



CLOUDMASTER

Operation Manual



C | L | O | U | D | M | A | S | T | E | R



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I'm In A Hurry

If you want to be up and running fast with Cloudmaster, just take a look at the 3 points listed at the beginning of the section 'Using The Operations' on page 10.

Reading sections 2 and 3, however, will give you a much more solid understanding of the controller's capabilities and keyboard operating procedures. Most of this manual can be treated as reference information; it does not need to be read cover to cover.

1 Introduction

Thank you for purchasing our Cloudmaster controller. We will do our best to make the experience one that you will be happy with for many years.

Jeffery Electronics is a Sydney based company with over 60 years experience in nursery and irrigation electronics. Our equipment has been installed extensively throughout Australia and many countries around the world.

By specialising in electronic control and using up to date technology and production techniques we are able to produce and support a cost effective, powerful product. We are, however, aware that technology is constantly improving and techniques and ideologies are always changing. Hence we are always eager to get feedback from our clients, be it in the form of criticisms or suggestions for future product development. A user response sheet can be found in appendix C for this purpose. Company contact details are:

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This document serves as an operator's reference manual, going into the keypad and SMS operation of the standalone Cloudmaster controller. The unit can be directly or remotely connected to a standard Windows based PC or notebook computer. Single or multi site versions of the Cloudmaster software are available to make programming simpler and to compile detailed reports such as water consumption, soil moisture levels and history log of all system activity. Operation of the PC software is documented separately.

Many advanced features of the Cloudmaster need to be enabled or turned on before they become operational. This philosophy enables a unit to be, in effect, customised to suit many applications from a simple 10 station stand alone irrigation controller to a PC based, 400 station, radio telemetry/phone/internet linked irrigation and floodlight control network using flow meters, soil moisture probes and environmental sensors. The example LCD displays depicted in this manual may vary from your own controller slightly depending on how your controller is configured. These differences are mentioned where confusion may result. For more information on these features see Section 3 - Using The Operations and OP70 Customise Unit's Functions.

Like any piece of equipment, the basics must be learned. To gain a solid understanding of the day-to-day keyboard operations, all of section 2 and section 3 up to 'OP40 Set time' should be read, preferably whilst pushing the buttons on the controller, which need only be plugged into a power outlet. Once learnt, the display messages are intuitive enough that reference back to the manual is rarely required.

Software Version (V3.0.6)

Cloudmaster is constantly being developed. The screen examples and features described in this manual may vary slightly from your unit but the basic programming philosophy and operations have not changed since the first version was released back in 1989 so most of

the information will be relevant to you regardless of how old your unit is. Display the version using OP90 and contact JEC to discuss getting your unit upgrading your controller to the latest version.

10 / 20 Station Versions

From serial number 2000, the 10 and the 20 station versions were combined into the one hardware unit. When a 10 station unit is purchased, an internal setting disables the upper 10 stations. The purchaser can decide, at a later date, to have these stations re-enabled. OP90 can be used to display the present setting by showing CM10 or CM20.

Station 0 Labelling

From serial number 2000 the Cloudmaster station numbering scheme was changed from starting at 0 to starting at 1. In instances where a client wishes to maintain compatibility with legacy Cloudmaster units the controller can be changed back to the original numbering scheme. Refer to section 12 – Changing First Station 0 or 1.

Use of the Terms 'Station' & 'Watering'

Cloudmaster is used in a wide variety of applications to control and monitor various asset types. The term 'Station' is used by the irrigation industry when controlling a solenoid valve. The term 'Channel' or 'Output' would be more appropriate if it was a lighting circuit that was being controlled. Treat these terms as interchangeable.

Similarly, in this manual the term 'Watering' is only used when specific to the irrigation application. For example, the term 'program' or 'timeclock program' is used instead of 'watering program' to signify any output event that is programmed to occur at a regular time of the repeat cycle.

2 Programming Methods

The Cloudmaster unit can be programmed to turn stations on using 6 various methods. This choice means most irrigation, lighting and security situations can be catered for. Once entered, program information can be viewed and modified with OP01 'Display or modify PROGRAM'.

Single Station Events - Repeat Cycle

Individual station events can be setup by specifying station number, start time, stop time (or volume if enabled), days of repeat cycle (1 to 28 days) to be included and finally fertiliser (if enabled) start time and duration. This allows stations to be programmed totally independently of each other and run time durations of up to 24 hours. See OP02 'Enter new station program' for details and an example.

Programs - Repeat Cycle

A program of stations can be entered by specifying start time, days of repeat cycle that the program is to be run, and then station number and duration (or volume if enabled) of any number of stations. Each station will start the instant the previous one has finished. Stations can be run in any order and durations (1 to 250 hours, minutes or seconds) and volumes can be changed throughout the program. If a station does not turn on for any reason, for example, if it has an open circuit wire then a warning message will be logged and the program skips immediately to the next station. The following operations are used with programs:

- OP01 Display or modify program
- OP05 Delete a program
- OP06 Delete all programs
- OP08 Enter a watering program
- OP11 Stop, start pause a program
- OP12 Change a program by a % (water budget).

A program can be temporarily disabled without deleting it from memory by turning off (set to ':') all days of the repeat cycle that the program is to operate. This is also a useful method of setting up manual start programs that are never to operate automatically.

Date Events

Variations to both methods above entail specifying a date that the event or program is to occur instead of days of repeat cycle. This provides the facility to program a once only event a long time in advance. This is useful when controlling lighting, security etc. The date facility must be enabled with OP70 Customise Unit's Functions before it can be used. Once the event has occurred it is automatically deleted from memory.

Override Station Operations

The timeclock program can be overridden using OP03 'Override a station on/off' at any time. Any running station can be turned off or one or more stations can be turned on immediately until a specified off time, for a duration of 1 to 999 minutes (or seconds/hours if enabled) or for a certain volume of water (if enabled). Refer to Section 4 – OP03 Manual Override a Station for more details.

Loop Cycle

The loop cycle has been used in both hydroponics and propagation applications. A program of stations can be setup with duration times down to 1 second (if second durations are enabled with OP70). An interval can be setup between each repetition and this repeat cycling can be enabled and disabled at certain times of the day.

For example, you may wish to cycle through stations 2, 6, 10, 5 and 3 applying 10, 15, 15, 5 and 10 seconds respectively. You may wish this cycling to occur constantly between the hours of 6:00 AM and 7:00 PM every day of the week with an interval of 30 minutes between repetitions. Any number of these loop cycles can be setup to run simultaneously and any of these parameters can be changed at any time. Loop cycles are entered with OP09 'Enter a Loop program'.

It should also be noted that a loop cycle will automatically start at any time of the day. If, for example, a power fail occurred during the day, the loop cycle would start up automatically when power was restored provided the time of power restoration was within the loop cycle start & stop times.

A loop cycle can consist of a single station which means a single station can be pulse watered independently to any other station.

Syringe Cycle

The Syringe function provides a method of quickly and easily initiating a commonly used program of stations. Use cases could be a quick cycle to remove dew from a golf course or playing field, a maintenance cycle for checking sprinkler heads and valve operation or a quick manual start program to apply extra water during very hot weather.

The Syringe cycle is identical to a standard program in that it can be displayed, edited, %changed, manually started, stopped or paused. Station numbers do not need to be sequential and a different duration can be specified for each station. The difference is that a Syringe cycle does not have a start time or days of repeat cycle and OP62 is used to enter the Syringe cycle rather than OP08. Once the Syringe cycle is entered, OP10 can be used to start the cycle quickly and easily simply by pressing the keys 'OPERATION', '1', '0', 'ENTER'. Only one Syringe cycle can be entered. OP62 will ask you if you wish to delete the existing syringe cycle if one already exists.

Fertiliser Application

Once enabled, fertiliser details can be entered in single station events described above. As irrigation start/stop times and fertiliser start and duration details are entered separately, any pre and post wash times can be setup. Note that fertiliser cannot be applied using loop or programs. The fertiliser facility is enabled by OP70 Customise Unit's Functions. An example is given in 'OP02 Enter new station program'.

Soil moisture controlled programs

When the correct type of soil moisture probes are connected to the Cloudmaster unit, soil moisture threshold levels can be set to disable programs. This feature must be enabled using OP70 before it comes into effect. Once it is in effect, during entry of the above programs, the operator is asked whether the program is to be moisture controlled and, if yes, which soil sensor, level and threshold moisture level is to be used.

For a detailed discussion of soil moisture sensing see 'Section 9 - Soil Moisture Sensors'.

3 Keypad & Display Operation

The Display

The Cloudmaster display consists of a 16 character by 2 line, permanently backlit liquid crystal display. This display is used for all programming and displaying of current status, error information and logged history.

12/24 Hour Clock Notation

Whenever programming is not taking place the display shows the date and time. From firmware version 3.0.6 OP70 can be used to select between 12 and 24 hour clock notation. The LCD examples in this manual are shown using 24 hour notation. When in 12 hour mode, the 'a' and 'p' character can be changed with the '0/CHG' button. The following examples reads Thursday 23rd of September at 17:10:34 or 5:10 P.M. and 34 seconds.

Cloudmaster Th23SE 17:10:34
--

Cloudmaster Th23SE 05:10p34
--

The repeat cycle is the number of days that the controller will repeat its program. It can be any value from 1 to 28 days but is usually set to 7 days in which case the day of week ('Th' in the example above) indicates the current day of cycle. The current day of the repeat cycle appears in the top right hand corner of the display if the repeat cycle is set to any value other than 7 days.

LCD Status Line

The bottom line of the display is used to scroll through current activity, warning messages and, if enabled, the 24 hour totals. This tells the operator what is currently turned on and warns of any problems that have occurred without having to press any buttons. The arrow keys can be used to move and hold the message for easy reading. For example:

1. - **Power Failure 02:27/17 to 04:12/17**
2. - **Stn 26 118minrem, Stn 12 06:00-06:20 - Stn 19 Paused**
3. - **Irrigation off - Rain**
4. - **Stn 6,14 shorted - Stn 57 open cct.**

Example 1 shows power was lost from 2:27 AM to 4:12 AM on the 17th of the month. Example 2 shows station 26 is currently active and has 118 minutes to run, station 12 turned on at 6:00 AM and is due to turn off at 6:20 AM and a program has been paused at station 19 and is awaiting restart. Example 3 indicates irrigation has been disabled automatically due to the rain sensor. Example 4 indicates station 6 and 14 both have shorted wires and station 57 has a broken wire. A faulty solenoid valve coil could also cause these last 2 warnings to appear. Warning messages are cycled constantly until cleared with OP15 Clear all warning messages.

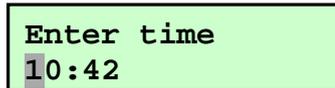
5. **12Cy, 17370LA, 410LU, 20LL, 205Mwa, 180MSP**

This last example shows 24Hr totals of 12 loop cycles have run today and 17,370 litres of water has been applied to stations. Unaccountable flow of 410 litres which is water applied

when more than one station was on at once. Twenty litres of leakage has been detected which is water that was sensed going through the main line when the controller had no stations on. Irrigation stations have been running for a total time of 205 minutes and special stations, such as lighting control stations have been running for a total of 180 minutes. Only non zero values are displayed. Refer to OP71 for details about how to setup daily totals.

The Character Cursor

The cursor is a blinking block which indicates where numbers will be entered into the display from the keypad and to select from a range of options. The cursor is moved to the next character every time a number is entered or a selection made. See also 'The Arrow Keys' in the following section. The example below shows the cursor sitting on the '1'.



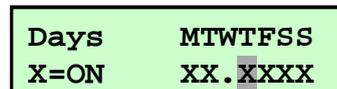
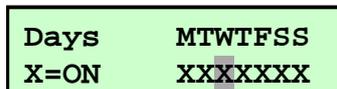
The remaining LCD examples given in this manual will not show the cursor unless it is pertinent to the topic being discussed.

The Keypad

The keypad consists of 15 keys. Note, these are true, discrete, tactile key switches. It is NOT a membrane keypad. These keys are divided into numeric and control keys.

The Numeric Keys

The 10 numeric keys are used to type numbers into the display at the present cursor position. The '0/CHG' key is also used to change or toggle the setting currently displayed. For example, When selecting days of the repeat cycle a '.' (period) character indicates the day is omitted and an 'x' character indicates the day is included. To turns days on and off move the cursor to the required day and press the '0/CHG' key. The following examples show all days on, and immediately after, Wednesday has been turned off with the '0/CHG' key. Note the cursor is automatically moved to the right after the key was pressed.



The 'OPERATION' Key

This key is used to select any of the 99 operations. When this key is pressed, a brief description of the operation is displayed. For convenience, the last operation performed is displayed as a starting point. If the number of the operation required is known (note all commonly used day to day operations are listed on the front of the unit) then it can be entered directly into the numeric pad. If the required operation is not known, then each operation description can be stepped through with the arrow keys. In this way, any operation can be found without having to remember its number. Once the description for the required operation is displayed, pressing the 'ENTER' key will start the operation. See also next section 'Using The Operations'.

The 'ENTER' Key

This key is used to enter or accept the information currently displayed, and proceed to the next step. A valuable rule of thumb is to press this key whenever the information displayed is correct or is what you want to do.

The Arrow Keys

The left and right arrow keys can be used to search for a particular operation so operation numbers do not need to be memorised. See next section 'Using The Operations' for an example.

These keys are also used to position the cursor to a point in the display where a change is required. For example, to change a duration value from 20 to 45, position the cursor over the '2' with the arrow keys and type the numbers '4' then '5'. Leading 0's can be used to

reduce a value by one digit. For example, to reduce a volume value from 5000 to 750, position the cursor over the '5' and type the numbers '0', '7', '5' and '0'. In later versions of the software entering a number at the first position of a value clears the existing value so leading 0's are not required.

Pressing the left arrow key when the cursor is at the left most position of the display steps the display back to the previous display. This would be useful if you accidentally press the 'Enter' key once too often when stepping through entries in memory. This is described in more detail, when it is relevant, for each operation.

Finally, the arrow keys are used to make a selection from a group of options. For example, OP41 'Set Date' prompts for the day of the week by displaying 'MoTuWeThFrSaSu'. To make a selection move the cursor to the correct day of the week and press 'ENTER'.

The 'END' Key

This key aborts the current operation and returns the display to the clock ready for the next operation. If you ever become confused, press the 'END' key and start again.

Using The Operations

Operation of the Cloudmaster keypad is very easy and intuitive, if you keep three things in mind whilst pressing the buttons:

1. All programming and setting up is done by distinct operations, which are numbered 1 to 99. You can search with the arrow keys so you don't need to memorise them.
2. Always read the display. It is prompting you for the next piece of information required. If the information displayed is correct, then pressing the 'ENTER' key will accept this information and proceed onto the next step.
3. The 'END' key can be used at any time to abort the current operation and return the user back to the starting point.

Initial configuration and day to day programming tasks are done using numbered operations with the lower numbered ones (1 to 16) being for common day to day tasks. Many of the more specialised operations you may never use. For example, if a particular installation has a rain sensor and some under cover stations, then operation 55 'ENTER a NORAIN station' would be used to instruct the unit to irrigate these stations regardless of the state of the rain sensor. The vast majority of sites however, would never need to use this facility and therefore would never run operation 55. Many of the operations have not yet been implemented allowing future expansion and the addition of extra features.

Commonly used operations are listed on the front panel. A header is displayed at the start of each operation to indicate the function of the operation. For example, operation 40 is used to set the clock. After pressing 'OPERATION', '4' and '0', the header of operation 40 would appear 'OP40 Set clock'. The operation is started by pressing 'ENTER'. Alternatively, the arrow keys can be used to search forwards and backwards through the headers. Continuing our example, pressing the right arrow would bring up 'OP41 Set Date'. In this way you do not need to memorise operation numbers.

It is also important to understand that certain features of the controller must be enabled or turned on before they come into effect. These features include; fertiliser control, volumetric watering, activating stations on a specific date, seconds & hours duration times, flow error detection, frost sensing and restart stations after a power fail. If a certain facility is turned off, the controller will not prompt the operator for information required for that facility. For example, if volumetric watering is enabled, the controller will ask for a water volume every time a new station watering event is entered. Similarly, if date watering is enabled, the controller will ask whether a watering event is to be a repeat cycle or once only date event.

These extra key strokes would be a nuisance for a user who never needs these functions. Leaving these facilities off vastly simplifies programming.

Operation Example: Setting The Clock

In this example we will reset the Cloudmaster's internal clock. The set time function is OP40 as listed on the front of the machine. We select this operation by pressing the 'OPERATION' key then the '4' and '0' keys. The OP40 header is then displayed as follows:



```
OP40-Set time
```

At this point we could press the arrow keys to search through the operations to find the one that we wanted but as this is what we want we press the 'ENTER' key to accept it and start the operation. The current time is displayed with the cursor blinking over the first digit, '1' in the example below:



```
Enter time  
10:42
```

The cursor can be moved right or left with the arrow keys and new numbers can be typed in over the old. Numbers can only be entered into valid locations in the display. You cannot, for example, place the cursor over the colon or step past the last number.

When the new time has been typed in, pressing the 'ENTER' key will accept the new setting and then return to the clock ready for the next operation.

If an invalid number is entered (e.g. an hour value greater than 23) the message 'Invalid Entry' is momentarily displayed and the cursor is positioned at the location of the error so a correct value can be entered. In this way it is impossible to enter an invalid number. This applies to all operations. As another example it is impossible to enter a station number that does not exist.

If you keep in mind the 3 important points listed at the start of this section, operating the Cloudmaster becomes very intuitive. You should not need to remember anything to operate the unit.

4 The Operations

OP01 Display or modify program

This operation enables the user to display and modify all programs. After pressing 'Operation', '1', 'Enter', the display appears:

```

Display
All Stn# FindPrg
    
```

'All' will step through all program entries in the memory of the Cloudmaster. 'Stn#' will prompt for a station number and only display entries for that particular station. 'FindPrg' allows the user to search for one particular program when many have been entered. A selection is made by moving the cursor to the option required with the arrow keys and pressing 'ENTER'.

If 'FindPrg' was selected, the arrow keys are used to step forwards and backwards through memory displaying the start time and current status (Stopped, Active or Paused) of each program in memory. Press 'ENTER' when the required program is displayed. If 'Stn#' was selected then the station number is asked for and then only entries for that particular station will be shown.

The first program entry is then displayed. Press the 'ENTER' key to step forward through each program entry and press the left arrow key, when the cursor is at the far left position of the display, to step backwards through each entry. As the details are displayed they can be modified by positioning the cursor with the arrow keys and typing the new information over the old.

As detailed in section 2, 'Station Programming Methods', there are various methods of programming a station to come on. The details displayed will depend on the type of entry and what facilities, such as volumetric, date activation or fertiliser, have been enabled. The following example shows a single station event that will activate station 17 from 6:00 PM for 15 minutes every day of the 7 day repeat cycle. This type of entry is entered with OP02 and deleted with OP05:

```

Stn  On   Off
17   18:00 18:15
    
```

```

Days  MTWTFSS
X=ON  XXXXXXXX
    
```

Notice that the cursor is sitting at the first character that can be changed by the operator. To change any of the settings, position the cursor with the arrow keys and type new values in over the old. Days of repeat cycle can be toggled between include day (x) and skip day (.) by moving the cursor to the day in question and pressing the 0/CHG button.

```

Program start
06:00 (Stopped)
    
```

```

Days  MTWTFSS
X=ON  .X..X..
    
```

```

Stn Dur
5   25   06:00
    
```

```

Stn Dur
12  15   06:25
    
```

This example shows a program that is not currently running, which starts at 6:00 AM every Tuesday and Friday of a 7 day repeat cycle. The program starts with 25 minutes being applied to station 5 and then 15 minutes to station 12. The time displayed at the right hand side of the display is the actual start time of the station. This value is maintained by the Cloudmaster and cannot be changed by the user.

If any of the more advanced features such as volumetric watering, date programming or soil

moisture control are enabled then this information will be prompted for when appropriate.

Timeclock programs are entered with OP08, manually started, stopped and paused with OP11 and deleted with OP05 or OP06. The program can consist of any number of stations; they can overlap or start together. Note also, programs with all days turned off (set to '.') can only be manually started with OP11. They will never start automatically.

Program start 22:00 (Active)	MTWTFSS MTWTFSS 1.X.X.X.2X.X.X.X
Stn Dur Volume 5 90 S 65	Stn Dur Volume 6 45 S 55

This example shows a currently running program with the seconds duration and volumetric facilities enabled. The first station in the program, station 5, will be on for 90 seconds or 65 litres of water, whichever occurs first. The 'S' could be changed to 'M' to signify minutes by placing the cursor over the 'S' and pressing the '0/CHG' key. If hours duration was enabled it could also be set to 'H'. As this example has the second week of repeat cycle displayed, this indicates that the repeat cycle is set in the range 8 to 14 days.

Stn Rem Till 6 15 M 07:30

This example shows an override watering entry that was started with OP03 'Override a station on/off'. It indicates station 6 has 15 minutes remaining and is due to turn off at 07:30. The remaining time can be extended or set to 0 for immediate turn off by typing new values over the '15', or changing the Till time, and then pressing 'Enter'.

Loop On Off 07:00 21:00	Days MTWTFSS X=ON XXXXXXXX	Interval 10
Stn Dur 15 25 S	Stn Dur 16 15 S	

This last example shows a loop cycle that will apply 25 and 15 seconds duration to stations 15 and 16 respectively. This cycling will be repeated constantly between the hours of 7:00 AM and 9:00 PM every day of the 7 day repeat cycle with a 10 minute interval between repetitions. Loop cycles are entered with OP09 'Enter a loop cycle' and deleted with OP05.

Inserting/deleting stations into/from a program

OP01 can also be used to edit programs. Stations entries can be deleted from, or inserted into, a program. This is achieved by positioning the display at the entry to be deleted or the entry immediately before the position at which the new entry is to be inserted, then pressing the 'OPERATION' key. The following screen is displayed:

Edit program
Quit Insrt Delet

A selection is made by moving the cursor to the required option and pressing 'ENTER'. The 'Quit' option exits back to the display screen of OP01 without making any changes. The 'Insrt' option will insert a new station entry into the program immediately AFTER the entry displayed and the 'Delet' will remove the entry from the program. After the 'ENTER' key is pressed the display returns back to OP01.

OP02 Enter new station program

This operation is used to create a new timeclock entry. Refer to section 2 'Station Programming Methods' for a description of each method available.

Stn	On	Off	Days	MTWTFSS	Fert	Min
17	18:00	18:15	X=ON	XXXXXXX	18:03	5

This example shows a single station event that will turn on station 17 at 6:00 PM and turn it back off at 6:15 PM every day of the 7 day repeat cycle. The fertiliser facility is enabled with fertiliser being turned on for 5 minutes after a 3 minute prewash.

Days of repeat cycle can be toggled between 'x' (include day) and '.' (skip day) by moving the cursor to the day in question and pressing the 0/CHG button. Fertiliser details will only be prompted for if the fertiliser facility has been enabled with OP70. After the entry is complete it can be displayed or modified with OP01 and deleted with OP05.

OP03 Override a station on/off

This operation is used to either setup an immediate, once-only activation of a station or to turn off any stations that are currently on. When run, the operator is presented with the following screen:

Turn stn on/off	Stn Rem	Till
On Off AllOff	6 15	M 07:30

Move the cursor to the desired option with the arrow keys and press 'Enter'. The 'AllOff' option will simply turn off all stations that are currently on.

If the 'On' option is selected, as shown above, the user is prompted for station number, duration in minutes (and volume if enabled) or an off time. Move the cursor with the arrow keys and type numbers from the keypad. When these details are entered with the 'ENTER' key, the station will start immediately. The entry is deleted automatically after completion.

If a volume figure is specified the duration value becomes a safety time-out period, so a station will not flood if the flow meter becomes jammed or its wires broken. The station will turn off when the specified amount of volume has been detected or the duration expires, whichever occurs first.

A station that is already running, regardless of whether it was turned on by a timeclock program or a manual override, can have its off time/duration adjusted by running OP03. For example, say station 3 is on and due to turn off in 30 minutes time. If you decide you want the station to run for 45 minutes you can run OP03, select station 3 and a duration of 45 minutes. This will modify just this one event even if the station was turned on by a timeclock program in which case, after this event completes, the standard program will take over as previously programmed.

Override entries are automatically deleted from memory after they complete they do not affect the standard timeclock program in any way.

Multiple manual override events can be entered but only a certain number of stations will be allowed to come on simultaneously (Ref OP48 'Setup max active stations) the rest will queue and wait their turn. Active and queued manual override entries can be displayed and modified using OP01.

If 'Off' is selected then the user types the station number to turn off and then presses 'ENTER'. The station will turn off immediately. If this station is part of a program then the user is also asked if the program is to continue with the next station or be terminated.

OP04 Enable or disable a station

This operation is used to disable individual stations so that no programmed start times for this station will occur. An example of when this might be used would be when maintenance

work was being done to a valve. The station can be disabled without having to go through memory and deleting, or zeroing program durations for the station. After the work is completed, the station would be re-enabled.

The user is prompted for the first station number to display. The arrow keys are used to change the setting for each station between 'On' for 'Disable' and the 'ENTER' key then steps from this station to the next. The 'END' key returns the operator back to the main clock screen. Disabled stations are scrolled in the status display to remind the operator that the station will not activate.

```

Station
0  On  Disable
    
```

```

Cloudmaster
Stn 46 disabled
    
```

OP05 Delete an entry

This operation is used to delete single time clock entries one at a time, or complete programs from the memory of the Cloudmaster. This operation can also be used to remove a single station from a program.

After pressing 'Operation', '5' then 'ENTER', the user can step forwards or backwards through all programmed entries with the right/left arrow keys until the required entry is displayed. Pressing the 'ENTER' key then indicates 'yes this is the entry I wish to delete'. The Cloudmaster will display a confirmation message to give you a chance to change your mind. Pressing the 'ENTER' key a second time will delete the entry and display the next entry in memory. If the entry is a station in a program then only that station entry is removed from the program. If, however, the program start time is deleted then the whole program is erased from memory. Refer to OP01 to reinsert a station back into a program.

Remember, press arrow keys to search for entry to delete and 'ENTER' key to actually delete the entry currently displayed. The 'END' key will end the delete operation and return to the clock.

OP06 Delete all entries

This operation will delete all programs from memory. You are asked for confirmation, which is given by pressing the 'ENTER' key. The 'END' key aborts the operation and returns the operator to the clock without deleting anything. This operation should be used with caution. All entries means ALL entries regardless of whether they are individual station, programs or date type entries. The syringe cycle will also be deleted. This operation does not affect set-up information such as clock or calendar settings, special station set-ups, disabled stations etc.

OP07 Turn on or off irrigation

This operation puts the controller into rain mode so no programs will start. Override operations using OP03 can still be performed as they override the irrigation off state. The current setting is indicated by the position of the cursor. The following example shows irrigation currently enabled:

```

Irrigation
Enable  Disable
    
```

Change the state by moving the cursor with the arrow keys and then press the 'ENTER' key.

Apart from being manually selected by the operator, irrigation can be automatically disabled by the Rain input (refer to OP54), any of the general purpose inputs (refer to OP59), a soil moisture sensor (refer OP36) or the anemometer sensor (refer OP72). The message ' - Irrigation off', together with all currently active causes of the irrigation off state, are scrolled in the status display.

OP08 Enter a new watering program

This operation is used to create a timeclock program. Refer to section 2 'Station Programming Methods' for a description of each program method available.

The user is prompted for the time of the day that the program is to start and the days of the repeat cycle (or date if enabled) that the program is to be performed. A station number, duration and volume (if enabled) is then asked for. If a volume figure is entered and a flow meter attached then the duration value becomes a safety time-out period so a station will not flood if the flow meter becomes jammed or its wires broken. The 'ENTER' key will then make an entry for this new station to start the instant the previous one finishes.

When the 'ENTER' button is pressed and a station entry made, the station number in the display is incremented by one. This is done for convenience only. A new station number, duration or volume can be entered at any time. Station numbers do not need to be consecutive. The 'ENTER' key is pressed for each station in the program and finally the 'END' key aborts the entry process and returns to the clock. Note that the final station number displayed when the 'END' key is pressed will not be included in the program.

For example, to enter a program starting at 6 PM on Mondays and Wednesdays, running stations 1 through to 10 for 20 minutes and then stations 15 to 19 for 30 minutes, you would enter 18:00 for the program start time, select Monday and Wednesday with an 'X', station 1, duration 20, a volume of 0 and then press the 'ENTER' key 10 times. At this point the station number would read 11. This would then be changed to 15, the duration set to 30 and the 'ENTER' key pressed 5 times. At this point the display would be asking for station 20. As station 20 is not required the 'END' key would terminate the operation. These entries could be displayed or modified with OP01.

Program start 18:00	Days MTWTFSS X=ON X.X....
Stn Dur 1 20 18:00	Stn Dur 2 20 18:20

This example, partly shown above, would result in a program starting with station 1 at 6 PM and finishing with station 2 finally turning off at 11:50 PM. The time displayed is the actual start time of each station. Note that switching between outputs is done instantaneously and the pump output remains on. Only 15 out of the 500 available entries would be used. There is no limit to how many programs can be entered and programs may overlap, start simultaneously or at separate times.

Timeclock programs can be of any length, are manually started/stopped/paused with OP11 and deleted with OP05. Note also, programs with all days set to '.' are manual start programs only. They will not automatically start. See OP01 for more display examples.

When sending SMS commands to start, stop or pause programs, the start time is entered and the command will affect all programs with that start time. For example, if you had 2 programs both starting at 06:00 but selected for different days of the repeat cycle then the SMS command 'PROGRAM 06:00 START' would start both programs. If you only intended to start one of the cycles i.e. you wanted individual control of each program then you could stagger the starts. To do this change one of the start times to, say, 06:01.

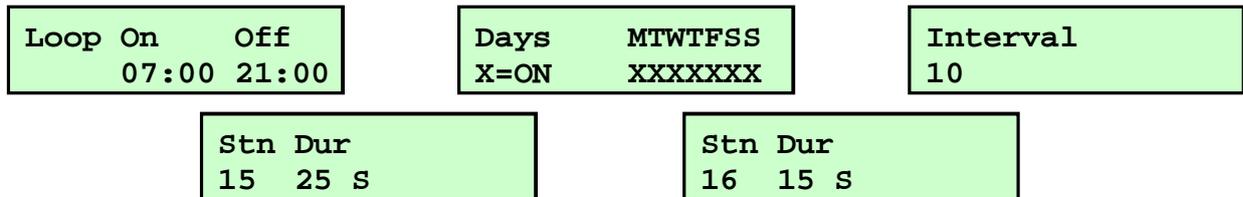
OP09 Enter a new loop Cycle

A loop cycle is a program of stations with duration times down to 1 second and an adjustable interval between cycles. The first parameters requested are the times of the day you want the loop cycle to start and stop. These times are in 24 hour format and left at 00:00 if the cycle is required 24 hours a day. After pressing 'ENTER' the days of the repeat cycle are entered. An 'x' indicates the loop cycle will occur on that day, a '.' indicates that day will be skipped. The next parameter entered is the interval in minutes. The interval can be set from 1 to 250 minutes. After pressing 'ENTER', station numbers and durations are

entered. The seconds duration facility must be enabled with OP70 before seconds can be specified. This is done by changing the 'M' to an 'S' with the '0/CGH' key. After entering all stations in the program the 'END' key returns to the clock.

Any number of loop cycles can be entered and setup to run simultaneously or at different times. Loop cycles will automatically restart after a power fail if the time of power restoration is within the cycle enable/disable times.

This example shows a loop cycle to apply 25 and 15 seconds duration to stations 15 and 16 respectively. This cycling will be repeated constantly between the hours of 7:00 AM and 9:00 PM every day of the repeat cycle with a 10 minute interval between repetitions.



OP10 Start the syringe cycle

This operation allows a fast and simple method of kicking off the Syringe cycle (which is simply a commonly used, manually started program of stations). An example of where this may be useful is a quick program to check sprinkler heads or to remove the dew off a golf course. The format of the syringe cycle is similar to a standard program except a start time and days of repeat cycle cannot be entered. A Syringe cycle can therefore only be manually started. OP62 is used to enter a syringe cycle.

OP10 does not ask for any information; it simply starts the syringe cycle running. If no syringe cycle has been entered then this is briefly indicated by displaying the message 'No Syringe cycle - Run OP62' before returning to the clock. Once running, the syringe cycle can be paused or stopped using OP11.

OP11 Stop, start or pause a program

This operation allows programs to be manually started at any time of the day, regardless of their programmed start time. It also allows currently active programs to be stopped or paused. The operation will display the programmed start time and current status of the first program as shown on the left. The arrow keys can then be used to step forwards or backwards through all programs entered until the correct one is found. Pressing the 'ENTER' key will then bring up the screen illustrated on the right.



The cursor is moved with the arrow keys and the 'ENTER' key pressed to change the current status. For example, selecting 'Start' will immediately start the program and selecting stop will immediately terminate an active program. If the programs is currently paused then the 'Stop' option will terminate it altogether and the start option will continue the program from the point at which it was paused. Any paused station is scrolled in the LCD status line to remind the operator that a sequence is in the paused state.

The selection takes effect immediately and the operator is returned back to the display program screen so another program can be selected and stopped, started or paused. The operation is terminated with the 'END' key.

OP12 Change a program by a %

This operation allows all durations and volumes (if enabled) in a program to be increased or decreased by a certain percentage. The required program is located as described in OP11. Pressing the 'ENTER' key will then bring up the following:

%Value More/Less
0 More

A value of up to 100% can be entered and 'More' or 'Less' selected with the '0/Chg' key. When the 'ENTER' key is pressed all duration times and volumes in the program are adjusted and the operator is returned back to the program search screen so another program can be found and modified. The operation is terminated with the 'END' key. Note that single station events (refer OP02) cannot be modified with OP12.

OP13 Step active programs

This operation is used to step any active programs to the next station. No other parameters are required it simply steps all currently active programs and returns to the clock. If there are currently no active programs running then this operation does nothing.

OP14 Select auxiliary pump

This operation is used to select either the main or the auxiliary pump. Note the auxiliary pump must be first enabled using Operation 46.

OP15 Clear all warning messages

This operation is used to clear any warning messages that are being cycled in the display. Power fail/restore and station open/short circuit messages would be typical examples. This operation does not prompt for any information, it simply clears the message and returns to the clock. A station open/short circuit message will also be cleared if the station in question subsequently turns on successfully.

OP16 Display logged history

The Cloudmaster unit logs in its memory a record of every event that occurs, including station on/off times, volumes applied, power fail & restore times, hydraulic and wiring problems, chemical activations etc. OP16 is used to display this history log. The operation prompts for a start date from which the display will begin. By default, the current date will be displayed but this can be changed to any date required. The earliest date available is displayed at the right of the bottom line as shown on the left below. After the date is entered with the 'ENTER' key, the left and right arrow keys then step backward and forward through time displaying all logged history events. The 'END' key terminates the operation.

Start from date
23-09-11 170407

Saturday
23-09-11

OP17 Manual run pump

This operation allows the operator to manually activate a pump for a certain period of time without having to turn a station on. The user is prompted for the pump number and run time in minutes up to a maximum of 250. The pump number is 0 for the master unit's pump output, 1 for slave number 1 etc. After pressing 'Enter', the selected pump turns on immediately. Remaining pump run time is displayed in the status line of the LCD.

OP18 Display current draw

This operation is used to display the current presently being drawn by the decoder cable driver. This current includes the quiescent current of all decoders plus the current being drawn by any active decoders.

OP19 Zero 24Hr totals

This operation is used to zero all the 24 hour totals values. There are no parameters required. The values are zeroed and then the display returns to the clock. Refer to operations 71, section 3 'LCD Status Line' and section 7 'Daily SMS Report' for more details about the 24Hr totals facility.

OP20 Monitor an input

This operation is used to display the current value of an input in the LCD. If the input is a switch contact type then 'Active' & 'Inactive' will appear to indicate the present state of the input. If the input is an analog type on the input expander unit then the current value between 0 and 12V or 4 and 20mA is displayed both as a percentage and as an analog bar across the bottom of the LCD. The display updates about every second. The 'END' key terminates the operation and returns the display to the clock.

OP21 Show WW sensor readings

This operation is used to display the current light and temperature values read from any of the Weather Watcher sensors. When run the first sensor values is displayed and any other sensors can be stepped through with the arrow keys. Values change in real time.

OP22 Show modem signal strength

This operation is used to display some important parameters of the modem. For example:

```
Sig Reg SIM Ntwk
27 Yes OK Tels
```

The signal strength is analogous to bars of signal on a mobile phone. This figure gives an indication of how close is the local cell and how well the antenna system is working and therefore how reliable the modem data connection is likely to be. These signal quality values refresh every 2 seconds. A value of 17 is usually sufficient. A value of 23 or greater is excellent. A low reading, say less than 14 with the cabinet door open, would indicate the antenna should be relocated or a problem with the antenna or a very bad reception area. See the installation section '9 - Connecting the Cellular Modem & Antenna' for a more detailed discussion.

A 'Yes' in the Regstd column indicates that the modem has registered with the cellular network and an 'OK' in the SIM column indicates the SIM card is installed correctly and ready for use. Both of these indications are essential for the modem to function. If 'PIN' or 'PUK' appears under SIM then the SIM card needs to be put into a mobile phone and the SIM PIN code disabled in security settings or the PUK code entered. The Ntwk column indicates the provider Telstra, Optus or Voda.

OP23 Show box temperature

This operation displays the internal temperature of the Cloudmaster unit. If the Cloudmaster unit is mounted inside a fully sealed cabinet out in the sun then the internal temperature can get very high. Any temperature greater than around 60 degrees Celsius is likely to affect the reliability of the unit and the life of the LCD and other components. Shading, ventilation and internal insulation measures can dramatically reduce the temperature maximums.

OP24 Monitor a flow meter

This operation displays current flow meter values of litres counted and flow rate in litres per minute. The display updates every second. Enter the number of the slave unit that has the physical flow meter connected. Enter slave 0 for the master unit and slave 1 for the first slave unit and so on. The following example shows an accumulated volume of 6,714 litres and a current flow rate of 278 litres per minute:

```
Flow Meter 0
6714L      278 /M
```

OP25 Monitor wind speed

For the Cloudmaster to sense wind speed the anemometer supplied by Jeffery Electronics must be connected as described in section 12 'Connecting The Anemometer'. For a detailed discussion of wind speed control, refer to section 8 'Wind Sensing'. The following example shows the wind speed is presently 25km/h and the 16 second average is 18km/h.

Wind	km/h Avg
25	18

OP26 Monitor a tank level

This operation is used in conjunction with the 4 or 8 digital input expansion unit which can be connected to up to 4 or 8 float switches mounted at equidistant heights within a fluid storage tank. This operation displays the slave number of the first input expansion unit and the % value of the highest active float level switch. Right and left arrow keys can then be used to step to other input expansion units to display their respective values. Example:

Slave	Level%
1	80%

Use 'OP20 Monitor an input' to view 4-20mA analog tank level sensors.

OP27 Show soil moisture values

This operation displays the current reading of all the soil moisture sensors that are connected to the unit. Examples are:

Sensr	Moist	Temp
01	73	20

Sensr	Moist	Temp
02.4	36	19.5

The first example indicates that sensor 1 is a single level sensor and is currently measuring a soil moisture level of 73% and a temperature of 20 degrees Celsius. The second example indicates that sensor 2 is a multi level sensor, its temperature is 19.5 degrees Celsius and its level 4 sensor is currently measuring a soil moisture level of 36%. Step through all levels of all sensors with the arrow keys and return back to the clock with the 'END' key. Refer to 'OP35 Setup soil moisture sensors' & Section 9 Soil Moisture Sensors' for more details.

OP31 Setup SMS club control

Required details for this facility are whether the club floodlight control SMS can be sent from any phone or only nominated phones and if advisory SMS messages should be sent back to the club's mobile phone if their command did not work for some reason. Example:

Allow any phone
Enable Disable

Send advice SMS
Enable Disable

If 'Allow any phone' is disabled then the floodlight control commands will only be accepted from authorised club phones which are entered using OP32.

For details of the Council floodlight control feature see Section '5 - Council Floodlight Control & Billing.

OP32 Authorised club phones

This operation allows entry of the authorised mobile phones that can be used by the clubs to send floodlight control commands. Phone numbers are numbered 1 to 68. Type the 10 digit number (for example 0415222160) and press 'Enter' to step to the next number. Existing numbers can be modified by typing new numbers over the old or removed by setting all digits to 0. You can step backwards through the list by pressing the left hand arrow key when the cursor is at the far left of the display. When the last phone number has been entered press the 'End' key to return to the clock. An example follows:

Phone number 1
0415222160

OP33 Setup SMS staff control

This operation is equivalent to OP31, but for commands received from a staff phones. It works exactly the same as OP31. For a description of 'staff' and 'club' terminology see section '7 Clubs and staff'.

OP34 Authorised staff phones

This operation is used to enter the list of up to 10 authorised staff phones. It works exactly the same as OP32. For a description of 'staff' and 'club' terminology see section '7 Clubs and staff'.

OP35 Setup soil moisture sensors

This operation presents the user with the first of the following screens:

Moisture sensors	Sensors Added	Sensr S/N
List/Sort Scan	02 01	01.1 0034791437

The 'Scan' option causes the Cloudmaster to search for any compatible soil moisture probes that are connected to the Cloudmaster, retrieve their serial numbers and add them to the list of existing sensors. If you know which cable is for which sensor, but do not know the serial numbers for each sensor then connecting sensors one at a time, running a scan, and then looking at the list, allows the installer to identify each sensor by its serial number. After each scan the total number of sensors in the list and the number of new sensors discovered during the scan is displayed as shown above.

The List/sort option allows the serial numbers of the probes to be displayed. The order that the Cloudmaster registers the sensors is random. In a situation where you have numbered hydrozones and a sensor in each, as each sensor is numbered 1 to 16, it would be logical to have these numbers match. In this situation as each sensor is being displayed a new sensor number can be entered in over the old one. If the new sensor number entered already exists, the 2 sensors will be swapped. Sensors can be deleted from the list by setting its sensor number to 0.

See also 'OP27 Show soil moisture values' & Section 9 Soil Moisture Sensors' for more details.

OP36 Setup rain soil sensor

This operation prompts the operator for a soil moisture sensor and a moisture threshold level as shown in the following example:

Sensr Moist
04.3 65

In this example, rain mode will be activated whenever soil sensor, soil depth level 3 detects that the soil moisture is above 65%. When rain mode is active, all programs are disabled. Refer to section 9 Soil Moisture Sensors for more details.

OP40 Set time

This operation is used to set the time in the controller. When the operation is performed, simply enter the new time in over the old and press the 'ENTER' key. Seconds are set to 0 the moment the 'ENTER' key is pressed. Clock and program information is battery backed by a 10 year internal battery which does not require recharging.

OP41 Set date

This operation is used to enter the date/month/year and day of week into the controller. The date information is entered over the current date displayed and the day of week is set by moving the cursor to the correct day and pressing the 'ENTER' key. The display is then returned to the clock ready for the next operation.

OP42 Setup or mod slave units

This operation is used to attach devices such as Cloudmaster slave units, decoder cable drivers (translators), input expander units, keytag readers or Weather Watcher sensors. When the operation is first performed the user is asked whether the slaves are to be listed, a new one added or an existing one deleted. The required option is selected by moving the cursor with the arrow keys and pressing 'ENTER'. When listing, each display is simply stepped through with the 'ENTER' key. When deleting, the slave number is prompted for and confirmation of the deletion is requested. Pressing the 'END' key will abort the command without deleting the device.

The 'New' option will prompt for slave unit number and the serial number of the unit being attached. For convenience, the next available slave unit number is displayed but this can be overwritten as required. Up to 19 devices can be attached to a Cloudmaster controller.

Stations are allocated in blocks of 20 and the slave unit number will determine the station number range. For example, slave unit 1 will be stations 21 to 40, slave unit 2 will be stations 41 to 60 and so on. The master unit will always be stations 1 to 20. Refer to Section 1 – Introduction – Station 0/1 Labelling.

When running OP42 to connect a decoder cable driver always use device serial number 0201. Decoder station numbers are allocated in 20 station blocks. If, for example, the decoder driver has 55 decoders connected then 3 blocks of 20 stations would need to be allocated to it. OP42 would be used to enter serial number 0201 for slave unit numbers 1, 2 and 3 which would allocate stations 21 through to 80 to the decoders on this cable driver. If you have more than one cable driver then contact JEC for assistance. Refer to 'OP74 Setup decoder addresses' to match the station numbers within this range to the actual decoder addresses.

OP43 Setup the cycle period

This operation sets up the repeat cycle period that will be used. The cycle period can be anything from 1 to 28 days. It should be noted that a multiple of 7 must be used if the day of week figure ('MTWTFSS') displayed in the display is to be meaningful. The default setting is 7 days. If a value other than 7 days is selected then the current day of cycle is shown in the top line of the clock display.

OP44 Setup the day of cycle

This operation sets the current day of the repeat cycle. Typically the cycle period would be set to a multiple of 7 and the day of cycle would be set to match the day of the week (i.e. Monday = 1, Tuesday = 2, etc.). The default day of cycle is setup exactly in this manner.

OP45 Setup slave for remote pump

Slave units can be attached to the master unit to expand the total number of stations in the system. The master unit controls station numbers 0 to 19; slave unit 1 controls stations 20 to 39 and so on up to slave unit 19 which controls stations 380 to 399. By default, each slave unit will activate its own pump output and expect flow pulses on its own flow meter input. OP45 is used to setup a slave unit to activate a pump other than its own. In our example we may want the pump output on the master unit to be activated whenever any stations on slave unit 1 come on. Similarly, the master unit can be setup to activate one of the pump outputs on a slave unit. This may save wiring if the pump is physically located closer to a slave unit than the master.

The user is prompted for the unit number of the slave controlling the stations, and then the unit number of the slave controlling the pump to be activated whenever any of these stations turn on. The master unit pump output is considered pump number 0.

OP46 Setup slave auxiliary pumps

This operation allows the user to set auxiliary pumps which can be done on an individual slave basis. In other words you may want slave 2 to have an auxiliary pump but not any of the other slave devices. When a slave has its auxiliary pump enabled, its fert output becomes

the pump start signal for the auxiliary pump and its input 1 input becomes the auxiliary pump flow meter input. After at least one auxiliary pump has been enabled, use operation 14 to select between main and auxiliary pump.

OP47 Setup flow pulse volume

This operation allows the user to enter in the number of litres applied for each flow meter pulse detected. This enables volumes to be displayed and entered in true litres and not counts of pulses. The present setting is displayed and valid values are 1, 10 or 100 litres or 'Pulse'. The pulse setting would be used if a flow pulse is to be as any unit other than 1, 10 or 100 litres. An example would be an imperial flow meter giving a pulse per gallon. In this situation volumes would be displayed in pulses, which would be treated as gallons.

OP48 Setup max active stations

This operation sets the maximum number of stations that the controller will allow to come on at once. This value can be setup for each pump in the system (i.e. each slave unit) and a separate value can be setup for irrigation and special stations such as floodlights, fountains etc. By default the unit allows up to 20 simultaneous channels. The user can change these values by moving the cursor with the cursor control keys, overwriting the old values and then pressing the 'ENTER' key.

OP50 Setup flow error detection

The Cloudmaster system determines any overflow or underflow condition using the following procedure: firstly, at some time the station must have been put into the learn mode so the Cloudmaster can teach itself what the correct flow for that particular station should be. Thereafter whenever that station comes on it is allowed a time (the FLOWSETTLE time) for the pipes to fill up with water and the flow rate to settle down. Then, flow pulses are counted for each sample time period (the FLOWSAMPLE time) that the station is on. If the number of flow pulses counted is greater or less than the flow rate for that station by a percentage greater than the tolerance allowed (the FLOWERROR value), then an overflow or underflow condition is declared. The station is turned off and a warning message is logged.

Values for error percentage, settle and sample times are set by moving the cursor with the arrow keys and typing the new values in over the old. The 'ENTER' key then accepts these values and ends the operation. A flow settle time of 0 is valid but not recommended. An error percentage or sample time of 0 will turn the flow error detection facility off. OP51 is used to learn either one or all station flow rates. As a rule, the sample time chosen should be long enough to ensure at least 20 flow meter pulses for the station with the lowest flow rate. The longer the sample time the greater the accuracy, but the longer the time taken to detect a flow problem.

OP51 Learn a station flow rate

This operation is used to put one or all stations into learn mode. This means that the next time the station comes on and after the flow has been allowed to settle, a sample is taken of the flow rate. The station is then taken out of learn mode and from then on the sample is used as the correct flow rate for that particular station when doing overflow or underflow calculations. If a modification is later done to the station, such as installing or removing some sprinkler heads, the station will have to be put into learn mode again, so the new flow rate can be learnt. The user is prompted for 'All' or only a single station. This selection is made with the arrow keys and then 'ENTER'. If a single station was selected then the station number is also asked for.

OP53 Setup station function

This operation tells the system that a station output is to be used for a special purpose such as floodlight control. In fact any station that is not an irrigation station. The user is prompted for the station number and the function. There are 4 categories of station function. As depicted below these are: Irrigation, Lighting, Courts and a general purpose category 'C4'. The 'ENTER' key then steps from this station forward and the arrow keys can be used to change the category for each station. For any category other than irrigation minimum on and off periods are also prompted for. The operation is terminated with the 'END' key.

Station
17 Ir Li Ct C4

Minon	Minoff
15	15

Ref to section '8 - Special Purpose Outputs' for a detailed discussion on non irrigation outputs

OP54 Setup rain switch

This operation sets up the rain sensor. Rain sensing can also be enabled and disabled by the OP70 Customise Unit's Functions operation. As shown below, the user is initially asked if the rain sensor is enabled or disabled. The cursor position indicates the present setting which can be changed with the arrow keys and pressing 'ENTER'. The user is then asked which input number the rain sensor is wired to. Valid input numbers are 0,1,10,11,20,21,30,31 etc up to 190,191. These are the numbers of the 2 inputs on each of the units from 0 (master unit) through to slave unit 19. By default the rain sensor is on input 0. The operation then prompts for setup parameters required for that input.

For example, if the rain sensor was a normally open contact type and was wired into the terminal marked 'INPUT 0' on the master unit (ref to section 9 'Installation and Cable Connections' for details), then the following settings would be typical:

Rain sensing Enable Disable	Input 0	Contact normally Open Closed
Validation time 5 Seconds	Enable Disable 00:00 00:00	

For a description of each screen, and another example, see OP58 'Setup an input'.

OP55 Setup NORAIN stations

This operation is used to tell the controller to ignore the rain sensor for certain stations such as undercover stations. The user is prompted for the first station number to display. The 'ENTER' key then steps from this station forward and the arrow keys can be used to change the setting for each station between 'Std' and 'NoRain'. The operation is terminated with the 'END' key. Note, special purpose stations such as lighting control stations do not need to be setup as norain stations.

OP56 Setup the frost sensor

This operation sets up the frost sensor. Frost sensing can also be enabled and disabled by the OP70 Customise Unit's Functions operation. The user is asked if the frost sensor is enabled or disabled with the cursor position indicating the present setting. The setting can be changed with the arrow keys and pressing 'ENTER'. If enabled the frost mode causes the controller to loop cycle through all stations applying a short preset run time until the frost condition abates. This action is similar to a loop cycle except the duration time is common to all stations.

The operator is then asked which input number the frost sensor is wired to, the duration to apply to each station and an interval between cycle repetitions which can be left at 0 if no interval is required. Valid input numbers are 0,1,10,11,20,21,30,31 etc up to 190,191. These are the numbers of the 2 inputs on each of the units from 0 (master unit) through to slave unit 19. By default the frost sensor is on input 1. The operation then prompts for setup parameters required for that input. For example, if the frost thermostat was a normally open contact type and was wired into the terminal marked 'INPUT 1' on the master unit (ref to section 9 'Installation and Cable Connections' for details), and you wanted the frost cycle to only operate from 4:00 AM to 9:00 AM, activating each station for 2 minutes and no waiting between cycles, then the following settings would apply:

Frost sensing <input checked="" type="checkbox"/> Enable <input type="checkbox"/> Disable	Inp Dur Interval 1 2 0	Contact normally <input checked="" type="checkbox"/> Open <input type="checkbox"/> Closed
Validation time 5 Seconds	Enable Disable 04:00 09:00	

For a description of each screen, and another example, see OP58 'Setup an input'.

OP57 Setup NOFROST stations

This operation is used to tell the controller to skip certain stations during the frost cycle. An undercover station could be an example. The user is prompted for the first station number to display. The 'ENTER' key then steps from this station forward and the arrow keys can be used to change the setting for each station between 'Std' and 'NoFrost'. The operation is terminated with the 'END' key.

OP58 Setup an input

This operation is used to configure an input. After the input number has been entered the next screens prompts for whether the input is currently enabled or disabled (an input must be 'Enabled' state before it will function; the sensor is normally open or normally closed; a validation time and finally input enable/disable times. A typical example would be:

Input <input checked="" type="checkbox"/> Enable <input type="checkbox"/> Disable	Contact normally <input checked="" type="checkbox"/> Open <input type="checkbox"/> Closed
Validation time 5 Seconds	Enable Disable 04:00 09:00

The input validation time is a time delay that the sensor must be valid for before the change of state is recognised. This delay can be set for seconds or minutes. The enable & disable times can be used to limit the hours of the day that this input will function. Outside these times the input will in effect be turned off. This feature could be used to limit a security gate entry switch to night hours only or the frost sensor to a period of sunrise. Values of '00:00' indicate the input is enabled 24 hours a day.

All input events are logged in the history of the controller so the operator can see exactly when the sensor was tripped (Ref OP16 'Display history log'). Note that inputs are logged by their logical input number.

OP59 Setup an input reaction

This operation is used to setup the controller to take certain action when an input is detected. For more information and examples on input reactions refer to Section '8 More Cloudmaster Features/Input Reactions'. After prompting for input number the following reactions can be setup.

Stop irrigation <input type="checkbox"/> Enable <input checked="" type="checkbox"/> Disable	Skip station <input type="checkbox"/> Enable <input checked="" type="checkbox"/> Disable	Pause programs <input type="checkbox"/> Enable <input checked="" type="checkbox"/> Disable
---	--	--

The 'Stop irrigation' action causes the controller to terminate all programs. The 'Skip station' action causes the current station in a program to be skipped so the next station in the program starts immediately. The 'Pause programs' action causes any active programs to be paused. These actions, if enabled, occur when the particular input becomes active. A paused program will resume after the input goes inactive. Note all the normal input parameters must be met such as the input must be enabled and the time must be within the inputs enable/disable times and the validation delay must also be met.

OP60 Setup Club PIN facility

Use this operation to list, add, or delete club PIN entries. The example below shows a PIN

entry with club PIN number 1234 can be used to turn on lighting station 19 between 4:45PM and 9:15PM on Tuesdays, Wednesdays and Thursdays. In this case the channel will switch off at 9:45PM if the club has not turned the lights off before that time so the on time duration, 24 hours, just needs to be longer than the 4 ½ hours between the enable and disable times. An example of when you would want a very short duration time would be if the channel was used to unlock an electric gate lock to provide access to the site. The enable disable times would determine when access is available but the station duration would be set to, 10 seconds, just giving the person sufficient time to push the gate and gain access.

PIN	Stn	Dur	HMS	Enable	Disable	Days	MTWTFSS
1234	19	24	H	16:45	21:15	X=ON	.XXX...

For more details on the Club PIN feature see Section '5 - Council Floodlight Control & Billing'.

OP62 Setup Syringe cycle

A syringe cycle (which is discussed further in section 2) is the same as a normal program except it does not have an automatic start time so it will never start by itself. A syringe cycle can only be started by running operation 10.

This operation is used to enter the syringe cycle. This procedure is the same as OP08 'Enter watering program' except start time and days of cycle are not asked for. Station numbers do not have to be consecutive and durations and volumes can be the same or individually set for each station. After the final station has been entered with the 'ENTER' key, the 'END' key terminates the process and returns the display to the clock ready for the next operation. Note that the final station number displayed when the 'END' key is pressed is not included in the program.

OP64 Setup pump hold on delay

This operation allows entry of a delay, in seconds, that the pump is to remain on after all stations turn off. This can be useful for ensuring the pressure stays up so the last solenoid valve closes correctly.

OP66 Setup sending alarms

This section illustrates the screens that appear when setting up the alarm feature. For a more detailed explanation of the alarm functionality, and some alarm examples, refer to 'Section 6 Alarms' The operator is initially presented with the following options:

Setup
Phns Notfy Alrms

The 'Phns' option allows the entry of up to 15 recipient phone numbers. Each phone number is numbered 1 to 15. Type the 10 digit number (for example 0415222160 or 0291442666) and press 'Enter' to step to the next number. Existing numbers can be modified by typing new numbers over the old or removed by setting all digits to 0. You can step backwards through the list by pressing the left hand arrow key when the cursor is at the far left of the display. When the last phone number has been entered press the 'End' key to return to the clock. An example follows:

Phone number 1
0415222160

The 'Notfy' option allows the entry of a sequence of up to 4 recipients who will be notified of an alarm. The following example shows the details of the first recipient of notification sequence number 1. Note that the 'Set BMS output' option will only appear if the BMS function has been enabled in 'OP70 - Customise units functions'.

Notify
1

Set BMS output
Yes No

The following screens are then repeated 4 times, once for each enabled recipient.

Recipient 1
Enabled Disabled

Send method
SMS Phn Cbl LAN

Recipient phone
3

Allow clear alarm
Yes No

Tries
3

Retry minutes
5

This example shows that this recipient is to receive the alarm message via SMS and their phone number was entered as phone number 3 in the phones list. This recipient has also been given the ability to clear the alarm so, if they do, recipients 2, 3 and 4 will not receive the alarm message. As they have been given this capability the operator is also asked for number of times the message will be sent to this recipient and a delay, in minutes, between each. If this recipient was not able to clear alarms then the message will only be sent once and these last 2 item would not be asked for.

After entering this recipients details with the 'Enter' key, these same details are requested for recipients 2, 3 and 4. If, for example, there are only 2 recipients in this sequence then select 'Disable' for recipients 3 and 4. This would complete the setting up of notification sequence number 1. Up to 15 notification sequences can be setup.

The 'Alrms' option allows the operator to select a notification sequence for any of the alarm types. The screen displayed is as follows:

Setup
Evt Input Moist

The 'Evt' option presents the operator with a list of each type of system event that can trigger an alarm and the ability to enter an alarm notification number for each. A notification number of 0 indicates the event type will not trigger an alarm.

The 'Input' option allows the operator to enter an alarm notification number and a custom text message for any of the general purpose hardware inputs. The inputs are numbered 0 and 1 on the master unit, inputs 10 and 11 on slave unit 1, inputs 20 and 21 on slave unit number 2 and so on. Ref to 'OP58 – Setup an input' for details about the other parameters that can be entered for each input. Input number and notification sequence number are requested. The default notification number of 0 indicates the input will not trigger an alarm. Custom text messages are numbered 1 to 15. A message number of 0 indicates that a text message is not required and the standard, system generated alarm message will be sent. See 'OP67 Setup alarm messages' for details on entering the custom messages

Finally, the 'Moist' option allows the operator to enter details for soil moisture level alarms. A notification sequence number and moisture sensor and moisture threshold level is requested as in the following example:

Notify
1

Sensr Moist 1
01.01<50

Sensr Moist 2
05.08>90

This example shows that moisture alarms are to be dealt with using notification sequence 1. Two moisture alarms have been setup. The first specifies an alarm condition when soil sensor number 1, soil profile level 1 falls below a moisture threshold of 50. The second specifies an alarm condition when soil sensor number 5, soil profile level 8 goes above a moisture threshold of 90. The < and > symbols are changed by placing the cursor at that location and pressing the '0/CHG' key. To remove an alarm setting simply set the sensor number to 0.

OP67 Setup alarm messages

This operation allows the entry of up to 16 custom text messages. As described in the previous operation 66 'Setup sending alarms', when an input alarm is setup then any of the 16 messages can be selected to be sent as well as the system generated SMS alarm message. As the general purpose inputs can be connected to any closing contact switch then it is useful to be able to send some text describing the nature of the input. Examples of messages are:

Main pump fail Cabinet opened Tank low alarm

Other types of alarms, such as moisture level high/low alarms, do not need this custom text as the system generated text gives enough information about the alarm.

The messages are numbered 1 to 16 and can be a maximum of 16 characters long. During entry of the text message the cursor is changed to an underline which can be moved with the arrow keys. The '4', '5' and '6' keys begin the character at 'A', 'a' and '0' respectively. From there the character can be increased or decreased with the '7', '8' and '9' or '1', '2' and '3' keys respectively. The '6', '9' and '3' keys allow selection of many punctuation marks and the space character.

OP70 Customise unit's functions

Many features in the Cloudmaster unit can be disabled or turned off. In fact many of the features are disabled by default and need to be explicitly turned on. If a facility is disabled, the controller will not prompt the operator for information required for this facility. For example, if volumetric watering is enabled, the unit will ask for a water volume when a new program event is entered. Similarly, if date events is enabled, the controller will ask whether a program is to be a repeat cycle or once only date event. These extra keys would be a nuisance for a user who never needs these functions. Thus leaving them disabled simplifies programming for this user.

This operation is used to enable or disable these features. Press 'ENTER' to step to the next feature and change a features setting with the arrow keys. You can press 'END' to exit the operation after your changes have been made.

Features are listed in the order that they appear in OP70.

- Power save
- SMS Alerts
- * Loop Logging
- * Rain sensing Ref OP54 'Setup the rain sensor'
- Frost sensing Ref OP56 'Setup the frost sensor'
- Fertiliser control Ref Section 2 'Programming methods'
- Volumetric watering Ref Section 2 'Programming methods '
- Hours durations Ref Section 2 'Programming methods '
- Seconds duration Ref Section 2 'Programming methods '
- Date events Ref Section 2 'Programming methods '
- * Lights category channels Ref Section 8 'Special Purpose Outputs'
- * Courts category channels Ref Section 8 'Special Purpose Outputs'
- * C4 category channels Ref Section 8 'Special Purpose Outputs'
- Weather-Watcher
- WW advanced mode
- Power up restart Ref Section 8 'Powerup Restart of Stations'
- Power monitor
- Auto start pump Leave this option disabled
- Rain pause Ref Section 8 'Rain Pause'
- Send Alarms
- BMS alarm output Ref Section 8 'BMS Mode'
- Moisture control
- Upper moist levels
- Multi station frost

- Pause loop programs
- * 24Hr time format
- * Irrigation Same as OP7 'Turn on or off irrigation'
- * Features enabled by default

OP71 Setup 24Hr totals

This operation is used to setup the 24 hour totals facility and the daily SMS report. The 24 Hr totals, when enabled, scrolls in the LCD total station run time and volume applied (if flow meters are connected) over the last 24 hour period. The daily SMS report functionality, which requires the cellular modem, sends an SMS message to a nominated mobile phone everyday at a preset time.

The first item of information required is the time of the day that the totals should be zeroed. By default this value is set at midnight (00:00). This is also the time that the daily SMS report will be sent. Type the time of day in 24 hour notation and then press the 'Enter' key. If the daily SMS report is required and the cellular modem hardware is connected then enter the notification number (Refer to 6 Alarms for details) and then press 'Enter'. The 'Show 24Hr totals' is used to turn the scrolling of the totals values in the LCD on and off and the 'Daily SMS report' setting is used to enable or disable the daily SMS message. After setting these two parameters the operator is returned back to the clock.

Refer to OP19 'Clear daily totals', section 8 'More Cloudmaster Features' and section 3 'The LCD Status Line' for an example of the daily totals display.

OP72 Setup anemometer

This operation is used to enter the parameters of the wind speed control function. The following screens show that the anemometer facility is enabled, wind speed threshold is set to 15km/h and once the 16 second average wind speed exceeds this value any programs that are currently running will be terminated and irrigation will be disabled for 30 minutes.

Anemometer Enable Disable	km/h 15	Minutes 30
Stop irrigation Enable Disable	Pause programs Enable Disable	

The 'Pause programs' action causes any active programs to be paused. A paused program will resume after the average wind speed has remained below 15km/h for at least 30 minutes. Note that this means the paused program could restart at any time. Any programs that were due to start during the time the controller was in the paused state will not start.

For electrical connection of the sensor refer to section 12 'Connecting the Anemometer' and a more detailed discussion of wind control refer to Section '8 More Cloudmaster Features/Wind Sensing'.

OP74 Setup decoder addresses

As described in 'OP42 Adding a decoder translator' station numbers are allocated to a decoder translator in blocks of 20 stations starting at 21 for slave device 1. The decoders themselves are programmed with unique addresses prior to installation. OP74 allows the operator to match controller station numbers with decoder addresses. If the decoder addresses match the station number then this operation is not required. Initially the operator is asked for the slave number and then the decoder address for each station starting at the first station as determined by that slave number. The following example illustrates that when station 21 corresponds to decoder with address 38.

Slave 1	Station Decoder 21 38
-------------------	--------------------------------------

The 'Enter' key steps to the next station. The 'End' key terminates the process and returns the operator back to the clock. On older CM units OP75 must then be used to send this information to the decoder driver.

OP75 Send decoder addresses (CM versions 3.0.1.j or older)

This operation is required with Cloudmaster units with versions earlier than 3.0.1.j. After station numbers have been matched with decoder address with OP74, this operation sends this information to the translators so they know which decoder to activate for each station. The translator needs to be connected and powered up for this to work. Slave number is requested and, after pressing 'Enter', each station and decoder address is displayed as it is successfully written to the translator. It may take a minute or two to send all 20 addresses.

OP76 Show decoder cable current

This operation is relevant to older Cloudmaster versions only. For later versions ref to OP18. This operation displays the current that is being drawn on a decoder cable. This reading includes the quiescent current drawn by all connected decoders as well as any current that is being drawn due to active decoders. As per the previous 2 operations, slave number is requested and then the current figure is displayed in mA.

OP80 Setup demo mode

This operation allows the operator to specify a time period in minutes, during which, the soil moisture sensor poll rate is reduced from 1 minute down to 5 seconds. Then, by running OP27 'Show soil moisture values', you can wrap your hand around the sensor and see the values change virtually in real time. This can be useful when demonstrating the machine or determining whether a moisture sensor is functioning correctly before installing it. After demo mode expires the sensor returns to the 1 minute poll rate.

OP83 Clear alarms

This operation is used to terminate any active alarms. Refer to section 6 Alarms for a detailed discussion of the alarm function. This operation requires no parameters it simply clears any active alarms and then returns the operator to the clock.

OP84 Clear all warm/cool delays

Use this operation to clear any floodlight channel warm up or cool down period. In this way the channel can be turned on or off again immediately. Note, this practice should be avoided to maximise the life of large discharge type lamps. The operation requires no parameters it simply clears any delays and then returns to the clock prompt. Refer to section 5 'Council Floodlight Control & Billing' for details about this facility.

OP86 Disable modem PIN

The light on the modem flashing very quickly indicates that there is a PIN set on the SIM card. This operation is used to disable the PIN. In the event of this operation not working the SIM card may need to be put into a phone and the PIN disabled using the security settings of the phone. Alternatively, the network provider can provide a SIM card with no PIN number set.

OP87 Enter a new PIN

This operation is used to setup a password that needs to be entered before access is allowed to the keypad operations. Enter any number up to 10 digits in length and then press 'ENTER'. After the grace logon period has expired this 10 digit number will need to be entered to gain access to the keypad. See Section '8 - More Cloudmaster Features/Access Password' for a more detailed discussion of passwords.

OP89 Show last keytag detected

This operation displays the ID number of the last keytag detected by the Cloudmaster unit. Keytags and their use are discussed in detail in Section '5 - Council Floodlight Control & Billing' This can be useful if you suspect a keytag has a flat battery or is becoming faulty.

The ID is displayed and the 'END' key returns you back to the clock.

OP90 Display serial number & version

This operation displays the serial number of the unit and the firmware version. The below example shows the serial number is 1234, it is a 20 station unit with a firmware version of E306a. The '1' on the end of the version number signifies that this unit has station numbers starting at '1' and not '0'.

```
SN: 1234 (1234)
VN: CM20c E306a1
```

OP91 Set system parameters

This operation is used to set various settings in the controller. There are two serial numbers associated with a Cloudmaster unit. One is permanent and cannot be changed. This is the number displayed on the front of the unit and displayed in brackets above. The second serial number can be changed by the operator. An instance of when you may want to do this is if you swapped out a Cloudmaster unit with a standby replacement and you wanted to change the serial number of the new unit to match that of the unit being replaced. In this way the serial number would not need to be changed at the central PC software.

The 'First stn 0' setting determines whether the outputs should be numbered 0-19 or 1-20. In most cases this should tally with how the terminals on the controller are physically labelled although they do not have to be. An example of when they may differ is if the unit is temporarily replacing a unit that is otherwise marked.

In most applications the remaining settings should be set as follows:

RS232 baud rate	96
Radio/LAN baud	12
Simplex repeater	Disabled
Delay (x8mS)	0
Config flags	0

OP96 Testing & exchanging units in the field

This operation is used in conjunction with the Cloudmaster central PC software which must be running and ready to receive from the Cloudmaster. It allows a person at a Cloudmaster unit in the field to initiate one of 3 different processes on the PC. The 3 options are: instruct the PC software to send a clear LCD warnings packet to the Cloudmaster, retrieve the history log from the Cloudmaster or perform a full re-initialisation of the Cloudmaster unit. Example screens follow:

<p>Notify 1</p>	<p>Select type Clear Hist Init</p>	<p>Previous unit SN 1234</p>
----------------------------	---	---

The 'Clear' option is useful for testing the communications link between PC and Cloudmaster. The 'Hist' option is useful for ensuring all history in the memory of the Cloudmaster has been retrieved back to the PC before clearing it or swapping the unit out.

When 'Init' is selected, the operator is asked for a serial number. In the case of a Cloudmaster unit being exchanged, for example serial number 1111 is being exchanged with serial number 2222, the PC software will have in its database the serial number 1111 for this site. It must therefore be notified that this unit has been physically swapped with serial number 2222 by entering the serial number 1111. The software will then update its database with the new serial number 2222 and then reinitialise the new unit to suit the site.

For the Cloudmaster unit to know how to contact the PC, a notification sequence (see section 6 – Alarms) needs to be setup using OP66. The following example shows typical settings entered for notification sequence 1 for a system using cellular communications with the PC on phone number 0291442666 which is the first number entered in the list of

phones.

Setup Phns Notfy Alrms	Phone number 1 0291442666	
Setup Phns Notfy Alrms	Notify 1	Recipient 1 Enabled Disabled
Send method SMS Phn Cbl LAN	Recipient phone 1	Allow clear alarm Yes No

This next example shows notification sequence 3 has been setup for a system where the PC is connected via direct cable connection. In both of the following examples above recipients 2, 3 and 4 would be left disabled.

Setup Phns Notfy Alrms	Notify 3	Recipient 1 Enabled Disabled
Send method SMS Phn Cbl LAN	Allow clear alarm Yes No	

OP99 Reset all system variables

This operation is used to reinitialise the controller. This operation should be used with great care. All setup and system configuration parameters are set to defaults and all programs and logged history is deleted from memory. All configuration commands will need to be run again. The unit effectively returns to a state as delivered from the factory.

5 Council Floodlight Control & Billing

Overview

Many Cloudmaster units have been installed in the municipal park management application where they control irrigation, floodlighting, security lighting, hot water systems, barbecues etc. Optional communications, by telephone, cellular or Council radio channel, can provide full control and monitoring of these facilities for all parks scattered around the municipality from a central PC running Cloudmaster Windows software.

Sporting clubs who regularly use the floodlights can be issued with uniquely encoded keytag transmitters or send an SMS message with their unique PIN number from any mobile phone (or only nominated phones) to control the floodlights. From the central PC the Council sets up 'time windows' for each club, specifying time of day, day of week etc. Within these time windows the club can turn on and off what they want and when they want it—half lights for training or full lights for a night game. It is their choice. If it rains, then they don't turn the lights on and they don't pay. The lights will turn off automatically at the end of their time window if the club has not turned them off beforehand. Casual bookings can be handled on an on-off time clock basis, which eliminates the need to issue a PIN code.

The life of discharge type floodlight lamps is maximised by the minimum warm up and cool down periods that can be set for each floodlighting channel. These periods, typically 10 to 15 minutes, prevent the clubs from power cycling the lights too quickly. Total run time reports can be generated to assist in lamp replacement scheduling.

The keytag reader operates through a brick wall, so all hardware is safely mounted out of harms way. In its memory the Cloudmaster unit logs all activity such as floodlight usage, irrigation, wiring problems, power fails etc. The Cloudmaster software retrieves this history log automatically and generates usage reports and club accounts for actual floodlight time used by the club. These accounts can cover any accounting period, include GST and can be printed directly to council letterhead and enclosed in a standard DL window envelope (see sample account). For security, the account also lists the phone number of the mobile phone used to activate the lights by SMS. The Cloudmaster can optionally SMS the club with advisory messages such as 'Invalid PIN nr', 'Out of hours', 'Park is closed', 'Invalid Phone nr' or 'Cool-Warm period'.

The result is a much fairer user-pays system for the club. It also eliminates many problems for the council, such as floodlights left burning overnight or on unused playing fields, lost keys to switch boxes, vandalised switch gear and coin-operated machines, arguments over floodlight usage and wasted man hours in cost accounting and visits to the site to change timers, empty coin machines etc. The unit also controls irrigation so that significant water savings can be achieved through central control. The system has been installed extensively throughout Sydney and many councils around Australia.

Setting up the Floodlight Control Facility

See the following operations for details on setting up the floodlighting control facility:

- OP31 Setup SMS club control
- OP32 Authorised club phones
- OP53 Setup station function
- OP60 Setup Club PIN facility
- OP89 Show last keytag detected

6 Alarms

This section describes the alarm functionality in detail. Refer to 'OP66 – Setup alarms' for examples of the screens displayed when configuring alarms. See also 'Operation 71 Setup 24Hr totals'

An alarm can be triggered by:

1. The occurrence of a particular event type. For example a broken or shorted solenoid wire or a power fail or power restore.
2. A contact closure on one of the general purpose inputs.
3. A low or high moisture level threshold being exceeded by any of the soil moisture sensors

Alarms can be sent:

1. Via SMS text message.
2. To a land line phone to simply ring the phone to effectively sound an alarm.
3. To the Cloudmaster PC application running on a computer and linked via dial up modem, LAN or direct cable connection.
4. To a Building Management System by activating the BMS output.

Notification lists of up to 4 recipients can be specified, for example a list of up to 4 mobile phones where each of the recipients will be sent the alarm in sequence. After an alarm is triggered, a recipient who has been given the ability to cancel an alarm, is given a time period to do so so recipients further down the list will not receive the alarm. This is done by sending a return SMS in the format 'CLEAR ALARM 3'. As can be seen in the example alarm messages below, these instructions are included in the SMS alarm message that is sent to them.

A second method of clearing an alarm is for the person who has just received the alarm to simply phone back the Cloudmaster number, let the phone ring a couple of times and then hang up. The system uses CLI (caller line identification) to check the call was made from the phone to which the SMS was just sent and, if it was, and the recipient has been given permission to clear the alarm, then it is cleared. This saves the cost and time taken to send a return SMS message.

Up to 16 of these notification lists can be setup and the various alarms can be handled by a different notification list. In this way the relevant people can be notified for each different alarm condition.

Up to 15 recipient phone numbers can be entered. These 10 digit numbers can be mobile phone numbers or land lines. Each phone number is numbered 1 to 15 and it is this number that is used throughout the alarm setup procedure not the actual phone number itself. The reason for this is that a number represents a person and that person may be included in more than 1 notification sequence. If this person changes their mobile phone number or somebody else temporarily takes over that persons duties, then the phone number only needs to be changed in the phone number list and not every where that person is specified.

A phone number could also be the land line number of a PC that is running the Cloudmaster software application. It could also be a land line phone which is to simply ring in the event of an alarm. In the former case, assuming the Cloudmaster application is running on the PC, when it receives the message it displays an alarm box on the screen with details of the alarm and the site from which it was received. The 'Allow clear alarm' setting will determine whether the PC is able to clear the alarm. If not, then subsequent recipients will still receive the alarm after the PC has been notified.

Example SMS alarms:

```
Cloudmaster Alarm -
Stn 18 off 15:45 Open
valve wire - Phone
back or SMS 'CLEAR
ALARM 2' to clear this
alarm
(alrm:05533F0049001815
45AE)
```

```
Cloudmaster Alarm -
15:35 01.01 dry alarm
(42<50) - Phone back
or SMS 'CLEAR ALARM 7'
to clear this alarm
(alrm:05533F0049001815
45AE)
```

```
Cloudmaster Alarm -
22:41 05.08 wet alarm
(93>90)
(alrm:05533F004900181
545AE)
```

The first example indicates that station 18 turned off at 15:45 because a broken wire was detected. The recipient is advised how to clear the alarm by phoning back or by return SMS 'CLEAR ALARM 2'. Example 2 indicates that at 15:35 soil sensor 1 soil profile 1 detected a dry condition as soil moisture level 42 is less than the threshold set which is 50. The last example depicts an alarm where soil moisture reading of 93 was read from sensor 5, soil profile level 8 and this is wetter than the alarm threshold of 90. Note that this last alarm cannot be cleared by this recipient.

7 SMS Control

Overview

When fitted with the cellular modem option, Cloudmaster is able to accept SMS messages as control commands. You can configure Cloudmaster to accept control commands from any mobile phone, or, for extra security, only authorised phones. Ref also to the 24Hr totals facility described in section 8.

SMS Control Commands

The following list shows the commands that can be sent to a Cloudmaster unit. Note, the abbreviated form, shown in brackets saves typing, but remember you can easily pre-program commonly used commands into the outbox of your phone. The commands are not case sensitive.

Command	Function
REPORT	Returns an SMS report of current activity and warnings (RE)
HELP	Returns an SMS menu of typical control commands (HE)
DISABLE 17	Disables station 17 (DI 17)
ENABLE 159	Enables station 159 (EN 159)
IRRIGATION ENABLE	Enables irrigation or take out of rain mode (IR EN or IR ON)
IR DI	Disables irrigation or put into rain mode
LIGHTS ENABLE	Enables floodlight control facility (LI EN or LI ON)
LI DI	Disables floodlight control facility
STATION OFF	Turns off all active stations, terminating programs (ST OFF)
ST ALL OFF	Same as above
ST 7 ON 15	Manual override station 7 immediately for 15 minutes
ST 7 ON 15S *	Manual override station 7 immediately for 15 seconds
ST 7 ON 15H *	Manual override station 7 immediately for 15 hours
ST 7 TILL 22:00	Manual override station 7 immediately until 22:00
ST 7 OFF	Turns station 7 off. Terminate programs
PROGRAM 06:00 STOP	Stops all programs with a start time of 6:00AM (PR)
PR 06:00 SKIP	Skip current station in all programs with a start time of 6:00AM
PR 15:30 START	Starts (or unpauses) all programs with a start time of 3:30PM
PR 06:00 PAUSE	Pauses all programs with a start time of 6:00AM
AUXPUMP ON	Select auxiliary pump and turn main pump off
AUXPUMP OFF	Select main pump and turn auxiliary pump off
MOISTURE 5 **	Returns an SMS of current soil probe readings from probe 5

* Versions prior V2.6.3 require the 'S' or 'H' before the duration for example S15 or H15.

** The sensor number (5 in the example) is optional. If not specified the list starts at the first sensor.

Example SMS Commands

Multiple commands can be appended together in the one SMS message. For example, to turn station 17 on for 30 minutes and have the Cloudmaster unit return an SMS message back to confirm that the command has been executed and station 17 is in fact on, the command would be:

station 17 on 30 report

Daily SMS Report

The daily SMS report is a useful method of ensuring the irrigation system is operating as expected at a remote site. It is an SMS message that is sent to a mobile phone every day at a preset time. The text of the message is the same text that is scrolling through the LCD (as detailed in Section 3 'The LCD Status Line') at that time. This facility is the equivalent of sending the REPORT SMS command to the controller at the same time everyday. This serves two purposes. Firstly, if you do not get the SMS then this may indicate a serious problem on site such as the controller has lost power. Secondly, if you have the 24 hour totals enabled (Ref Operation 71 'Setup 24Hr totals') then you will know what the total station run time and volume applied has been over the last 24 hour period. This will give an indication that the hydraulics is running as expected.

Refer to operations 71 and section 3 'LCD Status Line' for more details and an example of the 24 hour totals display.

Hardware Required

The SMS feature requires the cellular modem kit from Jeffery Electronics. This kit includes a 3G modem, a stubby antenna, serial cable with adapter and a power cable. The modem is powered directly from the Cloudmaster terminals so it does not require a plug pack. Also, the modem must be connected with any of the mobile phone service providers. On request JEC can provide a suitable SIM card.

Refer to section 12 Installation and Cable Connections for details on installing and connecting the modem.

Clubs and Staff

Operations 31 through to 34 refer to clubs and staff. This terminology is intended for the Council park management application (see section 5 'Council Floodlight Control & Billing' for details). Club users are only able to send the command to turn on and off the floodlights within their nominated time slots. Staff users, on the other hand, can send any control commands any time of the day. When used in any application other than municipal use the 'Staff' list and ignore the club list.

Configuring SMS

Refer to the following operations in section 4 to enable and configure SMS functionality:

- OP31 Setup SMS club control
- OP32 Authorised club phones
- OP33 Setup SMS staff control
- OP34 Authorised staff phones
- OP66 Setup sending alarms

8 More Cloudmaster Features

Central PC Control

The Cloudmaster can be operated remotely via direct cable, internet, radio, cellular, telephone land line or LAN (local area network). Applications to date include:

Council parks where irrigation and lighting of all fields, parks, reserves, roundabouts etc scattered around the municipality can be controlled and monitored from a central depot

1. Large landscaped areas such as university campuses
2. Nurseries where irrigation and misting can be controlled & monitored remotely
3. Systems remotely monitored by a landscape maintenance company.
4. Golf courses
5. Remote control and monitoring of large garden wall projects

The Windows based Cloudmaster central PC software can be used to setup a virtually unlimited number of irrigation and special purpose programs on the PC and downloaded to the Cloudmaster unit as required. Also, detailed history event, water consumption, station run time, council floodlight usage reports can be displayed and printed.

LAN Connection

Connection between PC and Cloudmaster can be achieved through a local area network (LAN) provided the unit is fitted with the LAN option. The photo in appendix B shows the location of the LAN cable connection on the right hand side of the unit. The two bi color leds marked 'A' and 'B' indicate 10Base-T and 100Base-T link activity respectively. Solid on indicates a physical connection to the LAN and blinking indicates the Cloudmaster PC program has established a link with the unit. For details refer to information sheet from <http://www.jec.com.au/downloadpage.html>

Access Passwords

An access code of up to 10 digits can be setup with OP87. After this has been done the number must be entered before any operation can be run at the keypad. After the number has been entered successfully the user is given access to all keypad operations in the normal manner. After 2 minutes of no keyboard activity the number would need to be re-entered. In this way the user can just walk away without needing to 'logoff' or end his current user access session.

Power up Restart of Stations

The Cloudmaster can be setup to handle power interruptions in 2 ways. The first (and default) method involves the Cloudmaster restarting any programs that were running at the time of the power fail, at a point where they would be if the power fail never occurred. In other words some stations may be skipped during the power fail but stations will always start when the operator intended. In this way, programs cannot be shifted in time by a power fail. A message is logged to the history log if stations were skipped in this manner.

For example, if we take a program of stations 1 through to 6 setup to start at 8:00 AM and run for 10 minutes each. If this program was interrupted by a 20 minute power failure from 8:25 AM to 8:45 AM then stations 1 and 2 would get their full 10 minutes, station 3 would only receive 5 minutes, station 4 would be skipped altogether and station 5 would start halfway into its 10 minute period so it would only get 5 minutes. Station 6 would run as normal. Stations that were skipped during the power fail or did not receive their full duration will be logged in the history log so they can be easily identified.

The second method is to turn this restarting facility off so that a program is simply terminated by a power interruption. This can be done using OP70 'Customise unit's functions'. Note that, as described in Section 2 - Programming Methods, Loop Cycle, a loop cycle will automatically restart after a power fail as long as the time of power restoration is within the normal enable/disable times of the loop cycle.

Control from Remote Slave Units

In a situation where Cloudmaster units have been connected together in a master/slave configuration (See OP42), any changes and interrogating can be done at any keypad display in the network regardless of whether it is the master or a slave unit. However, as the program actually resides in the master unit and all slaves take their instructions from the master, all keys pressed at slave units must be sent, over the comms cable, to the master. Similarly, LCD messages are actually generated at the master unit and sent to all slaves. Consequently, LCD response to keys is much slower at a slave unit.

Input Reactions

This operation is used to set up the controller to either stop, skip or pause a program when an input goes active. Refer to OP59 'Set up an input reaction' for further details and 'Rain Pause' below.

Rain Pause

This facility, when enabled, instructs the unit to automatically pause any active programs when the rain input is activated. When the sensor becomes de-active the program will continue from the point at which it was paused. This differs from the normal situation which simply terminates any programs when a rain condition is detected.

To enable this facility ensure that both the 'Rain sensing' and the 'Rain pause' functions are both enabled using OP70.

Special Purpose Outputs

Any station output in the Cloudmaster installation can be setup as a special purpose control output. Typical uses would be:

- | | |
|---------------------------|---|
| 1. Floodlight control | 5. Control of security systems |
| 2. Hot water systems | 6. Fountain control |
| 3. Reservoir fill pumps | 7. Park open/closed signs |
| 4. Automatic gate control | 8. Stations that must not activate the pump |

These outputs are treated similarly to timeclock stations but for 2 important differences. Firstly, the pump/master valve is not activated whenever a special purpose output comes on and secondly, any fertiliser and volumetric details are ignored. The procedure for identifying a special purpose output is detailed in section OP53 Setup station function.

24Hr Totals

When enabled, this facility scrolls in the LCD what the total station run time and volume applied (if you have flow meters installed) has been over the last 24 hours. The operator can nominate a time of the day at which 24Hr totals values are automatically reset to zero or they can be manually zeroed at any time using operation 13. Furthermore, if the SMS facility is available, an SMS message can be sent to a nominated mobile phone everyday at this reset time immediately before the values are zeroed. This should give a good indication that everything is running as expected at a remote site. Refer to operations 71 & 13 and section 7 'Daily SMS Report' for more details. Also see section 3 'LCD Status Line' for an example of the daily totals display.

BMS Mode

BMS mode allows the controller to be interfaced to a Building Management System or to cater for any situation where a hardware output is required to notify other equipment of an alarm condition. The fertiliser output is used to provide the alarm output so the fertiliser or auxiliary pump functionality are not available when BMS mode has been enabled. The output is typically wired through a 24VAC relay coil to provide a voltage free contact to the BMS.

To setup BMS mode run operation 70 and select 'Enable' when 'BMS alarm output' is displayed. Select which alarm notifications are to activate the BMS output with OP66 Setup sending alarms'.

Whenever any of the selected alarm notification events are triggered, the BMS (Fertiliser) output will be activated and the message '-Sending alarm' will appear in the display. The output and the message will remain active until cleared with an OP15 Clear all warning messages or OP86 Clear alarms even if the alarm condition clears itself.

Tank Level Monitoring

The 4 and 8 input expansion units can be connected to float switches mounted at equidistant heights within a tank and thereby monitor the level of fluid in the tank. The 4 float switches should be mounted at 20%, 40%, 60% and 80% levels and the 8 switches at 11%, 22% . . . 88% levels. The level of the top most active switch can then be displayed with OP26 Monitor a tank level. An icon can also be placed on the map at the central PC which displays the fluid level.

Wind Sensing

With the connection of the wind anemometer from Jeffery Electronics, the Cloudmaster is able to enable or disable irrigation based on measured wind speed. Note that only one anemometer can be connected and it must be physically wired to input 1 (refer to section 12) on the master unit. It cannot be connected to a slave unit. Also, the sensor must be of the correct type.

OP72 is used to enter all the setup parameters required and OP25 is used to display the current wind speed and 16 second average wind speed. Refer to those sections for examples.

Using OP72 the operator can enter a wind speed threshold, an irrigation off time in minutes and whether irrigation is to be terminated or paused. Any time the 16 second average wind speed exceeds the threshold setting any programs that are currently running will be terminated or paused and no new irrigation programs will be allowed to start for the irrigation off time period. Also, the irrigation off time is refreshed every time the average wind speed goes above the threshold. In other words, the wind must remain below the threshold speed for at least the irrigation off time before irrigation will be re-enabled and any paused programs resumed. Note that the paused program could restart at any time.

9 Soil Moisture Sensors

The Cloudmaster is designed to work with certain brands of soil moisture probes. Up to 16 soil moisture probes, from the single level up to 16 level probes can be connected covering a wide range of applications such as turf, agriculture, landscape, commercial and domestic. This section gives an overview of the main features such as automatic enable/disable of programs, moisture data logging, high/low moisture alarms and real time moisture level reporting.

Most soil moisture sensor manufacturers say their sensors can be connected to any controller. This is only true when the sensor is wired to simply disconnect, or break the wiring connection to the valves. The Cloudmaster/soil probe approach is far more powerful. The Cloudmaster actually talks directly to the probes in the ground enabling features such as soil moisture threshold control of individual programs, remote moisture threshold adjustment, soil moisture data logging, high/low moisture alarms sent in real time via SMS or PC, instant reporting of real time soil moisture levels via SMS or PC.

The moisture level is displayed as a % value. Where 0% is the sensor in open air and 100% is the sensor in a bucket of water. The reading at soil field capacity depends on soil type but would typically range from 75% to 100%. A value of over 100% indicates a high salt or iron content in the surrounding soil medium.

The multi level sensor, for example the 30cm long, 6 level turf probe has a sensing point every 5cm. The larger 50cm, 100cm and 150cm probes have sensors every 10cm. The level closest to the surface is level 1 and the deepest is level 6. There is a setting which the operator can set to tell the Cloudmaster to logically include all levels above the one specified when controlling programs. For example, a program was to be disabled if sensor 2 level 4 is above 65% then the program would also be disabled if any of the level 1, 2 or 3 were also above 65%. Refer to OP70 Customise units functions to turn this feature on or off.

Any sensor can also be set up to put the whole controller into rain mode thus disabling the irrigation function completely when a preset soil moisture level is reached. In this way a sensor could be installed outside the irrigation zone to put the controller into rain mode due purely to natural rainfall. A rain sensing moisture probe can be used as well as a standard rain switch. The rain switch would turn irrigation off immediately and the soil moisture level would hold the controller in rain mode whilst the soil remains moist. Refer to OP36 Setup rain soil sensor & OP54 Setup rain switch.

Selected soil moisture sensors can also be set up with high and low alarm trigger levels where an alarm will be sent if the soil moisture level goes above a high or below a low threshold level. These alarms can be sent to the central PC or a list of up to 4 recipients mobile phones. Refer to Section 6 Alarms & OP66 Setup sending alarms.

When used with the Cloudmaster PC application a data logging interval can be specified so all sensors readings will be logged to memory. Back at the PC this information can be exported to a spreadsheet.

The probe must have the AO protocol installed not the standard ASCII protocol to be compatible with Cloudmaster. It is beyond the scope of this manual to explain the different protocols. Check www.cloudmaster.com.au for the latest information or contact JEC for details.

See also 'OP27 Show soil moisture values' & 'OP35 Setup soil moisture sensors' for more details.

10 Weather-Watcher Sensor

Overview

The Weather-Watcher (WW) sensor is a hardware device that connects to the Cloudmaster controller and enables it to detect light level and temperature. Loop cycle programming can then be used to set up watering/misting schedules, which will automatically adjust to weather conditions. Typical applications are mist propagation benches, hydroponics and water conservation in general irrigation.

Units of Measure and Accuracy

The sensor is not intended as a laboratory instrument. Light level is displayed in watts per sq metre (W/m²) but it has not been calibrated against a standard, has no cosin correction and is not filtered for the PAR (photosynthetically active radiation, 400nm to 700nm) band. Temperature is displayed in degrees celsius, is accurate to about 3 degree celcius and has a time response in the order of tens of minutes.

Mounting and Electrical Connection

Mount the sensor vertically, in a position where it is subject to the same ambient temperature and light levels as the plants. As the sensor needs to measure ambient air temperature, it should only ever receive diffused light, never direct sunlight, which would heat the sensor well above ambient. The ideal location in a misting application would be inside the glasshouse or igloo, mounted at head height, out of the mist and pointing in towards the centre of the growing area. The unit 'looks' away from its wall mount bracket. In an outdoor setting, a painted glass or translucent plastic cover to shield the sensor from direct sunlight should suffice.

Connect the white(yellow) wire to the Cloudmaster terminal 'Slave+', the blue wire to 'Slave-', the red wire to 12V (or 'Spare' on earlier machines) and the black(green) wire, together with the shield drain wire, to the terminal immediately left of 12V ('Spare'). The cable can be lengthened to a maximum of 100m, as long as good quality shielded twisted pair cable is used. All connections should be sealed from moisture and the wires not shorted or crossed at any time. Do not use spare conductors in solenoid valve cable looms; the sensor will not work and damage to the controller or sensor may result. Note also, for long cable runs, extra lightning protection should be installed (ref. Jeffery Electronics info sheet).

Cloudmaster Configuration

Use Operation 42 (OP42) to logically connect the sensor to the Cloudmaster controller. You should now be able to see the glow of the red LED blinking at the end of the sensor. Multiple sensors can be connected if required.

The automatic weather adjustment of loop cycle intervals feature must be enabled before it will operate. This is done with OP70 and selecting 'Enable' for 'Weather-Watcher'. The 'WW advance mode' determines whether you want to specify temperature and light energy amount globally for all WW loop cycles or specifically for each one. This is explained in more detail below.

For the mist propagation application, which requires very short misting durations, you may also want to enable 'Seconds duration'. Similarly, irrigation scheduling requiring very long watering duration or interval times (>250 minutes) would need 'Hours duration' enabled as well. Leave other settings as required or at their default values.

OP65 is used to enter the parameters by which the watering schedule is adjusted according to the weather (detailed explanation below). For misting, enter starting values of 55 for Temp% and 30,000 S. The 'M' is changed to an 'S' with the '0/CHG' key. For irrigation, refer below to determine values.

View Current Sensor Readings

OP21 is used to display the current readings from the sensor. If more than one sensor is attached, use the arrow keys to step between them. An example is given below:

WW#	Temp	Light
1	26.5	126.4W

Enter a New Loop Cycle

The Cloudmaster controller can be programmed with both weather controlled misting and irrigation and standard time clock irrigation schedules. You can set up any number of loop cycles to run concurrently or at different times of the day.

To enter a new WW controlled loop cycle, run OP09 'Enter a new loop cycle' and select 'enable' when prompted for 'Sensor control'. A mist propagation cycle would use very short misting durations of typically 5 to 10 seconds. An irrigation schedule would typically have longer watering times and a much longer interval.

Choosing Temp% and LightW/ Values

OP65 is used to enter global parameters which determine how the loop cycle interval for all loop cycles entered are adjusted by the weather. If 'WW Advanced Mode' is enabled in OP70 then these parameters can be entered individually for each loop cycle. This would be required if, for example, you wanted the sensor to be adjusting both propagation mist cycles and irrigation cycles which have very different interval timing.

The 'Temp%' value determines how much affect the temperature has. A value of 0 means the temperature has no affect at all. A value of 55 approximates the temperature response of the original Jeffery Electronics 'Weather-Watcher' range of misting controllers. Assuming constant light level, a temperature above 25°C will shorten the interval between cycles and a temperature below 25°C will lengthen the interval. With a 'Temp%' setting of 55 the interval will be adjusted down to 66% of its normal (25°C) value at a temperature of 40°C and up to 133% at 10°C. A larger setting will result in a greater variation in interval.

The 'LightW/' value determines the time interval between cycles (at 25°C). It is used as a countdown timer and can be any number between 1 and 65,000 wathours, wattminutes or wattseconds (H, M or S in the display). It is the amount of light energy that must be detected before a cycle repeats. For example; a value of 500M (500 Watt'M'inutes) would result in the cycle repeating every 500 minutes at a light level of 1 W/m², every 50 minutes at 10 W/m², every 5 minutes at 100 W/m² or every 10 minutes at 50 W/m². Note, entering the figure in WSec results in a bigger number which would make it easier to watch the value count down. A value of 30,000 WSec is equivalent to 500 WMin (500 x 60 = 30,000), i.e. it is the same amount of light energy, so the above example figures would equally apply.

In complete darkness the interval of a WW controlled loop cycle extends to infinity i.e. the cycle stops. If you wish to apply some water during the night this can be achieved by programming the stations to come on using standard timeclock watering.

Although accurately calculating interval from these variables is possible, it is usually not necessary. The best way to determine a value for the 'LightW/' value for mist propagation is to start with 30,000S and let the system run for a while. If too much water is being applied then increase this value. If too little water is applied then decrease it.

Determining Start Time of Next Cycle

When waiting an interval the Cloudmaster will scroll in its display a countdown value. When the value reaches 0 the cycle will repeat. The interval count for a loop cycle that has been set up on a timeclock basis, i.e. it is not weather controlled, will decrement each second, minute or hour depending on whether the interval was specified in seconds, minutes or hours respectively.

The interval count for a sensor controlled loop cycle will decrement at a rate determined by the current weather parameters as displayed by OP21. It will count down faster in hot, bright conditions and slower in cold overcast conditions. Refer to technical explanation below.

Modifying Existing Program

To view or make changes to an existing program use OP01 'Display or modify entries'. Keep pressing the 'Operation' key until the required information is displayed. Type the new values over the old and press 'Enter'. This is described in more detail in the operators manual.

Immediate Override Control

To immediately start a loop cycle (or stated another way, set the current interval to 0) run OP01 and press the 'Enter' key until the 'Light Remain' details are displayed. If you have more than one loop cycle running then be sure to find the correct one. Use the arrow keys to move the cursor to the remaining countdown timer and set it to 0 and finally press 'Enter'. Assuming the present time is within the period that this cycle is permitted to run and the present day is selected, the cycle will start immediately, run through the sequence once and then wait its normal interval as determined by either time or the WW sensor. You can also use this method to lengthen the delay until the next cycle.

Example Propagation Mist Program

You have stations 1 to 5 controlling individual mist beds. They must be turned on in sequence 2, 3, 1, 5 and 4 for 5, 5, 8, 12 and 5 seconds respectively. You want the interval to be 20 minutes at 25 degrees celcius and a light level reading in the glasshouse of 500 W/m². Warmer/lighter conditions will shorten the interval, cooler/darker conditions will lengthen it. You also want the loop cycle to run every day of the week, from 6:00 AM to 9:00 PM. Use OP09 to initially enter the loop cycle and OP01 to thereafter modify it as follows:

OP09-Enter a new loop cycle	Loop On Off 06:00 21:00	Days MTWTFSS X=ON XXXXXXXX
Sensor control <u>E</u> nable Disable	WW# Temp LightW/ 1 55% 10000 M	Stn Dur 2 5 S
Stn Dur 3 5 S	Stn Dur 1 8 S	Stn Dur 5 12 S
	Stn Dur 4 5 S	

This example assume that 'WW Advanced Mode' has been enabled using OP70. This program will run concurrently with any other programs entered into the Cloudmaster.

11 Decoders

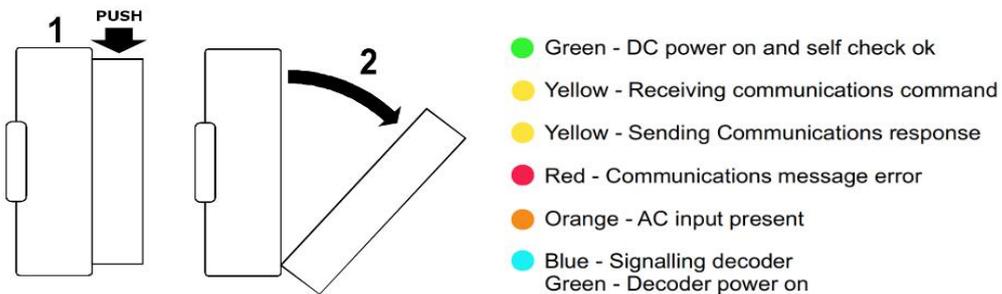
A decoder system uses a single copper cable pair running around a golf course, oval, nursery or large landscape area. This cable supplies both power and control signaling to uniquely addressed decoders that are spliced into the cable at any point around a site and directly buried in the ground. This approach can have 2 major benefits over a conventional controller. It can reduce wiring and it provides the ability to add future stations by simply splicing more decoders into the cable at the point where they are required.

Decoders can be connected to any 20 station Cloudmaster controller and thus provide the best of both worlds and allow station expansion beyond the 20 stations. This is achieved with a cable driver unit that connects to the slave comms pair on the Cloudmaster. This unit also has its own 30VAC power supply to power the decoders and valves.

Once setup, the decoder stations are treated just like a standard Cloudmaster station from the point of view of the operator at the controller or the central PC. Decoder stations can be programmed using any of the standard methods or be controlled via SMS command or soil moisture level in the standard manner.

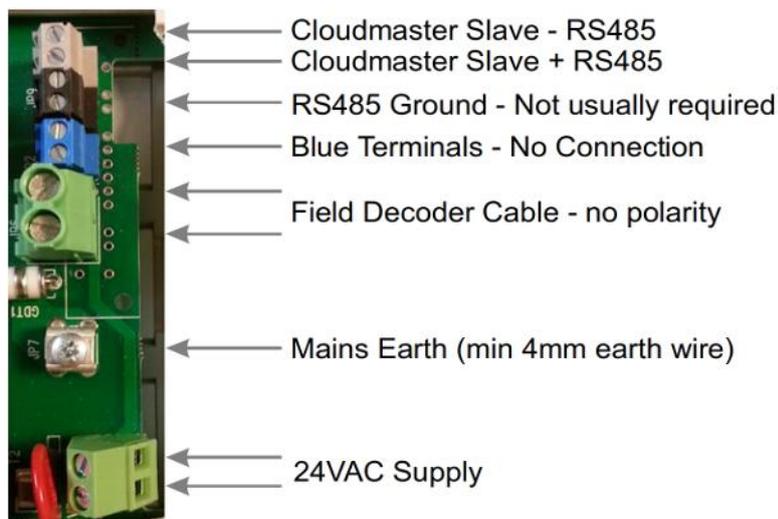
For more information refer to sections OP42 Setup or mod slave units, Adding a decoder translator, OP74 Setup decoder addresses, OP75 Send decoder addresses (versions 3.0.1j or earlier) and OP76 Show decoder cable current.

Removing Driver Unit Cover and Led Indicators



Removing decoder cable driver cover and led indicators

Cable Driver Connections



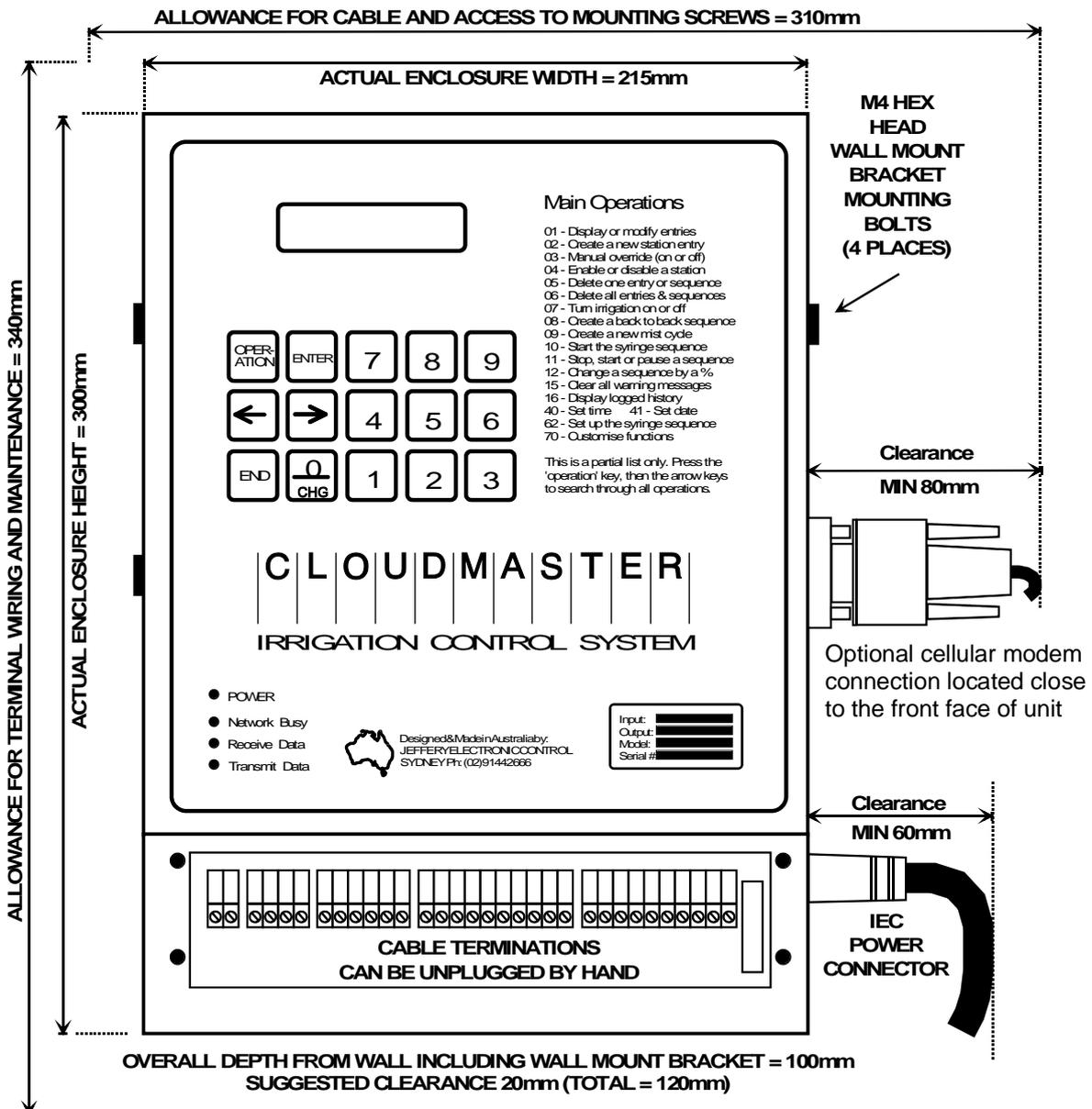
Decoder cable driver unit connections

12 Installation, Connection and Configuration

Controller Location

Cloudmaster units should be mounted in a position protected from the weather and direct sunlight. A pump house or shed is ideal. A weatherproof box will suffice, provided it is protected from direct sunlight, or sufficient ventilation is provided so it does not heat up inside. The temperature inside the enclosure should never exceed 50 degrees Celsius. It should also be noted that the total current output capability of the unit is automatically de-rated in high ambient temperature conditions. Internal temperature can be displayed with Operation 23.

Cloudmaster Dimensions



Cloudmaster dimensions and enclosure clearances

The units mount via detachable wall brackets which are removed by loosening the 2 hex head screws at each side of the units. When mounting the wall brackets, at least 6 cm should be provided above the unit to allow the front cover to be removed for servicing.

Sufficient space should be provided along the right hand side for the computer cable and power lead to be plugged in & removed easily.

The wiring positions on the units are clearly marked. The 24v AC common terminals (marked 'COMM') may have to be brought out using one wire and externally terminated as all wires may not fit into the two terminals provided. It is important to note that the terminals marked 'NO CONN' and 'SPARE' should not be used.

Connection of each solenoid valve is achieved by running a wire from each station output to one side of each valve. Each station terminal is clearly marked 0 through 19 on the front of both the master and slave units. A second wire should be run from the 24v common 'COMM' to the other side of all the solenoid valves. Runs of up to 500 metres can use 1.5 sq. mm cable otherwise 2 or 2.5 sq. mm cable should be used. The system pump/master valve should be wired between 24v common 'COMM' terminal and the 'PUMP' terminal on any of the units. Similarly, the fertiliser or chemical pump supply wires should be wired between 24v common 'COMM' terminal and the 'FERT' terminal on any of the units. Multiple water or chemical supplies can be configured by using these outputs on more than 1 unit in the whole installation. Similar gauge wire as described above should be used. The flow meter for each water supply must be of the momentary closing contact type and should be connected to the two terminals marked 'FLOW' of the same unit which is controlling that particular water supply.

Refer to Appendix B for a photo of the terminals.

Terminal	Connection
Slave + & -	RS485 slave data communications wires. To be connected to matching terminals on all Cloudmaster slave units in the system. Refer to lightning protection information sheet regarding protection of long cable runs.
'Input0'	One side of voltage free, closing contact switch type sensor. Default function rain sensor can also be general purpose input.
'Input1'	One side of voltage free, closing contact switch type sensor. Default function Frost sensor can also be general purpose input or auxiliary supply flow meter.
'Flow'	One side of contact head water meter (Refer below)
Far right hand terminal of the four way block	Other side of above 3 sensors and negative power supply to cellular modem.
'12V'	Positive supply to cellular modem. Not to be used for any other load.
'Sol Comm'	24VAC common supply to solenoid valves, pump and fertiliser circuits. These two terminals are electrically joined inside the unit.
'Pump'	24VAC supply to pump/master valve circuit. Comes on whenever any irrigation station is turned on
Fert	24VAC supply to fertiliser injector pump start circuit or fertiliser control solenoid valve. Can also be auxiliary pump or BMS interface output.
No Conn	Do not connect anything to this terminal
Stations 1 to 20	24VAC station outputs to solenoid valves. 1 to 10 on a 10 station controller

Terminal connection functions

Changing First Station 0 or 1

In instances where compatibility with pre serial number 2000 Cloudmaster units needs to be maintained, this section describes how to change the controller back to the original numbering scheme of starting with station 0 rather than station 1. Refer to Appendix B for a photo of the correct placement of the polycarbonate decal.

Remove all the cable plugs from the Cloudmaster and ensure the label area is clean. Remove the backing paper from the decal and carefully place the label against the lower edge of the label area. Then run 'Operation 91 – Set system parameters' and select 'Enable'

when asked 'First Stn 0'. All other parameters can be left at their default settings.

Suitable Flow Meter Pulsar Types

When a flow meter is connected to the flow input on the Cloudmaster controller it will log leakage and water consumption for each watering event so long as only one station is on at any one time. After the unit has 'learned' the correct flow rate for each station the unit will indicate an alarm and step to the next station if a stations measured flow rate ever varies from its standard flow rate by more than an allowed tolerance.

Maximum pulse frequency is about 50 pulses per second (assuming a 50% mark space ratio) and the flow meter must be of the correct type.

Suitable Types

A voltage free, momentary closing contact type. These are also referred to as a 'contact head' meter. Put another way, the pulser unit is simply a switch which closes and then opens back up again each time a unit volume of water passes through the meter. They usually consist of a magnet which sweeps past a reed relay and are always a two wire device (Note: this is not saying all two wire devices are this type).

Unsuitable Types

Opto types have a led shining on a spinning mirror face. The reflection is detected by a photo detector device. These devices are from 2 to 4 wires and often give a current pulse, rather than voltage or resistance pulse output. They can also have a waveform shape that indicates the direction of flow of the fluid through the meter. These types are not suitable for Cloudmaster.

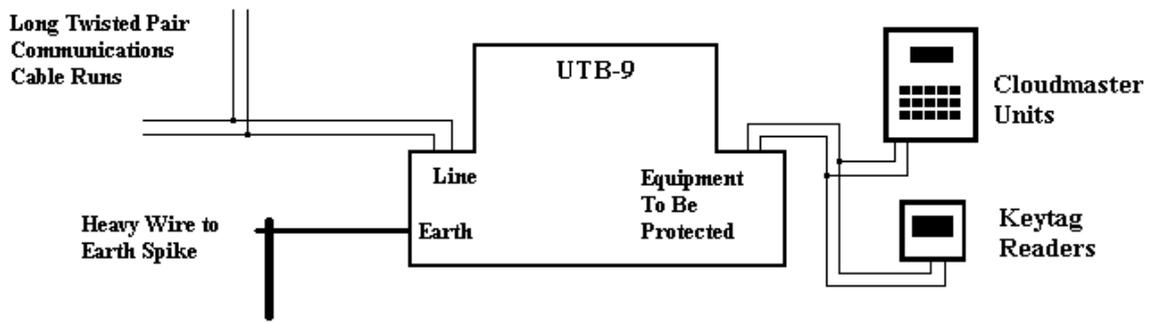
Slave Device Cabling

Note that master/slave communications can be achieved through a cellular link to avoid long cable runs which can be very susceptible to lightning damage.

The number of stations can be expanded by connecting Cloudmaster units together. Units connected this way (see OP42 for setup procedure) fall down to dumb slave mode taking all instructions from the master. The RS485 slave data link terminals are marked 'SLAVE' on the front of each unit. These terminals on the master and all slave units (marked '+' and '-') must be wired together without being reversed. In other words, all the '+' terminals wired together and all the '-' terminals joined together. Note that this connection can also be achieved with a radio link. The slave link cabling can be done with light gauge wire. The external waterproof type telephone cable will suffice and can be run up to about 1 kilometre. This figure should be treated as a rough guide only. A carefully designed wiring network will ensure a reliable installation.

Lightning Protection

The UTB15DP (Universal Transient Barrier) acts as a barrier to voltage spikes by clamping them to 15 volts. They are installed in series with the comms cable between the long cable run and the equipment: in this case, Cloudmaster slave units, keytag readers etc. The side of the UTB15DP is clearly marked 'Line' and 'Equipment to be Protected'. A very heavy grounding cable (min 6mm) is taken from the UTB15DP to a deep ground spike which should have maximum 2 to 3 ohms to earth. These devices are available from Jeffery Electronics. More information is available from the manufacturer's website: <http://www.erico.com.au>. Connect as follows:



Slave pair lightning protection device

Mains Protection Devices

In lightning prone areas extra lightning protection on the mains is important. Whilst a GPU with built in lightning protection is better than nothing, a dedicated high quality, high surge capability unit is far more effective. The recommended device for this purpose is called an Eliminator and is available through Jeffery Electronics.

13 Connecting the Cellular Modem & Antenna

IMPORTANT

1. Modem black power wire does NOT go to solenoid common (see photo)
2. Connect antenna, finger tight only, to connector marked 'Cellular' (not 'GPS')
3. Allow the power up sequence to complete. This can take up to 4 minutes
4. Signal strength must be better than 15 for a reliable result.
5. Constant fast blink means the SIM card has a PIN number set. (Ref OP86).
6. If the light is not blinking once per second then the modem will not work.
7. Operation 85 should not be run with the 3G modem.

Power up Led Sequence

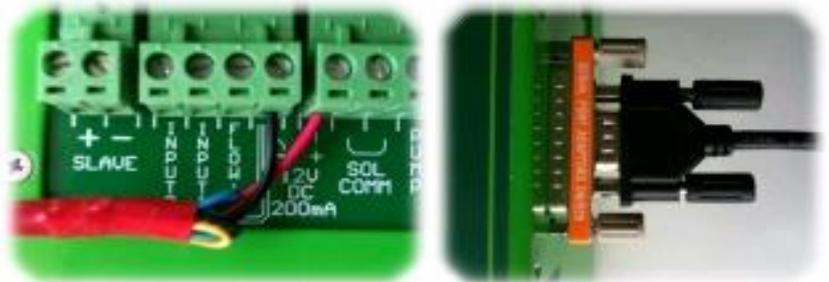
It is important to allow the modem to complete its power up sequence. This is particularly important the very first time a modem is powered up or when a SIM card has been changed. The sequence is indicated by a group of led blinks every 5 seconds. The number of blinks counts down from 9 to 2 to indicate progress through the sequence. Successful completion and normal operation is indicated by a short blink on every 2 seconds.

Location & Mounting

The modem should be located in a cool, dry place protected from the elements and possible ant or rodent infestation. The modem mounts on a horizontal section of 35mm DIN rail with the spring on the back mounting plate downwards. The mounting plate can be changed to achieve any 90° orientation. As delivered, the antenna connectors will be pointing to 3 o'clock.

Electrical Connection

To avoid plug packs, the modem is powered directly from the controller; power off the Cloudmaster before making connections. The modem power cable red wire connects to the Cloudmaster terminal marked '12V' (or 'Spare' on very old units). The black wire connects to the terminal



immediately to the left of 12V i.e. the far right hand terminal of the four way block. The serial cable & DB9 to DB25 adapter connects the modem to the DB25 on the side of the Cloudmaster. Take care when plugging the serial cable on and off as the pins are easily bent.

Antenna Location

Received signal strength is primarily determined by proximity to the local cell and efficiency of the antenna system. The antenna should be mounted as far from electrical cabling and metallic objects as possible. You may get away with the stubby antenna screwed directly onto the modem mounted inside a fully enclosed metal enclosure, but this is strongly discouraged. It is important to check the received signal strength as described below. If a sufficient signal strength reading cannot be obtained then a higher gain, external antenna can be purchased. Antenna connects to the connector marked 'Cellular' not 'GPS' and only needs to be done up finger tight. The 'GPS' connector should remain protected with the red cap.

Inserting the SIM Card

The modem should be powered off when changing the SIM card. The SIM card is fitted into the modem by pressing the yellow ejector button with a pen or similar, placing the SIM card in the holder, it can only go one way due to the bevelled corner. Slide the holder back into the modem.

Initialising the Modem

Operation 85 should not be run with the new 3G modem. The latest version Cloudmaster uses OP85 to allow the operator to disable the SIM PIN security code when it or the PUK code is known.

Testing Signal Strength

Operation 22 displays the signal strength which is equivalent to bars on your mobile phone. For reliable operation the signal strength should be 17 or more. A reading less than 10 will be very problematic. The number is from 1 to 31. It updates every second so this can be a useful way to find the best location for the antenna before permanently mounting it. The signal strength value can also be obtained remotely by sending the SMS command '.signal', without the quotes, with the leading period, not case sensitive.

If the modem is mounted inside a metal enclosure, the best solution is to use the panel mount antenna so the antenna itself is on the outside of the enclosure and thus not shielded by the enclosure. If the antenna must reside inside the enclosure it is important to check the signal strength with the door closed. To do this run OP22 and then hold the door in the shut position for at least 30 seconds before opening the door and observing the signal strength displayed.

SIM Card Requirements

The SIM cards need to meet certain criteria. JEC can provide the SIM card or the client can provide their own. Contact JEC to discuss the requirements.

Modem Fault Finding

Fault: Modem led remains off even though the Cloudmaster is switched on.

Fix: Check power cable is connected correctly on the Cloudmaster and the modem. The black wire does not go to solenoid common. Refer to section 'Electrical Connection' above.

Fault: Modem spends a lot of time in the power-up sequence.

Fix: Constant fast blinks – See below.

9 blinks – In network retry wait period, a Telstra requirement can be up to 3 minutes

8 blinks – SIM not ready. Check SIM card is paid up, activated and configured correctly.

7 blinks – Cannot register with the network, Check SIM card and antenna

6 to 5 blinks – Searching for available APNs, Check SIM cards access to network APNs.

4 to 2 blinks – Cannot connect to JEC servers. Contact Jeffery Electronics.

Fault: OP22 is showing a blank bottom LCD line.

Fix: Check that RS232 baud rate is set to 96 using OP91. Check that there are no bent pins on either end of the black serial cable connector. Power cycle the unit and, if necessary, run OP99. Caution; this will erase all setting from the controller.

Fault: SMS messages can take a long time to get through.

Fix: Check signal strength is within optimum range.

Fault: Constant fast led blink.

Fix: Turn off SIM card security PIN number by using Operation 86 on a late version Cloudmaster, contacting your SIM card provider, or putting the SIM card into an older mobile phone that uses standard size SIM card and going into Setup / security options.

14 Warranty and Service Information

All Jeffery Electronics manufactured equipment is covered by a two year, return-to-factory warranty commencing from the date of shipment. This warranty covers faulty workmanship and component failure. It does not cover misuse or act of God e.g. flood, lightning strike etc. Misuse includes not adhering to the instructions in this manual. Non Jeffery Electronics manufactured goods such as computers, printers, modems etc. will usually have their own warranties and are not covered under this agreement.

After the 24 months warranty has elapsed all servicing is done on a do-and-charge basis with the normal turnaround time being 2 to 3 days, depending on the fault and customer location.

A Word About Lightning

The nature of any irrigation system, with long solenoid and comms cables radiating out from a box of electronics, makes it susceptible to damage by lightning. Even distant lightning can induce voltage spikes of many thousands of volts on long cable runs, which can damage, or even totally destroy, the controller.

To combat this problem there are a number of strategies available, with various levels of cost and effectiveness. The lightning protection built in to the Cloudmaster controller includes relay isolation to switch the power to each solenoid valve and individual varistor protection is provided on every cable coming into the controller and the 24V AC from the mains transformer to guard against power surges and transients from the mains power. This provides excellent protection between the field wires and the delicate control electronics. This protection is sufficient for the solenoid valve wiring in most installations and also the comms wires for short comms cable runs; for example, a slave unit or keytag reader mounted within a few meters of the master unit.

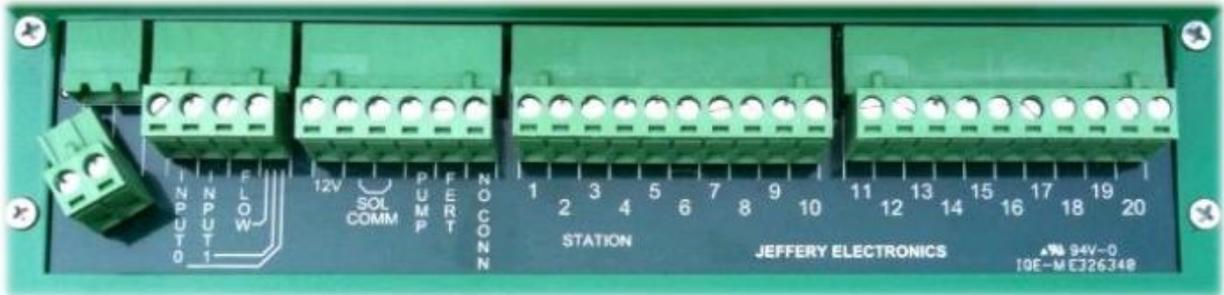
It is not, however, adequate to protect the delicate communications circuitry when long comms wires are used. An example would be master and slave units connected by a twisted pair comms cable running across a playing field or golf course. In this situation extra protection is mandatory. Installing the devices described in the section '9 - Installation and Cable Connections' on long slave device cabling runs will dramatically increase the protection level of the Cloudmaster units.

You will notice the word 'minimise' was used above. In fact, no amount of electronics can protect against a direct lightning strike. In the unfortunate event of a direct lightning strike Jeffery Electronics will, upon request, provide a letter indicating any damage caused by lightning. This letter can be used to substantiate an insurance claim.

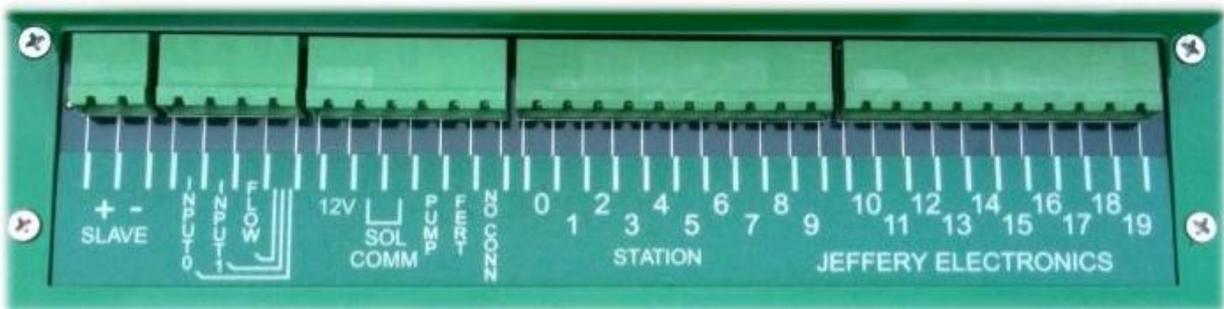
Appendix A Keyboard Operations List

OP01	Display or modify program	OP43	Setup cycle period
OP02	Enter a new station program	OP44	Setup day of cycle
OP03	Override a station on/off	OP45	Setup slave for remote pump
OP04	Disable or enable a station	OP46	Setup auxiliary pumps
OP05	Delete a program or stn	OP47	Setup flow pulse volume
OP06	Delete all programs	OP48	Setup max active stations
OP07	Turn on or off irrigation	OP50	Setup flow error detection
OP08	Enter a new watering program	OP51	Learn a stn flow rate
OP09	Enter a new loop program	OP52	Setup a station flow rate
OP10	Start the syringe cycle	OP53	Setup station function
OP11	Stop, start pause a program	OP54	Setup rain switch
OP12	Change a program by a %	OP55	Enter a NORAIN station
OP13	Step active programs	OP56	Setup frost sensor
OP14	Select auxiliary pump	OP57	Enter a NOFROST station
OP15	Clear all warning messages	OP58	Setup an input
OP16	Display logged history	OP59	Setup an input reaction
OP17	Manual run pump	OP60	Setup Club PIN facility
OP18	Display current draw	OP62	Setup syringe cycle
OP19	Zero 24Hr totals	OP64	Setup pump hold on delay
OP20	Monitor an input	OP65	Setup Weather-Watcher
OP21	Show WW sensor readings	OP66	Setup sending alarms
OP22	Show modem signal strength	OP67	Setup alarm messages
OP23	Show box temperature	OP70	Customise units functions
OP24	Monitor a flow meter	OP71	Setup 24Hr totals
OP25	Monitor wind speed	OP72	Setup anemometer
OP26	Monitor a tank level	OP74	Setup decoder addresses
OP27	Show soil moisture values	OP80	Setup demo mode
OP31	Setup SMS club control	OP83	Clear all alarms
OP32	Authorised club phones	OP84	Clear all warm/cool delays
OP33	Setup SMS staff control	OP86	Disable modem PIN
OP34	Authorised staff phones	OP87	Enter a new keypad PIN
OP35	Setup soil moisture sensors	OP88	Enter PIN
OP36	Setup rain soil sensor	OP89	Show last keytag detected
OP40	Set time	OP90	Show serial number & version
OP41	Set date	OP91	Set system parameters
OP42	Setup slave devices		

Appendix B Photos



Cloudmaster terminal blocks showing first block unplugged



Station re-numbering decal to change numbering to start at 0 or 1



Cellular modem cable connection showing adapter



IEC power cable



IEC power socket showing fuse access



LAN cable connection

Appendix C User Response Sheet

We welcome and value your feedback. Please give us a call (phone number on page 3) or photocopy this sheet, fill out and return to address at the start of this manual. If insufficient space, please attach a separate page. Thank you.

1. Cloudmaster system capability. _____ out of 10 (1 - Poor, 10 - Excellent)
Comments:

2. Ease Of use. _____ out of 10 (1 - Poor, 10 - Excellent)
Comments:

3. The documentation. _____ out of 10 (1 - Poor, 10 - Excellent)
Comments:

4. Value for money. _____ out of 10 (1 - Poor, 10 - Excellent)
Comments:

5. After sales support. _____ out of 10 (1 - Poor, 10 - Excellent)
Comments:

Suggestions for future product development.

Cloudmaster is a registered trade mark of Jeffery Electronic Control Pty Limited