

HERON ELECTRIC COMPANY LTD

# **Basic User and Installation Manual**

**MCI-100S Two Wire Decoder Controller**

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## 1. About This Controller

The MCI-100S is a sequential irrigation controller that operates 24V AC solenoid valves via "decoders". Up to 100 decoders can be connected to the controller via a common two-wire cable.

## 2. Installation

**WARNING** Installation should be carried out by a Competent Electrician.

### Mounting the MCI-100S Controller

The controller should be mounted on a wall using four screws, one screw through each corner lid bolthole.

Warning: Additional holes should not be drilled through the controller casing.

Do not mount the controller in direct sunlight. Do not mount the controller where it can be exposed temperatures above 40 deg C.

### Connecting Mains Supply

**IMPORTANT.** Switch off the mains supply before connecting the controller.

Check that the mains supply voltage IS the SAME AS the VOLTAGE OF the CONTROLLER. The controller voltage is displayed on the inside the controller casing. The mains supply should be fused with a 3 amp fuse and be connected via a Residual Current Circuit Breaker as per any equipment used in damp conditions.

Connect the mains supply to the three terminals inside the IEC plug Live to L, Neutral to N and Earth to E as shown in Fig 1.

### Installing Decoders

Never expose decoders to direct sunlight or in locations where they be exposed to ambient temperatures of more than 38 deg C. In warmer climates this will necessitate installing in valve box underground.

The solenoid output voltage is an **Extra Low Safety Voltage**. Keep solenoid cables and connections well away mains voltages as per regulations for Extra Low Safety Voltages.

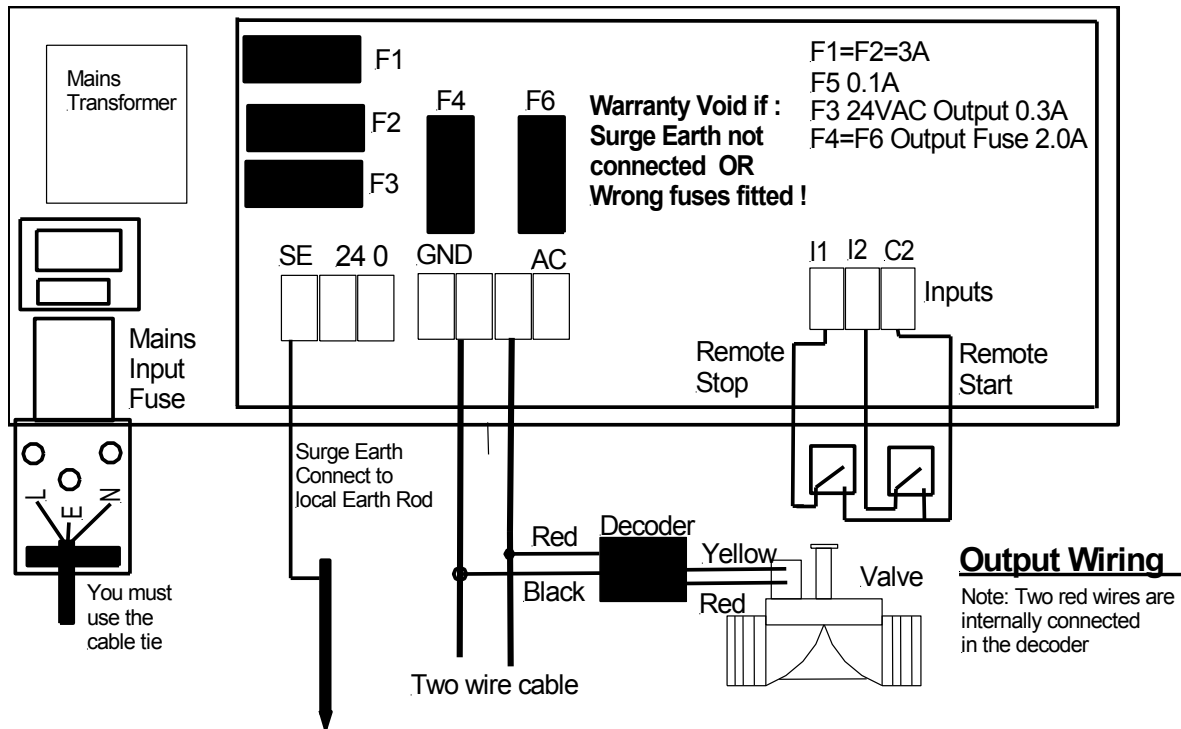
It is recommended that a two wire waterproof cable eg. polythene cable or similar, is used to connect the decoders. All cable joints must be sealed to minimise water ingress.

The controller gives out 30VAC to power 24VAC solenoids. This larger voltage allows for voltage drop in the two wire cable. If you are connecting solenoids close to the controller (less than 200m) there will be little voltage drop and you should check that the solenoids are capable of withstanding a voltage as high as 30VAC.

The decoder outputs are on the following wires. The return wire from the solenoid valves is wired to either of the red wires.

	<i>1st Serial No.</i>	<i>2nd Serial No.</i>	<i>3<sup>rd</sup> Serial No.</i>
Serial No. controls decoder output on	YELLOW wire	WHITE wire	PURPLE wire

# Fig 1 Output Wiring



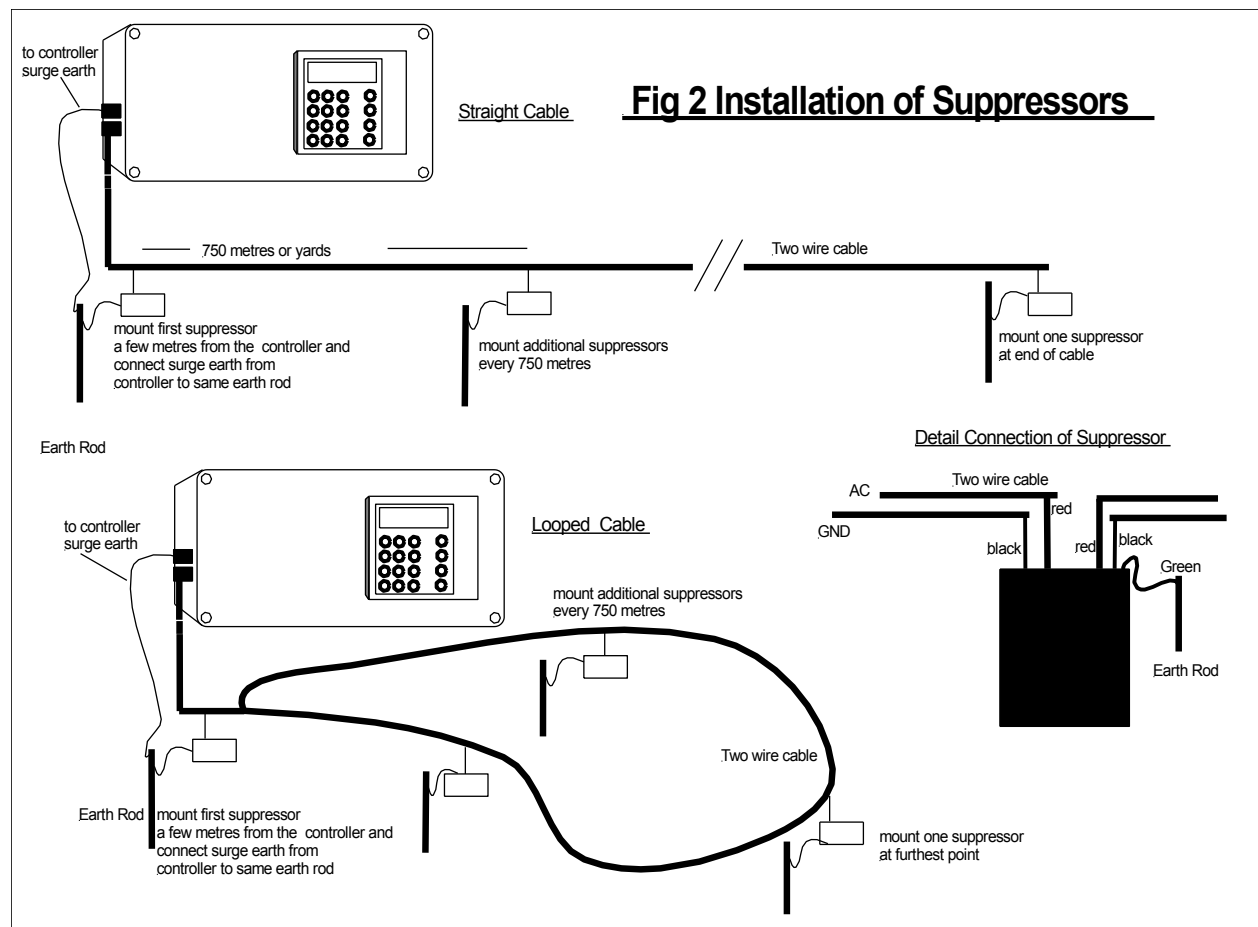
**IMPORTANT: YOU MUST CONNECT SURGE EARTH!!!!!!!**

## Pump Start

The MCI-100S **does not have** a pump start output. To facilitate a pump start output you must purchase a Heron Two Wire Pump Start. There are a number of options available. Never connect any relay across the two wire cable.

## Cable Earth Points

Cable earth points should be wired to the cable with earth rods as also shown in Fig 2. A minimum of 3 should be installed for a looped cable and a minimum of 2 for a straight cable. Additional cable earth points should be wired every 1000 m if necessary. Failure to wire these earth points will make the controller liable to surges caused by lightning which may causes serious damage.



### 3. More Inputs and Outputs

#### Remote Start

The remote start input is across "I2" and "C2". Joining these terminals will start program 1. The terminals have to be connected for only a short period, 1 second, to activate the program. If the contacts are left shorted program 1 will continually cycle.

#### Remote Stop

The remote stop input is across "I1" and "C2". Joining these inputs halts the irrigation programs. The programs will continue once the short is removed.

This input may be connected to a float switch in the water reservoir so that the irrigation sequence is halted if the water level is low.

When the remote Stop Input is active the following messages can be displayed depending upon Options 9 and 10.

#### Low Tank

"Low Tank" indicates that the water level in the storage tank is low. The irrigation program will temporarily stop. Once the water tank has been filled, the irrigation program will start again.

#### Freeze

"Freeze" indicates that a sensor connected to the remote stop input has been activated. Once the freeze condition has been removed from the input, the irrigation program will start again from the point at which it was temporarily halted.

#### Stop

"Stop" indicates that a sensor connected to the remote stop input has been activated. In this case, the irrigation program will not restart when the remote stop condition is removed.

#### PC Connection

The PC connection is white 4 Pin connector on the top side of the processor board. (The processor board is mounted in the lid.) Plug a Heron RS232 interface onto this connector (RS232INT-B) to allow your controller to be connected to a PC running Ground Control software.

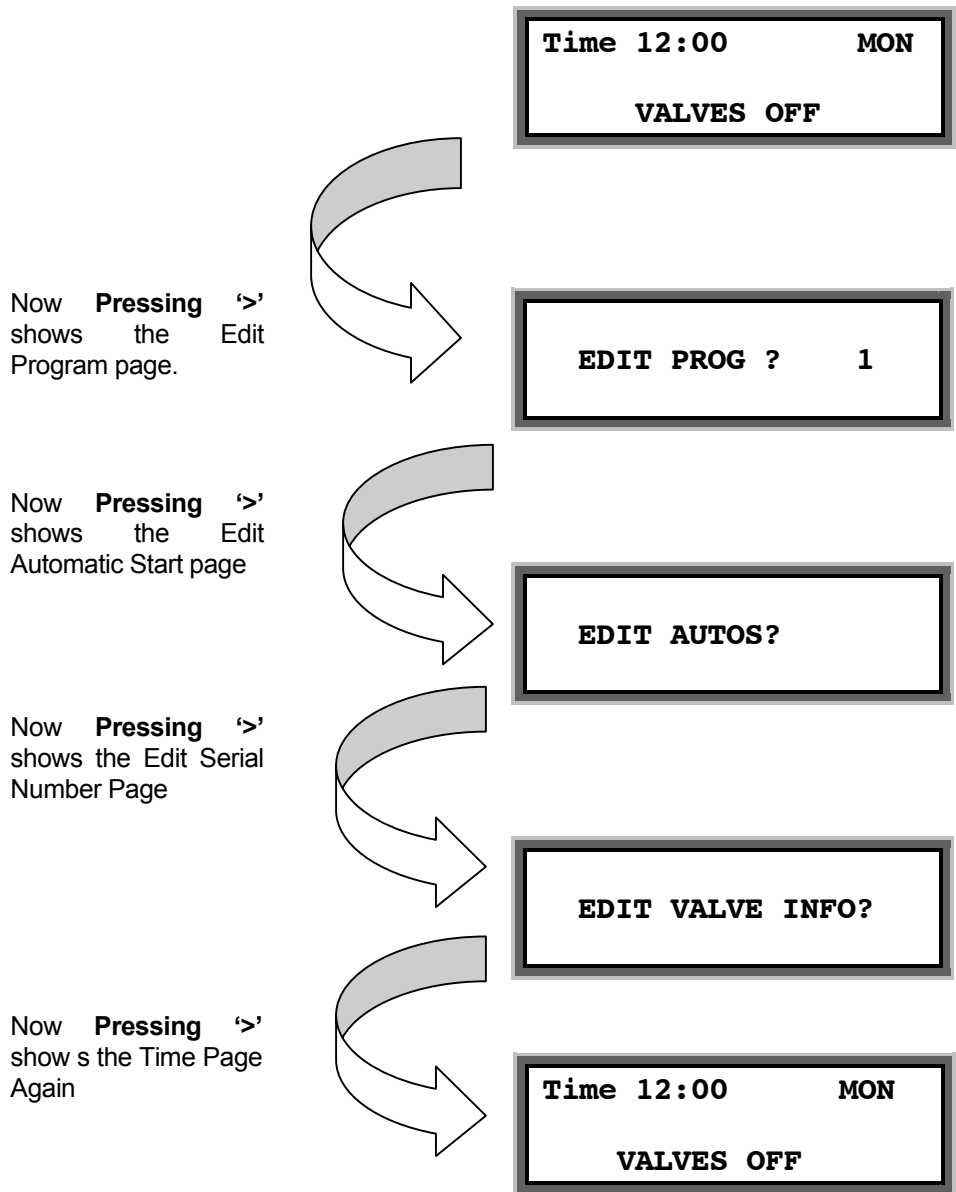
#### 24VAC Permanent Output

A 24VAC permanent output is available across the terminals marked 0 and 24. This output is to supply low power 24VAC devices such as Heron interface cards and the Heron GSM module. This output is fused with a **0.3A** fuse.

**DO NOT** use this output to power a pump contactor as these devices normally take more than 0.3A .

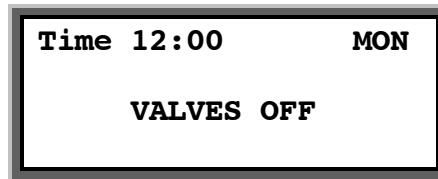
## 4. Getting to know your controller

When you switch on the power the **Time Page** is displayed as shown below.



Pressing **Select** at the appropriate page will take you into either the Irrigation Programs, the Automatic Starts or the Valve Properties.

## 5. Resetting the Clock and Day



When your controller is first powered up the "Time Page", as shown above, is displayed.

To reset the time and day:

- Press and hold down the **"0"** key for five seconds. A black flashing cursor will appear over the hours field.
- Use the number keys to enter the correct hour.
- Move the cursor to the minutes field by pressing the arrow forward **">"** key. Use the number keys to enter the correct minutes.
- To change the Day of the Week press **">"** to move the cursor over the day. Now press **'Select'** to toggle through the days.
- When you have reset the time, press the **">"** twice or wait 15 seconds key again. The black flashing cursor will disappear.

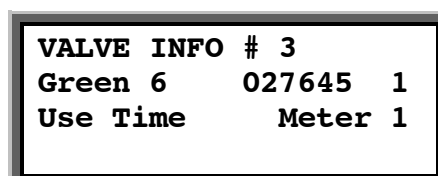
## 6. Setting Decoder Serial Numbers / Changing Valve Names

Valve information page allows you to set the properties of a valve. You can specify:

- Enter the decoder serial number
- The valves name
- Whether the valve runs on time or flow.

Note: A valve name consists of a prefix and a number. The standard prefixes are Valve Green and Tee. Additional prefixes can be programmed using Ground Control software.

From the **"Time Page"** press **'>'** until the **"Edit Valves Info?"** page is displayed. Press **'Select'** and the following page will be displayed.





### Line 1 of the Display

**IMPORTANT** The **Valve Information Reference Number** is shown on the top line, number 3 in the above example. You will need to use the Reference Number to set up your irrigation programs **as** described in the next section. Furthermore, any valve errors are reported using the Name Reference Number

### Line 2 of the Display

Move the cursor over the valve name and press the '**Select**' key to toggle through the prefix names.

Press arrow forward key ">" to move the cursor to the Valve Name Number. Use the keypad to enter the Valve Name Number desired. In the example above, the valve name has been set to "Green 6".

The next number on this line of the display is the decoder serial number. Move the cursor to the decoder serial number using the ">" key and enter the decoder serial number.

The final number on this line of the display is the card number. See advanced options manual.

### Line 3 of the Display

The next line of the display allows you to select whether the valve operates in **Time or Volume**. Press the **Select** key to toggle between time and volume.

If you wish to irrigate on volume then you must select the flow meter. Flow Meter 1 will be on card 1 and flow meter to 2 will be attached to card 2.

In the example above, VALVE 01 will irrigate on time and is using Flow Meter 1.

If irrigation programs are to irrigate by time and no flow meter is connected, then the '**Meter**' value should be set to '0'.

A maximum of two flow meters are permitted.

## 7. Your First Irrigation Program

By means of an example this section describes how to set an irrigation program and an automatic start. The example will set **Valve 1 for 10 minutes, Valve 2 for 5minutes** in irrigation **program 1**. An **automatic start** will be set to start the irrigation **program 1** at **6.00 am**.

### Setting the Irrigation Program

From the "Time Page" press '>' to display the "Edit Program" page.

```
EDIT PROG ? 1
```

Now press Select to edit Program 1 and the "Enter Valve Times" page, as shown below, will be displayed.

```
1 VALVE 1 1:00
1 VALVE 2 1:00
1 VALVE 3 1:00
1 VALVE 4 1:00 1
```

We want VALVE 1 to run for 10 minutes and VALVE 2 to run for 5 minutes.

Use the ">" key to move the flashing cursor over the minutes fields for Valve 1. Use the number keys to enter the required minutes value.

Again Use the ">" key to move the flashing cursor over the minutes fields for Valve 2. Use the number keys to enter the required minutes value.

```
1 VALVE 1 10:00
1 VALVE 2 5:00
1 VALVE 3 1:00
1 VALVE 4 1:00 1
```

When you have finished press the 'Return' key. The "Edit Program" page will be displayed.

Press the backwards arrow "<" key to return to the "Time Page".

**Note:** The numbers on the left column are the zone numbers. These indicate what valves, if any, run together. In the above example all valves are in the same irrigation Zone (Zone 1) so no valves will run together.

The number in the bottom right hand corner of the display is the "line number" for the valve that the cursor is currently positioned on.

## Setting the Automatic Start Times

From the "Time Page" press the ">" key twice to display the "Edit Autos" Page.

<b>EDIT AUTOS?</b>
--------------------

Now press Select to edit the Automatic Starts.

<b>AUT START 1</b>		
<b>OFF</b>	<b>OFF</b>	<b>OFF</b>
<b>0:00</b>	<b>0:00</b>	<b>0:00</b>

Now enter 6 under the first automatic start for 6:00 am start time.

<b>AUT START 1</b>		
<b>OFF</b>	<b>OFF</b>	<b>OFF</b>
<b>6:00</b>	<b>0:00</b>	<b>0:00</b>

You must now activate the start time by pressing the "Select" button whilst the flashing cursor is still positioned on the start time you have just entered. You will see the display above the start time change from "OFF" to "PRG1".

<b>AUT START 1</b>		
<b>PRG1</b>	<b>OFF</b>	<b>OFF</b>
<b>6:00</b>	<b>0:00</b>	<b>0:00</b>

"PRG1" indicates that a start time has been activated and assigned to program 1. To assign an automatic start to a different program, press the "Select" button repeatedly to toggle through the programs until the one you want is displayed.

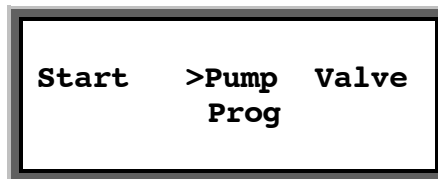
To enter a second automatic start time, press the arrow forward key ">" until it is positioned on the first zero of the second start.

To return to the "Time Page" press the 'Return' key followed by the backwards arrow "<" key twice.

**Congratulations.... You have now set up your first irrigation program.**

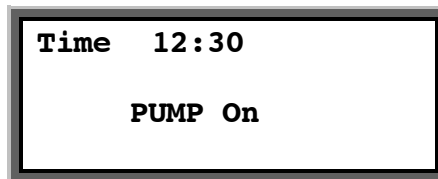
## 8. Starting and Stopping

To manually start the **pump, a valve or an irrigation program** press 'Start/Stop' and the following page will be displayed.



### Pump Start

With the flashing arrow pointing at **"Pump"** press **"Select"** to start Pump 1. The display below will be shown.



### Valve Start

Press the arrow forward key **">"** to position the flashing arrow to point at **"Valve"**.

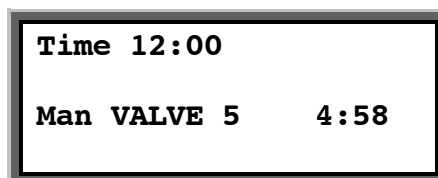
Press **"Select"** and the page below is shown.



Use the forward and backward arrow keys to enter the number of the valve to be started and the number of minutes for the valve to run.

In the example above valve 5 has been set to run for 2 minutes.

Now press **"Select"** to start this valve. After 3 seconds the **"Time Page"** will be displayed as shown below.



### Program Start

To start an irrigation program press the arrow forward key **">"** to move the flashing arrow to point at **"Prog"**. Press **"Select"**.



Enter the number of the irrigation program to be started. Press **"Select"** to start the irrigation program.

After 3 seconds the time page will be displayed showing the program running.



## Manual Stop

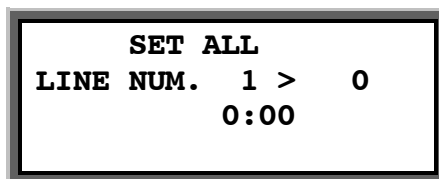
Pressing **"Start/Stop"** at any time when a program, valve or pump is running will stop the program, valve or pump immediately.

## 9. A Couple of Short Cuts

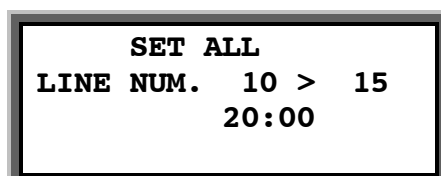
### Set All

When setting up an irrigation program, the **'Set All'** key is a quick method of setting a number of valves to the same time.

When the **"Enter Valve Time"** page is displayed, press the **"Set All"** key. The following page will be displayed.



Using the arrow forward key ">" and the keypad, the range of valves to be set to the same run time, and the run time itself, can be entered. In the example shown below, valves between line number 10 and 15 have all been set to run for 20 minutes each.



The line number is the position in the program and is shown in the bottom right hand corner of the **"Enter Valve Times"** page.

Pressing **"Set All"** again will return you to the program and set the times.

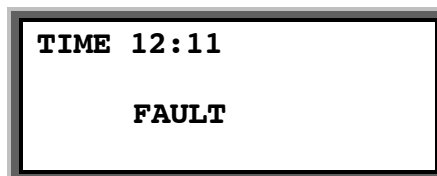
### Manual Advance

When the irrigation program is running, press **"Manual Advance"** to move the program onto the next valve in the sequence.

This can be useful when testing your system.

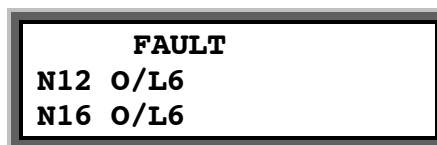
## 10. Faults

If a fault occurs whilst the controller is running a watering program, for example a cable breaks, then the following display is shown.



**TIME 12:11**  
**FAULT**

The nature of the fault is displayed by pressing '>'. The Fault Page will be displayed.



**FAULT**  
**N12 O/L6**  
**N16 O/L6**

In the example above the Fault Page indicates that current Over/Load 6 (O/L6) has occurred on valves with Valve Reference Numbers 12 and 16.

**IMPORTANT:** To find the appropriate decoder serial number and/or valve name from the Valve Reference Number go to the Serial Number Pages.

Controller Displays	Fault	MCI-100s Response	Action
<b>CAB O/L1</b>	Two wire cable line loading not OK (see Testing in)	All irrigation programmes will be immediately stopped	Refer to Next Section ' <b>Testing</b> '
<b>CAB O/L2</b>	Short on two wire cable. Short equivalent to 330 ohms	All irrigation programmes will be immediately stopped	Check Cable
<b>CAB O/L3</b>	Short on two wire cable. Short equivalent to 100 ohms.	All irrigation programmes will be immediately stopped	Check cable
<b>CAB O/L4</b>	More that 1.6A being drawn when valves operating	Controller will advance to the next valve or valves in the program	Check solenoid coil current and number operating at the same time.
<b>Nx DECO</b> x=valve reference number	No acknowledgement from decoder when switching on	Current and subsequent irrigation programmes will continue as normal. If 20 faults occur all programs will stop.	Find the decoder with the 'valve reference number'. Check decoder serial number is correct. Check decoder is connected and is connected the correct way round. See also next Section ' <b>Testing</b> '. Finally try the decoder locally at the controller.
<b>Nx OFF</b> x=valve reference number	No acknowledgement from decoder when switching off	All irrigation programmes will be immediately stopped	Find the decoder with the 'valve reference number'. Retry the decoder many times to see if problem repeats. Check joints to decoder. If decoders still fail try decoder locally at the controller. See also next Section ' <b>Testing</b> '.

## Clearing Fault Conditions

The fault page is cleared by manually starting and stopping an irrigation program.

## Optical Fault

If 'OPTICAL FAULT ' is displayed it means that the optical link is not working correctly. Check that F3 is not blown.





## 11. Taking Care of Your Controller

**Never** - use sharp objects to press the buttons on your controller. Avoid pressing the buttons with your finger nails.

**Always** - ensure the lid screws are screwed down tightly to keep the inside of the controller dry and to reduce exposure to high humidity.

## 12. Changing Configuration Options

This section describes the basic options you can set on your controller. There are just 15 basic options. If you need to use the more advanced features please refer to the 'Advanced Options' manual.

To access the configuration options, on the "Time Page" press and hold down "Manual Advance" button for **10 seconds**. The following page will be displayed.

OPTION		
1	2	3
8	3	0

The arrow forward key ">" is used to position the cursor under the option you want to change. Use the keypad to enter the required number, as described below, to activate the option.

In the example above, Option's 1,2 and 3 have been set to 8, 3 and 0. When the required options have been set, press the "Return" key. The 'Time Page' will be redisplayed.

**IMPORTANT:** Always fully test any new configuration after you have changed any options to check the controller functions as you require.

**Note:** You irrigation installer or dealer may have already set the configuration options to the required values for you.

The 15 basic options are listed below.

Option	Brief Description	Default Value
Option 1	Set number of valves.	48
Option 2	Set number of Daily automatic starts.	0
Option 3	Set number of Weekly automatic starts.	3
Option 4	The number of irrigation programs	1
Option 5	Set pump pressurisation time in minutes.	0
Option 6	Set pump pressurisation time in seconds.	2
Option 7	Rain sensor connected and number of historical rain days	0
Option 8	Spare	0
Option 9	Controller does a permanent Stop instead of Freeze	0
Option 10	Display Low Tank instead of Freeze or Stop	0
Option 11	Use Percentage Up and Down	0
Option 12	Spare	0
Option 13	Use 'Disable Automatic Starts' facility	0
Option 14	Spare	0
Option 15	DISPLAY ADVANCED OPTIONS (OPTIONS 16 TO 77)	0

## Number of Valves (Option 1)

Option 1 is maximum number of valves you can assign and the maximum number of valves in a program. Set it to the maximum number of decoders you wish to assign.

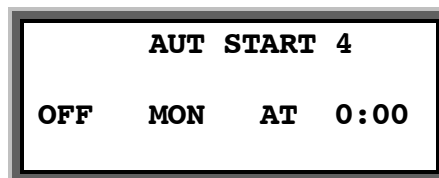
## Number of Daily Automatic Starts (Option 2)

If you need to increase or decrease the number of Daily automatic starts change Option 2. Enter the required number under Option 2. There will be no change to the operation of the controller just more Daily automatic start pages will be displayed. (Values between 0 and 30 are allowed).

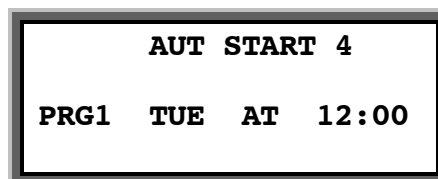
## Number of Weekly Automatic Starts (Option 3)

If you need to increase or decrease the number of Weekly automatic starts change Option 3. Enter the required number under Option 3. Values between 0 and 32 are allowed.

When weekly programming is selected an additional page will be displayed for each automatic start. The "Weekly Automatic Start" page will be displayed at the end of all the "Daily Automatic Start" pages. Press the ">" key to move through the "Daily Automatic Start" pages until the first "Weekly Automatic Start" page is displayed. An example is shown below.



- To enable the automatic start move the cursor under 'OFF'. Now press the **Select** button to select the program.
- To set the day of the week move the cursor under **MON**. and press the **Select button** repeatedly to change the day of the week.
- Set the time move the cursor under the time and change it.



In the example above Program 1 will start at 12:00 on Tuesday.

## Number of Irrigation Programs (Option 4)

Set option 4 to the number of irrigation programs you need. A maximum of 16 irrigation programs are allowed. If this is option is not set the controller will use just one irrigation program.

Once you have set this option you can then modify and use more than one irrigation program. Modification of additional irrigation programs is exactly the same as modifying Irrigation Program 1. All you have to do is set the number of the program you want to edit.

## Pump Pressurisation Time in Minutes (Option 5)

The pump pressurisation time (in minutes) can be set with Option 5. (Values between 0 and 99 minutes are allowed).

## Pump Pressurisation Time in Seconds (Option 6)

The pump pressurisation time (in seconds) can be set with Option 6. (Values between 0 and 99 seconds are allowed).

## Rain Sensor to Reduce Watering (7)

The Heron rain sensor allows the irrigation program to be reduced depending on the amount of rain that has fallen over the last few days. Two trip points can be set.

If you have a rain sensor, set Option 7 to the number of days you wish the rain sensor to work over. For example if you set Option '7' to 3 then rain that has fallen within the last 3 days will still be included in the rain fall measurement. The maximum value you can set option 7 to is 4.

Setting Option 7 to zero will disable the rain sensor.

### Connecting the Rain Sensor

Connect the two terminals inside the rain sensor to Input 2 (across "I2" and "C2"). The terminals in the rain sensor are accessed by removing the bottom of the rain sensor.

### Using the Rain Sensor

When option 7 is set, the rain page is displayed after the Automatic Start pages. Press ">" or "<" to view the page. The rain page is shown below.

<b>RAIN FALL 2mm</b>		
<b>ADJ</b>	<b>50%</b>	<b>100%</b>
<b>TRIP</b>	<b>4</b>	<b>9</b>

On the rain page you can set two trip points in mm of rainfall. When these trip points are met irrigation programs will run for either:

- 50% (half) of their normal time
- 0% of their normal time (i.e. not run).

To set a trip move the cursor under the appropriate percentage (50%, or 0%) and enter a number. In the example above trip points have been set at 4 mm and 9 mm.

### Testing the Rain Sensor

The rain sensor can be tested by pressing the spoon down inside the rain sensor. Pressing the spoon down every 10 seconds will increment the rainfall by 1 mm. If you press the spoon enough times so that a trip level is reached you will see a reduction in the irrigation watering programs.

#### **Note:**

- The rain sensor has no effect on a manual valve start
- One minute must elapse before the percentage reduction will be registered after the threshold is reached.

## Remote Stop Option (Option 9)

This controls whether irrigation programs should freeze or permanently stop when the remote stop input is activated.

Set option 9 to '0' to freeze irrigation programs. Irrigation programs will start again from the point at which they stopped when the remote stop condition is removed.

Set option 9 to '1' to stop irrigation programs. Irrigation programs will not automatically start again when the remote stop condition is removed.'

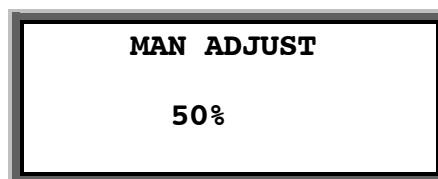
## 'Low Tank' Display (Option 10)

Option '10' changes the remote stop input message to 'Low Tank'. To display 'Low tank' instead of 'Freeze' or 'Stop', set option '10' to '1'. Default is '0'.

## Percentage Up and Down (Option 11)

Percentage Up and Down allows all irrigation run times to be temporarily adjusted by a specified percentage (0%-250%). With Option 25 set to '1' the following page will be displayed after the Automatic Start pages.

If no increase or decrease is required, then the percentage value must be set to 100%.

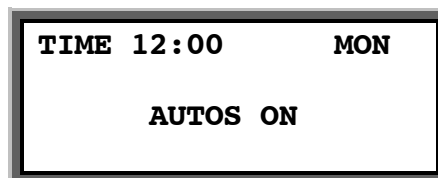


In the example above irrigation programs will run for half their normal time.

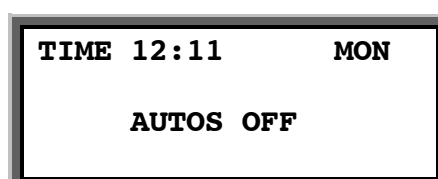
**IMPORTANT:** Do not leave the percentage value at 0%. No irrigation will run.

## Automatic Start / Disable (Option 13)

Option 13 allows all automatic starts to be disabled by pressing and **Holding** the **Select** key when on the "Time Page". When automatic starts are active the controller will display the following: -



If the **Select** key is pressed the controller will then display the following and all automatic starts will be disabled until the **Select** key is pressed again.



## Enable and Display Advanced Options (Option 15)

If you wish to use the 'Advanced Options' set Option 15 to 1. Advanced Options are Options 16 onwards.

With option 15 set at 0 you will not be able to access the Advanced Options. Furthermore, the controller will ignore the value of all Advanced Options if Option 15 is 0.