

FROSTWATCH

Temperature Monitor unit v3.10



USER MANUAL (All Models)

WEL

Willowbank Electronics Ltd

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1.0 Introduction to FrostWatch

FrostWatch environmental monitor unit has been designed with microcomputer technology to allow the user the benefits of accuracy and reliability at an affordable price.

When used in accordance with the manufacturer's instructions, **FrostWatch** will give years of trouble free service.

1.1 **Choosing the right FrostWatch**

FrostWatch is available in a number of different models, depending on your requirements. A full feature list is given in **section 1.2**. This manual applies to all models, so it is important to know which model you have, as this determines which features your new FrostWatch has built in.

It is possible to upgrade your FrostWatch to a higher featured version by returning it to the manufacturer. Please contact the manufacturer for details of this upgrade service.

Power Supply:

FrostWatch is available as either a 12V DC unit, for operating off 12V batteries (including 12V solar installations), or a Mains plug-pack model that will also accept from 15 to 24 volts (AC or DC).

Cellular Models:

FrostWatch is also available with built in cellular communications. This allows multiple users to be alerted on any phone or TXT under alarm conditions. TXT queries to the unit determine current wind, temperature or recent rainfall information, historical min/max temperature and max wind, and also the current settings of the device. With a password, it is also possible to control the relay outputs via TXT message. The cellular option is available on the GMS (Vodafone or 2degrees) network. The cellular model is provided as a prepay device, but can be connected to monthly cellular plans.

Enhanced Models:

The enhanced model includes all features of the basic model but also allows the addition of an anemometer for wind detection and a tipping bucket rain gauge for rainfall detection. This information can be used to trigger alarms at user-defined set points. The enhanced model includes Growing Degree Days (GDD), Richardson Chill Units (RCU), and an additional 2 user definable output relays.

1.2 Features

Features - All Models:

- 2 Temperature Sensor inputs (supplied with one 15m sensor cable).
- FROST and SUNBURN control loops.
- User programmable alarm ON and OFF temperatures, with programmable on delay.
- 2 configurable output relays.
- Pump prime and start feature, with monitoring via 1 digital input.
- Selectable fault output relay.
- MIN and MAX temperature logging.
- Temperature rate of change.
- Unit is dual point calibrated. A low and high point is provided to ensure accuracy throughout the entire temperature range.
- User programmable site name field to assist with site recognition (via TXT in cellular models).
- User set-up controls are mounted internally to minimise inadvertent adjustment of settings.
- Info Key to allow settings and logged values to be displayed without opening the case.
- Backlit Liquid Crystal Display allows viewing in the dark.
- Recognition of various cable/sensor faults and display of appropriate message on the display.
- Audible Alarm.
- Battery back up option for display of temperature during power failure. Low-battery detect alarm.
- Low Power Consumption.
- Waterproof Case (IP 65).
- Friendly software ensures ease of operation.

Additional Features - Cellular Models:

- 3 additional digital inputs that can generate TXT messages.
- 2 Additional User-configurable output relays.
- Output relays controllable via TXT message (password protected).
- Up to five individually configurable phone contacts, with selectable TXT and/or CALL modes.
- Programmable call retries and repeat TXT during alarm conditions.
- TXT query. Send a request to the unit via TXT from any cell phone and receive via return TXT detailed information of temperature, rainfall, wind or current device status.

Additional Features - Enhanced Models:

- Anemometer input, with 4 independent user configurable directional wind alarms.
- Rain gauge input, with 1hr and 24hr user configurable rainfall alarms.
- Calculations for Growing Degree Days (GDDs) and Richardson Chill Units (RCUs).

1.3 Accessory order codes

Please use the following codes for ordering accessories for your FrostWatch. Each Model of FrostWatch is supplied with a single 15m temperature sensor cable by default. See below for ordering custom length sensor cables.

Order Code	Description
10WSOL	10W Solar Panel (Suits 12VDC models only)
SOLKIT	Solar Power Kit (Suits 12VDC models only). Includes 10W solar panel, sealed lead-acid battery, mounting bracket to suit '10WSOL' solar panel, and waterproof enclosure to fit battery and any 12VDC model of FrostWatch.
TSENSE	Additional Temperature Probe – Please Specify Length
TCABLE	Custom Length Temperature Sensor. Use this code if you require a temperature probe longer than 15m. Specify the total length of probe required (in metres) and this will be supplied instead of the default 15m cable. If a second custom length probe is required, please specify a second 'TCABLE' length separately.
RGAUGE	Tipping Bucket Rain Gauge (Suits Enhanced models only)
WGAUGE	Wind Anemometer (Suits Enhanced models only)
UPGRD1	Upgrade any Non-Cellular FrostWatch into a GSM Cellular model (for any FrostWatch V3.00 onwards).
UPGRD2	Upgrade any Non-Enhanced FrostWatch into an Enhanced model (for any FrostWatch V3.00 onwards).
UPGRD3	Upgrade a Non-Enhanced, Non-Cellular FrostWatch into an Enhanced GSM Cellular model (for any FrostWatch V3.00 onwards).

For further product information, please visit:

www.willowbankelectronics.co.nz

2.0 Installation

All Models:

1. Mount unit in an appropriate indoor location (eg in the shed). Mounting holes are provided in the case where the lid screws secure the lid.
2. Remove the Main PCB to expose the output board beneath with connectors to relay outputs and sensor inputs.
3. To operate a pump, use the normally open contacts of output 1 (O1).
4. To make use of the pump prime feature, use the normally open contacts of output 2 (O2).
5. Connect Temperature sensor to terminal A1 and GND. Ensure that wiring polarity is correct, as shown in **section 11**. If an additional temperature sensor is used, connect to sensor terminal A2 and GND.
6. Connect the input power leads (battery or plug pack) provided to the Power In terminals. Note that both AC and DC supplies can be connected either way around.

Enhanced Models only:

7. If purchased, connect anemometer to sensor input D4, +12V and GND. Ensure that wiring polarity is correct, as shown in **section 11**.
8. If purchased, connect tipping bucket rain gauge to input D3 and GND. Ensure that wiring polarity is correct, as shown in **section 11**.

All Models:

9. **Ensure wiring is complete and correct before applying power.**
10. Switch on Power and check that unit operates correctly.

Cellular Models only:

11. Check the internal phones signal strength to guarantee communications
See **section 5.8.4**.
12. Fill out the Phone details page so that the information in the FrostWatch matches the sheet. Keep in a safe place.

All Models:

13. Proceed to the Calibration Menu **ONLY** if you have altered the temperature sensor cable length.
14. Remove and complete the Warranty Card located at the back of this manual and send back to us.

Warning: Do not use an insulation tester on ANY wiring connected to this equipment. Such usage will cause damage to the sensor, main unit or both!

3.0 FrostWatch basics

3.1 Operating

After installation, and initial set up, the unit requires no further action from the user.

In the event of any alarm occurring (frost, sunburn, rain or wind) the unit will operate an internal buzzer (if enabled) as well as the output relay selected for that type of alarm condition. If the prime feature is enabled the prime output (O2) will operate for the programmed time before output 1 (O1).

Cellular Models operation under alarm conditions:

Cellular models will dial contacts according to the parameters set by the user. In **phone** mode the unit will send an alarm tone to the receiving phone. If the **ph call attempts** option is set to more than 1, that contact will be redialled if the receiving party does not answer and terminate the call within the set period. In TXT mode the unit will send the current value (temperature, rainfall or wind, as appropriate) and location name to the receiving phone.

Repeat TXT messages allow the selected TXT capable contact(s) to be kept up to date with current active alarm values. The time interval between these TXT messages is user programmable.

Alarm Operation (All Models):

In Frost control mode, the alarm will operate when the temperature has been equal to or below the **alarm on point** for the required **on delay** time. The alarm will reset when the temperature rises above the **alarm off point**. If the **prewarn** feature is enabled for a given contact (Cellular Models only) the unit will send a TXT to that contact when the temperature drops below the programmed temperature.

In Sunburn control mode, the alarm will operate when the temperature has been equal to or above the **alarm on point** for the required **on delay** time. The alarm will reset when the temperature falls below the **alarm off point**. If the **prewarn** feature is enabled for a given contact (Cellular Models only) the unit will send a TXT to that contact when the temperature rises above the programmed temperature.

Additional Alarm Operation (Enhanced Models only):

In Rain detection mode, 2 independent alarm thresholds are available. The user can set alarm on point rainfall levels for the previous hour, and/or 24 hours. The alarm will operate when the total rainfall during either of these selected time periods exceeds the level chosen. The 1hr and 24hr alarms will reset when there has been no further rainfall for the **off delay** time.

In Wind detection mode, 4 independent alarm direction thresholds are available. For each of the 4 zones, the user can select one of 16 compass directions, and the wind speed threshold for the chosen direction. In addition, the user can select **all directions** as a direction option. The alarm will operate if the prevailing wind within one sector

either side of the selected direction exceeds the chosen threshold value for the **on delay** time. The alarm will reset when the wind has stayed consistently under the chosen threshold for the **off delay** time.

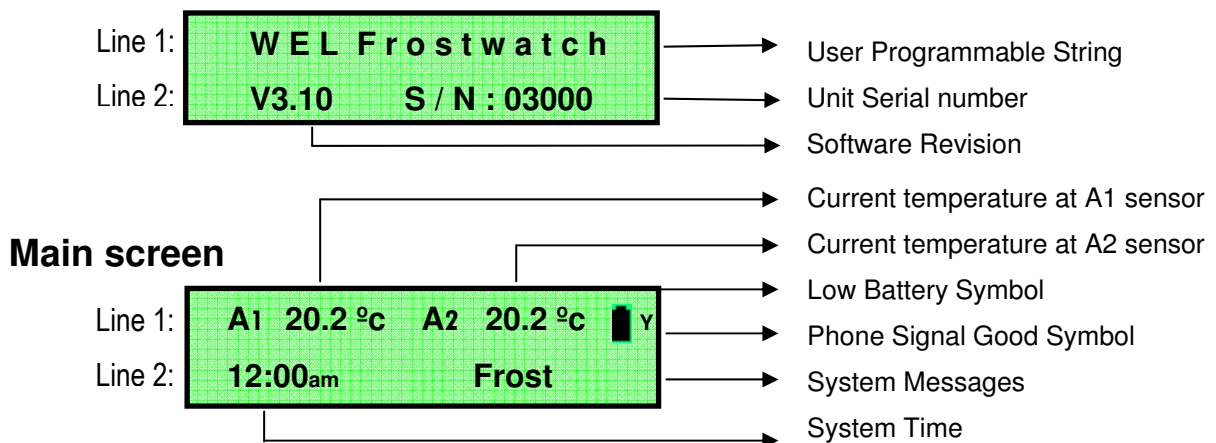
General Operation:

If a hardware/system error is detected (**section 8**), the audible alarm will operate and the relevant error message will display on the screen. For cellular models, any contact that has selected to receive system messages will be notified by TXT message.

To silence the audible alarm, press the **INFO** key.

With no audible alarms activated, press the **INFO** key to view the unit settings and log (**section 4**). The display messages will rotate at 3 second intervals, although additional pressing of the **INFO** key will step through each screen instantly.

3.2 Power-up screen



User programmable string:

- See **section 5.6.2** under device setup.

Low Battery symbol:

- Symbol flashes when the battery is low and needs replacing. This occurs only when running in battery backup mode. (ie: No power is being supplied to the FrostWatch Unit).

Phone Signal Good Symbol:

- To Check Signal strength with greater resolution see **section 5.8.4** under device settings.

System Messages:

- Messages here inform the user of Temperature rate of change, alarm status, system status and errors. Enhanced models also use this area to cycle displaying GDDs and RCUs if enabled.

4.0 Viewing settings and log

With the lid screwed on and no audible alarm active, Press the **INFO** key to display system information. The following screens will rotate at 3 second intervals. To step through the screens manually, press the **INFO** key to move to next screen.

Screen 1:

The backlight will switch on enabling viewing of the existing screen in the dark.

```

A1 20.2 °C  A2 20.2 °C  Y
12:00      Frost
  
```

Screens 2-5:

Shows the Highest and Lowest recorded temperatures today, and since the last time the log was cleared.

```

MIN temp - TODAY
3.2 °C  2:33pm
  
```

Screens 6-7 (enhanced models only):

If the Wind input is enabled, these screens show the Maximum recorded wind speed / direction today, and since the last time the log was cleared.

```

MAX wind – 29 Mar
N-NE 2.3kmh 10:16am
  
```

Screens 8-12 (enhanced models only):

If the Rain input is enabled these screens show the recorded rainfall for the previous 1hr, 24hrs, and for the current week and month, as well as the total rainfall since the last time the log was cleared.

```

Rain this MONTH
13.7mm
  
```

Screens 13-14 (enhanced models only):

Shows the previous seasons Growing Degree Days (GDDs) and Richardson Chill Units (RCUs) total.

```

RCUs last year
354
  
```

Screens 15-16:

Shows the Frost Alarm and Sunburn Alarm *on point* temperatures, and which relays (if any) will operate under alarm conditions.

```

FROST ALARM
1.0 °C  output1
  
```

Screens 17-18 (enhanced models only):

If the Rain input is enabled these screens show the 1 Hr and 24 Hr Rain Alarm *on point* values.

**RAIN ALARM – 1 Hr
0.3mm**

Screens 19-22 (enhanced models only):

If the Wind input is enabled these screens show the wind direction and speed threshold for each of the four zones.

**WIND ALARM – zone3
N-NW 4kmh**

Screen 23:

Gives the user an opportunity to clear the min/ max logs.

**Press INFO to
clear min / max**

Screen 24:

If **INFO** was pressed during *screen 23* the following screen will appear to confirm that the log has been cleared.

**LOG
CLEARED!**

Screen 25:

Shows the power up screen details, as specified in *section 3.2*.

**WEL Frostwatch
V3.10 S / N : 03000**

5.0 Main menu

At the main screen press any key to enter the main menu.
Using the **DOWN** or **UP** key rotate through the main menu until the desired option is displayed on line 2, then press the **ENTER** key.

Line 1:

Line 2:



MENU LISTING:

1. Frost alarm
2. Sunburn alarm
3. Rain alarm – Enhanced models
4. Wind alarm – Enhanced models
5. System log
6. Device setup
7. Hardware setup
8. Phone alarm – Cellular models
9. exit menu

In Enhanced models, Rain alarm and Wind alarm menu options will only be displayed if the relevant input as been enabled under the Setup I/O menu – see **section 5.7.1** for details.

5.1 Frost alarm

Step 1.

With the **frost alarm** menu option chosen from the **main menu**, the screen will now display the message below.

Using the **DOWN** or **UP** key, select **enable** or **disable**.

Press the **ENTER** key to store.

If **disable** was selected, the frost alarm will not operate and the following steps will not apply.

```

FROST ALARM
Alarm:  enable
  
```

Step 2.

Using the **DOWN** or **UP** key, increase or decrease the **on temperature**.

The output relay and audible alarm will turn on when the temperature is equal to or less than this set temperature for the required set time (**step 4**).

Press the **ENTER** key to store the setting.

```

FROST ALARM
On Pnt:    1.0 °c
  
```

Step 3.

Using the **DOWN** or **UP** key, increase or decrease the **off temperature**.

The output relay and audible alarm will turn off when the temperature is equal to or greater than this set temperature.

Press the **ENTER** key to store the setting.

```

FROST ALARM
Off Pnt:   2.5 °c
  
```

Step 4.

Using the **DOWN** or **UP** key, increase or decrease the **on delay** time.

This is the amount of time in **minutes** the temperature must be continuously at or below the alarm on point before the alarm will operate.

Press the **ENTER** key to store the setting.

```

FROST ALARM
On Dly:    02 min
  
```

Step 5 (Cellular Models Only).

Using the **DOWN** or **UP** key, increase or decrease the **prewarn** temperature.

When the temperature drops below this point a TXT message will be sent to all contacts who have **Frost Prewarn** enabled, warning them of an approaching frost condition. To disable this feature take the temperature down until **disable** is displayed. Press the **ENTER** key to store the setting.

```

FROST ALARM
Prewarn:   3.0 °c
  
```

Step 6.

Using the **DOWN** or **UP** key, select the **output** to operate under frost alarm conditions. To disable this feature, select **none**.

If **Pumpmode** is selected, output 1 and 2 operate as specified in **section 5.7.2**.

Press the **ENTER** key to store the setting and return to the **main menu (section 5)**.

```

FROST ALARM
Output:    output1
  
```

5.2 Sunburn alarm

Step 1.

With the **sunburn alarm** menu option chosen from the **main menu**, the screen will now display the message below.

Using the **DOWN** or **UP** key, select **enable** or **disable**.

Press the **ENTER** key to store.

If **disable** was selected, the frost alarm will not operate and the following steps will not apply.

SUNBURN ALARM
Alarm: enable

Step 2.

Using the **DOWN** or **UP** key, increase or decrease the **on temperature**.

The output relay and audible alarm will turn on when the temperature is equal to or greater than this set temperature for the required set time (**step 4**).

Press the **ENTER** key to store the setting.

SUNBURN ALARM
On Pnt: 37.5 °c

Step 3.

Using the **DOWN** or **UP** key, increase or decrease the **off temperature**.

The output relay and audible alarm will turn off when the temperature is equal to or less than this set temperature.

Press the **ENTER** key to store the setting.

SUNBURN ALARM
Off Pnt: 35.0 °c

Step 4.

Using the **DOWN** or **UP** key, increase or decrease the **on delay** time.

This is the amount of time in **minutes** the temperature must be continuously at or above the alarm on point before the alarm will operate.

Press the **ENTER** key to store the setting.

SUNBURN ALARM
On Delay: 02 min

Step 5 (Cellular Models Only).

Using the **DOWN** or **UP** key, increase or decrease the **prewarn** temperature.

When the temperature rises above this point a TXT message will be sent to all contacts who have **Sunburn Prewarn** enabled, warning them of an approaching sunburn condition. To disable this feature take the temperature down until **disable** is displayed. Press the **ENTER** key to store the setting.

SUNBURN ALARM
Prewarn: 34.0 °c

Step 6.

Using the **DOWN** or **UP** key, select the **output** to operate under sunburn alarm conditions. To disable this feature, select **none**.

If **Pumpmode** is selected, output 1 and 2 operate as specified in **section 5.7.2**.

Press the **ENTER** key to store the setting and return to the **main menu (section 5)**.

SUNBURN ALARM
Output: pumpmode

5.3 Rainfall alarm

Step 1.

With the **rain alarm** menu option chosen from the **main menu**, the screen will now display the message below.

Using the **DOWN** or **UP** key, select **enable** or **disable**.

Press the **ENTER** key to store.

If **disable**, was selected the rain alarm will not operate and the following steps will not apply.

```

RAIN ALARM
Alarm:  enable
  
```

Step 2.

Using the **DOWN** or **UP** key, increase or decrease the **off delay** time.

This is the amount of time in **minutes** there must be no rainfall before any rain alarm condition ends.

Press the **ENTER** key to store the setting.

```

RAIN ALARM
Off Div:  12 Hrs
  
```

Step 3.

Using the **DOWN** or **UP** key, select the **output** to operate under rain alarm conditions. To disable this feature, select **none**.

If **Pumpmode** is selected, output 1 and 2 operate as specified in **section 5.7.2**.

Press the **ENTER** key to store the setting and return to the **main menu (section 5)**.

```

RAIN ALARM
Output:  output3
  
```

Step 4.

Using the **DOWN** or **UP** key, select **1hr** or **24hr** alarm to edit.

Press the **ENTER** key to select the setting.

```

RAIN ALARM
Select:   1hr
  
```

Step 5.

Using the **DOWN** or **UP** key, increase or decrease the rainfall **on point**.

The output relay and audible alarm will turn on when the rainfall during the selected time period is equal to or greater than this set rainfall level.

Press the **ENTER** key to store the setting, and return to step 4 to edit additional alarm settings. Select **exit** to return to the main menu.

```

RAIN ALARM – 1hr
O n Pnt:   0.3mm
  
```

5.4 Wind alarm

Step 1.

With the **wind alarm** menu option chosen from the **main menu**, the screen will now display the message below.

Using the **DOWN** or **UP** key, select **enable** or **disable**.

Press the **ENTER** key to store.

If **disable** was selected, the wind alarm will not operate and the following steps will not apply.

WIND ALARM
Alarm: enable

Step 2.

Using the **DOWN** or **UP** key, increase or decrease the **on delay** time.

This is the amount of time in **minutes** the wind must be continuously at or above the alarm on point before the alarm will operate.

Press the **ENTER** key to store the setting.

WIND ALARM
O n D l y: 5 min

Step 3.

Using the **DOWN** or **UP** key, increase or decrease the **off delay** time.

This is the amount of time in **minutes** the wind must be continuously at or below the alarm on point before the alarm condition ends.

Press the **ENTER** key to store the setting.

WIND ALARM
O f f D l y: 07 min

Step 6.

Using the **DOWN** or **UP** key, select the **output** to operate under rain alarm conditions. To disable this feature, select **none**.

If **Pumpmode** is selected, output 1 and 2 operate as specified in **section 5.7.2**.

Press the **ENTER** key to store the setting and return to the **main menu (section 5)**.

WIND ALARM
Output: output4

Step 7.

Using the **DOWN** or **UP** key, select the wind **zone** to edit. The unit has 4 independent zones, which can be used to set 4 different wind alarm criteria.

Press the **ENTER** key to select the zone.

WIND ALARM
Select: zone3

Step 8.

Using the **DOWN** or **UP** key, select the **direction** for the selected wind zone, or select **AnyDIR** for setting an alarm for any direction.

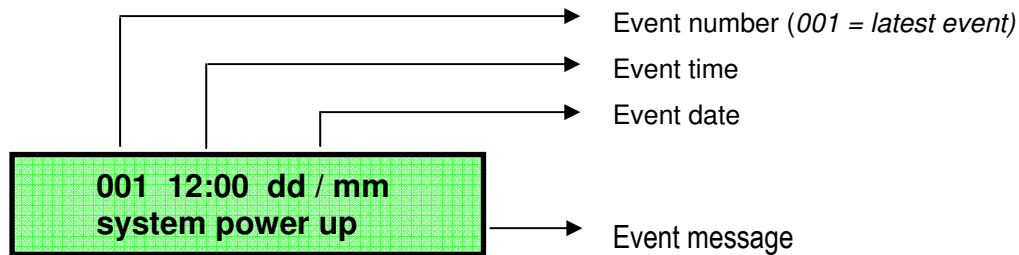
The output relay and audible alarm will turn on when the wind during the selected time period is equal to or greater than this set level.

Press the **ENTER** key to store the setting, and return to step 2 to edit additional alarm settings. Select **exit** to return to the main menu.

WIND ALARM – zone1
E-NE 3Km/h

5.5 System log

The system log allows the latest 256 events to be viewed.
Using the **DOWN** or **UP** key rotate through the events.
Press the **ENTER** key to exit.



5.6 Device setup

With the **device setup** menu option chosen from the **main menu**, the screen will now display the message below.

Using the **DOWN** or **UP** key rotate through the settings menu until the desired option is displayed on line 2, then press the **ENTER** key.

Line 1: **DEVICE**
Line 2: **Set time/date**

MENU LISTING:

1. Set time/date
2. Location name
3. Setup backlight
4. Setup buzzer
5. Setup GDDs – Enhanced models
6. Setup RCUs – Enhanced models
7. exit menu

5.6.1 Set time/date

Use this menu to set the system time and date, this needs to be set to allow accurate time and date stamping for all logged events.

Step 1.

Using the **DOWN** or **UP** key, modify the value pointed to by the flashing cursor. **ENTER** will move the cursor onto the next value.

SET TIME
1:50 pm

Step 2.

Using the **DOWN** or **UP** key, modify the value pointed to by the flashing cursor. **ENTER** will move the cursor onto the next value.

To exit this menu press **ENTER** through each of the values.

SET DATE
Thu 02 Aug 07

5.6.2 Location name

This menu option allows the user to set a unique name that could be used to identify location. This string is displayed on initial power up of the unit and is included in certain TXT messages sent by the unit.

Using the **DOWN** or **UP** key, modify the character slot pointed to by the flashing cursor. **ENTER** will move the cursor to the next character slot. To exit this menu press **ENTER** through each of the character slots.

LOCATION NAME
WEL Frostwatch

5.6.3 Setup backlight

Using the **DOWN** or **UP** key, select either *disable*, *timed* or *enable*.

Press the **ENTER** key to return to the device menu.

SETUP BACKLIGHT
Mode: *timed*

5.6.4 Setup buzzer

Using the **DOWN** or **UP** key, select either *disable*, *timed* or *enable*.

Press the **ENTER** key to store the setting and return to the device menu.

SETUP BUZZER
Mode: *enable*

5.6.5 Setup GDDs – see section 10 for calculation details

Step 1.

Using the **DOWN** or **UP** key, select either *enable* or *disable*.

Press the **ENTER** key to store.

If *disable* was selected the GDD calculation will not be performed and the following steps will not apply.

SETUP GDDs
Mode: *enable*

Step 2.

Using the **DOWN** or **UP** key, select the *calendar start date*.

Press the **ENTER** key to store the day, then the month.

GDDs CALENDAR
Start: 15 Nov

Step 3.

Using the **DOWN** or **UP** key, select the *calendar stop date*.

Press the **ENTER** key to store the day, then the month.

GDDs CALENDAR
Stop: 15 Feb

Step 4.

Using the **DOWN** or **UP** key, select the **base temperature**.
Press the **ENTER** key to store.

GDDs TEMPERATURE
Base: 10.0 °C

Step 5.

Using the **DOWN** or **UP** key, select the **cap temperature**.
Press the **ENTER** key to store, then return to the device menu.

GDDs TEMPERATURE
Cap: 30.0 °C

5.6.6 Setup RCUs – see section 10 for calculation details**Step 1.**

Using the **DOWN** or **UP** key, select either **enable** or **disable**.
Press the **ENTER** key to store.

If **disable** was selected the RCU calculation will not be performed
and the following steps will not apply.

SETUP RCUs
Mode: enable

Step 2.

Using the **DOWN** or **UP** key, select the **calendar start date**.
Press the **ENTER** key to store the day, then the month.

RCUs CALENDAR
Start: 15 Feb

Step 3.

Using the **DOWN** or **UP** key, select the **calendar stop date**.
Press the **ENTER** key to store the day, then the month, then return
to the device menu.

RCUs CALENDAR
Stop: 15 Feb

5.7 Hardware setup

With the **Hardware setup** option chosen from the **main menu** the screen will now display the message below.

Using the **DOWN** or **UP** key rotate through the menu until the desired option is displayed on line 2, then press the **ENTER** key.

Line 1:
Line 2:

```

HARDWARE
Setup I/O
  
```

MENU LISTING:

1. Setup I/O
2. Setup pumpmode
3. View I/O status
4. exit menu

5.7.1 Setup I/O

Use this menu option to enable / disable inputs and map user definable names to inputs and outputs.

These names are used as references during remote communications e.g.TXT

Step 1.

Using the **DOWN** or **UP** key, select the desired input / output to setup. Press the **ENTER** key to proceed.

```

SELECT I/O
Select: A1 (temp)
  
```

Step 2.

Using the **DOWN** or **UP** key, enable or disable the input/ output. Press the **ENTER** key to proceed.

This step does not appear when setting up **A1**, as it cannot be disabled.

```

SETUP A2
Mode: enable
  
```

Step 3.

Using the **DOWN** or **UP** key, modify the character slot pointed to by the flashing cursor. **ENTER** will move the cursor to the next character slot.

To exit press **ENTER** through each of the character slots.

This step does not appear when setting up **D3** or **D4** on enhanced models as they are used for wind and rain and cannot be renamed.

```

SET NAME FOR A2
10digit name here
  
```

5.7.2 Setup pump mode

Use this menu option to setup automatic pump control. This specifies the settings used if pump mode is selected as an output for any alarm. If such an alarm is activated and the prime feature is enabled the prime output (O2) will operate for the programmed **prime time** before output 1 (O1). If line pressure input D1 is enabled, **Line Fill Delay** and **Low Pressure Cutout** options are available.

Step 1.

Using the **DOWN** or **UP** key, increase or decrease the prime time for output relay 2 (O2). Select **disable** if no priming is required.

Press the **ENTER** key to proceed.

PRIME on OUTPUT 2

Time: 02 min

Step 2 (if input D1 is enabled)

Using the **DOWN** or **UP** key, increase or decrease the **line fill delay** time for D1.

This is the time the system ignores low pressure on D1 from when the pump mode relay (O1) is activated

Press the **ENTER** key to proceed.

LINE FILL DLY – D1

Time: 10 min

Step 3 (if input D1 is enabled).

Using the **DOWN** or **UP** key, select either **enable** or **disable**.

If **Low Pressure Cutout** is enabled, then if low pressure is detected on input D1 after the **Line Fill Delay time** is up, then the pump relay (O1) will turn off.

Press the **ENTER** key to return to the hardware menu.

LowPress. Cutout

mode: enable

5.7.3 View I/O status

Use this menu option to view the current state of all inputs and outputs, and to test correct operation of output relays.

Using the **DOWN** or **UP** key, select the desired input/ output to view.

While viewing a relay output that is off, pressing the **INFO** key will turn that output on, while the key is held down.

Press the **ENTER** key to return to the hardware menu.

OUTPUT2 Status

PRIME: off

5.7.4 Set fault output

Use this menu option to select the output that turns on during a fault condition.

Set fault output

Output: output4

5.8 Phone alarm

With the **phone alarm** menu option chosen from the **main menu**, the screen will now display the message below.

Using the **DOWN** or **UP** key, rotate through the **phone alarm** menu until the desired option is displayed on line 2, then press the **ENTER** key.

Line 1: **PHONE ALARM**
Line 2: **Setup contacts**

MENU LISTING:

1. Setup contacts
2. Ph call attempts
3. Repeat txt mssgs
4. Signal strength
5. System ph number
6. TXT cmd password
7. exit menu

5.8.1 Setup contacts

Step 1.

With the **setup contacts** menu option chosen from the **phone alarm** menu, the screen will now display the message below.

Using the **DOWN** or **UP** key, select the required contact number.

Press the **ENTER** key to advance to **step 2**.

SELECT CONTACT
Select: C1

Step 2.

Using the **DOWN** or **UP** key, modify the number slot pointed to by the flashing cursor. **ENTER** will move the cursor to the next number slot.

It is up to the user to check the number is appropriate for the mode chosen.

C1 PH NUMBER
0 6 8 4 4 1 0 7 9

To exit press **ENTER** through each of the character slots.

Step 3.

Using the **DOWN** or **UP** key, select the required contact mode **disable** / **Phone** / **TXT** / **Ph&TXT** for the selected **contact** during **Frost Alarm** events.

Press the **ENTER** key to store the setting and advance to **step 3**.

If mode is set to **disable** that contact will not be dialled and will not receive TXT messages during Frost alarm events.

C1 FROST USE
Alarm: Ph&TXT

Step 4.

If TXT or Ph&TXT was selected in step 3, the user can select to receive repeat TXT messages during Frost alarm events, as described in **section 5.8.3**.

Using the **DOWN** or **UP** key, select either **enable** or **disable**.

Press the **ENTER** key to store the setting and advance to **step 5**.

If repeat is set to **disable** that contact will only receive a single TXT message during Frost alarm events.

C1 FROST USE
Repeat: enable

Step 5.

If TXT or Ph&TXT was selected in **step 3**, the user can select to receive a **prewarn** TXT message to warn of approaching Frost alarm events, once the temperature reaches the selected alarm point (*section 5.1*).

Using the **DOWN** or **UP** key, select either **enable** or **disable**.

Press the **ENTER** key to store the setting and advance to **step 6**.

C1 FROST USE
Prewarn: **enable**

Step 6.

After setting up the **Frost Alarm** contact settings for the selected contact, a similar set of screens are given for the other alarms.

C1 SUNBURN USE
Alarm: **TXT**

Step 7.

Using the **DOWN** or **UP** key, select **enable** or **disable** system TXTs.

If enabled, this contact will receive a TXT message if any system fault occurs or any enabled digital input changes state.

Press the **ENTER** key to store the setting, and return to **step 1** to set up another contact.

The first system TXT enabled contact will receive repeated Network TXTs.

C1 SYSTEM TXTs
Mode: **enable**

5.8.2 Ph call attempts

With the **ph call attempts** menu option chosen from the **phone alarm** menu the screen will now display the message below.

PH CALL ATTEMPTS
up to **3**

Using the **DOWN** or **UP** key, adjust the amount of times the unit will attempt to dial a phone number in **Phone** mode if, communications cannot be established or, the receiving party does not answer and terminate the call within 30 seconds.

Time between attempts is factory set to 1 minute.

Press the **ENTER** key to store the setting and return to the **phone alarm** menu.

5.8.3 Repeat txt messages

With the **repeat txt messages** menu option chosen from the **phone alarm** menu, the screen will now display the message below.

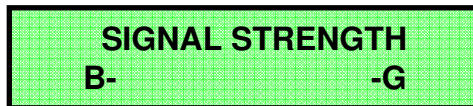
REPEAT TXT MSSGS
every **10 mins**

Using the **DOWN** or **UP** key, adjust the time interval at which TXT messages are repeated during any alarm activation, for any contact who has selected **repeat txt messages** for that type of alarm.

Press the **ENTER** key to store the setting and return to the **phone alarm** menu.

5.8.4 Signal strength

Selecting the *signal strength* menu option displays the message below.



```
SIGNAL STRENGTH
B-          -G
```

B- = *bad* signal strength **-G** = *good* signal strength

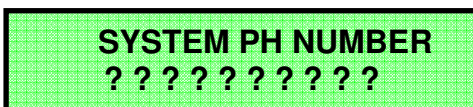
The bars in between these two symbols represent the current signal strength. ***The more bars the better!***

Press any key to return to the *phone alarm* menu.

Adequate signal for reliable operation is 1 bar or better.

5.8.5 System ph number

Selecting the *system ph number* menu option displays the units phone number.



```
SYSTEM PH NUMBER
??????????
```

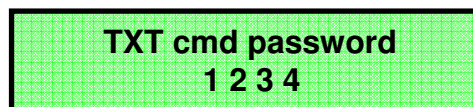
Press any key to return to the *phone alarm* menu.

5.8.6 TXT command password

This allows password protection of various TXT controls e.g. output control, callout stopping.

Using the **DOWN** or **UP** key, modify the number slot pointed to by the flashing cursor. **ENTER** will move the cursor to the next number slot.

This password needs to be entered at the start of any TXT message that *controls* the FrostWatch. ***Refer to the TXT Command table.***



```
TXT cmd password
1 2 3 4
```


6.0 Calibration menu

DO NOT adjust temperature settings unless you have the following items:

1. A known high and low temperature source.
2. A Precision Thermometer.

Accuracy of this unit will be impaired if these values are not set up precisely.

At the main screen hold down the **ENTER** key until calibration menu appears.

Using the **DOWN** or **UP** key, select the desired input to calibrate.

Press the **ENTER** key to proceed to the calibration menu for that input.

Line 1: **INPUT TO CAL.**
Line 2: **Select: A1**

6.1 Temperature inputs

If A1 or A2 (if enabled) was selected at the previous screen, the following options are displayed:

Using the **DOWN** or **UP** key rotate through the menu until the desired option is displayed on line 2, then press the **ENTER** key.

Line 1: **CAL. MENU**
Line 2: **Cal low point**

MENU LISTING:

1. Cal low point
2. Cal high point
3. Restore defaults
4. exit menu

6.2 Calibrate low point

Done where the temperature is below **5.0 °c**

Step 1.

With the **Cal low point** menu option chosen from the **CAL. MENU**, the screen will now display the message below.

Using the **DOWN** or **UP** key, increase or decrease the **set to** temperature to the actual temperature off the known low temperature source. Then press the **ENTER** key.

Temp: 0.3 °c
Set to: 0.0 °c

Step 2.

Using the **DOWN** or **UP** key, select either **yes** to store the new low point calibration values or **no** to exit without storing.

Press the **ENTER** key to proceed.

ARE YOU SURE?
no

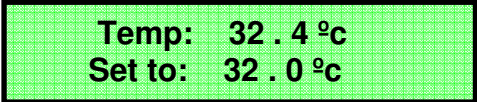
6.3 Calibrate high point

Done where the temperature is above **25 °c**

Step 1.

With the **Cal high point** menu option chosen from the **CAL. MENU** the screen will now display the message below.

Using the **DOWN** or **UP** key, increase or decrease the **set to** temperature to the actual temperature off the known high temperature source. Then press the **ENTER** key.

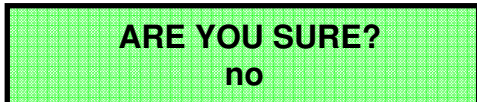


Temp: 32 . 4 °c
Set to: 32 . 0 °c

Step 2.

Using the **DOWN** or **UP** key, select either **yes** to store the new high point calibration values or **no** to exit without storing.

Press the **ENTER** key to proceed.



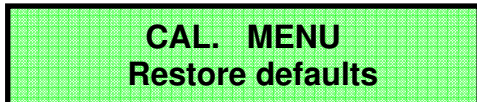
ARE YOU SURE?
no

6.4 Restore defaults

In the event that calibration of the unit is not performed correctly and you have no means of getting the unit to a known accurate temperature, FrostWatch has a set of known values, which will set the calibration to ± 1 °C accuracy. This is a last resort choice and the unit should be recalibrated to precise temperatures as soon as possible.

Step 1.

Rotate through the calibration menu until the screen displays the message below. Press the **ENTER** key.

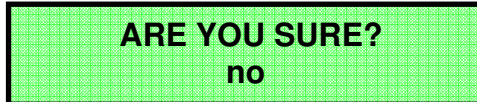


CAL. MENU
Restore defaults

Step 2.

Using the **DOWN** or **UP** key, select either **yes** to restore the factory default calibration values or **no** to exit without restoring.

Press the **ENTER** key to proceed.



ARE YOU SURE?
no

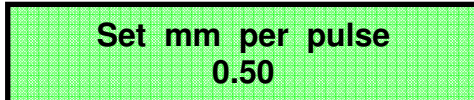
6.5 Rain input

(Enhanced models, and only if input D3 enabled).

Use this menu option to set the number of **mm per pulse** correctly to match your tipping bucket rain gauge. The factory set value of 0.5mm matches the rain gauges supplied by Willowbank Electronics Ltd.

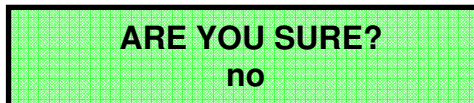
Step 1.

Using the **DOWN** or **UP** key, increase or decrease the **mm per pulse** to the required value. This value should be specified in the documentation supplied with your rain gauge. Then press the **ENTER** key.

A rectangular LCD screen with a green background and a black border. The text is centered and reads "Set mm per pulse" on the top line and "0.50" on the bottom line.

Step 2.

Using the **DOWN** or **UP** key, select either **yes** to save the new calibration value or **no** to exit without restoring. Press the **ENTER** key to proceed.

A rectangular LCD screen with a green background and a black border. The text is centered and reads "ARE YOU SURE?" on the top line and "no" on the bottom line.

7.0 Remote phone control

Cellular units can be queried remotely at anytime by dialling in or sending the appropriate TXT message to the unit.

7.1 Call query

Dial the unit's phone number from any other phone to hear the alarm tone. This assures the user the unit has reception and is functioning correctly.

7.2 TXT Commands

Send a TXT to the unit containing 1 of the following command strings from any TXT capable phone (**disable caller id block**). Commands aren't case sensitive.

TXT Command	Action taken by unit after reception of TXT
T?	Sends reply TXT containing current temperature and MIN/MAX logs.
R?	Sends reply TXT containing historical rainfall logs.
W?	Sends reply TXT containing current wind speed and direction and MAX logs.
Status	Sends reply TXT containing listing active alarms, active outputs, the state of digital inputs (if enabled) and supply voltage (battery models).
Day	Sends reply TXT containing current temperature, recent rainfall and current wind speed/ direction, GDDs and RCUs (if enabled) and supply voltage (battery models).
CLEAR T	Clears the current temperature (or rain 'R' or wind 'W') log. Combinations are OK in any order e.g. 'CLEAR WT'. Sends confirmation TXT.
(4digit password) STOP	Stops dialling the contact list during alarm events. Sends confirmation TXT.
(4digit password) TXT	Stops further Repeat TXT messages during alarm events. Sends confirmation TXT.
(4digit password) (Output name) ON	Turns on or off the appropriate output. Sends confirmation TXT. Turning relays on this way overrides alarm control of the relays.
(4digit password) PUMP START T (time)	Starts Pumpmode – see <i>section 5.7.2</i> . This will start the prime output for the prime time, then run the pump for (time) in minutes (max 1000 minutes).
(4digit password) PUMP STOP	Stops Pumpmode if running – immediately turns off the Prime and Pump relays.

The output name contained in the TXT messages must be identical to the output name set in the FrostWatch. See *section 5.7.1*

TXT Examples

In the following examples "1234" are the 4digit password. See *section 5.8.6*

- | | |
|---------------------|---|
| 1234 PUMP ON | - Turn the output with the name PUMP on |
| 1234 OUTPUT3 OFF | - Turn output 3 off |
| 1234 STOP | - Stop dialling the contact list |
| 1234 PUMP START T30 | - Start Pumpmode control – run for 30 minutes |

8.0 Error messages

The following error messages may be encountered when using FrostWatch.

Message	Explanation of message
cable cut	Cable to the sensor has a break in it, or the sensor is faulty
cable short	Cable to the sensor is shorted, or the sensor is faulty
range error	The signal received from the sensor is either excessively low or high. This can be caused by reversed sensor wires, liquid within the sensor or cable, or cable damage.
signal ?	Internal phone has no reception. Check that the cable from the phone to the aerial is intact and that the aerial is screwed on properly. Make sure you have reliable network coverage within your area.
phoneERR	Internal phone does not respond. Contact your local Supplier.
wind ERR	Cable to the anemometer (wind speed detector) is cut, short, or the detector is faulty.
Check setup	Possible internal memory corruption. Confirm all settings.
Write error	Internal memory failure. Return for servicing.

9.0 Topping up your prepay account (New Zealand Only)

9.1 Vodafone (GSM) *Default SIM card pin: 1419*

To keep your account active and your unused credit "alive" you must top-up at least once every 12 months with a minimum of \$20.

All Prepay top-ups must be in a whole dollar amount. The minimum top-up amount is \$20.

9.1.1 **By buying a Recharge Card of Prepay Voucher**

Buy a recharge card or prepay voucher, sold in most dairies, supermarkets and service stations

Dial 0800 800 021 free from any land line phone and follow the instructions.

9.1.2 **Over the internet www.vodafone.co.nz**

You can top-up using your credit card on the Vodafone website.

9.1.3 **Other ways**

- Over the phone with your credit card. Dial 0800 800 021 free from any land line.
- Telephone banking (you must be registered with Westpac's Telephone Banking).
- AT the ATM: ANZ, ASB, BNZ, and Westpac.
- AT NZ Post.

9.2 2degrees (GSM)

To keep your account active and your unused credit "alive" you must top-up at least once every 12 months with a minimum of \$20.

9.2.1 **By buying a Top-up voucher.**

Buy a Top-up voucher.

Dial 0800 022 022 from any landline phone.

Follow the instructions.

9.2.2 **Over the internet. <http://www.2degreesmobile.co.nz/topuonline>**

You can top-up using your credit card on the website.

9.2.3 **Over the phone.**

0800 022 022 from any land line phone and have your credit card details handy.

Follow the instructions.

10.0 Explanation of calculations used

10.1 Growing Degree Days (GDDs) – Enhanced models only

Growing Degree Days are a measure of accumulated heat above a specified base temperature for a specified time period (growing season).

FrostWatch allows the user to select start and stop dates for the season to perform the GDD calculation within. The base and cap temperatures should be chosen to suit the specific crop.

Our GDD calculation determines the average temperature each day, then subtracts the chosen base temperature from this. The result is added to the accumulated GDD total (zero is used if the result was negative).

To determine the average temperature, the daily minimum and maximum temperatures are added together, and the result is halved. However, if the maximum temperature is above the chosen cap temperature, then the cap temperature is used (instead of the maximum) in the averaging calculation.

10.2 Richardson Chill Units (RCUs) – Enhanced models only

Richardson Chill Units are a measure of the chilling effect of varying temperature during a specified time period (season).

FrostWatch allows the user to select start and stop dates for the season to perform the RCU calculation within.

Our RCU calculation determines the average temperature per hour, and adds/subtracts the corresponding hours RCU value to the accumulated total. The hours RCU value is determined from the hours average temperature, as given in the table below:

Average temperature for the hour (°C)	RCU value to accumulate
$T < 1.5$	0.0
$1.5 \leq T < 2.5$	+ 0.5
$2.5 \leq T < 9.2$	+ 1.0
$9.2 \leq T < 12.5$	+ 0.5
$12.5 \leq T < 16.0$	0.0
$16.0 \leq T < 18.0$	- 0.5
$18.0 \leq T$	- 1.0

10.3 Temperature rate of change

The Temperature rate of change in degrees per hour is calculated from the primary temperature sensor (input A1). This updates every minute, and is based on the temperature change over the past 15 minutes.

11.0 Specifications & wiring

Power: 12 Volts AC via plug pack supplied.

Power consumption: 6 Watts max.

Battery Back-up: 9volt DC Alkaline battery. **Change every 12 months**

Output 1 (O1): N/O contact, rated ~ 1Amp@24volts max.

Output 2 (O2): N/O contact, rated ~ 1Amp@24volts max.

Output 3 (O3): N/O contact, rated ~ 1Amp@24volts max. (optional output)

Output 4 (O4): N/O contact, rated ~ 1Amp@24volts max. (optional output)

Digital Input 1 (D1): On/Off inputs e.g. pressure switch

Digital Input 2 (D2): On/Off inputs e.g. pressure switch

Digital Input 3 (D3): On/Off inputs (rain gauge for enhanced models only)

Digital Input 4 (D4): On/Off inputs (anemometer for enhanced models only)

Analogue Input 1 (A1): Precision semiconductor type. Max cable 400 metres. ± 0.2 °C at 0°C

Analogue Input 2 (A2): Precision semiconductor type. Max cable 400 metres. ± 0.2 °C at 0°C

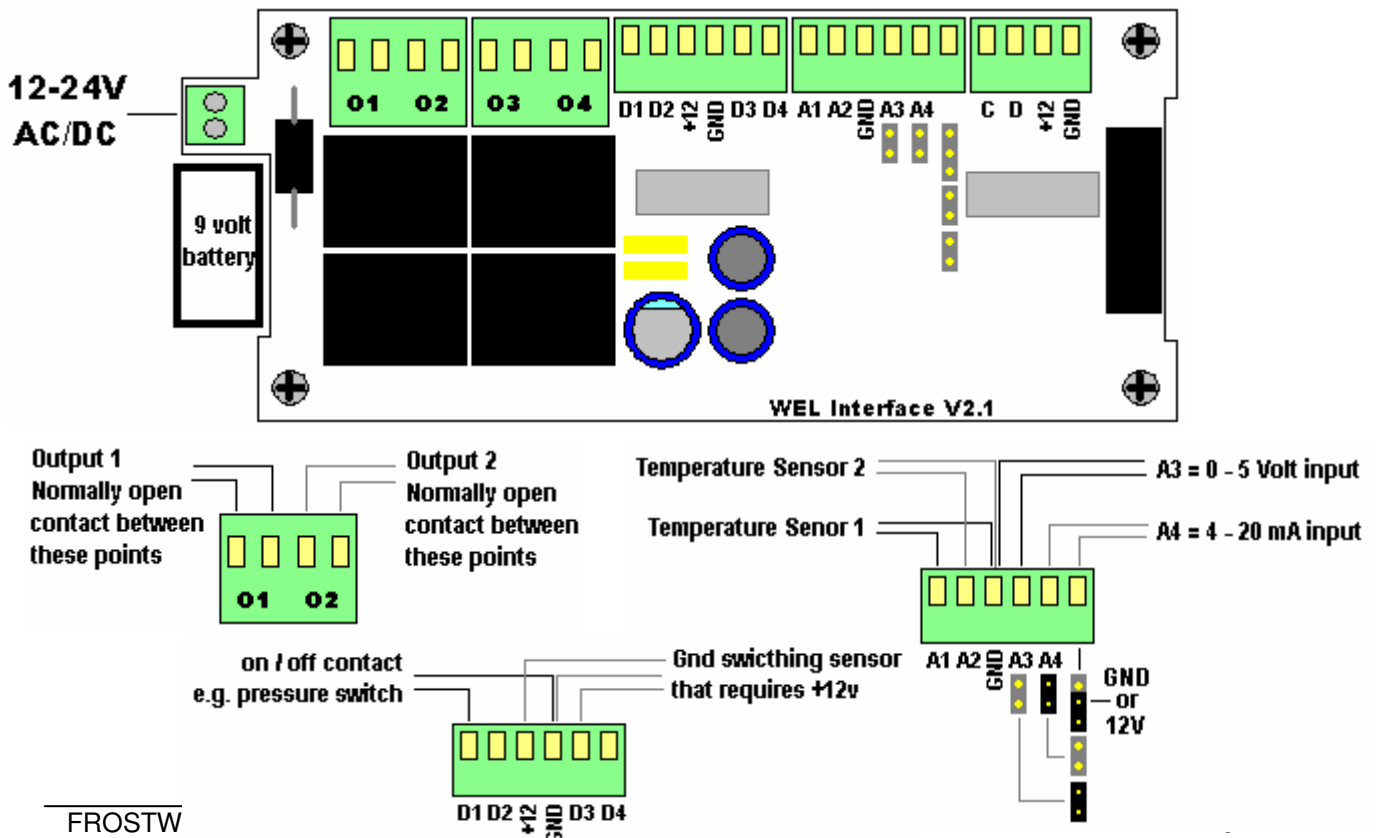
Analogue Input 3 (A3): 0-5volts, 4-20mA (optional input)

Analogue Input 4 (A4): 0-5volts, 4-20mA (optional input)

Phone: Dual Band GSM

Case: IP 65. Not suitable for direct outdoor installation.

Note: If you are disconnecting your unit from the mains supply for any length of time, remove the back-up battery to avoid the backup battery from going flat.



11.1 Wiring colour codes

11.1.1 Temperature sensors

To ensure the best pricing of temperature sensor cable, a range of wire colour codes may be supplied with your unit. The options are:

Brown and Blue:

Connect the Brown wire to input A1 (or A2 if using this input).
Connect the Blue wire to the GND terminal of the same connector.

Red and Black:

Connect the Red wire to input A1 (or A2 if using this input).
Connect the Black wire to the GND terminal of the same connector.

Red/White (joined) and Blue/Black (joined):

Connect the Red and White wires to input A1 (or A2 if using this input).
Connect the Blue and Black wires to the GND terminal of the same connector.

11.1.2 Tipping bucket rain gauge

Connect the Brown wire to input D3.
Connect the Yellow wire to the GND terminal of the same connector.

11.1.3 Anemometer (wind) detector

Connect the Brown wire to input D4.
Connect the Yellow wire to the GND terminal of the same connector.
Connect the Red wire to the 12V terminal of the same connector.

12.0 Warranty & Terms and conditions of sale.

Willowbank Electronics Ltd offers for sale and warrants this product against manufacturing defect or component failure for a period of 12 months from date of purchase providing,

1. The unit is installed in accordance to the manufacturer's instructions.
2. The unit is used in the application for which it is intended.
3. Items that are externally connected where applicable fall within the ratings specified in the "Specifications".

Exclusions:

The following items/events are not warranted.

1. Impacting or crushing of the device.
2. Excessive exposure to sunlight.
3. Acts of God. (e.g. Lightning)
4. Corrosion due to ingress of water or due to chemical contamination of ANY form.

Willowbank Electronics Ltd reserves the right to repair or replace any unit returned under warranty at its discretion.

All warranties are offered on a "return to base" basis and are to be freight paid by the purchaser.

No other warranties express or implied are offered other than those that may be required under the Consumer Guarantees Act where applicable.

All warranties and sales are offered under the terms of New Zealand Law and shall be remedied under these terms and conditions.

Liability in the event of failure shall not exceed the initial purchase price of the unit.

For Service Contact:

New Zealand:

Willowbank Electronics Ltd
1419 Korokipo Rd, RD3, Napier
Ph/Fax: 64-6-844 1079
Email: info@willowbankelectronics.co.nz
Internet: www.willowbankelectronics.co.nz

Australia:

T.I.I, Perth
Ph: 61-8-9240-2322
Fax: 61-8-9240-2210
Email: tii@iinet.net.au

Serial Number: _ _ _ _ _

Frost Alarm: disabled / enabled
On Point: _ _ . _ °C
Off Point: _ _ . _ °C
On Delay: _ _ **minutes**
Prewarn: _ _ . _ °C *(Cellular models only)*
Output: none / output1 / output2 / output3 / output4 / pumpmode

Sunburn Alarm: disabled / enabled
On Point: _ _ . _ °C
Off Point: _ _ . _ °C
On Delay: _ _ **minutes**
Prewarn: _ _ . _ °C *(Cellular models only)*
Output: none / output1 / output2 / output3 / output4 / pumpmode

Device Setup:

Location name: _ _ _ _ _
Backlight: disabled / timed / enabled
Buzzer: disabled / timed / enabled

Hardware Setup:

A1: disabled / enabled **Name:** _ _ _ _ _
A2: disabled / enabled **Name:** _ _ _ _ _
D1: disabled / enabled **Name:** _ _ _ _ _
D2: disabled / enabled **Name:** _ _ _ _ _
D3: disabled / enabled **Name:** _ _ _ _ _ *(Cellular models only)*
D4: disabled / enabled **Name:** _ _ _ _ _ *(Cellular models only)*
O1: **Name:** _ _ _ _ _
O2: **Name:** _ _ _ _ _
O3: **Name:** _ _ _ _ _ *(Cellular models only)*
O4: **Name:** _ _ _ _ _ *(Cellular models only)*
Fault Output: none / output1 / output2 / output3 / output4
Pumpmode: Prime output on O2: disabled / _ _ **minutes**
 Line fill delay on D1: _ _ **minutes**
 Low Pressure Cutout: disabled / enabled

System Phone number: _____
TXT command password: _____
Ph call attempts: _____ (1 – 5 attempts)
Repeat TXT messages: _____ (5 – 60 minutes)

Contact 1: Phone Number: _____
Frost Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
Sunburn Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
System TXT: Disable / TXT

Contact 2: Phone Number: _____
Frost Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
Sunburn Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
System TXT: Disable / TXT

Contact 3: Phone Number: _____
Frost Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
Sunburn Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
System TXT: Disable / TXT

Contact 4: Phone Number: _____
Frost Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
Sunburn Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
System TXT: Disable / TXT

Contact 5: Phone Number: _____
Frost Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
Sunburn Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT **Prewarn:** Disable / TXT
System TXT: Disable / TXT

Rain Alarm: disabled / enabled
Off Delay: ___ ___ hours
Output: none / output1 / output2 / output3 / output4 / pumpmode
1 hr Alarm ___ ___ . ___ mm **24 hr Alarm** ___ ___ . ___ mm

Wind Alarm: disabled / enabled
On Delay: ___ ___ minutes
Off Delay: ___ ___ minutes
Output: none / output1 / output2 / output3 / output4 / pumpmode
Zone 1: ___ ___ Km/h **Zone 2:** ___ ___ Km/h
Zone 3: ___ ___ Km/h **Zone 4:** ___ ___ Km/h

GDD: disabled / enabled
Start Date: ___ ___ / ___ ___ **Stop Date:** ___ ___ / ___ ___
Base: ___ ___ . ___ °C **Cap:** ___ ___ . ___ °C

RCU: disabled / enabled
Start Date: ___ ___ / ___ ___ **Stop Date:** ___ ___ / ___ ___

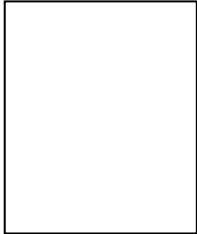
Contact 1:
Rain Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT
Wind Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT

Contact 2:
Rain Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT
Wind Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT

Contact 3:
Rain Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT
Wind Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT

Contact 4:
Rain Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT
Wind Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT

Contact 5:
Rain Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT
Wind Alarm: Disable / Phone / TXT / Ph&TXT **Repeat:** Disable / TXT



To: Willowbank Electronics Ltd
1419 Korokipo Rd
RD3 Napier
New Zealand

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WEL **Warranty Card** **WEL**

Model: _____

Serial No: _____ Date of purchase: ____/____/____

Purchased from: _____

Name: _____

Address: _____

Email: _____

fold here

fold here