTER key.

Run hours – Run for 0 hrs 5 mins indicates that the group will run for 5 mins.

Use the number keys followed by the ENTER key to set the number of hours and minutes to run the group.

Station Numbers – Stations 1,2 This is a list of the stations which are currently selected to run in this group.

To add stations to the group enter the station number followed by the ON key. Once the ON key is pressed the station will appear in the station numbers list.

For example, to add station 5 press the following:



To remove a station enter the station number and press the OFF key. Once the OFF key is pressed the station will disappear from the station numbers list.

For example, to remove station 5 press the following:



Once you have entered the stations you require press the ENTER key.

Pressing the SKIP key in this screen will skip all the groups and advance you to the next step.

### 5.1.5 PUMP SELECTION

The pump selection screen will only be available if pumps have been configured on the controller. A screen similar to the display below will be displayed.

12:00:00		Program 1
01/01/15		Pumps 1,2
Thu		
Week 2		(ON/OFF to add/remove)

Program name – Program 1 indicates that you are accessing program number 1.

Pump List – Pumps 1,2 is a list of the pumps which are currently selected to run in this program.

To add pumps to the list enter the pump number followed by the ON key. Once the ON key is pressed the pump will appear in the pump list.

For example, to add pump 2 press the following:



To remove a pump, enter the pump number and press the OFF key. Once the OFF key is pressed the pump will disappear from the pump list.

For example, to remove pump 2 press the following:



Once you have entered the pumps you require press the ENTER key

### 5.1.6 WATER BUDGET ENTRY

After you have set up the groups and pumps (or pressed the SKIP key) you will see the Water Budget Entry screen which looks similar to the display below.

```
12:00:00 | Program 1
01/01/15 | Normal run: 05:00:00
  Thu    | Scale factor 200%
Week 2   | Scaled run: 10:00:00
```

Program name – Program 1 indicates that you are accessing program number 1.

Scale factor – 200% indicates that the current scale factor for Program 1 is 200%.

If for example you wish to change the scale factor to 50% press the following keys.



Once you have entered the water budget you require press the DONE key to progress to the next step.

### 5.1.7 SUMMARY

At the end of the program all the information entered into the program is condensed in to a final summary screen. This screen is displayed for 10 seconds after the program has been entered for the user to perform a quick check of the program.

The program summary screen will look similar to the display below.

```
12:00:00 | Program 1
01/01/15 | Starts 1 time on 7 days
  Thu    | Runs for 10:00:00 at 200%
Week 2   |
```

Program name – Program 1 indicates that you are accessing program number 1.

Starts – Starts 1 time on 7 days indicates the number of start times and days which are active.

Run time – Runs for 10:00:00 at 200% indicates that the total runtime of all the groups is 10 hours and the program % boost is set to 200%

## 5.2 SMART PROGRAMS

Smart programs are accessed through the SMART PROGRAMS key. There are five optional standard programs:

- 16 Looping program
- 17 Frost Protection program
- 18 Heat Protection program
- 19 Fertigation program
- 20 Filter Flush program
- 21 Current Profile program
- 22 Pond Fill program
- 23 Remote Pump program
- 27 Flow Profile program

Pressing the SMART PROGRAMS key will scroll you through each of the above programs. You can also use the NEXT and PREV keys to navigate through these programs.



### 5.2.1 LOOPING PROGRAM

The looping program is designed to be used if there is a requirement for a program to run with a large number of starts. The operation of the looping program is different from the normal programs in that the watering restarts each time the loop duration has expired and does not cease until it reaches the end time.

Click SMART PROGRAMS and navigate to Looping, Program 16.

Start time – The time of day the program will start on each of the days selected in the day table (24 hr time).

End time – The time of day the program will stop (24 hr time). If set to Off program will loop continuously until stopped by the user or by an alarm.

Cycle (loop) duration – The duration after the program starts before the program will restart. If the program run longer than the cycle time then the program will restart immediately (hr:mins). For example, if the program takes 1 hr to run through and the cycle time is set to 3 hrs then the loop sequence will be: program runs for 1 hr, program waits for 2 hrs for cycle duration to elapse, then program is restarted and the sequence begins again.

### 5.2.2 FROST & HEAT PROTECTION PROGRAMS

The heat/Frost protection program operates similarly to looping programs but is triggered by temperature conditions rather than specific start times or day cycles. This program is designed to ensure precise control of irrigation during periods of extreme

heat/cold. When activated, the heat protection program halts or pauses (depending on user selection), any other ongoing programs and remains active until temperature conditions stabilize, prioritizing system safety and operational efficiency.

The program features configurable start and stop temperature thresholds in the menu of, allowing users to define operatable temperature limits on the controller.

In cases where irrigation must stop or pause due to high temperatures, the program halts/pauses all operations automatically and displays the active heat protection status on the MMI. If temperature thresholds are adjusted while the program is running, it will continue operating uninterrupted following the previous conditions.

Click SMART PROGRAMS and navigate to Program 17(Frost Protect) or Program 18 (Heat Protect).

In this manual, only the Heat Protect program is used as an example for demonstration purposes. Note that the behaviour of Heat Protect and Frost Protect programs is similar, with the key difference being their temperature logic:

- For Heat Protect, the start temperature is higher than or same as the stop temperature.
- For Frost Protect, the start temperature is lower than or same as the stop temperature.

```
12:00:00 | Heat Protect
01/01/15 | Start: 60 Deg
  Thu   | Stop : 40 Deg
Week 2  |
```

#### Setup the Cycle Duration

```
12:00:00 | Heat Protect
01/01/15 | Cycle Duration 01:00 hr:min
  Thu   | Other Programs: Pause
Week 2  |
```

Cycle (loop) duration – The duration after the program starts before the program will restart, same as the looping program (hr:mins). The cycle time should not be left to zero.

Next setup the group and stations, and Number of pumps or leave empty if there's no station to be run.

```
12:00:00 | Heat Protect Group 1
01/01/15 | Run for 0 hrs 0 mins
  Thu   | Stations (None)
Week 2  | (ON/OFF to add/remove)
```

Next

```
12:00:00 | Heat Protect
01/01/15 | Pumps No Pumps_
  Thu   |
Week 2  | (ON/OFF to add/remove)
```

You can toggle between the action Stop / Pause by Pressing “ON” button on this menu.

Press “Enter” to save the setting.

```
12:00:00 | Heat Protect
01/01/15 | Normal run: 00:05:00
  Thu    |   Scale factor 60
Week 2   |   Scaled run: 03:00
```

Fix the scaled factor from 0 to 100 percent to scale the runtime. Press “Enter” to save the setting. Then the program summary displays

```
12:00:00 | Heat Protect summary
01/01/15 | Run time 00:03:00
  Thu    |
Week 2   |
```

- When Frost /Heat program is active on ‘stop’ it operates in an exclusive mode, disabling functions like "Test Output," "Manual Cycle," and "Manual Control"
- Attempting to activate conflicting functions triggers an alarm with feedback messages, such as "Failed to start due to Heat Protect running," ensuring clarity and preventing operational conflicts.

The program stops when "Stop Irrigation" is pressed and restarts only when temperatures fall below the stop threshold and rise above the start threshold. Additionally, operators can manually start the heat protection program if temperatures exceed the stop threshold, ensuring flexibility in managing environmental conditions.

The program provides real-time feedback through the MMI, displaying program status, alarms, and active conditions, allowing operators to make informed decisions and maintain system control effectively.

The heat protection program ensures safe and efficient irrigation control, minimizing the risk of damage caused by extreme temperatures and maintaining operational reliability.

The alarm system for the heat protection program can be configured to provide warnings and errors related to temperature conditions. These alarms are crucial for monitoring and managing system performance. Key configurable alarm parameters include:

1. High Temperature Error.
2. High Temperature Warning.
3. Low Temperature Error.

Each with two categories including the Temperature Set point for triggering alarms, Time in (min:secs) Duration above which setpoint for the alarm to be triggered, this also is the case for the Frost Protect.

These alarms, detailed in Section 6.0 of the documentation, ensure comprehensive monitoring by notifying users of high and low temperature conditions and providing sufficient time to take corrective actions.

### 5.2.3 FERTIGATION PROGRAM

The Fertigation Program is used to control a fertigation pump connected to the irrigation system.

Click SMART PROGRAMS and navigate to Fertigation, Program 19.

Pre Wash time – The run time the program will run each group for before activating the fertigation pump (hr:mins).

Post Wash time – The run time each group will run for after the fertigation pump has stopped (hr:mins).

The runtime for each group is the time the fertigation is applied to each group. The total runtime for each group is the addition of the prewash time, the post wash time and the fertigation time.

### 5.2.4 FILTER FLUSH PROGRAM

The filter flush program is used to control and flush up to six filters

Click SMART PROGRAMS and navigate to Filter Flush, Program 20.

Run Time – This is how long the pumps have to run for before forcing a flush cycle to happen (hr:mins). Other programs are paused during a flush cycle.

Flush time – This is the run time each filter will flush for this time is in minutes and seconds (min:secs). Each flush valve is activated for this amount of time in sequence.

Pause time – This is the pause time after flushing a filter and before each filter will flush for this time in minutes and seconds (min:secs). Caution: During this pause time, no flush valves are active and pressure may build, use this setpoint to maintain pressure if valves close slowly.

Note: The runtime can be overridden by a Pressure differential switch if one is connected to the controller.

### 5.2.5 CURRENT PROFILE PROGRAM

The Current Profile Program is a level-based control system designed to measure the current draw of outputs for example a pump or outlet used for filling ponds, lakes, or tanks. It uses current sensor to sense in mA in real time stores and displays the values in the controller when system output the program draws. It can be used to setup the normal operational profile for the controller to learn and its device for abnormal conditions to optimize energy use or align with operational schedules, ensuring consistent and efficient management.

Click SMART PROGRAMS and navigate to Flow Profile, Program 27.

12:00:00		Smart programs
01/01/15		27 Current profile
Thu		
Week 2		

12:00:00		Current Profile Times to start
01/01/15		Start 1 Off Start 4 Off
Thu		Start 2 Off Start 5 Off
Week 2		Start 3 Off (24hr time)

12:00:00		Current Profile Days to start
01/01/15		Week 1 Su ___ Tu ___ Th ___ Sa ___
Thu		Week 2 ___ Mo ___ We ___ Fr ___
Week 2		(Set days: 1 All, 2 None, 3 Odd, 4

For more details on configuring start times and day cycle see sections 5.1.2, 5.1.3 .

### 5.2.6 FILL PROGRAM

The fill program is used to control a digital output which can be connected to a pump or outlet used to fill a pond, lake or tank. This program uses the analogue level sensor to determine if the low start point or the high stop point has been reached.

Click SMART PROGRAMS and navigate to Fill, Program 22.

The fill level can be specified differently during an off peak time if required.

Use the on and off to select a sensor (Level transducer) or Disable.

Peak Start Level – The pond fill program starts when the level drops below this setpoint.

Peak Stop Level – The pond fill program stops when the level rises above this setpoint.

Off-peak start/stop Level – setpoints used during the Off-peak window

Off-peak start/stop times – Between the start and stop times, the program will use the Off-peak level setpoints (24 hr time)

### 5.2.7 REMOTE PUMP PROGRAM

The Remote program is used to control a digital output via digital input to the control which can be connected to a pump or outlet used to fill a pond, lake or tank. This program allows programming of as many pumps as preconfigured in the controller's output setup.

Click SMART PROGRAMS and navigate to Remote Pump, Program 23

12:00:00		Remote Pump
01/01/15		Pumps No Pumps_
Thu		
Week 2		(ON/OFF to add/remove)

12:00:00		Remote Pump
----------	--	-------------

```

01/01/15 | Pumps Assigned:
  Thu    |
Week 2   |

```

For more details on selection the pumps see section 5.1.5.

### 5.2.8 FLOW PROFILE PROGRAM

The Flow Profile Program is an irrigation tool designed to detect the typical flow rates across multiple stations. Accessible through the Keypad under the Smart Programs section, the program allows users to configure and manage flow profiles efficiently and is integrated with the irrigation system to ensure precise flow monitoring and control.

Click SMART PROGRAMS and navigate to Flow Profile, Program 27

```

12:00:00 | Flow profile
01/01/15 | Pumps No Pumps:
  Thu    |
Week 2   | (ON/OFF to add/remove)

```

Press "ON", to add pumps, "ENTER" to save the setting, see section 5.1.

```

12:00:00 | Flow Profile
01/01/15 | Normal run: 00:00:00
Thu      | Scale factor 100
Week 2   | Scaled run: 00:00

```

Edit to change the Scale Factor, Press ENTER to save the setting, then the program summary displays.

```

12:00:00 | Flow Profile summary
01/01/15 | 0 starts on 0 days
Thu      |
Week 2   |

```

Press EXIT to save the setting and navigate back.

**Note:** Flow learning is with correct pump selection.

To initiate the Flow Profile Program, simply press the "Start Program" key and select number 27 Flow Profile Program. By default, the program will start running each station on the system.

Stations can be transitioned manually by pressing the "Next" button or automatically based on preconfigured runt times, which at 100% water budget is (5 minutes) for First Station 1 and (2 minutes) for subsequent stations.

In case we need more time duration to stabilize the pressure before reading the expected flow for the station we can use the scale factor to scale it up or scale it down.

For example;

% Water Budget	X mins:- station 1 for build up and Y mins
----------------	--

	for subsequent stations.
100%	X = 5 mins Y = 2 mins
200%	X = 10 mins Y = 4 mins
50%	X = 2 mins 30 secs, Y = 1 mins

If the program is stopped before completing all stations, irrigation ceases, but station flow rates already stored are preserved. The flow rates are accessible and can be edited manually in the System Setpoints menu button, see *APPENDIX B: SYSTEM CONFIG MENU ITEMS*.

A fixed sensor, "Flow Diff %," calculates the difference between actual and expected flow values and displays the percentage in real time within the System Status. The "Flow Diff%" formula is below.

$$\text{Flow Diff} = \frac{(\text{Actual Flow} - \text{Expected Flow})}{\text{Expected Flow}} \times 100\%$$

Press ALARM SETPOINTS, to configure the "Flow Differential Report Alarm" that triggers based on the threshold set for individual/group flow calculations as watering programs are running, see section 6.3.

To run the program, press 'START PROGRAM' button once, enter 27 and press ENTER. screen is shown below.

```
12:00:00 | Start program now
01/01/15 | Enter program number to
  Thu    | Start 27 (1-27)
Week 2  | Program 27 started
```

```
12:00:00 | Flow profile
01/01/15 |                               00:00:00
  Thu    | Stations 1
Week 2  | Pumps No Pumps
```

Press the Next to manually jump to the next station and saves the flow learnt for that station, or when the timer runs down the program automatically saves and jumps to the next station.

To view/Edit the recorded flow rates are accessible and can be edited manually in the System Setpoints menu button, press it few times to see Set total flow rate screen.

```
12:00:00 | Set total flow rate L/s
01/01/15 | Station 1 = 10.0
  Thu    |
Week 2  |
```

Use the NEXT Key to browse through other station flow rates.

To Configure the Flow Diff Report Setpoints;

1. Scroll through the setpoints until you reach the one you want to edit.
2. If the screen displays only `off` below the setpoint name then the setpoint is disabled and you must press the `ON` key to enable the setpoint.
3. Enter the value for the setpoint using the numeric keys and then press the `ENTER` key to confirm.
4. There may be more than one value needed to configure the setpoint. If this is the case, simply repeat step 1. You will notice that the cursor automatically moves to the next field when you press the `ENTER` key.
5. The `OFF` key can be used to disable most Alarm Setpoints (and hence also disable the alarms).

### Analogue Sensors

Alarm Setpoints for analogue sensors have both a setpoint and a timeout that must be configured.

- **Setpoint** – The sensor reading required to trigger the alarm condition.
- **Timeout** – How long (in minutes and seconds) the sensor must remain in the alarm condition before the alarm is triggered.

Flow Diff	Flow diff report
0%	15 % 05:00 mins:sec
Vol 1	
1234 L	

Note: In case we need to update the Flow rate for any particular station on later stage.

We can run the Profile program with particular station no to update the flow rate for that station without needing to run the program for all stations.

We can achieve this by Pressing the “START PROGRAM” button twice to allow you to select the program with group no. In case of flow learning program group number corresponds to station no. so can choose to start the Flow Profile Starting with particular station and once you have the values logged can stop the program.

When running the program with group selection for Flow Profile group no represents the Station No.

### 5.3 CLEAR AND COPY PROGRAMS

The CLEAR/COPY PROGRAMS key can be used to clear an individual program or all programs in memory. It also allows you to copy a program which is useful to write a new program based on an existing Program.

Pressing the CLEAR/COPY PROGRAMS key once at any time will jump you straight to the Clear Programs function from any other screen.

Press the CLEAR/COPY PROGRAMS key twice to access the Copy program's function.



```
12:00:00 | Clear program
01/01/15 |   Enter program number to
   Thu   |   clear _ (0=all)
Week 2  |
```

```
12:00:00 | Copy program
01/01/15 |   Copy program _ (1-15)
   Thu   |   to program  _ (1-15)
Week 2  |
```

## 6.0 ALARMS

Alarms are used to prevent damage to equipment as well as informing the user that something has changed in the system. When used correctly, alarms are a very useful tool in determining faults in the irrigation system. If an alarm is triggered, a message will be displayed on the screen and will remain there until a key has been pressed.

If a controller is connected to a Central Control System (CCS), then all alarms are reported to the central.

For a complete list of the alarms supported by the controller, see *APPENDIX A: ALARMS AND ALARM SETPOINTS*.

## 6.1 ALARM ACTIONS

When an alarm is triggered, the controller responds depending on the severity of the alarm.

The most severe alarms cause the controller to stop all irrigation including any programs/manual controls that are running.

For less severe alarms, the controller will initially assume that a problem only exists with the currently running station and will try and continue irrigating by skipping the current station. However, if skipping stations does not prevent the alarm from being triggered, then the controller will stop all irrigation.

Some alarms do not trigger any action from the controller. This may be because the controller can not take any suitable action, or that the alarm is an information only alarm.

The three different actions the controller may take.

1. **Shutdown** – Immediately stop all irrigation.
2. **Skip, skip, skip, shutdown** – Skip the currently running station. If the same alarm is triggered three times in a row, then stop all irrigation.
3. **None** – Take no action.

## 6.2 ALARM LIST

When pressed, the ALARM LIST key will display a description of any recent alarms along with the time the alarm occurred.



12:00:00		Alarm 1
01/01/15		11:00:00 01/01/15
Thu		Rain switch sensor on
Week 2		

Using the NEXT and PREV keys will scroll you through the ten most recent alarms.

## 6.3 ALARM SETPOINTS

Alarms Setpoints determine under what conditions an alarm is triggered and so must be configured before alarms will be triggered. Pressing the ALARM SETPOINTS key displays the Alarm Setpoints for the controller. Alarm setpoints only appear if the corresponding sensor has been set up in the System Config (see 7.0 CONFIGURATION).

Pressing the ALARM SETPOINTS key repeatedly scrolls through the Alarm Setpoints. The NEXT and PREV keys can also be used to scroll. For a complete list of the Alarm Setpoints available, see APPENDIX A: ALARMS AND ALARM SETPOINTS.

### 6.3.1 CONFIGURING SETPOINTS

Scroll through the ALARM SETPOINTS until you reach the one you want to edit.

1. If the screen displays only off below the setpoint name then the setpoint is disabled and you must press the on key to enable the setpoint.
2. Enter the value for the setpoint using the numeric keys and then press the enter key to confirm.
3. There may be more than one value needed to configure the setpoint. If this is the case, simply repeat step 2.
4. You will notice that the cursor automatically moves to the next field when you press the enter key.
5. The off key can be used to disable most Alarm Setpoints (and hence also disable the alarms).

### Analogue Sensors

Alarm Setpoints for analogue sensors have both a setpoint and a timeout that must be configured.

- **Setpoint** – The sensor reading required to trigger the alarm condition.
- **Timeout** – How long (in minutes and seconds) the sensor must remain in the alarm condition before the alarm is triggered.

### Digital Sensors

Alarm Setpoints for digital sensors have only a timeout.

- **Timeout** – How long (in minutes and seconds) the sensor must remain in the alarm condition before the alarm is triggered.

## 7.0 CONFIGURATION

The CONFIG key will enter the Configuration menu where you can change the configuration of the controller. This menu sets up what is connected to the controller and how the controller will operate. Do not adjust these values unless you are authorised to do so as damage to the irrigation system is possible with incorrect settings. The amount of settings that are accessible will vary depending on the access level of the current user.

For a complete list of the settings that can be changed using the CONFIG key, see *APPENDIX B: SYSTEM CONFIG MENU ITEMS*.



## 8.0 CONNECTION INFORMATION

To maximize the available outputs on the controller the output connections will vary depending on the following parameters: see *APPENDIX C: HYBRID CONTROLLER CONNECTION INFORMATION*

- Number of pumps, fertigation pumps.
- Number of filter stations.
- Fill Output
- Number of conventional stations.

The master valve is always output 1. Conventional stations then begin at output 2. Other outputs are optional and are assigned the highest numbers only if they are configured. Starting from the highest number, the following are assigned in order:

1. Irrigation pumps
2. Fertigation pump
3. Filter output
4. Fill output

See the example output assignment on the following page.

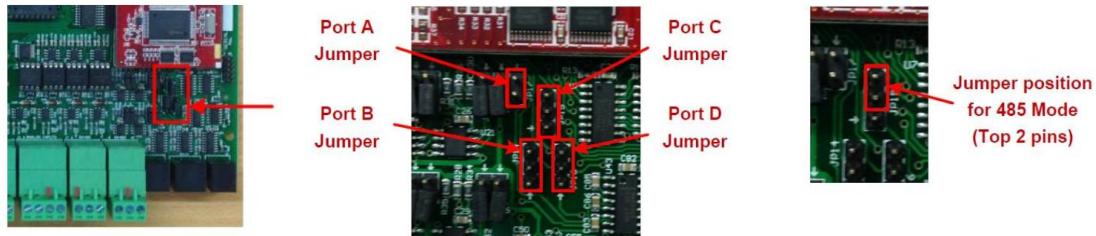
## 8.1 EXAMPLE OF OUTPUT ASSIGNMENT

<b>Pumps</b>	2	4	0	4	1
<b>Fertigation</b>	0	1	0	1	1
<b>Filters</b>	4	0	0	3	2
<b>Fill Output</b>	0	0	0	1	1
<b>Stations</b>	6	9	14	2	0

<b>Output 1</b>	Master Valve	Master Valve	Master Valve	Master Valve	Master Valve
<b>Output 2</b>	Station 1	Station 1	Station 1	Station 1	Spare
<b>Output 3</b>	Station 2	Station 2	Station 2	Station 2	Spare
<b>Output 4</b>	Station 3	Station 3	Station 3	Spare	Spare
<b>Output 5</b>	Station 4	Station 4	Station 4	Spare	Spare
<b>Output 6</b>	Station 5	Station 5	Station 5	Spare	Spare
<b>Output 7</b>	Station 6	Station 6	Station 6	Spare	Spare
<b>Output 8</b>	Spare	Station 7	Station 7	Fill	Spare
<b>Output 9</b>	Spare	Station 8	Station 8	Filter 3	Spare
<b>Output 10</b>	Spare	Station 9	Station 9	Filter 2	Spare
<b>Output 11</b>	Filter 4	Spare	Station 10	Filter 1	Spare
<b>Output 12</b>	Filter 3	Fertigation	Station 11	Fertigation	Fill
<b>Output 13</b>	Filter 2	Pump 4	Station 12	Pump 4	Filter 2
<b>Output 14</b>	Filter 1	Pump 3	Station 13	Pump 3	Filter 1
<b>Output 15</b>	Pump 2	Pump 2	Station 14	Pump 2	Fertigation
<b>Output 16</b>	Pump 1	Pump 1	Spare	Pump 1	Pump 1

## 8.2 SERIAL PORTS

The master controller board is fitted with four serial ports, named A, B, C and D. (Serial ports on slave cards can only be used to communicate with the master). Each serial port can be configured for either RS-232 or RS-485 operation via jumper settings. The positioning of the jumpers varies between board models but the numbering is consistent across all of them:

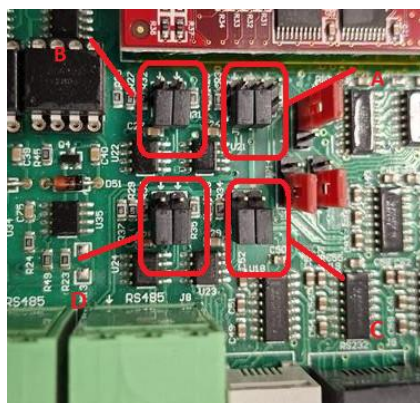


<b>Port</b>	<b>Jumper number</b>	<b>RS-232</b>	<b>RS-485</b>
A	J17	remove	Top 2
B	J14	Bottom 2	Top 2
C	J15	Bottom 2	Top 2
D	J16	Bottom 2	Top 2

**Note:** the serial port jumpers only affect the receive side of the circuit. An incorrectly configured serial port will still be able to transmit data but will be unable to receive any response.

On the terminating ends of an RS-485 cable it is necessary to set the terminating resistors. Installing a jumper across pins 1-2 of the following connectors will enable the terminating resistors.

<b>Port</b>	<b>Terminating resistor jumpers</b>
A	J2, J3
B	J4, J5
C	J6, J7
D	J8, J9



## 9.0 TROUBLESHOOTING GUIDE

### 9.1 OUTPUTS

1. **No Output on a single station?**  
Disconnect the field wire and using either a spare Solenoid or Multimeter, check output. Please remember to use **Test Output** function on the Controller as this will not start the Pump or Master Valve. If Solenoid used for testing activates or the Multimeter reads 24volts AC, the problem is on the field side, not the Controller.
2. **No Output on multiple stations?**  
Disconnect one (1) of the field wires and test as above. If you find that the fault is on eight (8) stations, this will most likely be the protection fuse for that bank. This is situated on the boards and will require replacing.

**NOTE:** Always test the field solenoids resistance with Multimeter set on Ohms. Replace ALL coils under 15 Ohms BEFORE powering up Controller again. If the Controller tests out ok, fault may be on field common.

### 9.2 DIGITAL INPUTS

1. **Function Concern?**  
If concerned about the function of any Digital Input, isolate the Pump Start circuit by turning off pump circuit breaker or key switch or remove Pump Start Output from Controller. If it is a Fault Input type, check, in the Alarm Setpoints Menu that the Alarm has been activated.  
Remove the Input wire from the terminal and then activate a Manual start on any station. With a short piece of wire connect into the Digital Input Common and the Digital Input Terminal to be tested. After the set amount of time (that the Alarm has been set for) the Controller should go into "fault mode" and an Alarm should be registered on the Controller display. If so, then the Digital Input is ok.
2. **Pulse Type Flow Meter problem?**  
Connect a short piece of wire from the Digital Input Common to the Digital Input terminal to be tested. Tap the short piece of wire on the Input terminal repeatedly (to simulate a "pulse"). The flow reading should increase on the Controllers' system display menu.

**NOTE:** Digital Inputs problems/faults on the Controller are very uncommon.

### 9.3 ANALOGUE INPUTS

1. **Power/Voltage present?**  
To test voltage, use a Multimeter set on DC volts. Test between the "V" and the "C" on the Analogue Input block. (Refer to the Manual or Connections Specifications sheet provided to the 'End-User' if unsure of which connections to test). 24volts DC should be present. If no voltage is present, remove ALL Inputs and test again, as a damaged/faulty instrument may be dragging the voltage down.
2. **Reading is not accurate?**  
Put the Multimeter in series with the Analogue Input to be tested. Set on Milliamps (mA), take the reading. 4mA is considered to be 0 and 20mA is full scale, and therefore there is a range of 16mA. It is now necessary to calculate the accuracy of the Input (mathematically).

**NOTE:** Analogue Input faults may require testing by a Qualified Technician. If uncertain, then please contact Micro Control Engineering.

## APPENDIX A: ALARMS AND ALARM SETPOINTS

The following is a list of all the Alarms supported by the controller. Also listed are the Alarm Setpoints (accessed through the ALARM SETPOINTS key) that must be configured for the alarms to be triggered. Alarm setpoints are only configurable if the corresponding sensor has been set up in the Configuration (see 7.0 Configuration).

### ALARM ACTIONS

When an alarm is triggered, the controller responds depending on the severity of the alarm.

The most severe alarms cause the controller to stop all irrigation including any programs/manual controls that are running.

For less severe alarms, the controller will initially assume that a problem only exists with the currently running station and will try and continue irrigating by skipping the current station. However, if skipping stations does not prevent the alarm from being triggered, then the controller will stop all irrigation.

Some alarms do not trigger any action from the controller. This may be because the controller can not take any suitable action, or that the alarm is an information only alarm.

The three different actions the controller may take.

- **Shutdown** – Immediately stop all irrigation.
- **Skip, skip, skip, shutdown** – Skip the currently running station. If the same alarm is triggered three times in a row, then stop all irrigation.
- **None** – Take no action.

### VALUE SENSORS

Value sensors have both a setpoint and a timeout that must be configured.

- **Setpoint** – The sensor reading required to trigger the alarm condition.
- **Timeout** – How long (in minutes and seconds) the sensor must remain in the alarm condition before the alarm is triggered.

### ON/OFF SENSORS

On/Off sensors have only a timeout.

- **Timeout** – How long (in minutes and seconds) the sensor must remain in the alarm condition before the alarm is triggered.

The OFF key can be used to disable most alarm setpoints (and hence also disable the alarm).

Alarm	Alarm Use	Alarm Action	Sensor (Configuration setting)	Sensor Type	Alarm Setpoint	Setpoint Desc (Analogue Only)
<b>Pump 1 Fault</b>	Pump 1 reports fault	Stop pump 1	Pump fault signal from pump 1 (Pump Fault 1)	On/Off	Pump Fault 1 input	N/A
<b>Pump 2 Fault</b>	Pump 2 reports fault	Stop pump 2	Pump fault signal from pump 2 (Pump Fault 2)	On/Off	Pump Fault 2 input	N/A
<b>Pump 3 Fault</b>	Pump 3 reports fault	Stop pump 3	Pump fault signal from pump 3 (Pump Fault 3)	On/Off	Pump Fault 3 input	N/A
<b>Pump 4 Fault</b>	Pump 4 reports fault	Stop pump 4	Pump fault signal from pump 4 (Pump Fault 4)	On/Off	Pump Fault 4 input	N/A
<b>Pump 5 Fault</b>	Pump 5 reports fault	Stop pump 5	Pump fault signal from pump 5 (Pump Fault 5)	On/Off	Pump Fault 5 input	N/A
<b>High Pressure 1</b>	When the pressure in the line reaches a critical level.	Shutdown	Pressure transducer 1 (Pressure 1)	Value	High pressure 1 error	<i>The pressure the system should not exceed (in kPa).</i>
			High pressure error switch 1 (High pressure sw 1)	On/Off	High pressure sw 1 error	N/A
<b>High Pressure 2</b>			Pressure transducer 2 (Pressure 2)	Value	High pressure 2 error	<i>The pressure the system should not exceed (in kPa).</i>
			High pressure error switch 2 (High pressure sw 2)	On/Off	High pressure sw 2 error	N/A
<b>Intermediate Pressure 1</b>	When the pressure in the line reaches a high level.	Skip, skip, skip, shutdown	Pressure transducer for system 1 (Pressure 1)	Value	Int pressure 1 warning	<i>The pressure the system should not exceed (in kPa).</i>

Alarm	Alarm Use	Alarm Action	Sensor (Configuration setting)	Sensor Type	Alarm Setpoint	Setpoint Desc (Analogue Only)
			Intermediate Pressure Error sw 1 (Int pressure sw 1)	On/Off	Int pressure sw 1 warning	N/A
Intermediate Pressure 2		Skip, skip, skip, shutdown	Pressure transducer 2 (Pressure 2)	Value	Int pressure 2 warning	<i>The pressure the system should not exceed (in kPa).</i>
			Intermediate Pressure Error sw 2 (Int pressure sw 2)	On/Off	Int pressure sw 2 warning	N/A
Low Pressure 1	When the pressure in the line is too low to run the system properly.	Skip, skip, skip, shutdown	Pressure transducer 1 (Pressure 1)	Value	Low pressure 1 warning	<i>The pressure the system should not run below (in kPa).</i>
			Low Pressure Error sw 1 (Low pressure sw 2)	On/Off	Low pressure sw 1 warning	N/A
Low Pressure 2			Pressure transducer 2 (Pressure 2)	Value	Low pressure 2 warning	<i>The pressure the system should not run below (in kPa).</i>
			Low Pressure Error sw 2 (Low Pressure sw 2)	On/Off	Low pressure sw 2 warning	N/A
High Temp	Protects the system from damage due to excessive temperature.	Shutdown	Temperature transducer (Temperature)	Value	<b>High Temp Error</b>	<i>Temperature limit at which all system operations must cease to prevent equipment failure.</i>
	Provides an early warning of rising temperature before reaching the critical threshold.	Skip, skip, skip, shutdown	Temperature transducer (Temperature)	Value	<b>High Temp Warning</b>	<i>Temperature level for operator awareness, allowing intervention before the critical limit is reached.</i>
Low Temp Error	Provides frost protection by detecting dangerously low temperatures.	Shutdown	Temperature transducer (Temperature)	Value	<b>Low Temp Error</b>	<i>Temperature threshold that indicates frost risk or unsafe cold conditions, prompting protective actions.</i>

<b>Alarm</b>	<b>Alarm Use</b>	<b>Alarm Action</b>	<b>Sensor (Configuration setting)</b>	<b>Sensor Type</b>	<b>Alarm Setpoint</b>	<b>Setpoint Desc (Analogue Only)</b>
<b>Diff Pressure</b>	When the differential pressure between two points in the line reaches a high level	None		On/Off		N/A
<b>High Current 1</b>	When the motor draws too much current and must be shut down for protection.	Shutdown	Current transducer 1 (Current 1)	Value	High current 1 error	<i>The current the motor should not exceed (in Amps).</i>
<b>High Current 2</b>			Current transducer 2 (Current 2)	Value	High current 2 error	
<b>High Flow 1</b>	When the flow in the line is higher than expected.	Skip, skip, skip, shutdown	Flow meter 1 (Flow 1 input)	Value	High flow 1 warning	<i>The flow the system should not exceed (in L/min).</i>
<b>High Flow 2</b>			Flow meter 2 (Flow 2 input)	Value	High flow 2 warning	
<b>Low Flow 1</b>	When the flow in the line is lower than expected.	Skip, skip, skip, shutdown	Flow meter 1 (Flow 1 input)	Value	Low flow 1 warning	<i>The flow the system should run below (in L/min).</i>
<b>Low Flow 2</b>			Flow meter 2 (Flow 2 input)	Value	Low flow 2 warning	
<b>Unscheduled Flow 1</b>	When there is a flow recorded while no irrigation is taking place on either system.	None	Flow meter 1 (Flow 1 input)	Value	Unscheduled flow 1	<i>The flow the system should not exceed while no irrigation is occurring (in L/min).</i>
<b>Unscheduled Flow 2</b>			Flow meter 2 (Flow 2 input)	Value	Unscheduled flow 2	
<b>No Flow</b>	Irrigation is running but no flow is being recorded.	Shutdown	No flow switch (Bore DD err sw 1)	On/Off	No flow sw error	
<b>High Level Error 1</b>	When the water level is too high.	Shutdown	High level switch 1 (High level sw 1)	On/Off	High level sw 1 error	N/A
<b>High Level Error 2</b>			High level switch 2 (High level sw 2)	On/Off	High level sw 2 error	N/A
<b>High Level Warning 1</b>	When the water level is too high.	None	High level switch 1 (High level sw 1)	On/Off	High level sw 1 warning	N/A

Alarm	Alarm Use	Alarm Action	Sensor (Configuration setting)	Sensor Type	Alarm Setpoint	Setpoint Desc (Analogue Only)
High Level Warning 2			High level switch 2 (High level sw 2)	On/Off	High level sw 2 warning	N/A
Low level 1	When the water level is too low.	Shutdown	Low level switch 1 (Low level sw 1)	On/Off	Low level sw 1 error	N/A
Low level 2			Low level switch 2 (Low level sw 2)	On/Off	Low level sw 2 error	N/A
Flow Diff	Monitors the difference between the actual flow and the expected flow.	Skip, skip, skip, shutdown	Flow meter 1 (Flow 1 input)	Value	Configurable (e.g., $\pm 10\%$ of learned flow)	<i>Triggers when the measured flow differs from the learned or expected flow profile beyond the allowable tolerance</i>
Phase Failure 1	When one of the three phases is out.	Shutdown	Phase failure error switch 1 (Phase fail err sw 1 input)	On/Off	Phase failure sw 1 error	N/A
Phase Failure 2			Phase failure error switch 2 (Phase fail err sw 2 input)	On/Off	Phase failure sw 2 error	N/A
High Local Current Sense Error	When the current draw of the local stations reaches a critical level.	Shutdown	Local current Sense (built in)	Value	High current sense error	<i>The current draw of local stations should not exceed (in mA).</i>
High Local Current Sense Warning	When the current draw of the local stations reaches a high level.	Skip, skip, skip, shutdown		Value	High current sense warning	<i>The current draw of local stations should not exceed (in mA).</i>
Low Local Current Sense	When the current draw of the local stations is less than expected.	Skip, skip, skip, shutdown		Value	Low Current Sense Error	<i>The current draw of local stations should not run below (in mA).</i>

<b>Alarm</b>	<b>Alarm Use</b>	<b>Alarm Action</b>	<b>Sensor (Configuration setting)</b>	<b>Sensor Type</b>	<b>Alarm Setpoint</b>	<b>Setpoint Desc (Analogue Only)</b>
<b>High MODULE Current Sense Error</b>	When the current draw of the MODULE stations reaches a critical level.	Shutdown	TWIN current sense (built in to TWIN interface translator)	Value	High module curr error	<i>The current draw the MODULE stations should not exceed (in mA).</i>
<b>High MODULE Current Sense Warning</b>	When the current draw of the MODULE stations reaches a high level.	Skip, skip, skip, shutdown		Value	High module curr warning	<i>The current draw the MODULE stations should not exceed (in mA).</i>
<b>Low MODULE Current Sense</b>	When the current draw of the MODULE stations is less than expected.	Skip, skip, skip, shutdown		Value	Low module curr error	<i>The current draw the MODULE stations should not run below (in mA).</i>
<b>RIC High Flow</b>	When the average RIC flow is higher than expected.	None (the flow calculations, and hence the alarms, are only calculated at the end of the irrigation on the RIC)	Flow meter for RIC (connected to RIC)		RIC High flow	<i>The flow rate that the average flow rate on the last RIC irrigation cycle should not exceed (in L/min).</i>
<b>RIC Low Flow</b>	When the average RIC flow is lower than expected.				RIC Low flow	<i>The flow rate that the average flow rate on the last RIC irrigation cycle should not run below (in L/min).</i>
<b>TWIN Board Current Overload</b>	TWIN line current is higher than 1.6A	Skip	MODULE communication (built in to MODULE interface translator)		Set by User	N/A
<b>TWIN Board Line Fused</b>	TWIN path wires are joined in dead short	Skips all Twin Stations			Set by User	N/A
<b>MODULE Board Comms Error</b>	When master card fails to poll MODULE communication	Skips all Twin Stations			Set by User	N/A
<b>Twin Board Checksum Error</b>	Corrupt response from TWIN card during communication	Skips all Twin Stations			Set by User	N/A

<b>Alarm</b>	<b>Alarm Use</b>	<b>Alarm Action</b>	<b>Sensor (Configuration setting)</b>	<b>Sensor Type</b>	<b>Alarm Setpoint</b>	<b>Setpoint Desc (Analogue Only)</b>
<i>Twin Decoder Failed</i>	Twin Board returned failed to switch on / off a decoder	Skip			Set by User	N/A
<i>Twin Decoder Timeout</i>	No response from TWIN card for station on / off command	Skip			Set by User	N/A
<i>Twin Port Busy</i>	<i>Serial Port is configured incorrectly</i>	<i>Skip</i>			Set by User	N/A

## APPENDIX B: SYSTEM CONFIG MENU ITEMS

The System Config is a series of menu items that allow the settings and functions of the controller to be changed. Some menu items are dependent and will only be available if other functions have been configured.

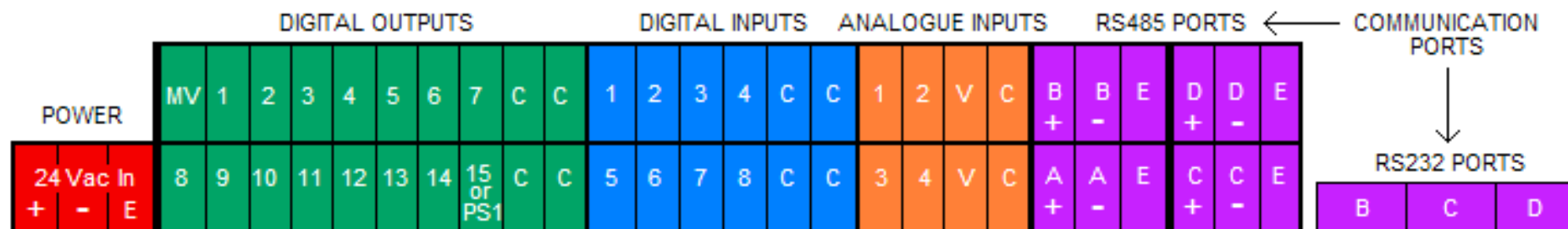
To change a setting, enter a new value using the numeric, ON and OFF keys and then press the ENTER key to confirm. If you enter the wrong value, you can use the CLEAR key to clear the value and start again. The OFF key can be used to disable most functions in the System Config. The ON key is needed to enable or toggle some functions in the System Config.

Menu Item	Section	Access Level	Description
Time and Date	CONTROLLER SETTINGS	Supervisor	Set the system time and date for the controller. The time and date are used to make sure programs are started at the correct time on the correct day. They are also used to timestamp alarms and events for reporting.
Default Access	CONTROLLER SETTINGS	Technician	Default Access is the access level that is granted to an operator before they login. The factory setting is <code>operator</code> which means that any user can start/stop or write programs without logging in.
Idle Logout	CONTROLLER SETTINGS	Supervisor	A user is automatically logged out if they do not press a key for the Idle Logout time.
Local valves	OUTPUT SETUP	Supervisor	This setting is the number of local stations connected to the controller. Local stations are the conventionally wired stations that are connected to the controller by a single common and a separate active for each station. These are usually 24VAC solenoids.
MODULE valves	OUTPUT SETUP	Supervisor	This is the number of <b>TWIn (Two Wire Irrigation Network)</b> or <b>IO Module</b> stations connected to the controller via the communication port and will only be displayed if the MODULE port is set up in the <code>COMMUNICATIONS</code> section. The controller will access these stations immediately after the local stations. This means that the first MODULE station will be addressed by the controller as the station number directly after the last local station. I.e. if there are 5 local stations and 10 MODULE 1 stations the first MODULE 1 station would be station 6 to the controller and the last TWIn station would be station 15.
No of RiCs	OUTPUT SETUP	Supervisor	This is the number of RiCs (Remote Irrigation Controllers) in the RIC network connected to the controller MODBUS port.
RiC valves	OUTPUT SETUP	Supervisor	This is the number of stations connected to each RIC (Remote Irrigation Controller) and will only be displayed if the RIC port is set up in the <code>COMMUNICATIONS</code> section. The controller will access these stations immediately after the local stations and the TWIN stations. This means that the first RIC station will be addressed by the controller as the station number directly after the last local plus TWIN station. i.e. if there are 5 local stations and 10 TWIN stations the first RIC station would be station 11 to the controller.

Menu Item	Section	Access Level	Description
Local pumps	OUTPUT SETUP	Supervisor	This is the number of pumps physically connected to the controller. If no pumps are connected then set to 0 else up to 5 pumps can be configured. These pumps are in addition to the master valve output.
Fertigation pumps	OUTPUT SETUP	Supervisor	Set this parameter to 1 if a fertigation pump is connected otherwise set it to 0.
Filter outputs	OUTPUT SETUP	Supervisor	This is the number of filter stations that are connected to the controller. If no filter stations are connected then set to 0 else up to 6 filter stations can be connected.
Fill run outputs	OUTPUT SETUP	Supervisor	Set this to 1 to create an output that will be used by the pond fill program.
All on/off sensors	ON/OFF SENSORS	Technician	Configure which physical inputs the ON/OFF sensors are connected to
All value sensors	VALUE SENSORS	Technician	Configure which physical inputs the Value sensors are connected to
CCS address	COMMUNICATIONS	Technician	This is the address of the controller when connected to a central system or Mobile Link and should not be changed unless instructed to by a commissioning engineer.
CCS connection type	COMMUNICATIONS	Technician	The CCS connection type. Choose the type which corresponds with the installed communications method.
CCS baud rate	COMMUNICATIONS	Technician	The baud rate for communications over the CCS serial port. This should match the baud rate of the communications equipment (usually radio or modem).
Slave cards	COMMUNICATIONS	Technician	This entry is to activate any slave cards a controller is connected to. Pressing the ON key will detect all the cards connected.
MODULE port	COMMUNICATIONS	Technician	The serial port on the controller used to communicate to the Two-Wire translator or 16TO interface. Valid ports are 2 – Port B and 3 – Port C. Configuring this port will activate all the features of the MODULE system.
MODBUS port	COMMUNICATIONS	Technician	The serial port on the controller used to communicate to MODBUS devices. Valid ports are 2 – Port B and 3 – Port C.
Moisture probes	COMMUNICATIONS	Technician	Number of Sentek moisture probes connected to the controller MODBUS port
MODBUS interval	COMMUNICATIONS	Technician	The amount of time between MODBUS sensor polls
RIC comms timeout	COMMUNICATIONS	Technician	The number of seconds before a RIC poll request fails
RIC status interval	COMMUNICATIONS	Technician	The amount of time between RIC status polls

<b>Menu Item</b>	<b>Section</b>	<b>Access Level</b>	<b>Description</b>
<b>RIC shutoff time</b>	COMMUNICATIONS	Technician	The maximum run time for a RIC station. Do not exceed this time when writing programs for RIC stations.
<b>Watering end</b>	PROGRAM OPTIONS	Operator	The Watering End time is a time of day at which no automatic irrigation is to take place. If an irrigation program is running and this time of day is reached, the program will be stopped and an alarm logged.
<b>Irrigation Method</b>	PROGRAM OPTIONS	Supervisor	The irrigation can be controlled in two ways, time or volume (recorded by Flow 1). If you want the irrigation programs to operate on a time basis set to 1, otherwise set to 2 if to operate using volume recorded by Flow 1. This affects all non-fertigation programs including Manual Control and Manual Cycle.
<b>Fertigation Method</b>	PROGRAM OPTIONS	Supervisor	The fertigation pump can be controlled in two ways, time or volume. If you want the fertigation programs to operate on a time basis set to 1, otherwise set to 2 if to operate using volume.
<b>Cancel when power out</b>	PROGRAM OPTIONS	Supervisor	The controller has the ability to resume any irrigation programs during power up that were running when power was lost to the controller. The Cancel When Power Out setting is the maximum amount of time the power can be off for to resume programs. If the power is off for longer than this time no programs will be resumed.
<b>Station on delay</b>	SYSTEM SETPOINTS	Supervisor	Station on delay is the time after the last station closed before the current station opens. This is used on systems which require the pressure to build up to close the current station or open the next station. The time is in minutes and seconds.
<b>Station off delay</b>	SYSTEM SETPOINTS	Supervisor	Station off delay is the time after the current station opened before the last station closes. This is used to avoid pressure spikes between stations when using slow valves. The station off delay is the opposite of the station on delay so there is no need to use them together. The time is in minutes and seconds.
<b>Last station hold</b>	SYSTEM SETPOINTS	Supervisor	This is the time the last station will remain open after the pump / master valve has been given the signal to stop. This is used on systems where the pressure in the line is to be drained. The time is in minutes and seconds.
<b>Pump delay</b>	SYSTEM SETPOINTS	Supervisor	If the controller is set up to run pumps, the starting of the each pump can be delayed using this setpoint. The delay can be used to stagger the starting of pumps for electrical reasons (ie reduce the starting current into the panel). The time is in minutes and seconds.
<b>All alarm setpoints</b>	ALARMS	Supervisor	See appendix A.

## APPENDIX C: HYBRID CONTROLLER CONNECTION INFORMATION



### Power

- 24VAC in –Bottom row of plugs (as shown in the above diagram). If the Controller has two cards, then power (24VAC) must be connected to both.

### Digital Outputs

- Commonly referred to as Conventional or Local Stations
- Top left of this section, labelled “MV”, (as per diagram) is for Master Valve (MV). The plug labelled “15 or PS1” is Output 15, or Pump Start 1 if applicable. To connect, run a wire from this plug and one from a common (C).
- The other plugs are for Conventional Stations. Connect in the same manner for each Station thereafter. Eg. Output (or Station) 1 and common (C), etc. Up to 15 Stations can be connected on this card when there is only one Master Valve (and no Pump Starts) and up to 14 Stations if a Pump Start is used (to a max of 4), etc.
- If two cards are connected, (such as for a 32 Station Controller), then the common (C) on both cards MUST be linked in order for Current Sense function to work correctly.
- BEFORE Powering Up, check ALL Solenoids using Multimeter, set on Ohms. The reading should be between 30 and 70 Ohms for a standard new coil. Anything 10 Ohms and under requires attention and/or replacement to avoid excessive current draw. (NOTE: Current draw will decrease with age).

### Digital Inputs

- Connected in the same manner as Conventional Stations, Digital Inputs are suitable for two categories, Counting Input or Fault Input.
- Counting Input is designed for instruments such as Pulse Type Flow Meter or Rain Gauge (or Rain Sensor).
- Fault Input is designed for a Door Switch, Pressure Switch, Phase Failure etc. If an instrument requires power and is 24VDC ONLY, (such as a Pulse Flow Meter) then use “V” from Analogue Inputs and a numbered plug from Digital Input for signal wire.

### Analogue Inputs

- For instruments such as a Pressure Transducer, Mag Flow Meter or Moisture Probe. Powered either internally (by Rainman Controller) or externally.
- Internal Connection –Instrument MUST have a supply voltage of 24VDC. (Most instruments are 10-30VDC). Use “V” plugs for power, (as shown in diagram above) and one numbered plug, (ie. 1, 2, 3 or 4) for signal wire.
- External Connection –Instruments have their own power supply and only require connection to one of the numbered plugs and the common (C).

### RS485 & RS232 (Communications Ports)

- “A” Port – RS485 (only) can be used to connect an additional “slave” card for when there are more than fifteen Conventional Stations.
- “B” Ports – RS485 Port can support a TWIN (two-wire card). RS232 Port can support a Weather Station (eg. Weather Master 2000), powered externally.
- “C” Ports – RS485 can also support a TWIN (two-wire card). RS232 Port supports a RIC (Remote Irrigation Controller).
- “D” Ports – RS485 can support a cabled link to a Central Control System (CCS), whilst RS232 Port can support Radio Communications to the CCS.

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