



Instruction Manual

for the

AquaTelemetry

Telemetry System

(Software Version 1.02)

and associated

LeveLine[®] Mini Depth Sonde

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1. Introduction to the Product

This manual covers the setup and operation of the AquaTelemetry Telemetry system running software version 1.02+ in association with any LeveLine® Absolute Level Sonde.

1.1. What Does The AquaTelemetry System Do?

The Aquaread® AquaTelemetry system, when used in association with a LeveLine® Mini Level Sonde forms a data-logging and telemetry system that records water level and temperature at pre-determined intervals then uploads the logged data periodically via email to multiple monitoring facilities.

Instantaneous level and temperature data can be requested by SMS. The current water level and temperature will be returned immediately by SMS. In addition, four level alerts and one rate-of-change alert can be set to automatically send SMS messages if an alert condition exists.

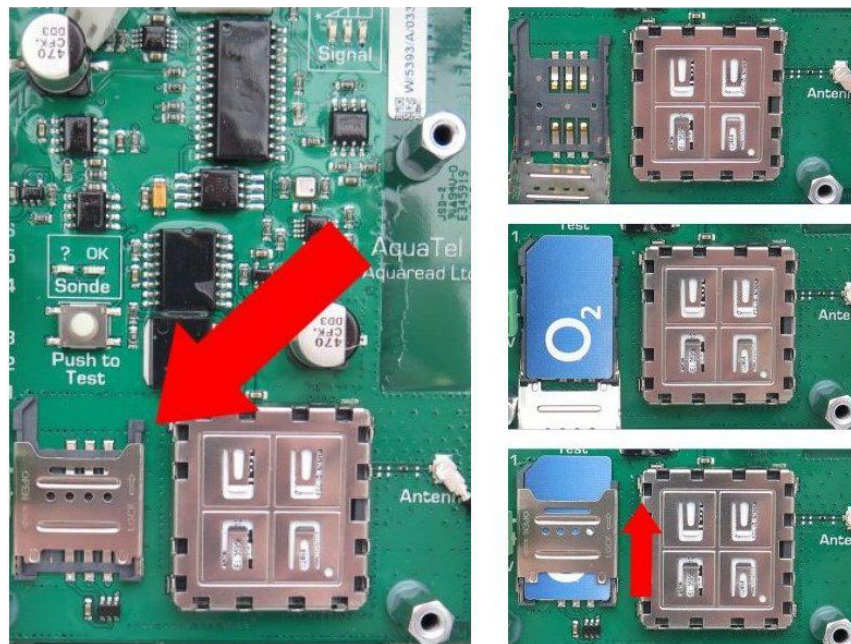
2. Setup Prior to Installation

Prior to installing the AquaTelemetry system in the field, the system must have a SIM card fitted and it must then be set up using a PC utility.

2.1. SIM Card Fitting

Prior to installation and fitting of the main batteries, an active SIM card must be fitted to the unit. **The SIM card must not be locked or PIN protected.** To install the SIM card, lay the AquaTelemetry unit flat on a workbench, remove the four corner screws, then remove the plastic cover. The SIM card socket is located at the bottom left of the circuit board.

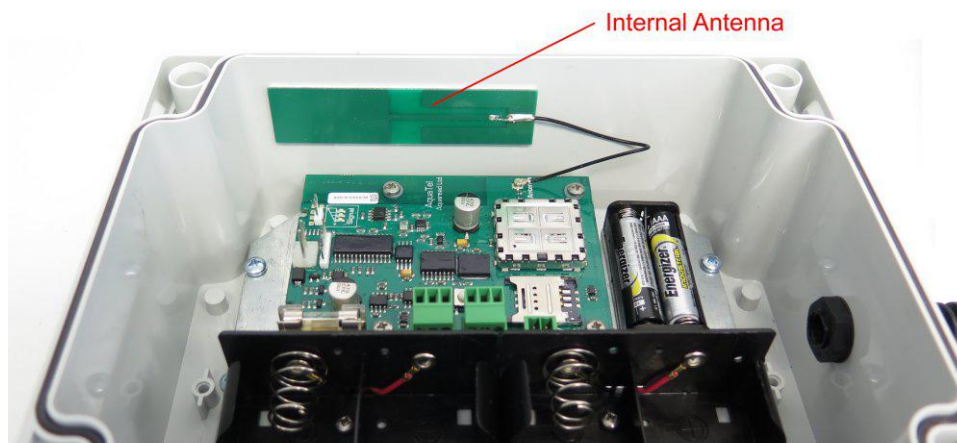
Open the SIM card socket cover by sliding it down towards the bottom of the unit then swinging it up. Fit the SIM card then shut the cover and lock it in place by sliding it towards the top of the unit. See sequence of photographs below.



Make a note of the phone number registered to the SIM card. You will need this for setup and communication later.

2.2. Antenna Installation

Standard AquaTelemetry units have a strip antenna attached to the inside of the enclosure (see photograph below. If your unit has this antenna fitted, please skip the next paragraph.



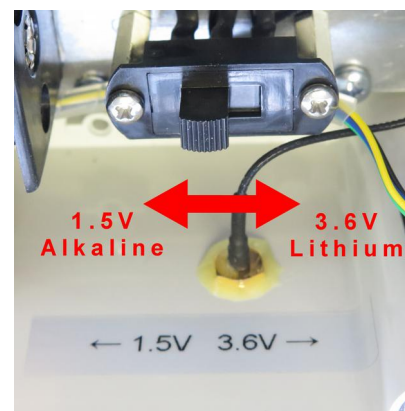
If your unit is set up for use with an external antenna, there will be an SMA type female antenna socket fitted to the underside of the enclosure. Connect a suitable GSM antenna and locate it in a position likely to receive a good network signal.

2.3. Real Time Clock Battery Installation

The AquaTelemetry unit requires two Alkaline 1.5V AAA batteries to supply power to the real time clock. These batteries will last approximately five years and once fitted, should not be removed unless being replaced with new. **If these batteries are removed, the time and date will be lost and the real time clock must be reset using the PC utility.**

2.4. D Cell Version Battery Installation

If you have specified the D Cell version of this equipment, the main power for the system is supplied by either two pairs of Primary Lithium-thionyl Chloride 3.6V D cells or two pairs of Alkaline 1.5V D cells (international size reference: UM1/R20/D). A selector switch allows the battery type to be chosen. The photograph shows the switch set to the 1.5V (Alkaline battery) position.



ENSURE THE CORRECT BATTERY TYPE IS SELECTED BEFORE INSERTING THE BATTERIES

2.4.1. Battery Life

Battery life varies greatly with battery type selected, logging rate, cellular signal strength, temperature and the number of emails programmed to transmit.

With normal use (reasonable signal strength, 15 minute logging rate and email upload once per 24 hours), a set of four Lithium-thionyl Chloride batteries should last around 9 - 12 months.

With normal use, one set of good quality Alkaline batteries (such as Duracell Ultra) should last 4 – 6 months. The capacity of Alkaline batteries varies by up to 50% with temperature, so expect a shorter battery life in the winter months.

Battery voltage is output with all logged data and also in the 'Level' SMS message. Battery voltage should be monitored periodically by the system administrator to ensure the batteries do not go flat leaving the system inoperative.

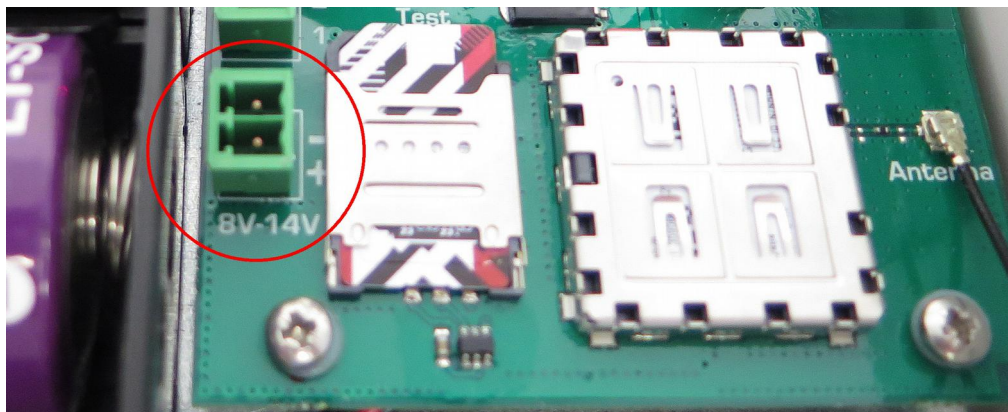
When the reported battery voltage drops to 4.0V (Alkaline) or 6.0V (Lithium), the batteries should be replaced.

Always replace all four batteries together. If old and new batteries are mixed, the new batteries will discharge rapidly and data may be lost.

2.5. External Power Supply with D Cells as Backup

If you have specified the D Cell version of this equipment, you may choose to supply primary power from an external 8V – 14V supply, and fit the D cells as a secondary backup.

In this case, wire your external power supply to the terminals adjacent the SIM card, marked 8V-14V. Polarity is also indicated.



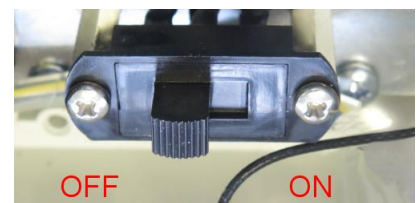
The external power supply should be capable of supplying a peak load of 2A during transmission of SMS messages and emails, although normal current consumption between transmissions is less than 5mA.

In the event that the external power supply fails, the internal D cells will automatically take over.

2.6. 12V Solar Panel Version

If you have specified the 12V Solar Panel version of this equipment, the system will come complete with a 12V battery and Solar Charge Controller pre-installed and wired.

In order to apply power to the system, simply slide the ON/OFF switch to the ON position. With the solar panel correctly fitted and orientated, and with normal use, the 12V battery should remain permanently charged.



Battery voltage is output with all logged data and also in the 'Level' SMS message. The voltage should be monitored by the user. If the reported battery voltage drops below 10.8V the solar panel may need cleaning or maintenance or the 12V battery may need replacing. Average life for the 12V battery is five years.

2.7. Initial Indications

Within a few seconds of the main batteries being installed (or in the case of the solar power version, the power switch being set to ON), the left hand (red) LED of the signal strength LEDs will start to flash. This indicates the system is initialising.

2.7.1. Network Signal Strength Indications

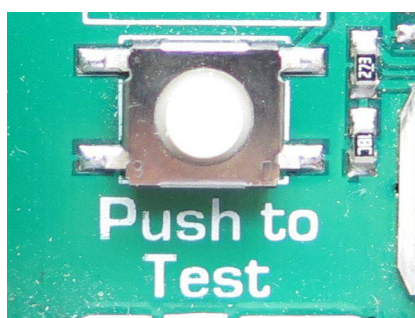
After several seconds more, the mobile network signal strength will be indicated on the LEDs in accordance with the table below.

LED Indication	Network Signal Strength
Red LED flashing	No network signal
Red LED only on	Signal strength 1/5
Red and Yellow LEDs on	Signal strength 2/5
Yellow LED only on	Signal strength 3/5
Yellow and Green LEDs on	Signal strength 4/5
Green LED only on	Signal strength 5/5

Ideally, for reliable communications, the unit should be positioned so that a minimum signal strength of 3/5 (yellow LED only on) is achieved.

After a short time, the unit will enter standby mode. In this condition the signal strength LEDs will switch off, but the yellow LED will give a very brief flash every five seconds.

To repeat the signal strength test, briefly press the Test Button. The signal LEDs will light up for several seconds to indicate the signal strength before the unit returns to standby mode.



2.8. Telemetry Setup

Before the AquaTelemetry unit will communicate, it must be programmed with some basic information concerning authorised SMS numbers, email addresses and email server details.

In order to program the unit, it must be connected to a PC running ***AquaTel Setup Utility*** software.

The *AquaTel Setup Utility* is designed to run under Microsoft® Windows® XP® or later on a stand-alone PC with a minimum screen resolution of 1024 x 768 and an available USB 2.0 socket.

Do not connect the AquaTelemetry USB cable to your PC until after the software and USB driver have been installed.

2.9. Downloading the PC Software and USB Driver from the Aquaread® website

The *AquaTel Setup Utility* Software is available for download using the following link: <http://www.aquaread.com/software-downloads>

From the Aquaread® Downloads page, select 'AquaTel Setup Utility'. The software will be downloaded as a .ZIP file.

2.10. Software Installation

Unzip the downloaded .ZIP file into a temporary directory. Browse the temporary directory and click on '**setup.exe**'. You will be given the usual Windows® security warnings. Allow the software to install. Once installed, the *AquaTel Setup Utility* will run automatically.

To communicate with the AquaTelemetry unit, two further software 'drivers' need to be installed. These are the '**AquaTel**' driver and a '**USB Serial Port**' driver.

2.11. Driver Installation

Connect the AquaTelemetry USB cable to your PC. The 'Found New Hardware' wizard on your PC should activate automatically.

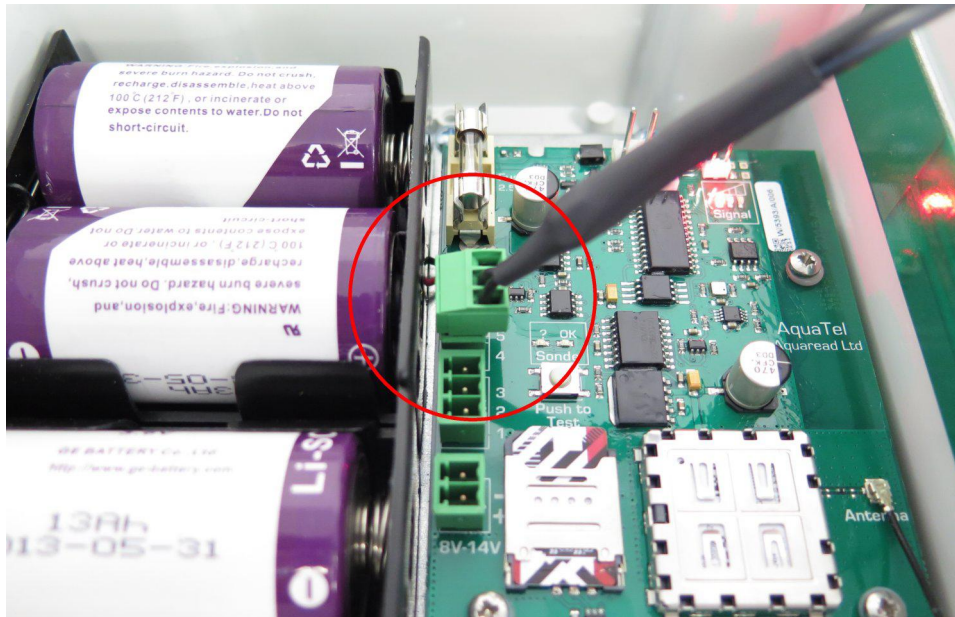
Different versions of Windows® react to plugging USB devices in differently. Earlier versions will give you the option to '**locate and install driver software**'. If this happens, direct Windows® to your temporary directory containing the unzipped download.

If your version of Windows® tries to search the Internet or 'Windows Update' for the drivers, stop the search and direct Windows® to your temporary directory.

If Windows® reports a problem installing the drivers, go to your Windows® Device Manager, locate the 'AquaTel' device and update the driver forcing Windows® to search your temporary directory for the driver. Repeat this process for the USB Serial Port.

2.12. Connecting the AquaTelemetry to a PC

Now connect the AquaTelemetry USB cable to the AquaTelemetry unit (sockets 4, 5 & 6) as shown in the photograph below.



2.13. Running the PC Utility

If the PC utility did not start automatically after installation, select ► *Aquaread* then ► *AquaTel Setup Utility* from your Programs menu. The Setup Utility screen will appear: If you are using a laptop or notebook with a small screen, the window can be resized by dragging the bottom right hand corner.

2.14. AquaTelemetry Setup Screen Overview

The AquaTelemetry Setup screen allows you to setup the following parameters:

- The AquaTelemetry unit's real time clock
- An email account for data uploads
- A mobile internet access point
- Up to fifteen email addresses
- Up to fifty SMS numbers

In addition, the software allows you to download logged data directly from the AquaTelemetry unit and save that data to a file on your PC.

2.14.1. On Screen Help

Help has been provided in this software in the form of 'Tool Tips'. If you want to know what a control button does or what a data box displays, simply move your mouse pointer over the item in question. A Tool Tip will appear after a few seconds to give you more information.

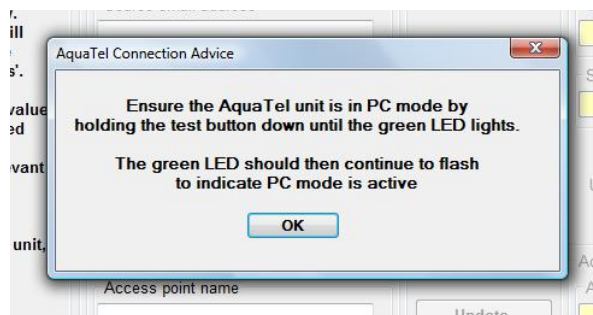
2.15. Initiating PC Mode

To initiate PC mode on the AquaTelemetry unit, ensure the batteries are fitted and the yellow LED is giving a single flash every five seconds (i.e. the unit is in standby mode).

Press and hold the 'Push to Test' button beside the USB cable connector until the Green LED lights up and starts to flash. Now, within 30 seconds, click the 'Connect' button located on the left of the PC screen just below the Setup Instructions.



The following warning box will appear to remind you to put the AquaTelemetry unit into PC mode.



Click on OK. The PC will communicate with the AquaTelemetry unit and display the AquaTelemetry unit's live clock data in the AquaTelemetry Clock window on the right hand side of the screen. In addition, if the AquaTelemetry unit has been previously set up, the email and phone book settings currently held in the unit will be displayed.

To change any AquaTelemetry settings, enter the revised setting into the relevant box in the 'User Setting Input' column, then click the relevant button to transfer the data to the AquaTelemetry unit.

2.16. Clock Setup

The clock setup windows are shown below.



The boxes within the window to the left labelled 'Setup Clock' show the current time and date from your PC. You can override/change this time and date if you want to by directly altering the values within the boxes.

The boxes within the window to the right labelled 'AquaTelemetry Clock' show the time and date of the connected AquaTelemetry unit's master clock (without any offset applied). To synchronise the master clock in the AquaTelemetry unit to the time shown in the 'Setup Clock' window, click the 'Update Clock' button.

Once the unit is deployed, an offset to correct for daylight saving time can be applied and removed by sending a special SMS message. This is detailed in section 3 of this manual.

2.17. Email Account Setup

In the group of boxes labelled 'Setup email Account', there are five pieces of information you must input. These are:

- **Source email Address:** The email address from which you wish to send emails
- **Server Name:** The name of your SMTP server
- **Port:** The SMPT port number
- **User Name:** Your SMPT user name
- **Password:** Your SMPT password

This information should be obtained from your Internet Service Provider. If you do not want to send logged data by email, leave all fields blank.

When you have filled in all five boxes, click the 'Update email Account' button and ensure the data is echoed in the boxes on the right of the screen.

2.18. Internet Access Point Setup

In the group of boxes labelled 'Setup Internet Access Point', there are three pieces of information you must input. These are:

- **Access Point Name:** The access point name
- **User Name:** The access point user name
- **Password:** The access point password

This information should be obtained from the Mobile Network Provider that supplied the SIM card. If you do not want to send logged data by email, leave all fields blank.

When you have filled in all three boxes, click the 'Update Access Point' button and ensure the data is echoed in the boxes on the right of the screen.

2.19. Email Address Book Setup

In this field, input up to fifteen email accounts to which you wish logged data to be sent. There is an index number on the left of the entry field along with an up/down arrow control to allow you to scroll through all ten addresses. If you do not want to send logged data by email, leave all ten email addresses blank.

When you have entered all the required email addresses, click the 'Update email Address Book' button and ensure the data is echoed on the right of the screen.

2.20. SMS Phone Book Setup

SMS is the primary communication medium of the AquaTelemetry unit. It is used to configure the system and to retrieve instantaneous level and alerts data. All SMS numbers registered in the unit will also receive rate and level alerts as they occur in real time.

The AquaTelemetry unit allows the input of two classes of SMS phone number; Administrator and User.

Any SMS numbers designated as Administrators can make changes to the AquaTel's setup parameters and phone book by SMS.

Any SMS numbers designated as Users, can only access information and setup parameters from the AquaTelemetry unit, they can not make any changes.

All SMS numbers registered will receive level and rate alerts.

Any SMS number, whether registered or not, can request level and alert data at any time.

Don't worry if you do not have all the required SMS numbers to hand at the time of initial setup. SMS numbers can be added, altered and deleted later on by SMS by any registered Administrator.

Be very careful when deciding which numbers to configure as administrators. Administrators have the power to change all settings by SMS, including adding and removing other SMS numbers from the SMS Phone Book.

It is essential to input at least one Administrator SMS number in order to allow configuration of the unit. Without at least one Administrator, you will be unable to set the unit up by SMS.

2.20.1. Phone Book Format

SMS numbers MUST be entered in the international format including the country code but excluding the leading + and any spaces.

Each SMS number must also be preceded by either an 'A' or a 'U' to indicate whether that number belongs to an Administrator or a User.

For example, to enter the UK mobile number **07881 523 164** as an **Administrator**, you must enter:

A447881523164

To enter the French (country code 33) mobile number 07954 256 142 as a **User**, you must enter:

U337954256164

So, to recap, enter an A or a U, followed by the mobile number in international format excluding the leading + and all spaces.

When you have entered all the required SMS numbers, click the 'Update SMS Phone Book' button and ensure the data is echoed on the right of the screen.

2.21. Saving and Retrieving Your Settings

When you have completed all your user settings and phone book, you can save them by clicking the 'Save Settings' button. You will be prompted for a file name, which will automatically be given the extension .ats (AquaTelemetry Settings).

Subsequently, the settings can be retrieved by clicking the 'Open Settings' button and selecting the appropriate file.

2.22. Leaving PC Mode

When all the necessary data has been input and transferred to the AquaTelemetry unit, click the 'Disconnect' button on the screen then momentarily press the test button on the AquaTelemetry unit. The AquaTelemetry unit will revert to standby mode.

If you click the 'Disconnect' button on the screen but do not push the button on the AquaTelemetry unit, the AquaTelemetry unit will enter standby mode automatically after 30 seconds.

2.23. Telemetry Testing

Now that the telemetry parameters have been set up, communications should be tested. To do this, use a mobile phone that has its number stored in the AquaTelemetry unit's Phone Book and send a message to the phone number that is registered to the AquaTelemetry unit's SIM card.

The message should contain a single word: **config**.

Watch the signal LEDs on the AquaTelemetry unit. As soon as you have sent the message, the AquaTelemetry unit should leave standby mode and display the network signal level on the LEDs in accordance with the table shown in section [2.7](#).

If all is well, the AquaTelemetry unit will reply with the two 'Settings' SMS messages, detailed below, before returning to standby mode:

Message 1 contents

SETTINGS UPDATE
SITE = XXXXXXXXXXXXXXXX
TIME OFFSET=+HH:MM
UPLD LOG EVERY=HH:MM
FIRST UPLD AT=HH:MM
SMS CHK EVERY=HH:MM
LOG INTERVAL=HH:MM

Brief explanation

Message heading
Site identifier (default is AquaTel's serial number)
Daylight saving offset applied to the master clock
Log upload by email interval
Time first log is uploaded by email each day
Interval at which SMS messages are read
Normal data logging interval

Message 2 contents

SETTINGS UPDATE
SITE = XXXXXXXXXXXXXXXXX
ALERT LOG INTERVAL=H:MM
L1 ALERT =+XXXXX
L2 ALERT =+XXXXX
L3 ALERT =+XXXXX
L4 ALERT =+XXXXX
RATE ALERT=+XXXX

Brief explanation

Message heading
Site identifier (default is AquaTel's serial number)
Shorter logging interval when an alert is active
Alert level 1 in mm
Alert level 2 in mm
Alert level 3 in mm
Alert level 4 in mm
Rate of change alert in mm/minute

The reception of these two messages will prove that the SIM card is properly fitted and that the communication section of the system is working correctly.

The individual settings can be set up to suite your application now, or the setup can be done at a later date, after installation of the equipment on site.

See section [4.2](#) for full details.

3. AquaTelemetry System Deployment

Prior to deployment of the AquaTelemetry unit, be sure to connect it to a PC running AquaTelemetry Utility Software and to set up the telemetry parameters. **If you do not set the AquaTelemetry unit's telemetry up, you will not be able to communicate with it when it has been deployed in the field!**

3.1. Identifying the LeveLine® Sonde Type

It is extremely important to identify your LeveLine® Sonde type prior to deployment. The AquaTelemetry unit is designed to work with LeveLine® Absolute (ABS) type sondes only. Gauge type sondes will not give correct level readings.

Also, deploying a water level sonde deeper than its maximum rating will cause overload damage.

To identify your LeveLine® sonde model and depth rating, remove the end cap and look at the label fitted into the end of the sonde. The label will show the maximum depth rating and the word ABS or GAUGE.



After identifying your sonde rating, replace the end cap and follow these simple rules:

- Never use a GAUGE type sonde with the AquaTelemetry unit.
- Never deploy a water level sonde deeper than its maximum rating.
- Never deploy a water level sonde where the water is liable to freeze.

3.2. Deploying the Sonde

The diagram to the right shows a typical borehole installation with the sonde submerged below the minimum water level line.

Please note, in this case the well or borehole cap must be ventilated in order to allow the water level to rise and fall freely.

Important: Always install the LeveLine® sonde vertically with the cable at the top as shown in the diagram. Water level measurements are made at the row of holes positioned around the bottom of the end cap. Use these holes as a reference point for measuring deployment offsets or when zeroing the level (see section 4.2.7) if required.

3.2.1. Deployment in Open Water

If the sonde is to be deployed in open water (i.e. a river, lake or the sea), a length of plastic pipe should first be mounted, then the sonde should be suspended within the pipe, but not on the bottom where it could become buried by silt. This will protect the sonde from currents, wave action, and debris.



3.2.2. Deployment Depth

Sondes must not be submerged below twice their rated depths. If any sonde is submerged past this limit, the pressure sensor will burst and will require replacing. Damage of this kind is not covered by your warranty.

3.3. Deploying the AquaTelemetry Unit

The AquaTelemetry unit is designed to be used outdoors and is rated to IP67, that is to say it is waterproof but it **is not** designed for submersion. You may notice a small hole on the base of the unit. This is a waterproof vent for the internal barometric sensor. **Do not poke anything in this hole!** Doing so will cause major damage to the vent's waterproof membrane and invalidate your warranty.

The AquaTelemetry unit includes a barometric pressure sensor. For this reason, any secondary housing MUST be vented in order to allow the barometric pressure sensor to operate correctly. If the AquaTelemetry unit is mounted inside a secondary sealed housing, incorrect level measurements will be recorded.

If you are mounting the AquaTelemetry unit directly, without the use of the tamper-proof bracket, remove the main box cover then screw the AquaTelemetry box directly to any suitable surface by passing screws through the four corner mounting holes.

If you are mounting the AquaTelemetry unit in a tamper-proof bracket, screw the bracket to a suitable surface then remove the main box cover and slide the AquaTelemetry unit into the bracket.

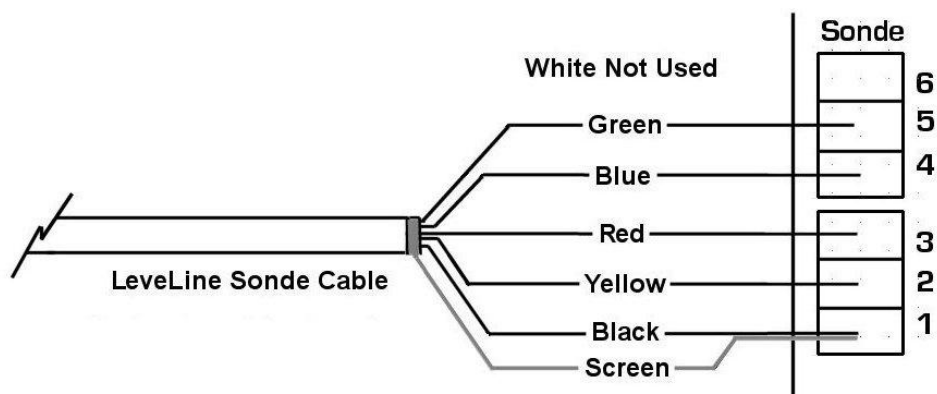
If the AquaTelemetry unit has an internal antenna, the unit must be mounted in a position where it is likely to receive a good network signal. Avoid mounting the unit too low to the ground.

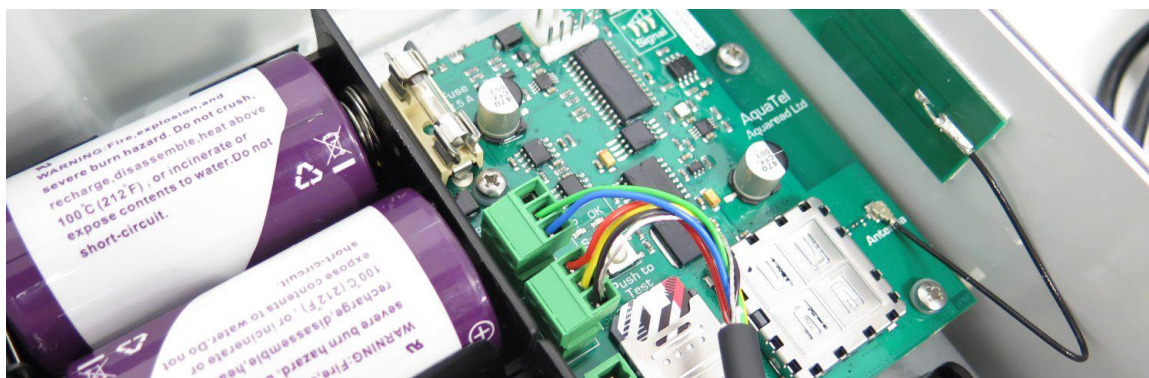
The side of the unit where the internal antenna is mounted must be kept clear of any external obstructions which may affect radio signal reception. Do not mount the unit with the antenna side up against any solid object such as a wall or tree.

3.3.1. AquaTelemetry Wiring

Before making connections to the AquaTelemetry unit, remove all the D size primary batteries. DO NOT remove the two AAA clock batteries. In the case of the 12V solar powered version, set the power switch to the OFF position.

The sonde connections to the AquaTelemetry unit are made on the circuit board using the removable connector headers. The sonde cable should be fed through the waterproof gland in the base of the unit and made off as shown below.





Once the sonde cable has been made off, ensure the cable gland is tightened to prevent water ingress.

3.3.2. Antenna Installation

If the unit is configured for use with an external antenna, a suitable antenna should be connected to the mating socket on the base of the unit and mounted in a position with good access to the mobile phone network.

3.3.3. Applying Power (D Cell Version)

Replace the D size primary batteries. Do not fit the main box cover until after the installation has been tested as detailed in section [4.1](#) below.

3.3.4. Solar Panel Installation

If you are installing a solar panel with this system, a Universal Side-of-Pole mount will have been supplied with the panel.

The solar panel should be pole mounted using the adjustable brackets provided and orientated due south (in the northern hemisphere) at a suitable angle to the sun. This angle will obviously vary with the time of year and periodic adjustments may optimise the panel's output, especially during the winter months. When mounting the solar panel, follow the instruction sheet enclosed with the mounting kit.

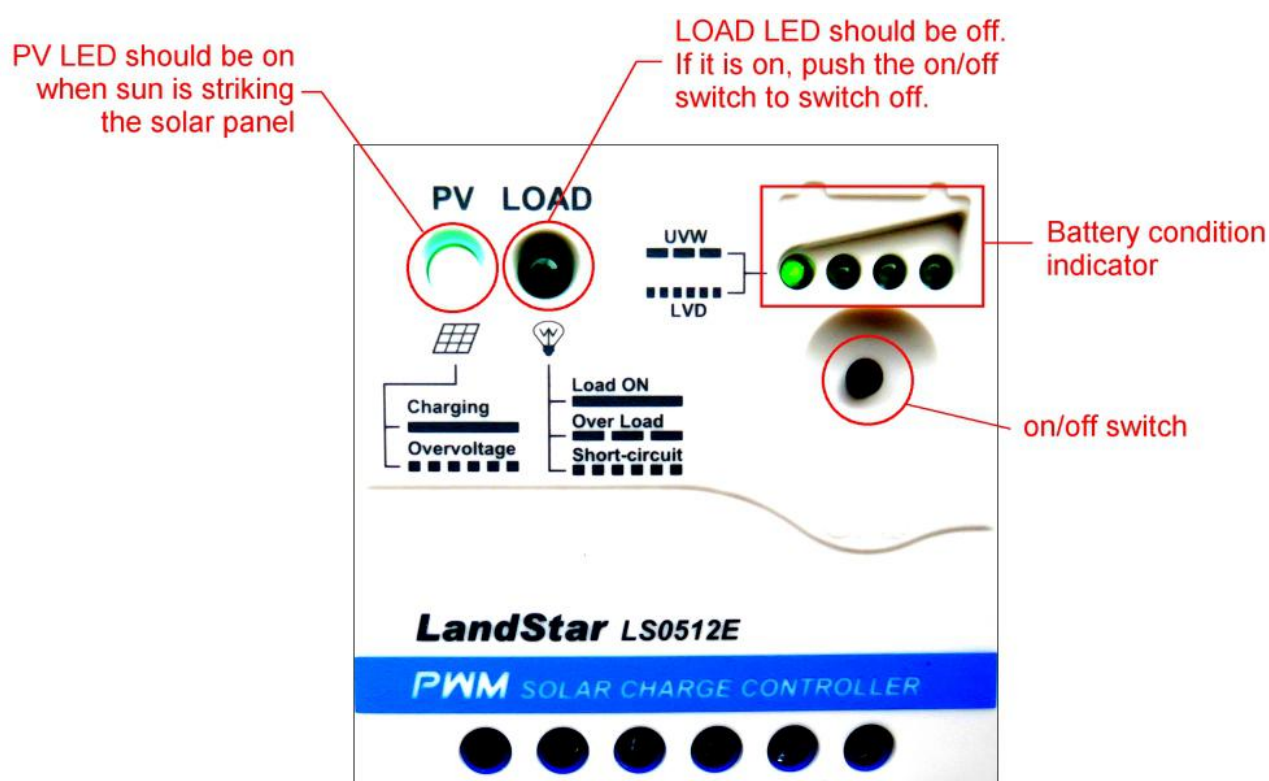
When the solar panel has been installed, connect the cable to the mating socket on the base of the Aqua Telemetry unit.

3.3.5. Activating the Solar Charge Controller

After attaching the solar panel plug to the socket, slide the power switch to the ON position.

If there is any sunlight striking the solar panel at all, the PV LED on the controller should illuminate solidly indicating that the solar panel is delivering voltage to the system.

The LOAD LED should be off. If the LOAD LED is illuminated, briefly push the on/off button on the controller to switch it off.



The four LEDs above the on/off button indicate the charge state of the 12V battery. The more LEDs that are illuminated, the better the charge state.

If the first LED is flashing slowly, this indicates that the 12V battery is completely discharged. In this case, provided the solar panel is clean and properly orientated, it is a sunny day and the PV LED is on, the battery should receive a full charge within a few hours.

Alternatively, the 12V battery can be charged by attaching the optional lead-acid battery charger to the charging socket located above the battery.

WARNING: USE ONLY THE RECOMMENDED BATTERY CHARGER. USE OF OTHER CHARGER TYPES MAY DAMAGE THE BATTERY.

Do not fit the main box cover until after the installation has been tested as detailed in section 4.1 below.

4. Final Setup and Test

4.1. Testing the Installation

When the installation is complete and the primary power applied, the AquaTelemetry unit will automatically register with the mobile phone network. After registration, the AquaTelemetry unit will display the network signal strength on the signal LEDs. The unit will then enter a low power standby mode where it will wait for the first scheduled logging time to occur or for an SMS message to be received. When the unit enters standby mode, the yellow LED will flash once briefly every five seconds.

When in standby mode, the unit can be woken up by **momentarily** pressing the test button located near the sonde connections. **Do not hold the test button down as this will cause the unit to enter PC Mode.** When the button is pressed, the AquaTelemetry unit will display the network signal strength on the signal LEDs in accordance with the table shown in section 2.7.1. After several seconds, the unit will return to standby mode.

Check the unit is receiving a good network signal. The signal value reported on the LEDs is in the range 0 – 5. A minimum signal strength of 3 is recommended for reliable operation. If the signal strength is less than 3, try repositioning the unit, or if applicable, the external antenna or using a more sensitive model.

Once the signal level is satisfactory, test the operation of the system by sending the AquaTelemetry unit an SMS message.

The message should contain a single word: **level**.

Watch the signal LEDs on the AquaTelemetry unit. As soon as you have sent the message, the AquaTelemetry unit should leave standby mode and display the network signal level on the LEDs in accordance with the table shown in section 2.7.1.

If all is well, the AquaTelemetry unit will reply with the 'Level' SMS messages, detailed below, before returning to standby mode:

Level Message content	Brief explanation
SITE= XXXXXXXXXXXXXXXX	Site identifier
LEVEL AT HH:MM DD/MM/YY	Current time and date of reading
LEVEL=XX.XXXm	Current water level over sonde
TEMP=XX.XXC	Current sonde temperature
RATE= +XXXXmm/min	Rate of level change since last reading
ALERT= NONE (or LEVEL X or RATE)	Alert status
BATTERY=XX.XX V	Battery voltage

Check the data received in the text message is correct with reference to the following paragraphs.

1. The site identifier will be either the AquaTel's serial number or, if it has been set up, a valid site name.
2. The time and date should be correct for the instant the message was sent. If the time and date are not correct, the real time clock in the AquaTelemetry unit must be reset using the AquaTel PC Utility as detailed in section 2.16.

3. The Level value should be valid for the position of the sonde. If the sonde is not submerged, the value should be very close to zero. If it is not exactly zero, use the zeroing command as detailed in the last paragraph of section 4.2.7 to reset the zero point.
4. The Temperature value should be valid for the position of the sonde.
5. The Rate value is the rate of level change since the last reading.
6. The Alerts value will be NONE unless you have previously set up an alert value which the sonde is now satisfying.
7. The Battery value is important. With fresh batteries, this value should be around 7.00V. If the value is significantly lower than this, check that all four batteries are correctly inserted and that they are in good condition.

Finally, if the signal strength and all the data in the Level message looks satisfactory, replace the unit's cover and screw it down. If you are mounting the AquaTelemetry unit in a tamper-proof bracket, fit the front hasp and a suitable padlock.

4.2. Setting up the Measurement and Logging Parameters (Administrators Access Only)

When you are confident that the sonde and communications are working correctly, proceed to setup the measurement and logging parameters. These settings are sent to the AquaTelemetry unit by SMS. After each setting is sent, the AquaTelemetry unit will respond with the SETTING UPDATE messages showing the new settings, as detailed in section 2.23.

If you make a mistake with the setting format or value sent, the AquaTelemetry unit will respond with a message stating:

```
SITE ID=XXXXXXXXXXXXXXXXXX  
SETTINGS UPDATE FAILED
```

If you make a mistake with the command header, the AquaTelemetry unit will respond with a message stating:

```
SITE ID=XXXXXXXXXXXXXXXXXX  
COMMAND NOT RECOGNISED
```

4.2.1. Settings Shorthand

In the following sections, each setting command is detailed. For ease of use, a shorthand version of each command has also been implemented, which involves using just the first two letters of the command. So, for example, to request the level from the unit, you can either send an SMS saying 'level' or simply send 'le'.

This shorthand system works with all commands except the 'clear memory now' command, which must be sent in its entirety to prevent accidental memory clearing.

4.2.2. Setting the Logging Interval

To set the logging interval in hours and minutes, send the following message to the AquaTelemetry unit as an SMS. Do not include any spaces in the command.

```
LOG INTERVAL=HHH:MM or LO=HHH:MM
```

The maximum value is 168:00 (168 hours = 1 week).

The minimum value is 00:01 (1 minute)

4.2.3. Setting the Log Upload Interval

To set the interval, in hours and minutes, at which the AquaTelemetry unit will upload logged data by email, send the following message to the AquaTelemetry unit as an SMS.

UPLD LOG EVERY=HH:MM or UP=HH:MM

The maximum value is 24:00 (once a day)

The minimum value is 00:01 (every minute)

The upload log interval will automatically be shortened if an alert condition is detected. See section 4.3.4 for more details.

4.2.4. Setting the Initial Upload Time

To set the time each day that the initial set of logged data is sent by email, send the following message to the AquaTelemetry unit as an SMS.

FIRST UPLD AT=HH:MM or FI=HH:MM

The value must be a valid time of day.

If your upload interval is less than 24 hours and will not divide evenly into 24 hours, the uploads will re-synchronise each day at the initial upload time.

4.2.5. Setting the Site ID

The site ID will default to the AquaTelemetry unit's serial number. In order to assign a unique identifier to the AquaTelemetry unit, send the following message to the AquaTelemetry unit as an SMS.

SITE=XXXXXXXXXXXXXXXXXX or SI=XXXXXXXXXXXXXXXXXX

The site ID can be up to 16 characters long and should only include normal ASCII characters and numbers.

4.2.6. Setting the Real Time Clock Offset

The real time clock in the AquaTelemetry unit should have been set up when the unit was initially connected to a PC. If, since the time was set up, daylight saving time has caused an hour to be added or subtracted from the original time setting, this can be accommodated by sending the AquaTelemetry a positive or negative time offset.

To send a time offset, send the following message to the AquaTelemetry unit as an SMS.

TIME OFFSET=+/-HH:MM or TI=+/-HH:MM

For example, to add one hour to the master clock, send TI=+01:00.

Please note, when the AquaTelemetry unit is connected to a PC, the time shown in the AquaTel Clock box is the master clock time and **will not** include any offset that has been set.

4.2.7. Zeroing the Level Value

When the sonde has been deployed under water, it will log and output the level with respect to the surface of the water (deployment depth).

If you want the level to read zero at this point so that you can monitor level changes rather than absolute depth, the sonde can be zeroed.

In order to zero the sonde, send the following message to the AquaTelemetry unit as an SMS.

ZERO LEVEL or ZE

The AquaTelemetry unit will reply with a confirmation SMS showing:

```
SITE=XXXXXXXXXXXXXXXXXX  
ZERO REFERENCE LEVELS SET AT HH:MM DD/MM/YY  
DEPTH =X.XXXm
```

The depth value shown in the SMS is the zero offset depth, i.e. the depth the sonde was reading prior to zeroing.

If you want to subsequently remove this offset from the readings, take the sonde out of the water then send it another ZERO LEVEL command. This will restore the sonde to reading true level (deployment depth) rather than level with an offset.

4.2.8. Clearing the AquaTelemetry Memory

The memory in the AquaTelemetry unit is capable of storing up to 53,000 sets of readings. At a logging rate of once / hour, this amounts to over six years worth of data. When the memory becomes full, it will wrap around and start overwriting the oldest data.

Whilst the AquaTelemetry unit will only send data logged since the last upload when it uploads data by email, if you upload data using the PC utility, it will upload the entire AquaTelemetry memory, which could be a great deal of data.

The memory should be cleared periodically in order to keep the logged data a manageable size.

In order to clear the memory, send the following message to the AquaTelemetry unit as an SMS.

CLEAR MEMORY NOW

To prevent accidental memory clearing, this message will only be accepted if it is sent in full as shown above.

The AquaTelemetry unit will reply with a confirmation SMS showing:

```
SITE=XXXXXXXXXXXXXXXXXX  
MEMORY CLEARED
```

4.3. Setting up the Alert Parameters

The AquaTelemetry unit has four separate level alerts and one rate alert that can be set by the user.

If the water level being measured exceeds one or more of the Alert Levels, or is rising faster than the value set for the Rate Alert, the unit will enter Alert Mode, where an Alert warning SMS will be sent to all numbers in the Phone Book. The logging rate and email log upload rate will also be increased.

4.3.1. Setting Level Alerts

The four alert levels are independently set and can have a positive or negative value in millimetres. Positive values will activate alerts for raising water levels with respect to the zero level reference, whereas negative values will activate alerts for falling water levels.

To set the four level alerts, send the following message to the AquaTelemetry unit as an SMS.

Message content	Brief explanation
L1 ALERT=+/-XXXXX or L1=+/-XXXXX	Alert level 1 in mm
L2 ALERT=+/-XXXXX or L2=+/-XXXXX	Alert level 2 in mm
L3 ALERT=+/-XXXXX or L3=+/-XXXXX	Alert level 3 in mm
L4 ALERT=+/-XXXXX or L4=+/-XXXXX	Alert level 4 in mm

If your mobile phone does not allow you to input a line feed after each line, insert a comma between each line as shown below.

L1=+XXXXX,L2=+XXXXX,L3=+XXXXX,L4=+XXXXX

If you send a zero value, that alert will be disabled.

For example, you have deployed your sonde at five meters depth and have subsequently zeroed the output. If the water level remains at 5m, a level of 0.0000 will be measured.

If you set L1 Alert at +1000mm and L2 Alert at -1000mm, the unit will enter Alert Mode when the water level increases above 6m (L1 Alert = 5m + 1m) or decreases below 4m (L2 Alert = 5m - 1m).

4.3.2. Setting the Rate Alert

The Rate Alert works in a similar way but rather than checking for a change in level, it checks for the rate at which the level is raising or falling in mm/minute.

To set the Rate alert, send the following message to the AquaTelemetry unit as an SMS.

Message content	Brief explanation
RATE ALERT=+XXXX or RA=+/-XXXX	Rate of change alert in mm/minute

If you send a zero value, the Rate alert will be disabled.

4.3.3. Setting the Alerts Logging Interval

The Alert Log Interval is the rate at which the AquaTelemetry unit will check for an alert condition. So, if the regular logging rate is set to say 00:15 (every 15 minutes) and the Alert Log Interval is set to 00:05 (every 5 minutes), the AquaTelemetry unit will check the water level every five minutes. If the water level is below any of the Alert levels, no action will be taken and the unit will return to standby mode.

If the AquaTelemetry unit detects an Alert state, it will log the data at the Alert Log Interval and upload data by email more often.

To set the Alert Log Interval, send the following message to the AquaTelemetry unit as an SMS.

ALERT LOG INTERVAL=HH:MM or AL=HH:MM

The value sent for this setting must be shorter than the regular logging interval that was set in section [4.2.2](#)

If, for example the unit is set to log every hour, a typical Alert Log Interval would be 00:15, i.e. fifteen minutes.

This means that when an Alert is active, the unit will log data four times more often than normal.

4.3.4. Log Upload Interval in Alert Mode

The relationship between normal and alert logging rates is reflected in the Log Upload Interval.

For example, if the unit is set to log data every hour and upload data every 24 hours in normal mode, and has been set to log data every 15 minutes in Alert mode (i.e. four times more often), the Log Upload Interval will be automatically decreased from 24 hours to 6 hours (i.e. four times more often) when in Alert mode.

4.4. Phone Book Maintenance

4.4.1. Phone Book Query (Administrators only)

In order to query any phone book entry in the AquaTelemetry unit, send the following SMS message:

PBXX=?

Where XX is the phone book entry reference (01 – 50).

So, to query phone book location 05, you would send: PB05=?

The AquaTelemetry unit will respond with its site ID and the requested phone number. For example:

SITE=XXXXXXXXXXXXXXXXXX
PB05=U447881324678

If the requested phone book entry is not assigned, the unit will respond with:

SITE=XXXXXXXXXXXXXXXXXX
PBXX=

4.4.2. Setting a Phone Book Entry (Administrators Only)

Phone book entries **MUST** be sent in the international format including the country code but excluding the leading + and any spaces.

Each phone book entry must also be preceded by either an 'A' or a 'U' to indicate whether that number belongs to an Administrator or a User.

For example, to set the UK mobile number **07881 523 164** as an **Administrator** in phone book location 05, you must send the following message:

PB05=A447881523164

The AquaTelemetry unit will respond with:

SITE=XXXXXXXXXXXXXXXXXX
PB05=A447881523164

4.4.3. Deleting a Phone Book Entry (Administrators Only)

In order to delete any phone book entry in the AquaTelemetry unit, send the following SMS message:

PBXX=

Where XX is the phone book entry reference (01 – 50).

The AquaTelemetry unit will respond with:

SITE=XXXXXXXXXXXXXXXXXX
PBXX=

Be extremely careful not to delete or overwrite your own phone book entry. Doing this will lock you out of the unit forcing you to get another administrator to re-enter your phone number.

If you are the only administrator, the AquaTelemetry unit will have to be retrieved from the field and connected to a PC for re-initialisation.

Alternatively, Aquaread engineers can reset telephone numbers in the AquaTelemetry unit remotely provided proper authorisation can be provided by the customer.

5. Requesting Data by SMS

5.1. Requesting Current Configuration (Will respond to any registered SMS number)

The current configuration can be requested at any time by sending the word CONFIG (or CO for short) to the AquaTelemetry unit by SMS. This will result in a reply spanning two SMS messages:

Message 1 contents

SETTINGS UPDATE
SITE = XXXXXXXXXXXXXXXXX
TIME OFFSET=+HH:MM
UPLD LOG EVERY=HH:MM
FIRST UPLD AT=HH:MM
SMS CHK EVERY=HH:MM
LOG INTERVAL=HH:MM

Brief explanation

Message heading
Site identifier (default is unit's serial number)
Daylight saving offset applied to the master clock
Log upload by email interval
Time first log is uploaded by email each day
Interval at which SMS messages are read
Normal data logging interval

Message 2 contents

SETTINGS UPDATE
SITE = XXXXXXXXXXXXXXXXX
ALERT LOG INTERVAL=H:MM
L1 ALERT =+XXXXX
L2 ALERT =+XXXXX
L3 ALERT =+XXXXX
L4 ALERT =+XXXXX
RATE ALERT=+XXXX

Brief explanation

Message heading
Site identifier (default is unit's serial number)
Shorter logging interval when an alert is active
Alert level 1 in mm
Alert level 2 in mm
Alert level 3 in mm
Alert level 4 in mm
Rate of change alert in mm/minute

5.2. Requesting Current Level and Alert Status (Will respond to any number)

Once all the setup has been completed, the current water level, water temperature, rate of change and alert status can be requested at any time by sending the word LEVEL (or LE for short) to the AquaTelemetry unit by SMS.

This will result in a reply containing:

Level Message content

SITE= XXXXXXXXXXXXXXXXX
LEVEL AT HH:MM DD/MMM/YY
LEVEL=XX.XXXm
TEMP=XX.XXC
RATE= +XXXXmm/min
ALERT= NONE (or LEVEL X or RATE)
BATTERY=XX.XX V

Brief explanation

Site identifier
Current time and date of reading
Current water level over sonde
Current sonde temperature
Rate of level change since last reading
Alert status
Battery voltage

5.3. Requesting and Immediate Log Upload by Email (Will respond to Administrators only)

In the event that an immediate upload of logged data is required by email, send the SMS message: SEND DATA NOW or SE for short.

The AquaTelemetry unit will respond with an SMS containing:

```
SITE= XXXXXXXXXXXXXXXX  
OK, SENDING LOGGED DATA  
BY EMAIL NOW
```

The unit will subsequently send an email to each registered email address containing all data logged since the last upload.

6. Downloading Logged Data to a PC

If required, it is possible to download all the data stored on the AquaTelemetry unit directly to a PC via the USB connection.

6.1. Regular Data Log

To download the regular logged data, connect the unit to a PC and activate PC mode as described in section [2.15](#)

When communications have been established with the AquaTelemetry unit, the full data log can be downloaded by clicking the Download Data Log button.



You will be prompted for a file name then the chosen log will be downloaded to your PC as a text file in CSV (comma separated variables) format.

This file can be opened directly with a spreadsheet application such as Microsoft® Excel®.

6.2. Alerts Data Log

Each time an Alert condition occurs or is cleared, an entry is made into a special Alerts Log, which can also be retrieved on a PC.

To download the Alerts Log, connect the unit to a PC and activate PC mode as described in section [2.15](#)

When communications have been established with the AquaTelemetry unit, the Alerts Log can be downloaded by clicking the Download Alerts Log button. You will be prompted for a file name then the chosen log will be downloaded to your PC as a text file.

The Alerts Log file, when opened in a text editor or word processor will look like:

```
site id;L1;201507011000;4.751
site id;RA;201507011107;+75
site id;L1;201507011210;CLEAR
site id;RA;201507011320;CLEAR
```

File format: site ID; Alert type; YYYYMMDDHHMM;Level/rate/clear

Explanation of the above log sample line by line:

Line 1: Alert L1 occurred at 10:00 on July 1st, 2015 and the level was 4.751m
Line 2: Rate Alert occurred at 11:07 on July 1st, 2015 and the rate was +75mm/min
Line 3: Alert L1 cleared at 12:10 on July 1st, 2015
Line 4: Rate Alert cleared at 13:20 on July 1st, 2015

6.3. Clearing the AquaTelemetry Memory

The memory in the AquaTelemetry unit is capable of storing up to 53,000 sets of readings. At a logging rate of once / hour, this amounts to over six years worth of data. When the memory becomes full, it will wrap around and start overwriting the oldest data.

Whilst the AquaTelemetry unit will only send data logged since the last upload when it uploads data by email, if you upload data using the PC utility, it will upload the entire AquaTelemetry memory, which could be a great deal of data.

The memory should be cleared periodically in order to keep the logged data a manageable size.

In order to clear the memory, send the following message to the AquaTelemetry unit as an SMS.

CLEAR MEMORY NOW

To prevent accidental memory clearing, this message will only be accepted if it is sent in its entirety as shown above.

The AquaTelemetry unit will reply with a confirmation SMS showing:

SITE=XXXXXXXXXXXXXXXXXX
MEMORY CLEARED

7. DECLARATION OF CONFORMITY

Aquaread® Ltd declares that the equipment described herein is in compliance with the essential requirements and other relevant provisions of Directives 2004/108/EC and 1999/5/EC.

8. Troubleshooting

This section details some of the common difficulties you may encounter when using the equipment.

Problem	Cause / Remedy
The LEDs do not show any indications when the test key is pressed.	<ul style="list-style-type: none"> ✓ Batteries are probably dead or incorrectly fitted. Check you have fresh batteries fitted and that they are inserted the correct way round and in the correct battery holders. ✓ Incorrect battery type switch position. Ensure you have set the battery type selector switch correctly for 3.6V Lithium or 1.5V Alkaline batteries
The red LED flashes when the Test key is pressed.	<ul style="list-style-type: none"> ✓ SIM card not fitted or fitted incorrectly. Ensure SIM card is properly fitted and door is in the locked position. ✓ SIM card not registered or locked. Put the SIM card into a mobile phone and check it is working correctly and is not password protected. ✓ Antenna not connected. Ensure a suitable antenna is connected and is located in a spot likely to receive a good network signal.
The AquaTelemetry unit will not reply to the 'Level' SMS request.	<ul style="list-style-type: none"> ✓ Poor network connection. Test signal level by briefly pressing the Test button and checking the signal strength LED indications.
The AquaTelemetry unit will only reply to the 'Level' SMS request. All other SMS requests are ignored.	<ul style="list-style-type: none"> ✓ Your number is not registered in the system. The AquaTelemetry unit will only reply to SMS requests made by registered users (except the 'level' request, which can be sent from unregistered phones). One of the System Administrators will need to add your number as a registered user. ✓ Your number has been input incorrectly. The format for inputting phone numbers must be rigidly adhered to. Refer to the manual and double check the phone numbers are correctly formatted.
ADMINISTRATOR PRIVILEGES REQUIRED message is received in reply to SMS requests.	<ul style="list-style-type: none"> ✓ Your number is not registered in the system as an Administrator. The AquaTelemetry unit will only allow registered Administrators access to some features. One of the System Administrators will need to change your number status from User to Administrator.
Level and temperature data is dashed out in the reply to the 'Level' SMS request.	<ul style="list-style-type: none"> ✓ The AquaTelemetry unit can not communicate with the LevelLine® sonde. Double check all connections. Ensure the colour sequence on the screw connectors is correct and that the connectors are properly plugged into the sockets.
The 'Could not find the AquaTelemetry Unit' message appears on the PC when trying to connect to the AquaTelemetry unit.	<ul style="list-style-type: none"> ✓ The USB cable is not properly connected. Refer to the manual and check connections at both the PC and AquaTelemetry ends. ✓ The AquaTelemetry unit is not in PC mode. Hold the Test button down until the green LED comes on then starts to flash. ✓ The USB drivers are not correctly installed. Refer to the manual and check drivers are installed and working. ✓ There may be a problem with the USB socket on the PC. Try an alternative socket.
Email uploads are not received as expected.	<ul style="list-style-type: none"> ✓ Email server setup incorrect. This is the most common cause for not receiving emails. Double check all the settings you have made. Fit the SIM card into a smart phone, duplicate the settings and ensure emails can be sent successfully. ✓ Email upload parameters not setup correctly. Check Initial Upload time and Upload Interval are correctly set. ✓ Poor signal strength. Emails require a more robust network signal than SMS messages. Ensure the unit is mounted in an area where the network is suitable for email communication. Fit the SIM card into a smart phone and ensure emails can be sent successfully from the installation site. If so, use the SE command to force the unit to send an email and watch the LEDs to check signal strength.

9. Limited Warranty

The Aquaread® AquaTelemetry and associated LeveLine® products are guaranteed for two years from date of purchase against defects in workmanship and materials when used for their intended purpose and maintained according to instructions.

This warranty is limited to repair or replacement free of charge. Accidental damage, misuse, tampering, lack of prescribed maintenance, water ingress through incorrectly fitted glands and covers, and damage caused by leaking batteries are not covered.

If service is required, contact our Service Department directly by email in the first instance (service@aquaread.com). Report the model number, date of purchase, serial number and problem. You will be given a Returns Authorisation number by our Service Department. You should then return the equipment, **thoroughly cleaned**, properly packaged, carriage paid, to the address you are given. If the equipment is within warranty, any necessary repairs will be carried out and your equipment will be returned free of charge.

If the repair is not covered by the warranty, you will be given an estimate for the costs of repair and return carriage. Upon receipt of payment, your equipment will be repaired and returned.

Please note: The majority of perceived problems can be rectified by careful study of this instruction manual, use of the [Troubleshooting](#) section, or with a little help from our engineers over the phone. **Always contact our Service Department prior to returning any equipment.**

9.1. Cleaning Prior To Return

In order to protect the health and safety of our employees, any equipment returned for service must be thoroughly cleaned and decontaminated prior to despatch, and must be accompanied by a completed copy of the Decontamination Certificate printed below. Any equipment returned for service without a satisfactory Decontamination Certificate, or any equipment deemed by our engineers to be contaminated, will be quarantined pending receipt of a properly completed Decontamination Certificate.

Never clean the LeveLine® Sonde with concentrated acid or alkaline based cleaning products such as Decon 90. These products can strip the finish from the equipment and damage some of the plastic components.

9.2. Decontamination Certificate

Please print this certificate, complete all sections, and enclose it with any returned equipment.

Decontamination Certificate

Company Name: _____

Address:

Postal code: _____

Country: _____

Phone: _____

email: _____

Product: _____

Serial No.: _____

Contaminant (if known):

Decontamination Procedure:

Certified by (print name): _____

Title: _____

Date: _____

Signature: _____

10. Appendix 01. Quick Reference Guide

The first two commands are available to all users. All subsequent commands will only respond to Administrators.

Command	Shorthand Header	Command Format	Function
Request Level	LE	N/A	Request current level, temperature, alert status and battery voltage.
Request Config	CO	N/A	Request all logging and alerts configuration.
Request Email	SE	N/A	Request the unit to upload data log by email immediately.
Set Logging Interval	LO=	HHH:MM	Sets the main logging interval.
Set Log Upload Interval	UP=	HH:MM	Sets how often the logged data is uploaded by email.
Set Initial Upload Time	FI=	HH:MM	Sets the time for the first email data upload of the day.
Set the Site ID	SI=	Up to 16 ASCII characters	Sets a unique identifier name for the deployment site.
Set the Clock Offset	TI=	+/-HH:MM	Add or subtract time from the clock to correct for daylight saving time.
Zero the Level	ZE	N/A	Sets the current level as zero. All subsequent level readings will be made +/- against this reference.
Clear Memory	N/A	CLEAR MEMORY NOW	Clear the unit's memory. No shorthand. Must be sent in full.
Set Level 1 Alert	L1=	+/-XXXXX	Level 1 alert value in mm.
Set Level 2 Alert	L2=	+/-XXXXX	Level 2 alert value in mm.
Set Level 3 Alert	L3=	+/-XXXXX	Level 3 alert value in mm.
Set Level 4 Alert	L4=	+/-XXXXX	Level 4 alert value in mm.
Set Rate Alert	RA=	+/-XXXXX	Rate alert value in mm/min.
Set Alert Logging Interval	AL=	HH:MM	Sets the alert testing and logging interval.
Query Phone Book	N/A	PBXX=?	Requests the phone number and status from entry XX in the phone book.
Set Number in Phone Book	N/A	PBXX=A/UXXXXX XXXXXXXXXX	Sets the status and phone number for entry XX in the phone book. Leave the number field blank to delete the entry.