



Instruction Manual

for the

AquaTel

Telemetry System

(Tube Version)

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1. Introduction to the product

This manual covers the installation, setup, and operation of the tube version of the AquaTel® telemetry system in association with Aquaread® LevelLine® Mini ABS Sondes and Aquaprobe® water quality probes.

1.1. What does the AquaTel® system do?

The AquaTel® system, when used in association with an Aquaread® level Sonde or water quality Probe, forms a data-logging and telemetry system that records water level and/or water quality at pre-determined intervals then uploads the logged data periodically to a web-based platform, where the data can be viewed and manipulated.

All setup and control of the AquaTel® system is achieved via text messaging (SMS). This allows the system to be used anywhere in the world, even in areas with basic cellular coverage. Any type of mobile phone, from the most basic model upwards, can be used to control the system without the need for a compatible app.

Current level and/or water quality data can also be requested by SMS. In addition, eight programmable alerts can be set to automatically send SMS messages if an alert condition exists.

1.2. About equipment compatibility

There are two different versions of the AquaTel® unit: The LevelLine® version and the Aquaprobe® version. The two different versions look similar but are labelled differently.

If you are planning to install the Aquaprobe® version of the AquaTel® unit to measure water quality, it is highly recommended that you use a version of the Aquaprobe® that includes an automatic cleaning mechanism, such as the AP-6000, AP-7000 or the AP-Pro. In addition, you will need an Aquaprobe® Extension Cable and a support cable to support the weight of the Aquaprobe®.

If you use one of the smaller Aquaprobe® models without automatic cleaning, fouling will become an issue after a period (dependent upon conditions), making regular cleaning and maintenance necessary.

The LevelLine® version of the AquaTel® is available with and without a sonde socket. If you are planning to install the AquaTel® unit with any LevelLine® LL-CTD-MINI-ABS-XXX type sonde or any of the LL-MINI-ABS-XXX sondes (all of which have a socket), you must use the AquaTel® version with a sonde socket and a non-vented LevelLine® cable.

If you are planning to install the AquaTel® unit with the basic LevelLine® LL-Mini-10M (which has a 10m non-vented cable built in) you should use the hard-wired AquaTel® LevelLine® version without a sonde socket.

1.3. About batteries and external power

The main power supply for the system is 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). If you are planning to deploy the AquaTel® unit in temperatures below 5°C, you should always use lithium batteries. A selector switch allows the battery type to be set. **Never mix battery types.**

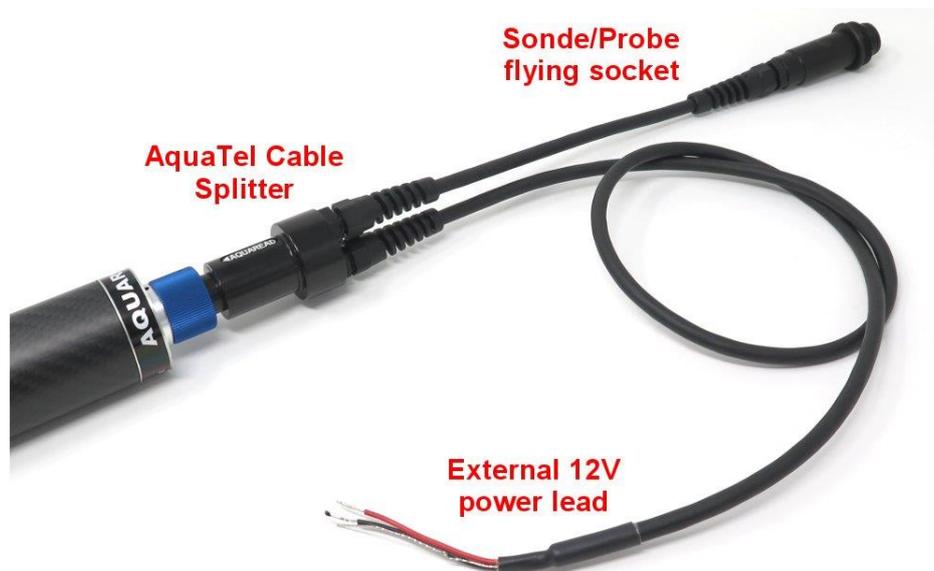
Four lithium batteries will provide roughly double the life of four alkaline batteries, especially

in extremes of temperature.

1.4. External power supply

As an alternative to internal batteries, the unit can be powered by an external 12V supply (typically a 12V battery maintained by a solar panel charger), but it is recommended that lithium batteries are also installed in this case to provide backup power in the event of an external power supply failure.

To supply power and connect a sonde/probe, an AquaTel® cable splitter is required (see photo below). This will allow both a sonde/probe and an external power supply to be connected to the socket on the AquaTel® unit.



1.4.1. Special notes

1. The wiring of the LeveLine® and Aquaprobe® versions of the splitter cable is different, so the correct type must be used to suit your AquaTel® unit.
2. The external supply must be capable of supplying a current of 2A at between 10V and 14V and should include a 2.5A quick-blow fuse. Do not exceed 14V. Nominal current drain on the external supply is only a few mA, but during transmission, the unit can draw up to 2A.
3. If you are planning to install the AquaTel® unit with the basic LeveLine® LL-Mini-10M, which has a 10m non-vented cable built in, and you are using the hard-wired AquaTel® version without a sonde socket, the external power option is not available.

2. Setup and test prior to installation

Prior to installing the AquaTel® system permanently in the field, the system must have a SIM card, batteries and an antenna fitted. In addition, the system should be tested in accordance with the following instructions.

All the steps detailed in this section (apart from SIM card installation) should be carried out in the field at the deployment site. This will ensure correct cellular connectivity and accurate geo-tagging.

2.1. SIM card installation

Prior to installation and fitting of the batteries, an active micro-SIM card must be fitted to the unit. **The SIM card must not be locked or PIN protected.** To install the SIM card, unscrew the large, knurled locking nut at the top of the unit then slide the carbon-fibre sleeve completely off the unit.



This will reveal the battery compartments, control switches and SIM socket.



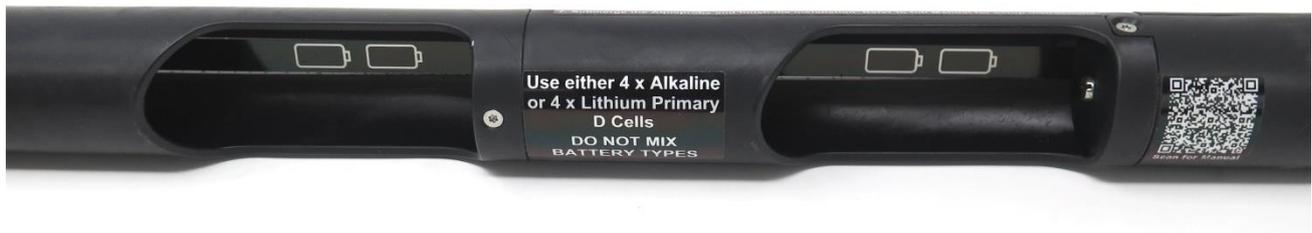
Insert the micro-SIM card into the slot marked 'SIM CARD' orientated as indicated by the graphic below the slot. The card should click into place. To remove the card, press it in, and it will pop out.

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

2.2. Battery installation

The unit can be powered 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). **The unit will not operate from just one pair of batteries.**

When choosing lithium cells, be sure to choose cells that can provide a maximum continuous current of at least 2000mA. This information is available as part of the battery specification. **Rechargeable cells SHOULD NOT be used.**



Before installing the batteries, ensure the battery selector switch is in the OFF position. Insert the batteries into the two battery holders as indicated.

Never mix battery types or old and new batteries. All batteries must be of the same type and in a similar condition. FAILURE TO OBSERVE THIS RULE COULD LEAD TO FIRE OR EXPLOSION.

Install the batteries, **but do not switch the unit on yet.**

2.2.1. Sonde/Probe installation

Before switching the unit on, the sonde or probe must be attached. For this you will need either a LevelLine® or Aquaprobe® extension cable, depending upon the type of AquaTel® unit you are installing.

The bottom end of the AquaTel® unit includes the sonde/probe socket, a hanger socket, and a vent hole for the internal barometer. The vent hole is covered internally by a permeable membrane to prevent water entry. **Do not poke anything in this hole as it will pierce the membrane and allow water ingress.**

The hard-wired version of the AquaTel® unit has a cable entry gland in place of the sonde/probe socket.



2.2.2. Socketed Version

To attach an extension cable to the socketed version, first apply a little silicone grease to the connector O-rings then line the Aquaread® logo on the connector up with the black dot on the AquaTel® socket. Push the connector home then tighten the blue locking ring.



If you are planning to connect an external power supply, this should be done later. For the purposes of proving the system, connect the sonde/probe directly to the unit.

Do not place the sonde/probe in water at this stage.

2.2.3. Hard-wired version

If you are installing the hard-wired version of the AquaTel® unit without the built-in socket, you should cut the 10m non-vented cable that is built-in to the LeveLine® Mini Sonde to an appropriate length for your installation, then pass the end through the cable gland in the base of the unit.

Strip the cable outer sheath back by 30mm. Cut the white core off as this is not used. Strip the remaining five cores back ready for insertion into the connector block. Twist the cable screen into a single core and insert it into the connector block along with the black core as indicated. Insert the remainder of the cores into the connector block as indicated.

Fit a Ty-Wrap to the cable where it passes through the aluminium end block for strain relief.



Do not place the sonde/probe in water at this stage.

2.3. Antenna Installation for Testing

The AquaTel® is supplied with a stubby GSM antenna. For the purposes of initial test and setup, the antenna should be fitted now. To fit the stubby antenna, simply screw it on to the antenna socket.

2.4. Initial Switch On

Once all the steps covered in this section have been carried out, switch the unit on by sliding the battery switch to the appropriate position.



It is very important that the switch is set at the correct position for the battery type in use.

If you have installed lithium batteries, slide the switch to the right position labelled **ON USING LITHIUM**. If you have installed alkaline batteries, slide the switch to the left position labelled **ON USING ALKALINE**.

2.5. Cellular signal strength indication

As soon as the unit has been switched on, observe the LED, which is visible through the window located on the top face of the unit.

The LED will flash red for a few seconds whilst the unit boots up and searches for a cellular signal. As soon as a signal is found and the unit has registered with a cellular provider's network, the LED will stop flashing and illuminate solidly in a colour representative of the signal quality.

| LED Indication | Network Signal Strength |
|-----------------------|--------------------------------------------|
| LED flashing red | No network available / registration failed |
| LED on solidly red | Poor signal strength |
| LED on solidly yellow | Medium signal strength |
| LED on solidly green | Good signal strength |

If the LED continues to flash red for several minutes, this indicates that no cellular service could be found. In this case, check the signal strength with a regular mobile phone using the same network. If the signal strength on a mobile phone is good, this indicates a SIM card problem. It could be the SIM is locked or it has not been activated.

If the LED is showing a solid red indication, this indicates the unit is receiving a signal, but it is weak. In this case, it would be worth installing a remote antenna, which can be sited in a better location.

If the LED is showing solid yellow or green, this indicated medium to good signal strength, which should be sufficient for normal operation.

The LED will continue to show the live signal level indication for ten minutes after power on to allow you to find the best antenna position. After that, the unit will drop into a lower power mode, where the LED will give a brief blue flash periodically.

If, after fifteen minutes you are still experimenting with the antenna position, switch the unit off then back on again to re-start the fifteen-minute signal indication period.

2.6. Checking communication by SMS

Once the signal strength is acceptable, send the **HE** command by SMS to the AquaTel® unit's mobile number, the **HE** command is the help request, see [section 5.4](#) or Appendix 01 – Command Quick Reference Guide for a full list of available commands. Once sent, observe the unit's LED.



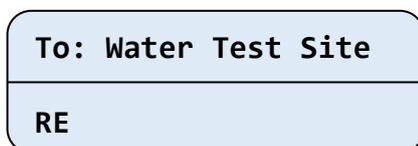
We recommend adding the AquaTel® unit's phone number to your phone contact list, using a friendly name.

As soon as the AquaTel® unit receives and processes the SMS, the LED will give a brief purple flash, and the unit will reply with a full list of commands that are valid for the installation.

If no purple flash is seen, check you are sending to the correct SIM number. If the purple flash is seen but you do not receive a reply, check that the SIM card has sufficient credit. Allow up to 30 seconds for the message to be received.

2.7. Checking Sonde/Probe Communication

Once a response to the **HE** command has been received, you should request a reading from the sonde/probe by sending **RE** by SMS.



The AquaTel® unit will activate the sonde/probe, then, within one minute it will return a full set of readings. If there is a problem with the sonde/probe, the unit will return an SMS alert indicating a probe error. If a probe error is reported, check the cabling to the sonde/probe and try again.

If a full set of readings is received, most of the readings will be irrelevant, because the sonde/probe should not be in the water at this stage. However, there is important information contained at the end of the SMS response regarding signal strength and battery condition.

Scroll to the end of the message and look for **Signal = XX% - XG**. This will give you a signal strength in percentage and an indication of the signal type (i.e., 2G, 4G etc).

For reliable operation, a signal strength of 40% or greater is desirable. If the signal strength is being reported as less than 40%, try using an alternative antenna located in a position where reception is better.

On the last line of the SMS, the battery voltage will be reported along with a condition indication. Please bear in mind that the battery voltage reported here is measured when the batteries are under load. This gives a realistic indication of battery condition and may not agree with voltages measured across the batteries when not under load.

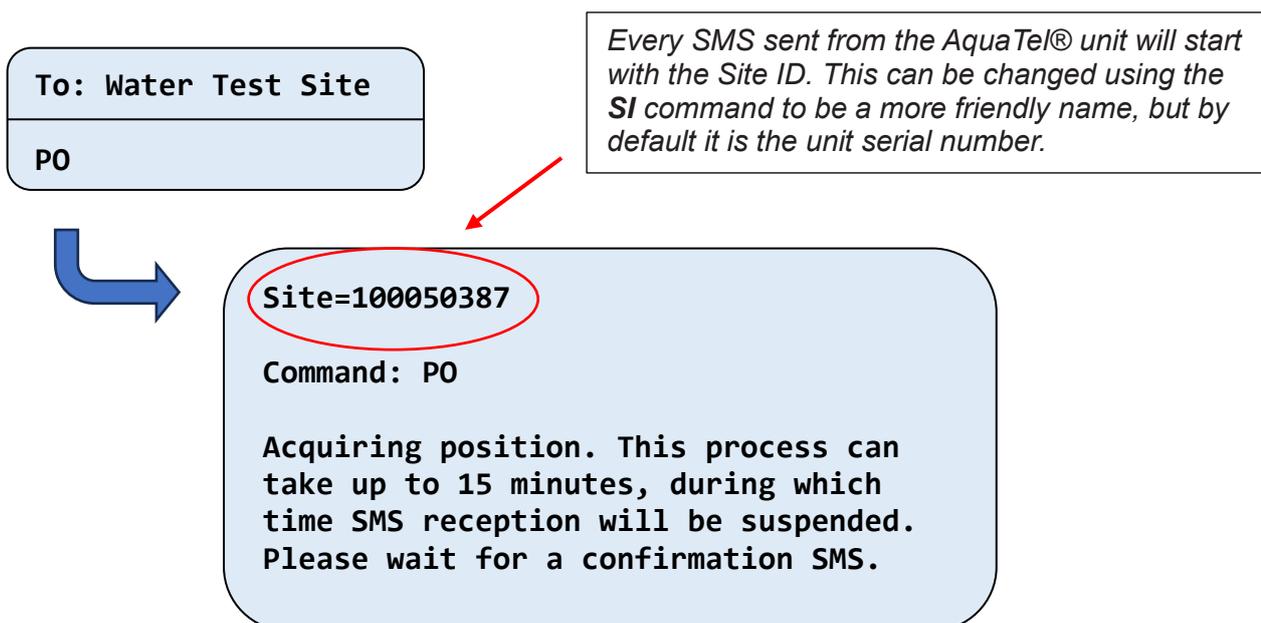
2.8. Geo-Tagging the Installation Position

For the AquaTel® unit to include position in the logged data, it is necessary to geo-tag the installation position at this point.

To do this, place the AquaTel® unit at the exact position it is to be installed with the GPS antenna, indicated below, facing up with an uninterrupted view of the sky.



Instruct the AquaTel® unit to calculate and store the current position by sending the **PO** command by SMS. This is the position command.



The AquaTel® unit will respond with a message informing you that position acquisition has begun. This procedure can take up to fifteen minutes. As soon as the position has been established, you will receive a confirmation SMS, which will include the latitude and longitude for the unit's location.

In the event the AquaTel® unit is unable to obtain a position, it will send a message to that effect instead. In this case, the position may be set manually, see [section 4.20](#). This can be done later if the exact position is not known at this stage.

Pre-installation testing and setup is now complete. Proceed to the next section to complete the installation.

3. Permanent installation

3.1. External power supply

If you are connecting an external power supply, unscrew the sonde/probe previously fitted for testing and attach an appropriate splitter cable (see photo below) to the unit.

Re-attach the sonde/probe to the flying socket.



The 12V power cable should be attached to a suitable fused 12V DC supply capable of supplying 2A. See section 1.4.

3.2. Suspending the Sonde/Probe

If you are installing a LeveLine® Mini Sonde or one of the small Aquaprobes, the electrical cable can support the weight of the sonde/probe and no additional support is required.

If you are installing Aquaprobe® models AP-5000, AP-6000, AP-7000 or AP-Pro, you must use a suspension wire or cord to support the weight of the probe.

To do this, screw the eyebolt provided into the threaded hanger socket as shown in the adjacent photo, then attach a suitable suspension wire or cord.

The other end of the suspension wire or cord should be attached to the Aquaprobe's hanger bracket and should be of a suitable length to relieve any tension on the electrical cable.

3.3. Suspending the AquaTel® Unit

The AquaTel® unit has a stainless-steel backbone and is designed to support the weight of any sonde/probe attached to the bottom of the unit when suspended by the top hanger.

The top hanger is located adjacent to the antenna socket and can be used to suspend the entire assembly (AquaTel® unit, cable, and sonde/probe). See notes on suspension cord material in section 3.4.



Alternatively, the AquaTel® unit can be strapped to any suitable structure using Ty-Wraps. The AquaTel® unit is designed to be used outdoors and is rated to IP68 (submersion at 1.5m for 30 minutes) depending on connected antenna, but it **is not** specifically designed for full submersion and therefore full submersion should be avoided. 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 AquaTel® unit includes a barometric pressure sensor. For this reason, any secondary housing MUST be vented to allow the barometric pressure sensor to operate correctly. If the AquaTel® unit is mounted inside a secondary sealed housing, incorrect level and Dissolved Oxygen measurements will be recorded.

The AquaTel® unit must be in a position that is above the maximum possible water level so that it is always dry, whilst the associated sonde/probe should be located below the minimum possible water level so that it is always submerged.

3.4. Antenna installation

The AquaTel® is supplied with a stubby GSM antenna, which can be fitted directly to the socket on the top of the unit. If the unit is to be installed under-ground in a borehole, below a man-hole cover or in a position where the signal strength will be insufficient for this antenna, a remotely mounted antenna may be used. Contact your Aquaread® dealer for antenna options.

If you are planning to use the AquaTel® unit with the stubby antenna and a suspension cord, **a non-conductive suspension cord such as Nylon or Kevlar is recommended**. If you use a conductive suspension cord, such as steel, this will cause the antenna's signal to be grounded resulting in poor cellular reception.

3.5. Final test of the installation prior to leaving the site

When the installation is complete, and the unit is switched on, replace the protective carbon-fibre sleeve, and secure it in place with the locking nut. Install the unit in its final position.

Request a reading from the sonde/probe by sending **RE** by SMS.

To: Water Test Site

RE

The AquaTel® unit will activate the sonde/probe, then, within one minute it will return a full set of readings. If there is a problem with the sonde/probe, the unit will send an alert indicating a probe error.

When a full set of readings have been received, check that they look realistic. Also check the important information contained at the end of the SMS response regarding signal strength and battery condition as highlighted in the response below.

Site=100050387

Command: RE

Mon 09/Oct/2023 16:35:55 (BST)

Water Level 1.00m

Water Temperature 20.50C

. . .

Signal=58% - 4G

No alerts configured

Lithium batteries =7.21V

Scroll to the end of the message and look for **Signal = XX% - XG**. This will give you a signal strength in percentage and an indication of the signal type (i.e. 2G, 4G etc).

For reliable operation, a signal strength of 40% or greater is required. If the signal strength is being reported as less than 40%, try repositioning the unit or using a remote antenna located in a position where reception is better.

On the last line of the SMS, the battery voltage will be reported along with a condition indication (Good, Low or Dead). Please bear

in mind that the battery voltage reported here is measured when the batteries are under load. This gives a realistic indication of battery condition and may not agree with voltages measured across the batteries when not under load.

Obviously, you want to see a 'Good' battery condition message before leaving site.

If a **Faulty Probe Alert** is reported, check the cabling to the sonde/probe and try sending the **RE** command again.

Site=100050387

Faulty Probe Alert
Please check installation

Once you are satisfied that the installation is working correctly, you can set-up all the remaining functionality remotely by SMS.

4. Full Setup

4.1. Sending Commands

The AquaTel® unit operation is configured using SMS text message commands which can be sent from any mobile phone. Each command is represented by a two-letter or three-letter code and is generally followed by an operator. Any additional letters between the code and the operator are ignored.

The available operators are:

- '=' This operator is used to assign a value and is followed by one or more parameters
- '?' This operator is used to query the current setting.

Multiple commands maybe sent in a single message using a semicolon as a separator. See section **10. Entering compound messages**

Commands are not case sensitive, so they can be sent in upper case, lowercase, or any combination of case. Spaces are permitted between commands, operators, and parameters.

The AquaTel® unit will only process commands that meet the minimum access requirements for the requested functionality. There are three levels of access requirement which are based on the mobile phone number that the message originated from:

- Open** Can be performed from any number.
- User** Can only be performed by numbers that were added to the phone book.
- Admin** Can only be performed by numbers that were added as administrators.

For a full list of commands along with operators and access requirements see:
[Appendix 01 – Command Quick Reference Guide](#)

4.2. Getting Help

At any time, you can send **HE** by SMS to the AquaTel® unit's mobile number. The unit will respond with a list of all the available SMS commands (sending **Help** will also work.)

To: Water Test Site

HE



Site=100050387

To get help, send "HE=xx" where xx is one of the following:

- AI-Alert check interval.
- AL-Alert threshold configuration.
- BR-Broadcast current readings.
- CK-Clock management.
- . . .
- UP-Data log upload interval.
- ZE-Zero the water level.

To get more detailed help on any command, send the message: **HE-XX** (or **HE=XX**)

Where **XX** is the command from the **Help** list. The unit will respond with more detailed help on that command. For example, to get additional help for the **TU** command send:

To: Water Test Site

HE-TU



Site=100050387

Command: HE-TU

Temperature units.

To query send: TU?

To set send: TU=C/F

Where C=Celsius and F=Fahrenheit

4.3. Setting up the SMS Check Interval (Command SM)

By default, the AquaTel® unit will enter sleep mode fifteen minutes after power up. When the unit is asleep, it will not be checking for incoming SMS messages.

Whilst in sleep mode, the unit will wake up periodically to check for incoming SMS messages. The interval between these awake periods is known as the SMS Interval.

By default, the SMS Interval is fifteen minutes, so when the unit is asleep, you may have to wait for up to fifteen minutes before you receive a reply to any SMS message.

Once the unit has woken up and has received an SMS message, it will stay awake for five minutes looking for further messages. If no further messages are received during that period, the unit will go back to sleep.

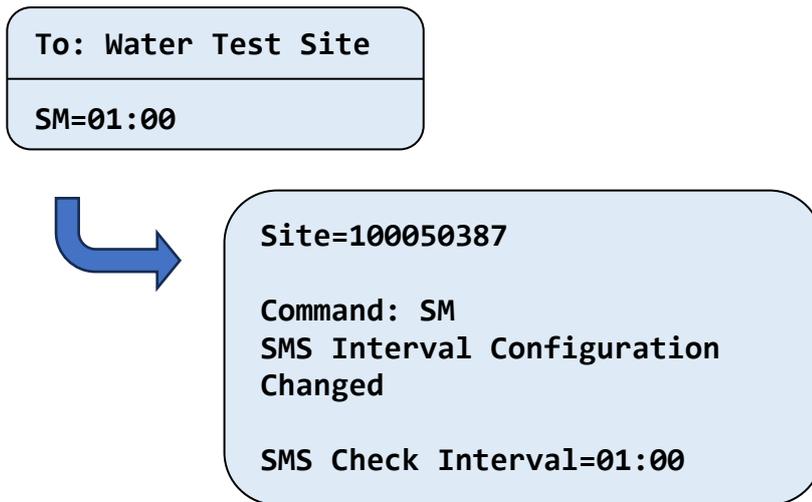
This system is designed to minimise battery usage and can be customised by sending the unit a new SMS Interval. To adjust the SMS Interval, send:

SM=HH:MM

Where HH:MM is a valid time interval in hours and minutes. The maximum permissible time interval is 24:00 (24 hours) and the minimum interval is 00:00.

If you set the SMS interval to 00:00, the unit will never enter sleep mode and will respond instantly to SMS commands. **While this may seem desirable, is not recommended, as it will lead to extreme battery usage, so should only be used when the unit is running on an external supply.**

The following example sets the time between checking SMS message to 1 hour:



4.4. SMS Phone Book Setup (Command PB)

SMS is the primary communication medium of the AquaTel® unit. It is used to configure the system and to retrieve readings and alerts. All SMS numbers registered in the unit's phone book will also receive alerts as they occur in real time.

From new, prior to setting up the phone book, the AquaTel® unit will respond to SMS messages from any number.

Once the first Administrator phone number has been set in the phone book, the AquaTel® unit will only respond to SMS messages from numbers stored in the phone book. The only exception to this rule is the **RE** command. The AquaTel® unit will respond to any number that sends this command.

The AquaTel® unit allows the input of up to forty phone numbers which can be either assigned as an Administrator or a normal user.

- All registered SMS numbers will receive alerts.
- Any SMS number, whether registered or not, can request readings 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 at any time via SMS by any registered Administrator as described below.

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.

4.4.1. Setting up the first Administrator

Phone book entries **MUST** be sent in the international format including the country code. (The leading + symbol and any spaces maybe left out if desired)

NOTE: The leading 0 of the national phone number must not be included.

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 **01**, you should send the following SMS message:

| |
|--------------------------------|
| To: Water Test Site |
| PB01=A +44 7881 523 164 |

(PB01=A447881523164 is also valid)



Site=100050387

Command: PB

Update contact 01=A447881523164

4.4.2. Phone Book Queries (Administrators only)

To see the entire phone book for the AquaTel® unit, send the **PB** message:

The AquaTel® unit will respond with a list of all phonebook entries.

| |
|----------------------------|
| To: Water Test Site |
| PB |



Site=100050387

Command: PB

01=A447881523164

02=Empty

03=Empty

04=Empty

05=Empty

06=Empty

07=Empty

. . .

39=Empty

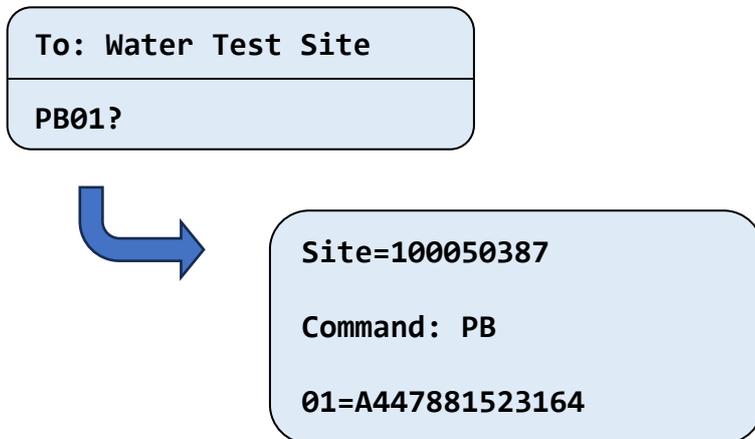
40=Empty

39 spaces remaining

To query any individual phone book entry in the AquaTel® unit, send the following SMS message: **PBXX?**

Where XX is the phone book entry reference (01 – 40).

So, to query phone book location 01, you would send: PB01?

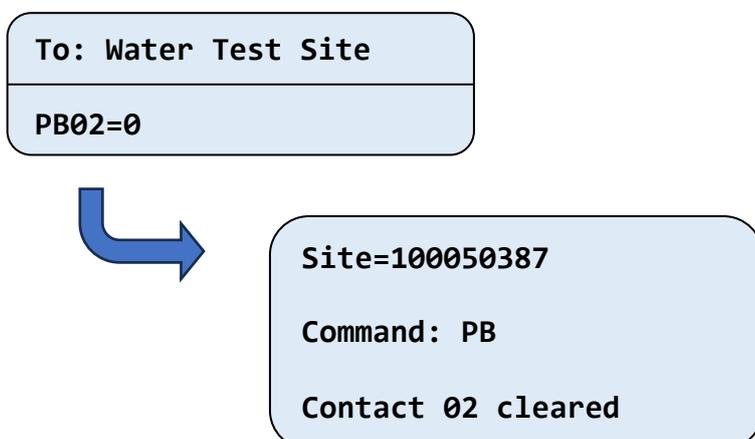


4.4.3. Deleting a Phone Book Entry (Administrators Only)

To delete any phone book entry in the AquaTel® unit, send the following SMS message: **PBXX=0**

Where XX is the phone book entry reference (01 – 40).

So, to delete phone book entry 02, you would send: PB02=0



Be 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.

4.5. Setting up the Measurement and Logging Parameters

When the phone book has been set up, proceed to set up the measurement and logging parameters. These settings are sent to the AquaTel® unit by SMS. After each setting is sent, the AquaTel® unit will respond with the Configuration Changed messages confirming the new settings.

If you make a mistake with command name, setting format or value sent, the AquaTel® unit will respond with an appropriate error message such as:

Site=100050387

Command: JX

Error: Unknown Command

Site=100050387

Command: P0

Error: Invalid Longitude

See [Appendix 03 – Error messages](#)

4.6. Requesting the Current Configuration (Command CO)

The current configuration of the AquaTel® unit can be queried by sending the unit **CO** by SMS. The unit will respond with the following information:

To: Water Test Site

CO



Site=100050387

**Command: CO
Configuration**

AquaTel version 02.20.01

H/W Revision=0

Serial No=100050387

Time Offset=Automatic

Upload Log Interval=24:00

First Upload Time=06:00

SMS Check Interval=00:15

Data Log Interval=00:15

Alert Check Interval=00:05

Latitude=N51.369640

Longitude=E001.420182

Temperature Units=Celsius

Server=ftp.server.com

Username= username

Password=p***d**

Port=21

Clean every=12 samples

Note: The *Clean every* option is only available on the AquaTel® Aquaprobe® version. The FTP server information is only sent if an administrator makes the request.

4.7. Setting the Logging Interval (Command LO)

To set the logging interval in hours and minutes, send the message **LO=HH:MM** to the AquaTel® unit by SMS.

| |
|---------------------|
| To: Water Test Site |
| LO=01:00 |



| |
|------------------------------------|
| Site=100050387 |
| Command: LO |
| Log Interval Configuration Changed |
| Data Log Interval=01:00 |

The maximum value is 168:00 (168 hours = 1 week).
The minimum value is 00:01 (1 minute)

The default logging interval for the LevelLine® version is 00:15 (fifteen minutes). The default logging interval for the Aquaprobe® version is 01:00 (1 hour). It is advisable to make the logging interval as large as possible for your application to extend the battery life.

To read the logging interval back from the AquaTel® unit, send **LO?** by SMS.

| |
|---------------------|
| To: Water Test Site |
| LO? |



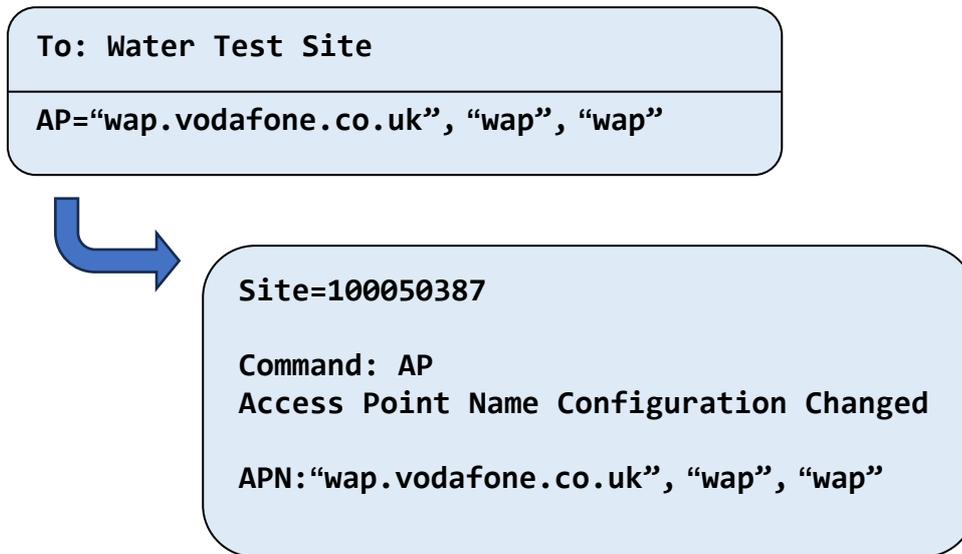
| |
|----------------------------------|
| Site=100050387 |
| Command: LO |
| Log Interval Configuration Query |
| Data Log Interval=01:00 |

4.7.1.1. Alert logging rate

The logging interval will automatically be altered to match the alert interval whenever there is any active alert, this happens automatically and does not alter the normal logging interval. This temporary change in logging rate is done to provide more logging data points during alert periods. The log upload frequency is also altered. See [4.18](#) for more details.

4.8. Setting the network Access Point Name (Command AP)

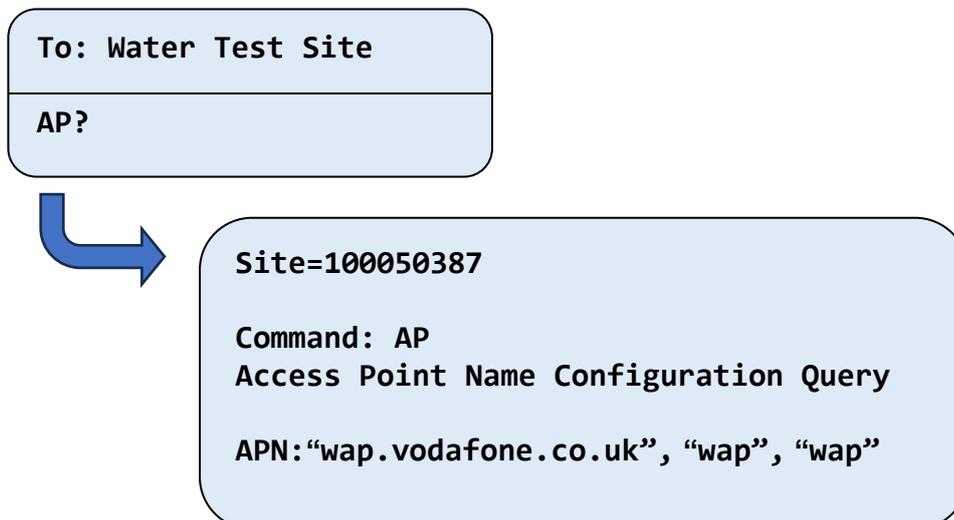
To set the network Access Point Name, send the message **AP="APN", "login", "password"** to the AquaTel® unit by SMS.



You need to send all three parameters, each with surrounded by quotation marks and separated by commas. If a parameter is blank (such as the password) enter ""

If you enter blank fields for all three parameters (AP="", "", "") the Aquatel® will use the default APN for the SIM card – This is the default setting.

To query the current APN settings, send the message AP? to the AquaTel® unit by SMS.



If you are not sure what to enter for the APN, please contact your SIM card provider. In many cases using the default APN will work correctly. However, if you have issues with the FTP data upload or local time settings, it is likely that the APN needs setting for you SIM card.

4.9. Setting the Log Upload Interval (Command UP)

To set the interval, in hours and minutes, at which the AquaTel® unit will upload logged data by FTP, send the message **UP=HH:MM** to the AquaTel® unit by SMS.

To: Water Test Site
UP=24:00



Site=100050387
Command: UP
Upload Interval Configuration Changed
Upload Log Interval=24:00

- The maximum value is 24:00 (once a day)
- The minimum value is 00:05 (every five minutes – 288 times a day)

The interval must divide evenly into 24 hours, so only the following values are permitted:

| Interval | Uploads per day |
|----------|-----------------|----------|-----------------|----------|-----------------|----------|-----------------|
| 24:00 | 1 | 02:24 | 10 | 00:45 | 32 | 00:16 | 90 |
| 12:00 | 2 | 02:00 | 12 | 00:40 | 36 | 00:15 | 96 |
| 08:00 | 3 | 01:36 | 15 | 00:36 | 40 | 00:12 | 120 |
| 06:00 | 4 | 01:30 | 16 | 00:32 | 45 | 00:10 | 144 |
| 04:48 | 5 | 01:20 | 18 | 00:30 | 48 | 00:09 | 160 |
| 04:00 | 6 | 01:12 | 20 | 00:24 | 60 | 00:08 | 180 |
| 03:00 | 8 | 01:00 | 24 | 00:20 | 72 | 00:06 | 240 |
| 02:40 | 9 | 00:48 | 30 | 00:18 | 80 | 00:05 | 288 |

The default upload interval is 24:00 (once a day). It is advisable to make the upload interval as large as possible for your application to extend the battery life. Entries shown in red are not recommended unless you are using an external power supply.

To read the upload interval back from the AquaTel® unit, send **UP?** by SMS.

To: Water Test Site
UP?



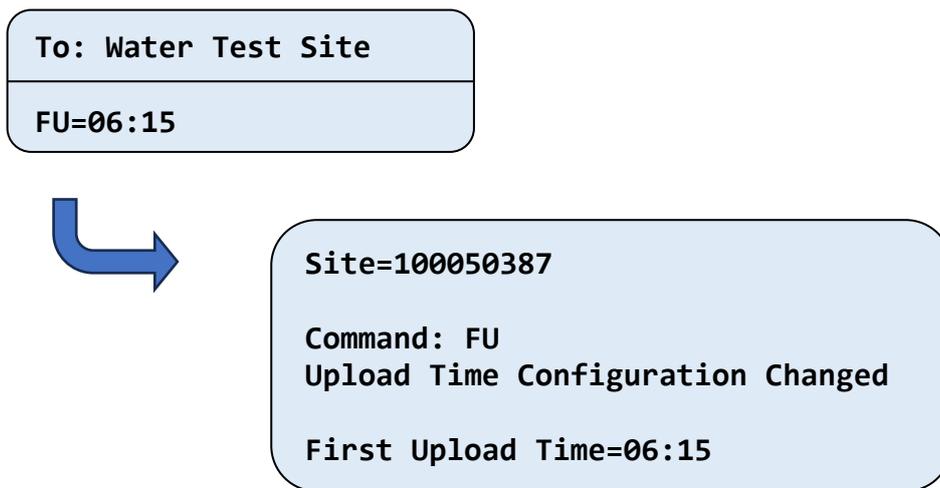
Site=100050387
Command: UP
Upload Interval Configuration Query
Upload Log Interval=01:00

The upload interval is automatically decreased while alerts are active (see 4.18)

If no log entries have been generated since the previous upload, then the uploaded is skipped with minimum impact on the battery.

4.10. Setting the First Upload Time (Command FU)

To set the time each day that the initial set of logged data is sent by FTP, send the message **FU=HH:MM** to the AquaTel® unit by SMS. The value must be a valid time of day.

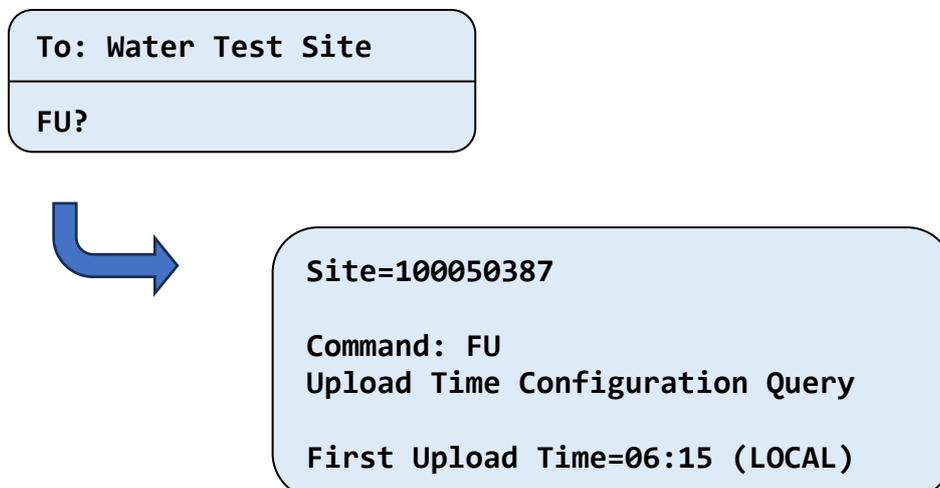


The first upload time is used to specify the time that upload time interval starts from. This is specified as a local time and is not necessary the first upload of the day.

For example, if the first upload time is set to **06:15** and the upload interval is set to **03:00**; uploads will occur at **06:15, 09:15, 12:15, 15:15, 18:15, 21:15, 00:15, 03:15**.

With an upload interval of **08:00**, those times would change to **06:15, 14:15, 22:15**

To read the first upload time from the AquaTel® unit, send **FU?** by SMS.



4.11. Setting the Site ID (Command SI)

The site ID will default to the AquaTel® unit's serial number. To assign a more friendly identifier send the message **SI=XXXXXXXXXXXXXXXXXX** to the AquaTel® unit by SMS. To avoid confusion, the site identifiers should be unique for each AquaTel® unit that you install.

```
To: Water Test Site
SI=Water Test Site
```



```
Site=100050387
Command: SI
Site Configuration Changed
Site ID
Water Test Site
```

Note: The Configuration Changed response will still show the original site name in its header. This will then change for all subsequent responses to the new site name.

The site ID can be up to 16 characters long and should only include valid ASCII characters. A table of valid ASCII characters can be found in Appendix 04 – Accepted ASCII Characters

To read the site ID from the AquaTel® unit, send **SI?** by SMS:

```
To: Water Test Site
SI?
```



```
Site=Water Test Site
Command: SI
Site Configuration Query
Site ID
Water Test Site
```

4.12. Setting the local time offset / daylight-saving time (Command TI)

The AquaTel® unit contains an internal clock which is corrected automatically each time the unit logs on to the cellular network. Times are stored internally in UTC and a local time offset is then applied to the time and date as appropriate for the location, and daylight-saving time when applicable. The log data is always uploaded with a UTC time stamp and SMS messages display local time.

Generally, it should not be necessary to manually set the local time offset, however there are two exceptions to this:

- The local time offset is not available for the unit's location, is wrong or cannot be accessed.
- You do not wish to apply a local time offset, or you wish to use a different offset to the one assigned automatically.

To set the local time offset, send the message **TI=+/-HH:MM** or **TI=AUTO** to the AquaTel® unit by SMS. The following command will set the local offset to two hours ahead of UTC.

To: Water Test Site

TI=+02:00

Note: The use of the + symbol is optional



Site=Water Test Site

Command: TI
Time Offset Configuration Changed

Time Offset=+02:00

Site=Water Test Site

Local time changed
Wed 11/Oct/2023 10:27:09 (LOCAL)

Note: As well as a Configuration Changed notification, the unit also sends a Local time changed alert to all users.

The permissible values for the time offset are between -13 and 13 hours and can be set to a resolution of one minute. If you wish all times to be always UTC, set **TI=0:00**.

Once an offset has been manually set, the AquaTel® unit will no longer attempt to set the offset automatically. If you wish to return to automatic time offsets send **TI=AUTO** to the AquaTel® unit by SMS and it will respond accordingly.

To query the current offset setting, send **TI?** to the AquaTel® unit by SMS.

4.13. Checking the current time. (Command CK)

You can check the current time that is being used by the AquaTel® unit by sending the clock query message **CK?** to the AquaTel® unit by SMS. The unit will respond with the current time and date in both UTC and local time.

To: Water Test Site
 CK?



Site=Water Test Site
 Command: CK
 Wed 11/Oct/2023 08:46:23 (UTC)
 Wed 11/Oct/2023 10:46:23 (LOCAL)

When the local time zone is set to Automatic, the name of the local time zone will be displayed if it is available.

Site=Water Test Site
 Command: CK
 Wed 11/Oct/2023 08:46:23 (UTC)
 Wed 11/Oct/2023 09:46:23 (BST)

When the local time changes to or from daylight saving time, the AquaTel® unit will send all users the Local Time Changed alert to indicate that the unit time has changed.

NOTE: There can potentially be a significant delay between the SMS response message being generated by the AquaTel® unit and its reception on your phone. When checking the time, you should compare the reported time with the sent timestamp recorded for the message, as opposed to the current time.

09:48

Site=Water Test Site
 Command: CK
 Wed 11/Oct/2023 08:46:23 (UTC)
 Wed 11/Oct/2023 09:46:23 (BST)

Sent 09:46

4.14. Zeroing the level value (Command ZE)

When the sonde or probe 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.

To zero the sonde, send **ZE** to the AquaTel® unit by SMS.

| |
|---------------------|
| To: Water Test Site |
| ZE |



| |
|--------------------------------|
| Site=Water Test Site |
| Command: ZE |
| Zero datum set to: 1.00m |
| Wed 11/Oct/2023 09:40:26 (BST) |

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

To clear the datum offset, send **ZE=0** to the AquaTel® unit by SMS.

| |
|---------------------|
| To: Water Test Site |
| ZE=0 |



| |
|--------------------------------|
| Site=Water Test Site |
| Command: ZE |
| Zero datum cleared. |
| Wed 11/Oct/2023 09:44:42 (BST) |

The current offset can be queried by send **ZE?** to the AquaTel® unit by SMS. The response will show the current zero datum level and the time and date that it was applied.

| |
|---------------------|
| To: Water Test Site |
| ZE? |



| |
|--------------------------------|
| Site=Water Test Site |
| Command: ZE |
| Zero datum set to: 0.00m |
| Wed 11/Oct/2023 09:44:42 (BST) |

4.15. Setting a zero offset

A user defined zero offset can be set by the user.

To set the offset, send **ZE=(user value in meters between -9999.9mm and +9999.99m)**

Please note, there is no need to use the + symbol on the text command for a positive offset. Any values smaller than -9999.99 and larger than +9999.99 will be clamped to the minimum/maximum value.

To: Water Test Site

ZE=0.108



Site=Water Test Site

Command: ZE

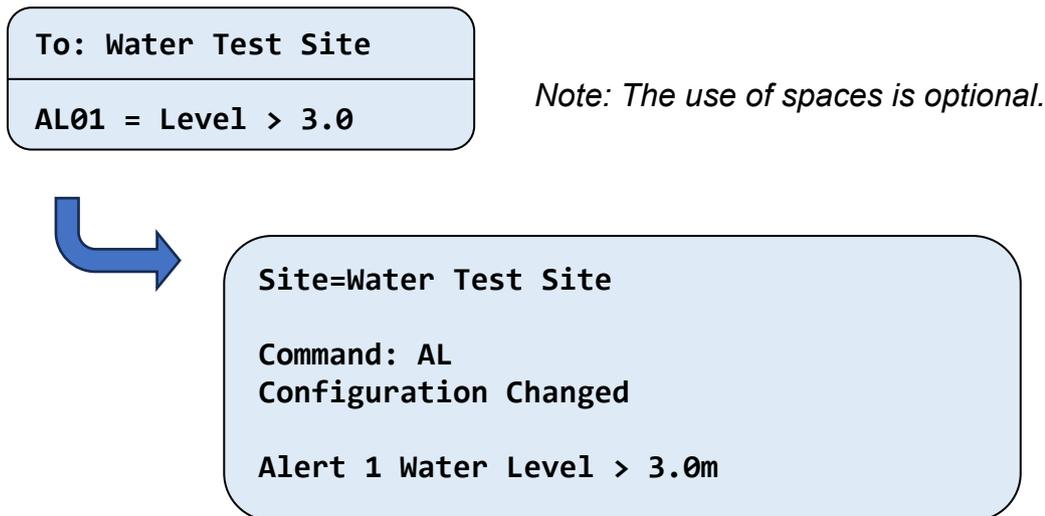
Zero datum 0.108m

Wed 11/Oct/2023 09:44:42 (BST)

4.16. Setting alerts (Command AL)

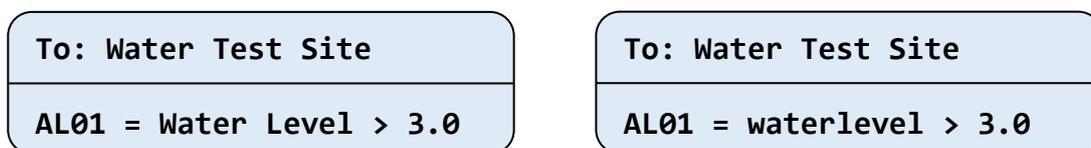
The AquaTel® unit has eight separate alerts that can be set by the user. Each alert is set up by sending an alert number (01-08), an alert parameter (level, water temperature etc.), an alert operand (< or >) and a threshold value.

For example, if you wanted an alert to be sent by SMS to all phone book entries when the water level rises above 3.0 metres, you would send **AL01 = Level > 3.0** to the AquaTel® unit by SMS.



See Appendix 01 – Command Quick Reference Guide for full table showing the available alert parameters for AquaTel® unit. An Alert can only be set for probes or sondes that are installed. Sending the **HE=AL** command will list all alert parameters available for your installation.

Each parameter has a full name and a short name, either may be sent. Case and spaces are ignored, so the above requests could also be sent as:



An indication of how many alerts have been sent is included in the response to the RE message.

```
Site=Water Test Site  
  
Command: RE  
  
Wed 11/Oct/2023 11:30:09 (BST)  
Water Level 1.00m  
.  
.  
.  
1 alert configured  
Lithiums=7.19V (Good)
```

To clear or disable an alert, **ALXX=0** to the AquaTel® unit by SMS.

```
To: Water Test Site  
-----  
AL01 = 0
```



```
Site=Water Test Site  
  
Command: AL  
Configuration Changed  
  
Alert 1 Disabled
```

To list all the currently configured alerts, send **AL?** to the AquaTel® unit by SMS.

```
To: Water Test Site  
-----  
AL?
```



```
Site=Water Test Site  
  
Command: AL  
  
Alert 1 Water Temperature < 3.00C  
Alert 2 Depth < 1.00m  
Alert 3 Disabled  
Alert 4 Disabled  
Alert 5 Disabled  
Alert 6 Disabled  
Alert 7 Disabled  
Alert 8 Disabled
```

Alerts are checked every time the data from the probe or sonde is read. This rate is controlled by the Logging Interval (**LO**) and the Alert Interval (**AI**). When an alert threshold has been reached, the AquaTel® unit will send an alert to all users in the phone book. The logging rate is automatically increased to match the alert rate while any alert is active (see 4.7.1.1). An alert will remain active until the threshold is no longer triggered. There is a hysteresis of 5% applied to this test, for example:

If a temperature threshold is set as > 20.00 then the alert will trigger when the temperature reaches 20.01 and will clear when it returns to 19.00 or below.

Alert that are set as < are treated as <= so a temperature threshold of <20.00 will trigger when the temperature is 20.00C or below. **Threshold values of zero are not permitted.**

4.17. Setting the alert interval (Command AI)

The Alert Interval is the rate at which the AquaTel® 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 Interval is set to 00:05 (every 5 minutes), the AquaTel® unit will check the readings every five minutes.

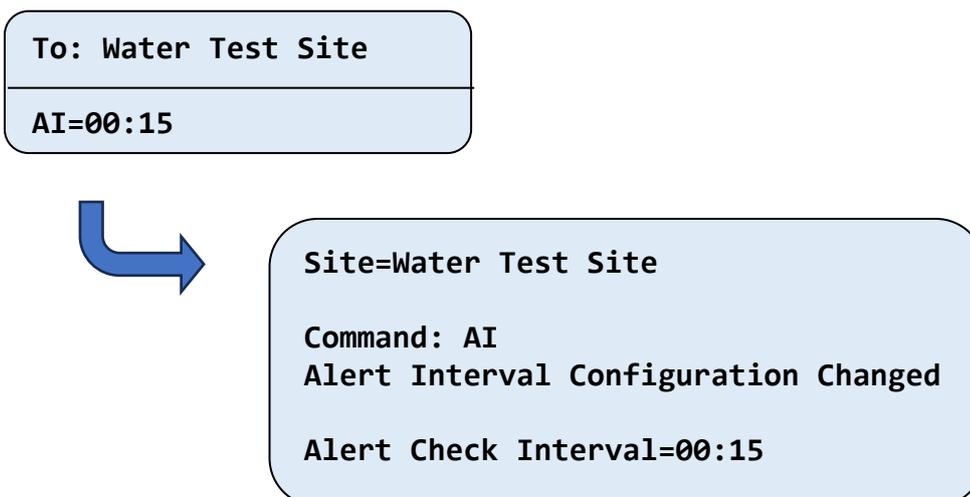
If all the readings are within the Alert thresholds, no action will be taken, and the unit will return to standby mode.

If the AquaTel® unit detects an alert state, it will start logging the data at the Alert Interval (see 4.7.1.1) and continue to do so until the alert is cleared.

The default Alert Interval for the Leveline version is 00:05 (five minutes). The default Alert Interval for the Aquaprobe version is 00:30 (thirty minutes).

Although during an alert check the unit may not log any data, it still uses the same amount of power from the batteries as a regular logging event. It is therefore advisable to make the Alert Interval as large as possible for your application to extend the battery life.

To set the Alert Interval, send **AI=HH:MM** to the AquaTel® unit by SMS.



The value sent for this setting must be shorter than the regular logging interval that was set in section 4.7. If, for example the unit is set to log every hour, a typical Alert Interval would be 00:15 (fifteen minutes). This means that while any alert is active, the unit will log data four times more often than normal.

The current Alert Interval can be queried by sending **AI?** to the AquaTel® unit by SMS.

To: Water Test Site

AI?



Site=Water Test Site

Command: AI
Alert Interval Configuration Query

Check Alert Interval=00:15

4.18. 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. See also [4.7.1.1](#).

4.19. Setting temperature units (Command TU)

Temperature can be reported in either Celsius or Fahrenheit. The default setting is Celsius.

To change the units of temperature to Fahrenheit, send **TU=F** to the AquaTel® unit by SMS.

To return the units of temperature back to Celsius, send **TU=C** to the AquaTel® unit by SMS.

To query the current setting, send **TU?** to the AquaTel® unit by SMS.

To: Water Test Site

TU=F



Site=Water Test Site

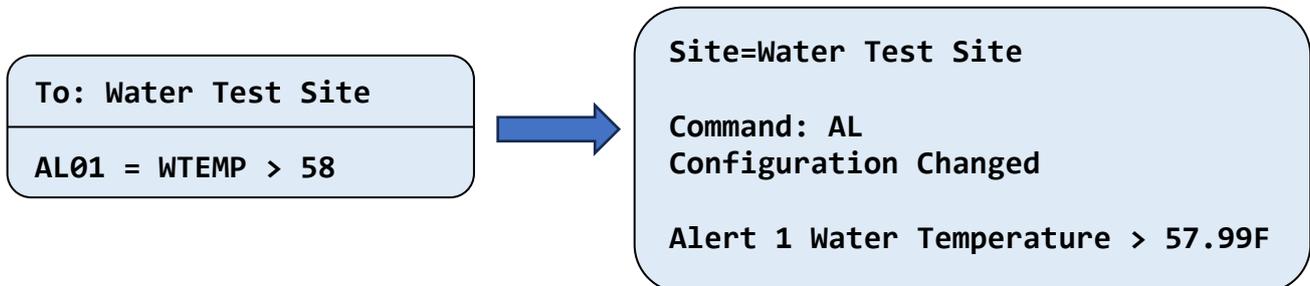
Command: TU
Temperature Units Configuration
Changed

Temperature Units=Fahrenheit

NOTE

The **TU** command only effects the units in which temperatures are entered in and displayed.

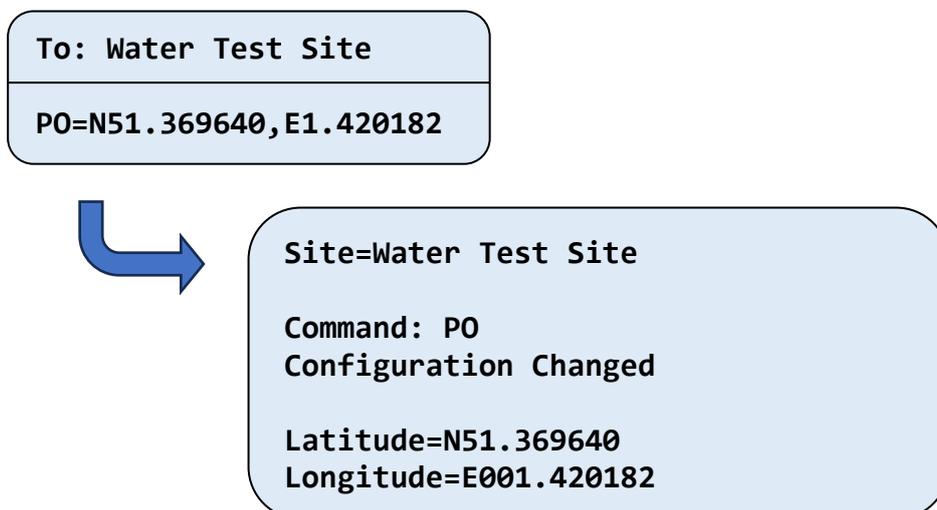
Internally the temperature is stored in Celsius, this means that temperature related alerts are not affected when the temperature units are changed. The internal conversion from Fahrenheit to Celsius may cause a very slight loss of resolution. For example, 58F is converted to 14.4444C, which would subsequently be displayed as 57.99F. This loss of resolution will never exceed 1/100th of a degree, so will not meaningfully affect alert accuracy.

**4.20. Manually Setting Site Position (Command PO)**

During installation, the PO command should have been used to geo-tag the installation site. See section [2.8 Geo-Tagging the Installation Position](#).

The **PO** command detailed in that section can be sent at any time, but there is no guarantee that the GPS antenna will be able to receive satellite data, especially if the AquaTel® unit is installed in a borehole, under a man-hole cover or in a secondary enclosure.

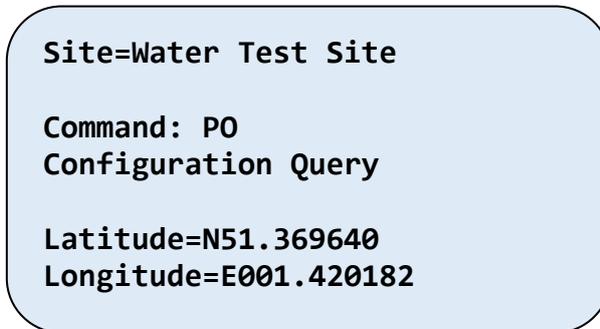
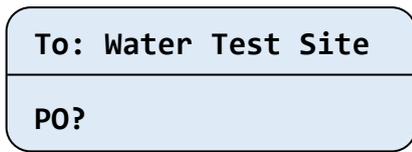
The **PO** command can also be used to manually set the latitude and longitude of the installation site, this is achieved by appending the Latitude and longitude to the message as follows:



The format is **PO = Latitude, Longitude** (Spaces are optional)

The latitude must start with **N** for the northern hemisphere, or **S** for the southern hemisphere followed by the number of degrees of latitude between 0 and 90.0 with up to 6 decimal places. The longitude must start with **E** for the eastern hemisphere, or **W** for the western hemisphere followed by the number of degrees of longitude between 0 and 180.0 with up to 6 decimal places. Leading digits are optional, so *E001.520182* would be accepted.

The current position may be read using the **CO** command or by sending **PO?** to the AquaTel® unit by SMS.



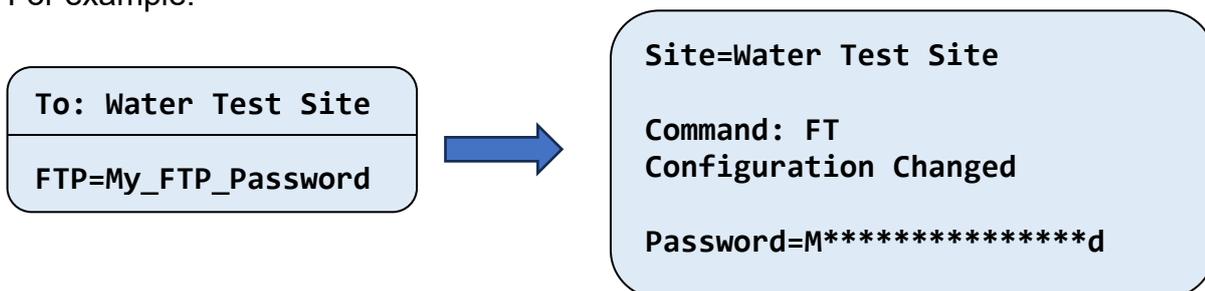
4.21. Setting up the FTP Details (Command FT)

By default, the AquaTel® unit will upload logged data to **Inoview web platform**.

If you wish to upload the data to your own FTP site instead, or restore the FTP back to the default site, send one or more of the following commands to the AquaTel® unit by SMS.

- **FTN=** {Server URL or I.P} (up to 32 characters)
- **FTU=** {Server Username} (up to 32 characters)
- **FTP=** {Server Password} (up to 32 characters)
- **FTS=** {Server Port} (normally 25)
- **FTM=** {Mode} (0,1 or 2)
- **FTR=0** - Restore the Aquaread default server

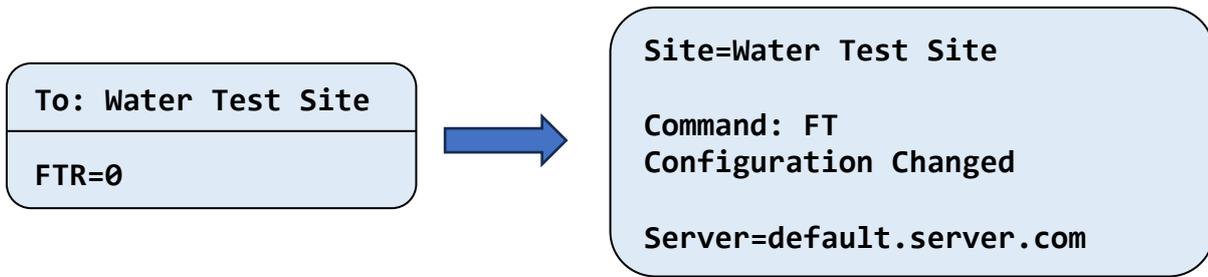
For example:



Note: Only the first and last character of the password is shown in the response for security reasons.

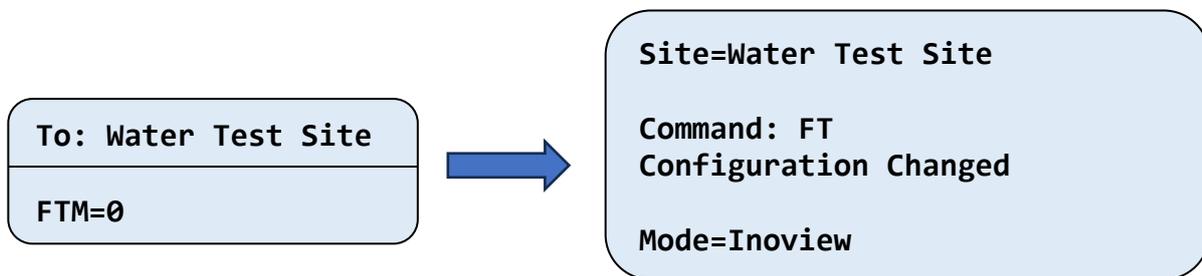
If you wish to restore the FTP site back to the Aquaread default server, send **FTR=0**.

The URL, username and password may only contain the characters as defined in Appendix 04 – Accepted ASCII Characters

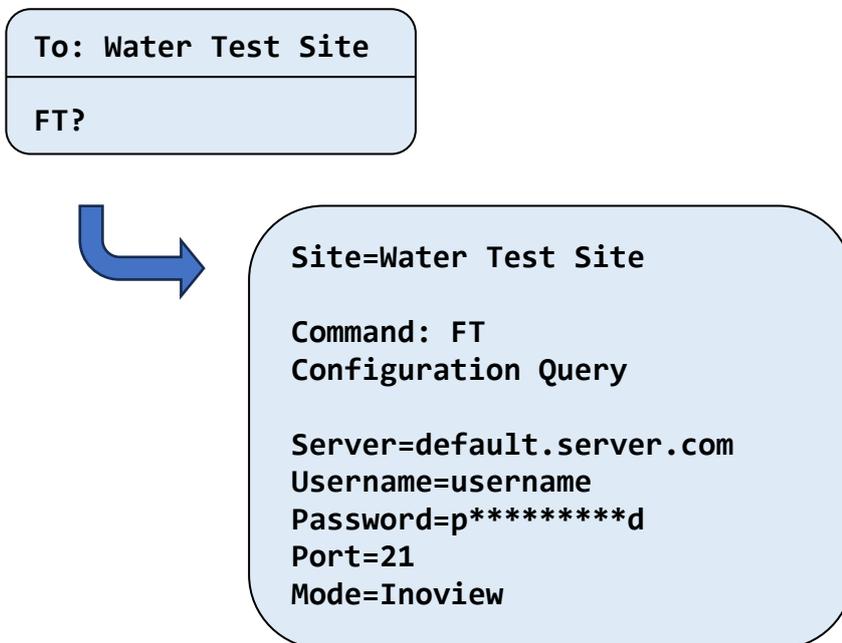


There are three upload modes available. send the FTM=m command to the AquaTel® unit by SMS. When m = the mode number:

- 0 – Inoview format (default) use this when connecting to Inoview servers.
- 1 – Single file CSV – All uploads are appended to the same file.
- 2 – Multiple file CSV – Each upload is written to a separate and unique file.



For full server details, send the FT? command to the AquaTel® unit by SMS.



4.22. Setting up the clean counter (Command CL)

As described in section 1.2, it is recommended that you use a version of the Aquaprobe® that includes an automatic cleaning mechanism. The frequency that the probe is cleaned can be set by sending the CL command by SMS to the AquaTel® unit.

| |
|----------------------------|
| To: Water Test Site |
| CL=12 |



| |
|------------------------------|
| Site=Water Test Site |
| Command: CL |
| Configuration Changed |
| Clean Count = 12 |

Note: Setting a value of 0 disables the clean counter, this is not recommended.

To query the current value, send:

| |
|----------------------------|
| To: Water Test Site |
| CL? |



| |
|-----------------------------|
| Site=Water Test Site |
| Command: CL |
| Configuration Query |
| Clean Count = 12 |

*This option is only available on the AquaTel® Aquaprobe® version

When setting the cleaning count value, you should balance the additional battery consumption required to regularly clean the probe with the need to maintain a high level of measurement accuracy. In situations where regular measurements are taken, it would be desirable to increase the clean count as the need to clean is dependent on time between cleans. For example, if have the Alert Interval set to thirty minutes, and you wish to clean the probe twice a day, you would select a clean count of twenty-four, whereas you would set it to twelve if you were only checking for alerts once per hour.

Cleaning more often than necessary will have an adverse effect on the battery life of the unit. Not cleaning often enough will have an adverse effect on the measurement accuracy.

The water quality on site may also play a part in dictating the optimum clean count value.

5. Normal operation

Once the unit is installed and fully set up it will operate as follows:

A measurement will be made and logged at the time interval defined by the **LI** command.

If any alerts have been configured, additional measurements will be taken at the time interval defined by the **AI** command, these will not appear in the log unless an alert is activated.

If an alert is triggered, the measurement will be written to the log and an alert will be sent by SMS to all users and administrators in the phone book. The SMS message will indicate which alert or alerts are active along with all the values measured.

While any alert is active the logging rate is increased to match the alert interval and the period between FTP uploads is decreased according.

An alert will remain active until the measured value no longer meets the threshold by a margin of five percent or more. Once there are no alerts active, the logging rate and upload rate will return to their programmed values.

Log data is uploaded to the FTP server at the interval defined by the **UP** command. The time that these uploads occur is defined by the **FU** command. Only new measurements are uploaded to reduce battery consumption.

To preserve battery, SMS messages are only checked when the unit comes out of standby mode. The frequency this happens is defined by the **SM** command. The unit will stay in SMS reception mode for a minimum period of two minutes if no new messages are received. Once a message has been received, the unit will remain awake for a further 10 minutes before returning to standby. When on site, the unit can be woken up by pressing the wake-up button and then releasing it when the blue LED flashes rapidly.

The data log automatically wraps around, so there is no need to ever clear it. The log capacity is 15360 measurements, which represents 320 days at a 30-minute logging rate. This ensures that no data is likely to be lost even if the FTP upload fails for an extended period.

5.1. General commands

In addition to the setup commands covered in Section 4, the following general commands are available.

- **RE** – Perform a one-off measurement and return the results.
- **BR** – Perform a one-off measurement and send the results to all users.
- **HE** – List all available commands.
- **SD** – Initiate an immediate upload of all new measurements to the FTP site.

These commands are detailed below:

5.2. The RE command

This SMS command is used to obtain a current set of reading from the unit. It can be initiated by any mobile number, including those not in the phone book.

| |
|---------------------|
| To: Water Test Site |
| RE |



```
Site=Water Test Site

Command: RE
Active alerts:
Alert 1 Water Level > 1m

Mon 16/Oct/2023 08:56:27 (BST)
Water Level 1.10m
Water Temperature 20.50C
Change rate 0.000m/min
Salinity 0.36PSU
ABS EC 552uS/cm
EC at 20C 551uS/cm
EC at 25C 554uS/cm
Dissolved Oxygen 7.54mg/L
Dissolved Oxygen Sat 99.8%
pH 7.00
pH 1234.4mV
ORP 101.0mV
Air Temperature 18.47C
Barometric Pressure 1020mbar
Signal=58% - 4G
1 alert configured
Lithiums=7.19V (Good)
```

Note: The exact format of the above message will be dependent on the type of probe or sonde you have installed and the probe configuration.

The **RE** command response is only sent to the phone number that sent the command.

As can be seen, the **RE** command lists any active alerts at the top. This is followed by the time and date stamp of the reading and all available measurement values.

Finally, there is an indication of the cellular signal strength and network type, an indication of the number of events that have been configured and the current battery voltage and battery health indication.

The **RE** command takes a full set of measurements before sending the results. Depending on the configuration of the probe, it can take up to a minute to capture all the measurement data, so this command takes longer to respond than others during the SMS monitoring period.

5.3. The BR command

This SMS command is used to obtain a current set of reading from the unit and have them sent to every user in the phone book. This command may only be initiated by phone numbers that are stored in the phone book. The information contained in the response to the BR message is the same as the **RE** Message shown above.

To: Water Test Site
BR



Site=Water Test Site
Alert 1 Water Level > 1m
Mon 16/Oct/2023 08:56:27 (BST)
...
Lithiums=7.19V (Good)

5.4. The HE command

This SMS command is used to obtain help on any of the commands. It can be requested by any number that is in the phone book. **HE-XX** can then be sent for more detailed information where XX is the two letter command code of interest.

This is a table of the of the commands available along with a brief description of its function and which section of the manual it is covered in.

| | Description | Section |
|-----------|---------------------------------------------------------------|---------|
| AI | Set/Query Alert check interval | 4.17 |
| AL | Set/Query/Delete Alert threshold configuration | 4.16 |
| AP | Set/Query the cellular networks Access Point Name (APN) | 4.8 |
| CK | Query Clock time and date | 4.13 |
| CO | Query the unit configuration | 4.6 |
| CO | Setting up the number of measurements between probe cleans | 4.22* |
| FT | Set/Query/Reset FTP configurations | 4.21 |
| FU | Set/Query the First upload time | 4.10 |
| LO | Set/Query the logging interval | 4.7 |
| PB | Set/Query/Delete Phone book entries | 4.4 |
| PO | Set/Query the unit's physical location | 4.20 |
| RE | Request the current measurement readings | 5.2 |
| SD | Start a data transfer to the FTP | 5.5 |
| SI | Set/Query the Site name | 4.11 |
| SM | Set/Query the period between SMS checks | 4.3 |
| TI | Set/Query the Time Zone offset to be applied to UTC | 4.12 |
| TU | Set/Query the units used for setting / displaying temperature | 4.19 |
| UP | Set/Query the data upload frequency | 4.8 |
| ZE | Set/Query/Clear the Zero Level datum | 4.14 |

*Only available on the AquaTel® Aquaprobe®

5.5. The SD command

This SMS command is used to initiate an immediate data transfer to the FTP site. This will send any new log data captured since the last transfer to the FTP. Sending this command does not affect the normal upload times.

To: Water Test Site
SD



Site=Water Test Site
Command: SD
Data log upload started

If there was no data available to upload, the response will instead be:

Site=Water Test Site
Command: SD
No log data to upload

An additional message is sent to indicate the success of failure of the update.

Site=Water Test Site
Command: SD
Upload complete

 or

Site=Water Test Site
Command: SD
Upload failed

If the upload as failed, it is probably because the FTP server was not available. This could be either due to a poor signal preventing internet access, a problem with the FTP site or a problem with the credentials being used to access the site.

6. Battery life

Battery life varies greatly with battery type selected, logging rate, alert checking rate, cellular signal strength, temperature and the number of FTP data uploads programmed per 24-hour period.

With normal use (reasonable signal strength, default logging rates and FTP upload once per 24 hours), a set of four Lithium-thionyl Chloride batteries should last over 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.

6.1. Low battery alerts

Battery voltage is output with all logged data and in the **RE** SMS message. When the battery level becomes low, the unit will transmit a 'Low Battery Alert' SMS to all numbers in its phone book. When this is received, the batteries should be changed as soon as possible to avoid data loss.

When the batteries are on the verge of being totally exhausted, the unit will transmit a 'Battery Dead Alert' SMS then shut the unit down.

Once the Dead Battery alert has been sent, the unit will not log any further data or respond to any SMS messages.

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

6.2. Battery Condition Indication on the LED

The LED on the top of the unit will normally give one blue flash per second when the unit is awake and one blue flash every sixteen seconds when the unit is asleep.

If the batteries are low, the LED will flash as detailed above but in yellow instead of blue.

If the unit has shut down due to a dead battery condition, the LED will flash red once every thirty seconds.

7. DECLARATIONS OF CONFORMITY

7.1. UK-CA Declaration



Declaration of Conformity

Aquaread Aquameter, Aquaprobe, Aquasonde, AquaTel, BlueLink and LeveLine water monitoring products are in compliance with essential requirements and other relevant provisions of Directives

Electromagnetic Compatibility Regulations 2016

Radio Equipment Regulations 2017

Approved by

A handwritten signature in black ink, appearing to read 'CH', followed by a horizontal line extending to the right.

Craig Harrison

Aquaread Limited

Bridge House
Northdown Industrial Park
Broadstairs
Kent
CT10 3JP

Date Jan 1st 2023

7.2. CE Declaration



Declaration of Conformity

Aquaread Aquameter, Aquaprobe, Aquasonde, AquaTel, BlueLink and LevelLine water monitoring products are in compliance with essential requirements and other relevant provisions of Directives

Electromagnetic Compatibility (EMC) Legislation
2014/30/EU

Radio Equipment Directive (RED)
2014/53/EU

Approved by

Craig Harrison

Aquaread Limited

Bridge House
Northdown Industrial Park
Broadstairs
Kent
CT10 3JP

Date Jan 1st 2023

8. Troubleshooting

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

| Problem | Cause / Remedy |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LED does not show any indications when the unit is switched on. | <p>Batteries are probably dead or incorrectly fitted. Check you have fresh batteries fitted and that they are inserted the correct way round.</p> <p>Incorrect battery type switch position. Ensure you have set the battery type selector switch correctly for Lithium or Alkaline batteries.</p> |
| The red LED flashes continuously. | <p>SIM card not fitted or fitted incorrectly. Ensure SIM card is properly fitted.</p> <p>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.</p> <p>Antenna not connected. Ensure a suitable antenna is connected and is in a spot likely to receive a good network signal.</p> |
| The AquaTel® unit will not reply to any SMS request. | <p>Poor network connection. Test signal level by cycling the power then checking the signal strength LED indications.</p> <p>Lack of credit. Check that the SIM card has enough credit to send SMS messages.</p> |
| The AquaTel® unit will only reply to the ' RE ' SMS request. All other SMS requests are declined with Access Denied message | <p>Your number is not registered in the system. The AquaTel® unit will only reply to SMS requests made by registered users (except the RE request, which can be sent from unregistered phones). One of the System Administrators will need to add your number as a registered user.</p> <p>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.</p> |
| Access Denied message is received in reply to SMS requests that require Admin privileges | <p>Your number is not registered in the system as an Administrator. The AquaTel® 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.</p> |
| A Probe Error is shown in the reply to the RE SMS request. Or a probe failed alert is received | <p>The AquaTel® unit cannot communicate with the Probe or Sonde. Double check all connections. Ensure the colour sequence on the terminal block is correct (hardwired version) or that the connector is properly plugged into the Probe/Sonde socket.</p> |
| FTP uploads are not received as expected. | <p>FTP setup incorrect. This is the most common cause for not receiving data. Double check all the settings you have made.</p> <p>Poor signal strength. FTP uploads 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.</p> |

9. Limited Warranty

The Aquaread® AquaTel® unit is guaranteed for one year 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: Most 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

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** (see Appendix 5 - Decontamination Certificate).

Appendix 01 – Command Quick Reference Guide

| Command | Description | |
|-------------------|-------------------------------------------------------------------------------|-------------------------------|
| AI | Set / Query the alert checking interval | |
| Type: | <i>Configuration</i> | Section: 4.17 |
| Options | Description | Access permissions |
| AI? | Query the alert checking interval | <i>Registered Users</i> |
| AI = HH:MM | Set the alert checking interval | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| HH | Time of day - Hours | 00 - 23 |
| MM | Time of day - Minutes | 00 - 59 |
| Comments: | Spaces are permitted, the time must be valid. Leading zeros are optional. | |
| Affects: | Logging rate when an alert is active. Upload rate when an alert is active. | |

| Command | Description | |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| AL | Set/Query/Delete Alert threshold configuration | |
| Type: | <i>Configuration</i> | Section: 4.16 |
| Options | Description | Access permissions |
| AL? | List all alerts | <i>Registered Users</i> |
| ALx? | Query alert x | <i>Registered Users</i> |
| ALx = type operand threshold | Set alert x | <i>Administrators</i> |
| ALx = 0 | Clear or disable alert x | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| x | The alert number | 1 - 8 |
| type | The value type to be tested | See |
| operand | < Value is less than > Value is greater than or equal | < or > |
| threshold | Numeric value | Any positive or negative value other than zero with up to 3 decimal places |
| Comments: | Spaces are permitted between the command, the operand, and the value but not within the value itself. Value is not range checked so care should be taken to enter sensible values for the type to ensure correct operation. Active alerts are sent to all registered users. The end of alert hysteresis is 5% beyond the trigger level. | |
| Affects: | Logging rate and upload frequency while an alert is active | |

| Command | Description | |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| AP | Set / Query the network Access Point Name (or APN) | |
| Type: | <i>Configuration</i> | Section: 4.8 |
| Options | Description | Access permissions |
| AP? | Query the network APN | <i>Registered Users</i> |
| AP = "APN", "login", "password" | Set the network APN | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| "", "", "" | The APN String made of 3 entries | "A-Z", or "", |
| Comments: | All three APN parameters must be entered, each surrounded by quotation makes and separated by commas. Enter empty values ("") for the default SIM settings. Check with you SIM provider for details. | |
| Affects: | The Network Access Point used for access to FTP and Local Time | |

| Command | Description | |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| BR | Request and broadcast the current measurement readings | |
| Type: | <i>Normal Operation</i> | Section: 5.3 |
| Options | Description | Access permissions |
| BR | Request a broadcast reading | <i>Registered Users</i> |
| Parameter | Descriptions | Permitted values |
| None | - | - |
| Comments: | The readings are sent to every user in the phone book. The measurement entry is written to the log | |
| Affects: | None | |
| Command | Description | |
| CK | Query Clock time and date | |
| Type: | <i>Configuration / Normal operation</i> | Section: 4.13 |
| Options | Description | Access permissions |
| CK? | Request the time and date | <i>Registered Users</i> |
| Parameter | Description | Permitted values |
| None | - | - |
| Comments: | Returns the current time and date in both UTC and local time. If local time and UTC are the same, only one time and date is returned. | |
| Affects: | None | |

| Command | Description | |
|---------------|--------------------------------------------------------------------------------|-------------------------------|
| CL | Set / Get number of measurements per probe clean* | |
| Type: | <i>Configuration / Normal operation</i> | Section: 4.22 |
| Options | Description | Access permissions |
| CL? | Query the configuration | <i>Registered Users</i> |
| CL=nnn | Set the number of measurements between cleans | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| nnn | The number of measurements take between cleans | 0 - 250 |
| Comments: | Leading zeros are optional. Setting 0 (zero) disables the cleaning function | |
| Affects: | None | |

* This command is only available on the Aquaprobe® with probes that supports cleaning

| Command | Description | |
|-------------|-------------------------------------------------------|------------------------------|
| CO | Query the unit configuration | |
| Type: | <i>Configuration / Normal operation</i> | Section: 4.6 |
| Options | Description | Access permissions |
| CO? | Query the configuration | <i>Registered Users*</i> |
| Parameter | Description | Permitted values |
| None | - | - |
| Comments: | *The FTP settings are only returned to administrators | |
| Affects: | None | |

| Command | Description | |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| FT | Set/Query/Reset FTP configurations | |
| Type: | <i>Configuration</i> | Section: 4.21 |
| Options | Description | Access permissions |
| FT? | List current FTP settings | <i>Administrators</i> |
| FTN= {Server URL or I.P} | Set the URL or IP address | <i>Administrators</i> |
| FTU= {Server Username} | Set the username | <i>Administrators</i> |
| FTP= {Server Password} | Set the password | <i>Administrators</i> |
| FTS= {Server Port} | Set the port | <i>Administrators</i> |
| FTM= {Mode} | Determine the file mode to be used | <i>Administrators</i> |
| FTR=0 | Reset to default site | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| URL or IP | A valid URL or IP address | Valid URL or IP address max. length 32 |
| Username | The server login username | A valid username max. length 32 |
| Password | The server login password | A valid password max. length 32 |
| Port | The server port number | Any port between 1 and 65535 |
| FTM=0 | Set Inoview format | Must be 0 (zero) |
| FTM=1 | Set CSV Single file format | Must be 1 |
| FTM=2 | Set CSV Multiple file format | Must be 2 |
| FTR=0 | Set the server back to the default | Must be 0 (zero) |
| Comments: | All values must be an accepted ASCII character (see Appendix 04 – Accepted ASCII Characters) Invalid settings will result in the data upload failing. | |
| Affects: | The data upload functionality. | |

| Command | Description | |
|-------------------|--------------------------------------------------------------------------|-------------------------------|
| FU | Set/Query the First upload time | |
| Type: | <i>Configuration</i> | Section: 4.10 |
| Options | Description | Access permissions |
| FU? | Query the first upload time | <i>Registered Users</i> |
| FU = HH:MM | Set the first upload time | <i>Administrators</i> |
| Parameter | Descriptions | Permitted values |
| HH | Time of day - Hours | 00 - 23 |
| MM | Time of day - Minutes | 00 - 59 |
| Comments: | Spaces are permitted, the time must be valid. Leading zeros are optional | |
| Affects: | The time the logged data is uploaded to the FTP server | |

| Command | Description | |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| LO | Set/Query the logging interval | |
| Type: | <i>Configuration</i> | Section: 4.7 |
| Options | Description | Access permissions |
| LO? | Query the logging interval | <i>Registered Users</i> |
| LO = HHH:MM | Set the logging interval | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| HHH | Time of day - Hours | 00 - 168 |
| MM | Time of day - Minutes | 00 - 59 |
| Comments: | Spaces are permitted, the time must be valid. Leading zeros are optional | |
| Affects: | The number of entries written to the log | |
| Command | Description | |
| PB | Set/Query/Delete Phone book entries | |
| Type: | <i>Configuration</i> | Section: 4.4 |
| Options | Description | Access permissions |
| PB | List all phone book entries | <i>Registered Users</i> |
| PBxx? | Set the URL or IP address | <i>Registered Users</i> |
| PBxx=A +DD NNNN NNNNNN | Add an administrator to xx | <i>Administrators</i> |
| PBxx=U +DD NNNN NNNNNN | Add a normal user to xx | <i>Administrators</i> |
| PBxx=0 | Clear entry xx | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| xx | The phone book entry number | 01 - 40 |
| A | Set as an administrator | Must be A or a |
| U | Set as a normal user | Must be U or u |
| +DD | International dialling code | Valid international dialling code |
| NNN... | The national phone number | Valid national phone number |
| Comments: | The international dialling code must be included even for national use. The leading zero must not be included in the national phone number. The + Symbol and all spaces are optional. | |
| Affects: | The phone book, who gets alerts, who can administrate the system, | |

| Command | Description | |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------|
| PO | Set/Query the unit's physical location | |
| Type: | <i>Configuration</i> | Section: 4.20 |
| Options | Description | Access permissions |
| PO? | Query the position | <i>Registered Users</i> |
| PO | Start GPS geo tagging | <i>Administrators</i> |
| PO=Y AA.AAAAAA,X BBB.BBBBBB | Set manual position | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| Y | Latitude hemisphere N for North or S for South | N,n,S,s |
| AA.AAAAAA | Degrees of latitude | 0.000000 – 90.000000 degrees |
| X | longitude hemisphere E for East or W for West | E,e,W,w |
| BBB.BBBBBB | Degrees of longitude | 0.000000 – 180.000000 degrees |
| Comments: | Spaces are optional. Leading zeros are optional other than 0 degrees. Up to 6 decimal places used (~ 11 cm accuracy) | |
| Affects: | The logged data | |

| Command | Description | |
|-------------|--------------------------------------------------------|------------------------------|
| RE | Request the current measurement readings | |
| Type: | <i>Normal Operation</i> | Section: 5.2 |
| Options | Description | Access permissions |
| RE | Request a current reading | <i>Everyone</i> |
| Parameter | Description | Permitted values |
| None | - | - |
| Comments: | The readings are sent to number that requested it only | |
| Affects: | None | |

| Command | Description | |
|------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------|
| SD | Start a data transfer to the FTP | |
| Type: | <i>Normal Operation</i> | Section: 5.5 |
| Options | Description | Access permissions |
| SD | Request an FTP upload | <i>Administrator</i> |
| Parameter Descriptions | Permitted values | |
| None | - | |
| Comments: | Uploads all log entries since the previous upload. This does not affect the normal FTP upload frequency. | |
| Affects: | None | |

| Command | Description | |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| SI | Set/Query the Site name | |
| Type: | <i>Configuration</i> | Section: 4.11 |
| Options | Description | Access permissions |
| SI? | Query the existing site name | <i>Registered Users</i> |
| SI = XXXXXXXXXXXXXXXXXXXX | Set a new site name | <i>Administrator</i> |
| Parameter | Description | Permitted values |
| XXXXXXXX | The new site name | Up to 16 characters |
| Comments: | All characters must be an accepted ASCII character. (see Appendix 04 – Accepted ASCII Characters) Spaces are permitted in the command and the site name | |
| Affects: | The reported site name | |

| Command | Description | |
|-------------------|---------------------------------------------------------------------------|------------------------------|
| SM | Set/Query the period between SMS checks | |
| Type: | <i>Configuration</i> | Section: 4.3 |
| Options | Description | Access permissions |
| AI? | Query the check period | <i>Registered Users</i> |
| AI = HH:MM | Set the SMS check interval | <i>Administrators</i> |
| Parameter | Descriptions | Permitted values |
| HH | Time of day - Hours | 00 - 23 |
| MM | Time of day - Minutes | 00 - 59 |
| Comments: | Spaces are permitted, the time must be valid. Leading zeros are optional. | |
| Affects: | The period between SMS message checks while the unit is in standby | |

| Command | | Description | |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------|
| TI | | Set/Query the Time Zone offset to be applied to UTC | |
| Type: | <i>Configuration</i> | Section: | 4.12 |
| Options | Description | Access permissions | |
| TI? | Query the time offset | <i>Registered Users</i> | |
| TI = +/-HH:MM | Manual time offset | <i>Administrators</i> | |
| TI = AUTO | Time offset set automatically | <i>Administrators</i> | |
| Parameter | Description | Permitted values | |
| + or - | Positive or negative offset | + / - (Note the use of + is optional) | |
| HH | Time of day - Hours | 00 - 13 | |
| MM | Time of day - Minutes | 00 - 59 | |
| AUTO | Sets automatic update mode | AUTO (not case sensitive) | |
| Comments: | Spaces are permitted, the time must be valid. Leading zeros are optional. Values are restricted to between -13:00 to +13:00 hours. Once a manual time offset is set, the time offset will no longer be obtained automatically until the mode is set back to AUTO When in manual offset mode, the time zone is reported as LOCAL Enter 00:00 to disable local time and show all times in UTC | | |
| Affects: | The time displayed in SMS messages but not the time written to the log which is always UTC | | |

| Command | | Description | |
|---------------|----------------------------------------------------------|------------------------------------------------------------------------|----------------------|
| TU | | Set/Query the units used for setting and displaying temperature | |
| Type: | <i>Configuration</i> | Section: | 4.19 |
| Options | Description | Access permissions | |
| TU? | Query the current temperature units in use | <i>Registered Users</i> | |
| TU = F | Set the units to Fahrenheit | <i>Administrators</i> | |
| TU = C | Set the units to Celsius | <i>Administrators</i> | |
| Parameter | Description | Permitted values | |
| F | Display in degrees Fahrenheit | F or f | |
| C | Display in degrees Celsius | C or c | |
| Comments: | Spaces are permitted, this command is not case sensitive | | |
| Affects: | The units used when logging and displaying temperature | | |

| Command | | Description | |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------|
| UP | | Set/Query the data upload interval | |
| Type: | <i>Configuration</i> | Section: | 4.8 |
| Options | Description | Access permissions | |
| AI? | Query the check upload frequency | <i>Registered Users</i> | |
| AI = HH:MM | Set the data upload frequency | <i>Administrators</i> | |
| Parameter | Description | Permitted values | |
| HH | Duration - Hours | 00 – 23 (See table below) | |
| MM | Duration - Minutes | 00 – 48 (See table below) | |
| Comments: | Spaces are permitted, the time must be valid. Leading zeros are optional. The interval may be shorter while alerts are active. The interval must divide evenly into 24 hours, so only the following values are permitted | | |
| Affects: | The period between SMS message checks while the unit is in standby | | |

| Interval | Uploads per day |
|----------|-----------------|----------|-----------------|----------|-----------------|----------|-----------------|
| 24:00 | 1 | 02:24 | 10 | 00:45 | 32 | 00:16 | 90 |
| 12:00 | 2 | 02:00 | 12 | 00:40 | 36 | 00:15 | 96 |
| 08:00 | 3 | 01:36 | 15 | 00:36 | 40 | 00:12 | 120 |
| 06:00 | 4 | 01:30 | 16 | 00:32 | 45 | 00:10 | 144 |
| 04:48 | 5 | 01:20 | 18 | 00:30 | 48 | 00:09 | 160 |
| 04:00 | 6 | 01:12 | 20 | 00:24 | 60 | 00:08 | 180 |
| 03:00 | 8 | 01:00 | 24 | 00:20 | 72 | 00:06 | 240 |
| 02:40 | 9 | 00:48 | 30 | 00:18 | 80 | 00:05 | 288 |

It is advisable to make the upload interval as large as possible for your application to extend the battery life. Entries shown in red are not recommended unless you are using an external power supply.

| Command | Description | |
|----------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------|
| ZE | Set/Query/Clear the Zero Level datum | |
| Type: | <i>Configuration / Normal operation</i> | Section: 4.14 |
| Options | Description | Access permissions |
| ZE? | Query Zero offset | <i>Registered Users</i> |
| ZE | Set the Zero point | <i>Administrators</i> |
| ZE=0 | Clears the level datum (level = depth) | <i>Administrators</i> |
| ZE=user value | Sets a zero offset | <i>Administrators</i> |
| Parameter | Description | Permitted values |
| 0 (zero) | Clears any zero offset | 0 (zero) only |
| User value | Sets a user defined zero value | Any value between -9999.99 and +9999.99m |
| Comments: | When ZE is sent the current depth is subtracted from the measurement to give a zero adjusted level. | |
| Affects: | The value displayed for level, but not the value displayed for depth | |

10. Entering compound messages

When initially setting up the system, it can be useful to send a series of commands in one message, and only receive a single response. This is both timesaving, and can save on unnecessary charges for SMS messages. To send a compound command, simply split each command with a **semicolon** within the same message. For example, if we wanted to set the logging rate, alert rate, upload interval and first upload time we could send the following compound message by SMS to the Aquatel unit:

To: Water Test Site

LO=00:30; AI=00:10; UP=04:00; FU=00:00



Site=Water Test Site

Command: LO
Log Interval Configuration Changed

Data Log Interval=00:30

Command: AI
Alert Interval Configuration Changed

Alert Check Interval=00:10

Command: UP
Upload Interval Configuration Changed

Upload Log Interval=04:00

Command: FU
Upload Time Configuration Changed

First Upload Time=00:00 (LOCAL)

NOTE:

Compound messages are only recommended for setting parameters and not for queries or reading requests, due to limitations in the maximum length of a response SMS message.

Appendix 02 - Parameters available for setting alerts.

(Note: The units are provided for reference and do not form part of the AL setting parameters)

| Full Name | Short | Units |
|----------------------|-------|---------|
| Air Temperature | ATEMP | °C / °F |
| Barometric Pressure | APRES | Mbar |
| Depth | DEPTH | m |
| Water Temperature | WTEMP | °C / °F |
| Salinity | SAL | PSU |
| ABS EC | ECABS | uS/cm |
| EC at 20C | EC20 | uS/cm |
| EC at 25C | EC25 | uS/cm |
| Resistivity | RESIV | ohm |
| Specific Gravity | SGRAV | Qt |
| Dissolved Oxygen | DO | mg/L |
| Dissolved Oxygen Sat | SOTOX | % |
| pH | PH | (none) |
| PH mv | PHMV | mV |
| ORP | ORP | mV |
| Water Level | LEVEL | m |
| Change rate | LRATE | m/min |
| Ammonium | AMMUM | mg/L |
| Chloride | CL | mg/L |
| Fluoride | FLU | mg/L |
| Nitrate | NIT | mg/L |
| Calcium | CAL | mg/L |
| Turbidity | TURB | NTU |
| Chlorophyll | CHPL | ug/L |
| BGA-PC | BGAPC | Cells/L |
| BGA-PE | BGAPE | Cells/L |
| Rhodamine | RHOD | ug/L |
| Fluorescein | FCEIN | ug/L |
| Refined Oil | ROIL | ug/L |
| CDOM | CDOM | ug/L |
| Crude Oil | COIL | ug/L |
| Tryptophan | TPHAN | ug/L |
| Ammonia | AMMIA | mg/L |

Note: This is the full list of available parameters. The actual parameters available for your AquateL® unit can be found using the **HE-AL** command.

Both the long or short versions may be used, spaces and case are ignored.

Apart from temperature, the number of decimal places entered for the alert dictates the resolution of the alert check. For temperature, the resolution is always 1/100 degrees C or the equivalent in Fahrenheit.

For example, if 1.00 is entered for depth, then the test resolution is 1 cm. However, if 1 is entered with no decimal places, the resolution is 1 m. You should enter the number of decimal places that best suits your application; also check the tolerance values for each probe and avoid entering values that are higher resolution than the probe is capable of measuring accurately.

Appendix 03 – Error messages

This is a list of all error messages and a brief description of their cause:

| Error Message | Cause |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Error: Requires = or ? | The command that you have sent must be include the = operator or the ? operator. |
| Error: Missing Value | An = operator has been provided but one or more of the parameters is missing |
| Error: Unknown Command | The command you have sent is not part of the recognised command set. |
| Error: Access Denied | The command you have sent requires a higher access permission than your number has been allocated. This normally occurs when a user with normal user access uses the assignment operator, or someone accesses the unit that is not in the phonebook. |
| Error: Missing < or > | This is sent by the ALxx= command when the < or > symbol is missing between the measurement type and the threshold. |
| Error: Unable to get a GPS position | This is sent by the PO command if it is unable to obtain a GPS position within fifteen minutes. |
| Error: Invalid Time | The time provided is not valid for the command. Check hours are 00-23 and minutes are 00-59 |
| Error: Invalid Alert | The alert number provided is not between 01 and 08 |
| Error: Invalid type – Available types: | This message is sent when the measurement type provided in the ALxx= command is not valid. It is followed by a list of valid types for your installation |
| Error: Invalid Threshold | The threshold value provided in the ALxx= message is invalid (probably nonnumeric) |
| Error: Invalid Clean Count | The clean count provided in command CE command is invalid, it must be 0 to 250 inclusive |
| Error: Invalid Port | The port number provided for the NTS command is invalid, it must be a number |
| Error: Invalid Option | The type of option specified in the NTx command is invalid, it must be N,U,P,S or R |
| Error: Missing command | The command specified in the HE-xx or HE=xx command is missing |
| Error: Invalid Interval | The interval provided as a parameter is invalid. It must be a valid number of hours and minutes |
| Error: Invalid PB entry (1-40) | The phonebook entry number provided in the PBxx command is invalid, it must be 1 - 40 |
| Error: Invalid Contact type | The contact type provided in the PBxx command is invalid, it must be A or U |
| Error: Invalid Latitude | The Latitude provided in the PO= command is invalid it must be between 0 and 90.0 degrees |
| Error: Invalid Longitude | The Latitude provided in the PO= command is invalid it must be between 0 and 90.0 degrees |
| Error: Invalid Offset | The offset provided as a parameter to the TI= command is invalid. |
| Error: Operation not supported | Sent by the CL command if probe does not support the cleaning operation. |

Appendix 04 – Accepted ASCII Characters

The following characters can be sent via SMS message to the Aquatel® unit:

| | | | | | | | | | | |
|-------|---|---|---|---|---|---|---|---|---|---|
| Space | (| 0 | 8 | ? | G | O | W | e | m | u |
| ! |) | 1 | 9 | @ | H | P | X | f | n | v |
| “ | * | 2 | 0 | A | I | Q | Y | g | o | w |
| # | + | 3 | : | B | J | R | Z | h | p | x |
| \$ | , | 4 | ; | C | K | S | a | i | q | y |
| % | - | 5 | < | D | L | T | b | j | r | z |
| & | . | 6 | = | E | M | U | c | k | s | |
| ' | / | 7 | > | F | N | V | D | l | t | |

Appendix 5 - 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(s): | _____ |
| Serial Number(s): | _____ |
| Contaminant (if known): | _____ |
| Decontamination Procedure: | _____ _____ _____ |
| Certified by (print name): | _____ |
| Title: | _____ |
| Date: | _____ |
| Signature: | _____ |
| <p>Please note, returns without an acceptable decontamination procedure being performed prior to sending will be returned to you for decontamination or a cleaning fee will be charged if the contaminant is not hazardous to health.</p> | |