



Instruction Manual

for the

Aquameter™ Series

Multiparameter Water Quality

Meters, Probes, Utilities & Accessories

(Software Version 3.00 and above including Optical DO & Depth Measurement)

Document No. 10401-00188

Revision: M

Date: February 16, 2011

Aquaread Ltd

Kent Innovation Centre
Thanet Reach Business Park
Millennium Way
Broadstairs
Kent
CT10 2QQ
ENGLAND

Phone: +44 1843 609 692

www.aquaread.co.uk

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1. Introduction

This manual covers the setup, operation, calibration and maintenance of the full Aquameter series of Meters, Aquaprobes and the associated AquaLink PC software. Depending upon the model of Meter and Probe you are using, some of the functions described may not be available. Please refer to the table in the [Specification](#) section of this manual for details of what to expect from your particular combination.

2. What's in the Box?

The Aquameter is supplied with the following:

- The Aquameter unit.
- Quick release lanyard.
- Set of 5 AA Alkaline batteries.
- USB Cable for downloading logged data to a PC.
- Cross-head screwdriver for fitting the batteries and Probe maintenance.
- Getting started cards for quick reference.
- CD containing AquaLink software, USB drivers and this Instruction Manual.
- Warranty card.

The accessories included with the Aquaprobe you have chosen will vary between models, but in all cases you will receive the following:

- The Aquaprobe unit.
- Protective Sleeve End Cap.
- 300mL of RapidCal Solution.
- Spare 300mL calibration / rinse bottle.
- Spare set of sleeve screws.
- Two mounting nuts.
- Getting started card for quick reference.
- Warranty card.

In addition, you may receive other solutions and spare parts (see [Aquameters & Aquaprobes](#) in section 18).

2.1. The Aquameter and the Environment

The Aquameter is designed to be used outdoors and is rated to IP67, that is to say it is waterproof but it **is not** designed for submersion. In order to prevent accidental dunking or loss, a lanyard is supplied.

Please note that the Aquameter is only waterproof when the associated Aquaprobe plug is fitted. Without the plug fitted, water can enter the Meter through the socket. Damage caused by water ingress through the socket is not covered by your warranty.

You may notice a small hole on the rear of the unit near the socket. 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.

2.2. The Aquaprobe and the Environment

The Aquaprobe is designed to be fully submerged in water and is rated to IP68, that is to say, it is rated for continual immersion to a depth of 10 meters.

2.3. About the Probe Sleeve

Each Aquaprobe is constructed with a two-part protective aluminium sleeve surrounding the more delicate sensing electrodes.

The lower half of the Probe Sleeve can be easily removed by unscrewing to allow cleaning of the individual electrodes, however, **both halves of the Probe sleeve form an integral, working part of the Probe's measurement system, and MUST be fitted for correct operation.**

2.4. Protective Sleeve End Cap

Whilst the Aquaprobe is fitted with an extremely rugged sleeve, damage may be caused to individual electrodes if sharp objects enter the open end of the lower sleeve.

In order to avoid this, a protective Sleeve End Cap is provided and should be used whenever there is a risk that sharp objects may be present in the water being sampled, i.e. down bore holes or in shallow streams littered with rocks or garbage.

When sampling in open water, leave the protective Sleeve End Cap off as the increased flow across the electrodes will give faster readings.

The protective Sleeve End Cap should never be fitted during calibration or when using the Aquaprobe with the optional Flow Through Cell (Flowcell).

If there is any risk of damage to the electrodes, fit the cap. Damage caused to electrodes when the Sleeve or Sleeve End Cap is not fitted, is not covered by your warranty.

2.5. About the Lanyard

The lanyard supplied with the Aquameter may, at first, appear to be a little long. This is intentional. In order to keep the Meter out of the way whilst your hands are full, the lanyard has been made long enough to wear round your neck and over your shoulder so the Meter sits on your hip.

The extra length also allows the meter to be held in a comfortable position in front of you during normal use. In order to prevent you being dragged into the water in the event of the Probe cable becoming snagged, the lanyard includes a quick-release clip.

3. Battery Installation and Care

The Aquameter requires five AA size batteries. To install the batteries, loosen the two screws on the centreline of the rear of the meter and remove the battery compartment lid. Following the battery polarity markings inside the battery compartment, insert five AA cells then replace the compartment lid and tighten the screws.

3.1. Choice of Battery Type

Alkaline or rechargeable batteries may be used, but never mix battery types in the meter. If you choose to use rechargeable batteries, we recommend *Energizer 2500mAh* (or greater) Nickel-Metal Hydride cells, which are widely available.

If the Meter is to be out of use for a long period, remove the batteries to prevent damage due to possible leakage.

3.2. Battery Life

A set of fresh alkaline cells will give over 20 hours use in the AM-200 GPS Aquameter and up to 40 hours use in the AM-100 Aquameter. A fully charged set of 2500mAh NiMH cells will give up to 40 hours use in the AM-200 GPS Aquameter and up to 60 hours use in the AM-100 Aquameter.

3.3. Battery Charging

During the charging process, batteries generate heat and vent gasses, and must never be charged inside a sealed unit. Because the Aquameter is a sealed unit, we do not allow charging in-situ. Batteries must be removed and charged with a suitable battery charger outside the Meter. We recommend the use of one of the *Energizer* range of NiMH chargers.

3.4. Battery Condition Icon

On all the main Aquameter screens, a battery condition icon is displayed in the top left corner. The icon shows full when the batteries are fresh, and gradually empties as the batteries are used. When the batteries need replacing, the empty battery icon will flash on and off. If you ignore this, the Meter will automatically switch itself off when the battery voltage becomes too low for reliable operation.

When using rechargeable batteries, the battery icon will not show completely full, even with freshly charged cells. This is due to the fact that rechargeable batteries are only rated at 1.2V per cell compared to 1.5V per cell for alkaline batteries. This indication does not affect battery life. The icon will simply sit at the $\frac{3}{4}$ full mark for a longer period of time.

3.5. Battery Saver Functions

The Aquameter is designed to switch off automatically if you do not touch any of the keys for 30 minutes. The only exception to this is if you have activated the [Automatic Data Logging](#) feature. In this case, the Meter will continue to operate until either the memory is full or the batteries go flat.

The display on the Aquameter incorporates a white backlight to improve visibility in low-light conditions. As on a mobile phone, the backlight switches on each time a key is pressed, and stays on at full brightness for 15 seconds. After 15 seconds, the backlight will fade to half brightness. After a further 15 seconds the backlight will switch off.

During normal operation, if you want to activate the backlight without changing the Meter function, simply press the **OK** key.

4. Overview of the Operating System

The operating software in the Aquameter has been designed for simple, intuitive use. Similarly, a great deal of development work has been put into simplifying and automating the calibration procedures in the Aquameter in order to allow normal field operatives (as opposed to trained lab technicians) to achieve quick and accurate results.

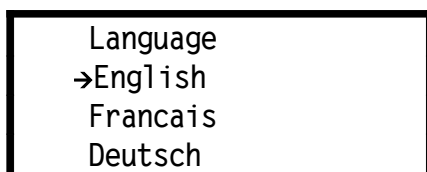
If you are used to operating a mobile phone or programming audio/visual equipment using a remote control, you should feel at home with the familiar up/down left/right arrow shaped navigation keys and central **OK** key.

The tree structure behind the **MENU** key should also be very familiar. Each item on the menu leads to a sub menu and then either onto further menus or final choices. Each branch of the menu system is navigated using the arrow keys. At each point, selections can be made by either pressing the **OK** key or the right arrow key.

To reverse along a branch of the menu system, use the **ESC** (escape) key or left arrow key. After a short time, you should be able to navigate around the entire menu system at speed using just the four arrow keys. If, at any time, you leave the Meter in one of the sub-menu screens, it will automatically back out to the main operating screen after 15 seconds.

4.1. Initial Switch On, Language and Clock Setup

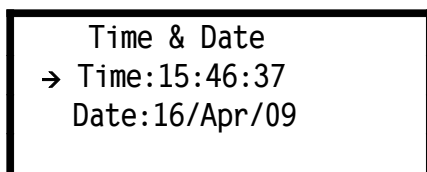
To switch the meter on or off, briefly press the red key. **Do not hold it down.** The meter contains a clock and is capable of operating in several different languages. When switching on for the first time, you must select an operating language and set the clock. The first screen you will see is the Language Selection Screen.



```
Language
→English
Francais
Deutsch
```

To select the language, move the cursor down the list using the down arrow key. To enter your selection, press the **OK** key or the right arrow key.

The next screen to be displayed is the Time & Date Setting Screen.



```
Time & Date
→ Time:15:46:37
Date:16/Apr/09
```

To set the time and date, use the arrow keys to move the cursor around the screen. Use the up and down arrow keys to adjust values. When the time and date are correct, press the **OK** key. Don't worry if you make a mistake first time round. You can easily get back to these screens later through the **MENU** key.

5. Connecting an Aquaprobe

The Aquameter is designed to operate in conjunction with any one of eight different Aquaprobes (each variant is considered in later sections).

To connect an Aquaprobe, align the key slot of the Aquaprobe plug with the Aquameter socket, then press the plug into the socket and tighten the retaining collar. **Always ensure the Aquameter is switched off prior to connecting or disconnecting an Aquaprobe.**

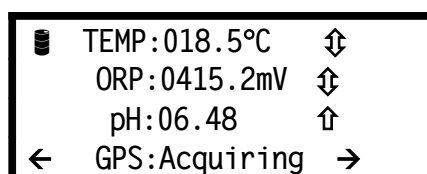
6. Taking Measurements

If the Aquaprobe you are using includes a pH/ORP electrode, remove the storage cap by pulling the red lanyard marked 'Remove Before Use / Replace After Use' straight down. **Do not use a twisting motion to remove or replace the cap as this can unscrew the electrode from the Probe body.** Rinse any salty deposits from the pH/ORP electrode with fresh water.

Fit the protective Sleeve End Cap into the end of the Probe sleeve if required, then immerse the Aquaprobe in the sample water, making sure that the water level covers the minimum immersion depth groove halfway up the Probe sleeve. Switch the Aquameter on.

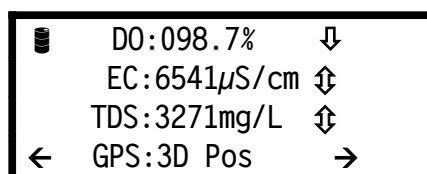
TIP: Occasional application of a smear of silicone grease or similar lubricant to the protective Sleeve End Cap O ring and the inside rim of the Probe sleeve will make fitting and removal of the Cap easier.

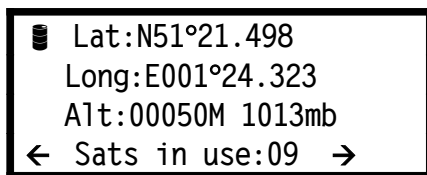
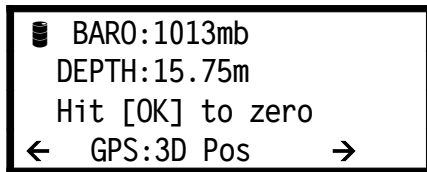
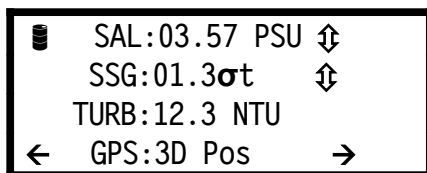
If the Aquaprobe is connected correctly, the meter will read the Probe's serial number and model number, then will automatically configure itself to display only those readings the current Aquaprobe is capable of taking. Initial Probe readings will be displayed on the meter's screen along with the current GPS status (GPS model only). The initial data screen for the GPS Aquameter in conjunction with the fully loaded AP-800 Aquaprobe is shown below.



If the current Aquaprobe / Aquameter combination is capable of reading more than three parameters, left/right arrows will appear at the bottom corners of the screen to indicate further data screens are available (as shown above).

To access these screens, simply press either the left or right arrow keys. Any value that is out of range or unavailable will be displayed as dashes. The other three screens available with the AM-200/AP-800 combination are shown below.





6.1. What Does It All Mean?

The screens above show the full default range of readings for the AM-200/AP-800 combination. If you are using a different Meter/Probe combination, you may have fewer screens to choose from and the readings may appear in a different order to facilitate logical screen layouts. If an asterisk (*) character is flashing just below the battery symbol, this indicates that Auto Data Logging is switched on. See [Automatic Data Logging](#) in section 8.

The table below explains the readings and indicates which to expect with each Meter/Probe combination.

Prefix	Meaning	Units	Available On
TEMP	Probe Temperature	°C or °F*	All Probe & Meter Models
TURB	Turbidity	NTUs	AP-200, 400, 600, 800, 900 & 1000
pH	pH (Acidity/Alkalinity)	pH or pHmV*	AP-100 & 400 thru 1000
ORP	Oxidation Reduction Potential	mV	AP-100 & 400 thru 1000
GPS	GPS Status	See section 6.4	AM-200 + All Probe Models
DO	Dissolved Oxygen	%Sat or mg/L*	AP-300 & 500 thru 1000
EC	Electrical Conductivity	µS/cm or mS/cm†	AP-300 & 500 thru 1000
TDS	Total Dissolved Solids	mg/L or g/l†	AP-300 & 500 thru 1000
SAL	Salinity	PSU or ppt*	AP-300 & 500 thru 1000
SSG	Sea Water Specific Gravity	σt	AP-300 & 500 thru 1000
BARO	Barometric Pressure	mb or inHg*	AP-300 & 500 thru 1000
DEPTH	Depth above / below zero datum	Meters / Feet*	AP-1000
Lat	Latitude	Degrees & Mins	AM-200 + All Probe Models
Long	Longitude	Degrees & Mins	AM-200 + All Probe Models
Alt	Altitude above Sea Level	Meters or Feet*	AM-200 + All Probe Models

Note: the BARO prefix is not displayed when an AM200/AP-800 or AP-900 combination is in use. In this case, barometric pressure is displayed after the altitude (Alt) at the end of line 3 on the position and altitude screen, with no prefix (as shown [1013mb] on the above screen example).

Items in the Units column marked with an asterisk (*) can be selected as alternative units of measurement in the Settings Menu (see section 9: [Setting Units of Measurement](#)). Items in the Units column marked with a dagger (†) are auto-ranging, i.e. when the values become too large to display, the units of measurement automatically re-scale.

On Probe models AP-100, 400, 500 and 600, the pH field will be replaced by ORP (Oxidation Reduction Potential) if an OPR electrode is fitted in place of the pH electrode. In this case, the reading will be shown in mV. This is again controlled via the Settings Menu. The EC field can be replaced by its reciprocal value, RES (Resistivity), if selected in the Settings Menu. If selected, readings will be displayed in either $\Omega\cdot\text{cm}$ or $\text{K}\Omega\cdot\text{cm}$, depending on the value.

GPS position information can also be displayed in the UK as an Ordnance Survey Grid Reference. See section 9: [Setting Units of Measurement](#) for more details.

6.2. Trend Indication

To the right of each reading, (except position, BARO and depth), a trend indication is given. This consists of either an upwards facing arrow (which indicates the numeric value of the reading is rising), a downwards facing arrow (which indicates the numeric value of the reading is falling) or a two-headed arrow which indicates a steady reading.

When taking a set of readings, gently stir the Probe, or raise and lower it in the sample (if there is no natural water flow) until the temperature value is steady. By this time the other values should be reasonably steady and ready for reading or saving.

Be aware, in order to achieve accurate Dissolved Oxygen readings, the Probe needs to be either placed in flowing water, or needs to be stirred or raised and lowered continuously to ensure a constant flow of fresh water over the DO Electrode. If there is no water flow across the Probe, the oxygen in the immediate area of the DO Electrode will be consumed and the reading will start to fall.

6.3. Temperature Compensation

The electrochemical properties of all solutions change as the solutions' temperature changes. In addition, the response of electrochemical measuring electrodes change with temperature. It is a fundamental, practical requirement in the field of water quality monitoring that test measurements taken at different temperatures can be compared.

In order to facilitate this, the Aquaprobe automatically applies corrections for temperature wherever required.

During calibration of the pH electrode, the variation in the calibration buffer solution due to temperature is automatically corrected for. The variation in response of the pH electrode due to temperature is also automatically compensated for. During measurement of pH, the variation in response of the pH electrode due to temperature is automatically compensated for.

During calibration of the EC electrode, the variation in the calibration buffer solution due to temperature is automatically corrected for. During measurement of EC, the readings can be displayed without any temperature correction, corrected to 20°C, or corrected to 25°C. See section 9: [Setting Units of Measurement](#) for more details.

During calibration of the DO electrode, variations due to temperature and air pressure are automatically compensated for. During the measurement of DO, temperature, air pressure and salinity are automatically compensated for.

During calibration of the ORP electrode, the variation in the calibration buffer solution due to temperature is automatically corrected for. During measurement of ORP however, temperature corrections are not applied as the correction factors are system and chemical dependent and are not easily determined.

ORP potential measurements are mostly made to follow reactions rather than for their own sake. The completion of an ORP reaction is normally accompanied by a sharp change in the ORP millivolts reading. This change is usually much larger than the errors induced by temperature side effects.

Turbidity calibration and measurements are made by the Aquaprobe using optical techniques, which are not susceptible to the effects of temperature. Temperature compensation is therefore not applied.

6.4. GPS Reception

The GPS version of the Aquameter (AM-200) contains a built-in GPS receiver and antenna. The antenna is situated at the top of the case, just behind the SQUAREAD Logo.

For optimum signal reception, the antenna must be able to 'see' a reasonably large amount of the sky. **The GPS receiver will not work indoors or when shielded from the sky by any solid structure.**

After switch-on, the GPS receiver will automatically start to search for satellites. During this phase, the message **GPS:Acquiring** will be shown on the bottom line of all the screens.

As soon as three satellites are acquired, two dimensional position (no altitude) will be calculated and the message **GPS:2D POS** will be shown on the bottom line of the screens.

Once a fourth satellite is acquired, altitude will be calculated and **GPS:3D POS** will be shown on the bottom line of the screens. With a good view of the sky, position should be calculated within ninety seconds of switch-on. To see your geographic position and the number of satellites in use, use the left or right arrow keys to scroll to the Position page.

If you switch the meter on indoors, then carry it outside after several minutes, there may be a considerable delay in acquiring satellites. In this case, switch the meter off, then back on again to reset the acquisition process.

7. Depth Measurement (AP-1000 only)

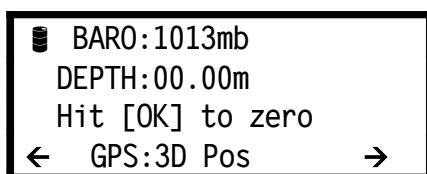
Depth is measured in the Aquaprobe AP-1000 by a pressure sensor mounted inside the body of the probe. The exact position of the sensor is 150mm (6") up from the bottom edge of the sleeve.

Depth is calculated by subtracting the barometric pressure being measured in the Aquameter from the water pressure being measured in the Aquaprobe. The pressure differential, once corrected for temperature and salinity (water density), is directly proportional to depth.

The depth measurement system uses the EC sensor to detect when the probe has been placed in water. All the time the probe is measuring an EC of zero, the depth will read zero. As soon as an EC value is detected, the meter will start to calculate depth. For this reason, it is important to ensure the Probe is connected to the Meter and switched on prior to submerging the probe in water.

7.1. Taking Depth Measurements

Connect the Probe to the Meter and switch on prior to submerging the probe in water. Select the Baro/Depth screen as illustrated below. The depth should be reading zero.



If the depth is not reading zero (this is possible if the probe is wet and a low EC reading is registering), press the OK key. You will be asked to confirm by pressing OK again.

Slowly lower the probe into the water. As soon as the depth value starts to register, you can lower the probe more quickly.

7.2. Differential Depth Measurement

If you want to measure changes in depth, it may be more convenient to zero the depth measurement once the probe has been submerged.

To do this, press the OK key whilst displaying depth, then confirm. The unit will now read positive or negative changes in depth from the current depth (zero datum).

If the values are positive, the water level has increased from the zero datum. If the values are negative, the water level has decreased.

Using the Automatic Data Logging feature detailed in the following section, it is possible to monitor water levels over a period of time for later recall.

8. Memory Mode

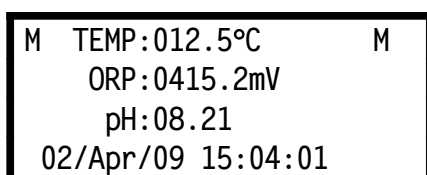
8.1. Manually Saving Readings

When you are happy that the readings are stable, press the **M+** key to snapshot the readings along with the time, date, GLP (calibration) data and position (GPS models only).

As each reading is saved, a numeric memory location 'Tag' will be briefly displayed which you can note down. This Tag can be used to identify readings at a later date, both on the Aquameter and when using AquaLink software.

8.2. Recalling and Viewing Saved Readings

To recall your readings, press the **MR** key. On entering Memory Recall mode, the most recent Tag and set of readings are displayed first along with the date and time the readings were taken shown on the bottom line of the screen.



```
M  TEMP:012.5°C      M
      ORP:0415.2mV
      pH:08.21
      02/Apr/09 15:04:01
```

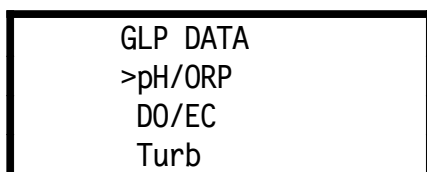
During Memory Recall, an 'M' is flashed in the top left and right corners of the screen alternatively with an up/down arrow and a left/right arrow. This is to indicate that the Meter is in Memory Recall mode and that other screens can be accessed using the arrow keys.

To see earlier readings, press the up arrow key. Just before each set of readings is displayed, the Tag will be briefly displayed. To view all the parameters within one set of readings, use the left/right arrow keys as described earlier. To exit Memory Recall mode, press the **ESC** key. If no key is pressed for 30 seconds, Memory Recall mode will be automatically cancelled.

8.3. Recalling GLP Data

Each time a set of readings is added to memory, the date of the last successful calibration of each electrode is also appended. This is called GLP (Good Laboratory Practice) Data. In addition to the date of the last successful EC calibration, the Calibration Standard value at which the EC was calibrated is also displayed (see section 14: [Calibrating EC](#) for further details).

To view the last successful calibration date for each electrode for any particular stored reading, enter Memory Recall mode, scroll to the reading you are interested in using the up/down keys, then press the **MENU** key. The screen below will be displayed.



```
GLP DATA
>pH/ORP
DO/EC
Turb
```

Using the up/down keys, select the electrode you are interested in, then press either the OK key or the right arrow key. If, for instance, you selected pH/ORP, the screen below would be displayed.

GLP DATA
pH7.00 [31/Jan/09]
pH4.01 [07/Feb/09]
ORP [09/Feb/09]

This tells you that the last successful calibration, **prior to the recorded reading being taken**, was January 31st for the pH 7.00 point, February 7th for the pH 4.01 point and February 9th for ORP. If the date field is dashed (==/==/==), this means the electrode was either not fitted or had never been calibrated.

To exit this screen press the **ESC** key or the left arrow key.

8.4. Clearing the Memory

The memory within the Aquameter is capable of storing up to 1900 full sets of readings.

To clear the entire memory, switch the Meter off, hold down the **M+** key, then switch the Meter back on. A screen will be displayed asking you to confirm your request. Press OK to clear the memory or ESC to cancel and return to normal operation.

8.5. Automatic Data Logging

If you want to save readings automatically on a regular basis, in order, say, to check water quality at a certain location over a period of time, you can set the Meter to record readings automatically.

To do this, press the **MENU** key. The Main Menu screen will be displayed.

Main Menu
→Auto Data Logging
Settings
Calibration

Select **Auto Data Logging** by pressing the right arrow key or the **OK** key. The Auto Data Logging screen will be displayed.

Auto Data Logging
→Interval:10 Mins
Status:OFF

Using the arrow keys to navigate, set the desired logging interval, then set the **Status** to **ON**.

To leave this screen, reverse back to the Main Menu screen then the normal operation screen by pressing the left arrow key. The Meter will now record a full set of data automatically at the set rate until either the memory is full or the batteries go flat.

To remind you that Auto Data Logging is switched on, an asterisk (*) character will flash on and off just below the battery symbol on all the main reading screens.

You can cancel Auto Data Logging at any time by going back into the screen above and setting the **Status** to **OFF**. Auto Data Logging will also be cancelled if you switch the Meter off.

8.6. Important Information About Memory Mode

When data is saved in the Meter, it is compressed in raw Probe format. In other words, the same way that it came up from the Probe. When you recall the data in Memory Recall mode, the data is decompressed, then processed for display.

The advantage of this is that the readings will always appear in the current Meter configuration. For example, if you spent a day taking readings with the Meter set to read Dissolved Oxygen in %Saturation, then when you got back you really want to see Dissolved Oxygen displayed in mg/L, you can do this by simply changing the Meter settings (see section 9: [Setting Units of Measurement](#)).

The stored data can be displayed any way you want on recall. You are not limited to viewing the data in the same way it was logged. This is a major advantage and allows you to actually store and recall far more parameters than can be displayed at any one time.

The same rules apply when data is output to a PC running AquaLink Software via the USB cable. The data that is output is always as per the Meter's **current** configuration. You can output the data as many times as you like in various Meter configurations.

9. Setting Units of Measurement

To alter the way the Aquameter displays readings, press the **MENU** key to get to the Main Menu, then choose **Settings**. The Settings Menu will be displayed.

```
Settings Menu
→Units
Time & Date
Language
```

From this screen choose **Units**. The Units Menu will be displayed. Remember, you can use just the arrow keys to navigate through the branches of the menus. You don't need to press **OK** or **ESC** at each level.

```
Units Menu
→DO/EC/TDS
TEMP/pH/ORP/SAL
BARO/Alt & Depth
```

At the Units Menu, you have a choice of which units you want to adjust. Choose the first line if you want to adjust Dissolved Oxygen, Electrical Conductivity or TDS. Choose line 2 if you want to adjust Temperature, pH, ORP or Salinity. Finally, line 3 will give access to Barometric Pressure, Altitude and Depth settings.

Moving the cursor right onto the first line will display the following screen.

```
Units
→DO:%SAT
EC:Ref 25°C
TDS Fact:0.50
```

On this screen you can adjust the DO: setting between %Sat and mg/L. This will set the Meter to display Dissolved Oxygen as either % Saturation or in milligrams/Litre (which is the same as parts per thousand). Both readings are automatically corrected for atmospheric pressure, sample temperature and sample salinity.

The second option on this screen allows you to choose how the Meter displays Electrical Conductivity. There are four options. EC can be displayed as 'Absolute EC' without any temperature correction [ABS EC], as 'Specific EC' referenced to 20°C [Ref 20°C], as 'Specific EC' referenced to 25°C [Ref 25°C] or as a reciprocal of Absolute EC, which is Absolute Resistivity [ABS RES].

Finally, this screen allows you to set the factor that the Meter uses to calculate Total Dissolved Solids from Specific EC. This is the TDS Fact: (TDS = EC x TDS Fact) and can be set anywhere between 0.00 and 1.00. Default value is 0.65.

Selecting the second line of the Units Menu will display the following screen.

```
Units
→TEMP:°C
pH:pH
SAL:PSU
```

The first option on this screen allows you to change the temperature display between °C and °F.

The second option allows you to change the pH display between plain pH and pHmV. Plain pH displays normal, temperature compensated pH values in the range 0 - 14.

pHmV displays the actual voltage being generated by the pH electrode in +/- millivolts (mV) over a range of +/- 625mV. This is not temperature compensated.

Finally, if you have chosen to replace the pH electrode with an ORP electrode (Aquaprobe models AP-100, AP-400, AP-500 & AP-600 only), this field **must be set to ORP**. The meter will then display ORP in +/- mVs over a range of +/- 2000mV.

The ORP option is not available when connected to Aquaprobe models AP-700 and AP-800 as they both have combined pH/ORP electrodes and ORP display is automatic.

The last option on this screen allows you to choose between displaying salinity in Practical Salinity Units (PSU), or parts per thousand (ppt), which is the same as grams per litre.

Selecting the third line of the Units Menu will display the following screen.

```
Units
→BARO:mb
ALT:Metres
```

The first line allows you to choose between displaying Barometric pressure in millibars (mb) or in inches of mercury (inHg).

The second line allows you to choose between displaying altitude and depth in metres (M) or feet (F). Whatever units ALT is set to, DEPTH (AP-1000 only) will follow. Altitude is displayed with respect to mean sea level.

Depth is displayed with respect to the depth zero datum, which can be the water surface or any point at which the depth has been zeroed. See section 7: [Differential Depth Measurement](#) for further details.

10. RapidCal Calibration Method

10.1. About Calibration

Calibration is a very important part of successful water quality measurement and should be carried out regularly as detailed in each separate section of this manual. A great deal of development work has been put into simplifying and automating the calibration procedures in the Aquameter in order to allow normal field operatives (as opposed to trained lab technicians) to achieve quick and accurate results.

In order to standardise calibration techniques, Aquaread provide purpose made, amber plastic, 300mL calibration bottles, some with non-reflective pads fitted to their bases. All Aquaprobes are designed to be calibrated in these calibration bottles with both halves of the Probe Sleeve fitted but **without the Sleeve End Cap fitted**.

Both halves of the Probe sleeve form an integral, working part of the Probe's measurement system, and MUST be fitted during calibration and measurement for correct operation.

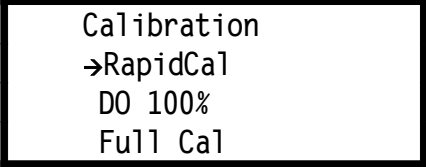
Whilst it is acceptable to use other vessels for calibrating EC, DO pH and ORP, **Turbidity calibration should always be carried out in the purpose made bottles**, otherwise accuracy can be seriously degraded.

10.2. Using RapidCal

RapidCal is an easy way to calibrate any of the Aquaprobes in the field using just one calibration solution. RapidCal calibrates EC at 2570 μ S/cm, the pH7.00 point and the Zero NTU Turbidity point simultaneously. Ideally, this procedure should be carried out at the beginning of each day the Probe is to be used. To use RapidCal:

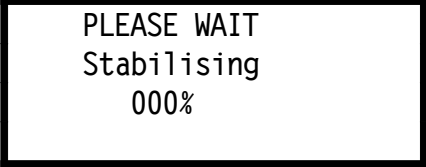
1. Remove the lid from a fresh 300mL bottle of RapidCal solution, remove the storage cap from the pH electrode if fitted, wash the Probe in distilled water, then drop the Probe in all the way. Bang the Probe against the pad in the bottom of the bottle several times in order to remove any air bubbles that may be clinging to the Turbidity electrodes.
2. When the Probe is inserted, **ensure the level of the solution is right up to the threaded part of the bottle**. If the level is low, as shown in the photograph on the right, the EC electrodes will not be covered and EC will not calibrate properly. If the level is low, top up with fresh RapidCal solution.
3. Switch the Aquameter on and wait until the temperature, EC, pH and Turbidity measurements are all **completely** stable. The longer you can leave the probe to achieve thermal equilibrium before proceeding, the better.
4. Ensure the temperature of the solution is between 5°C and 40°C (41°F - 104°F).
5. Press the **MENU** key then select **Calibration**. The following screen will be displayed.





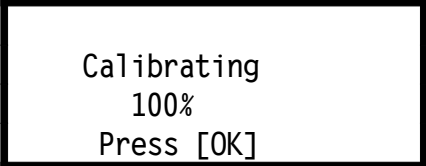
Calibration
→RapidCal
DO 100%
Full Cal

6. Select **RapidCal**. The screen will change to:



PLEASE WAIT
Stabilising
000%

The Meter will wait until all readings are stable, then it will send the RapidCal command to the Probe, where the calibration takes place. During calibration, the Calibrating screen is displayed and the progress counter counts up. If the calibration is successful, the counter will reach 100% and the following screen will be displayed.



Calibrating
100%
Press [OK]

When calibration is complete, press **OK** then **ESC** to return to normal reading mode.

Now the DO 100% saturation point should be calibrated in damp air.

To Calibrate the 100% Saturation Point in Damp Air

1. After calibrating with RapidCal, remove the Probe from the bottle, wash in fresh water, then shake off ensuring there are no droplets adhering to the DO membrane.
2. Take an empty calibration bottle, rinse with fresh water, then empty it leaving the inside wet but with no standing water.
3. Insert the Probe and wait until the temperature measurement is **completely stable**. **This is very important**. Temperature must be between 5°C and 40°C (41°F - 104°F).
4. Referring back to the screen shown in item 5 above, select **DO 100%**.
5. Wait while the Aquameter carries out the calibration procedure.
6. When the 'Calibrating 100%' screen (shown above) is displayed, press OK then ESC repeatedly to return to normal reading mode.

Due to the fact that debris, air bubbles and temperature variation can adversely affect EC calibration, it is essential to verify that EC calibration has been properly achieved after using RapidCal by following the technique described in the section 14 headed [Verifying EC Calibration](#).

10.3. Calibration Error Codes

If the Aquameter detects a problem with either the Aquaprobe or the calibration solution during the calibration procedure, an error will be indicated accompanied by an error code number. The chart below shows the possible errors and how to correct them.

Error Code	Problem	Action
Error 01	pH Electrode is less than 85% efficient	See pH Electrode Efficiency
Error 02	Full re-calibration required or Optical DO Cap needs replacing (AP-900 & AP-1000 only)	See note below.
Error 06	Battery Voltage is too low for reliable calibration	Replace the batteries
Error 07	The Probe is not responding	Check connections / cycle power
Error 08	Readings are unstable	Top up / replace the RapidCal
Error 09	Readings are outside calibration limits Lower Probe Sleeve is not fitted	Top up / replace the RapidCal. Ensure both halves of the Probe Sleeve are fitted and tight.
Error 11	Temperature is outside 5°C – 40°C limit	Warm / cool the RapidCal

Error 2 during Optical DO Zero calibration usually indicates that the DO Cap needs replacing. Perform a full DO calibration first at DO Zero then at 100% DO. If that does not cure the problem, replace the DO Cap (see [Replacing the Optical DO Cap \(AP-900 & AP-1000 only\)](#) in section 14).

If the corrective actions shown above for Errors 08 and 09 do not work, thoroughly clean the Probe and try again. If Error 09 persists, reset the calibration values to Factory Defaults then try again. If Error 09 persists when calibrating a Galvanic DO sensor, replace the DO Electrode Membrane Cap (see [Replacing the Galvanic DO Electrode Membrane Cap](#) in section 14). If Error 09 persists when calibrating EC, check you are using the correct EC Calibration Standard and that both halves of the Probe Sleeve are fitted and tight.

Remember: **Both halves of the Probe sleeve form an integral, working part of the Probe's measurement system, and MUST be fitted during calibration and measurement for correct operation. If you try to calibrate the Probe without the both halves of the sleeve fitted, you will get an error message.**

10.4. Resetting to Factory Calibration Defaults

In some cases, if there has been a serious calibration error, the easiest way to rectify the situation is to reset the Probe to its factory defaults. To do this, first bring up the Calibration screen:

Calibration
→RapidCal
DO 100%
Full Cal

Select Full Cal. This will give you a choice of three electrodes:

Calibration
>pH/ORP
DO/EC
Turb

Move the cursor arrow to the electrode you want to reset, then press the **MR** key. A confirmation screen will be displayed.

Are you sure you
want to restore the
factory calibration
values? [ESC]=NO

If you are sure, press the **OK** key. If you want to change your mind, press the **ESC** key. If you press OK, you will see a message that says CAL RESTORED.

Once factory calibration defaults have been restored, you **must** carry out a **full calibration** of the electrode in question.

10.5. Calibration Data Storage

Each Aquaprobe contains its own microprocessor and memory. All calibration data, including the GLP data, is stored within the Probe's memory. When a Probe is connected to a Meter, this data is transferred for display and logging.

This is a major advantage and allows you to use a variety of different Probes with a single Meter, without the need for re-calibration.

11. After Use

The Sleeve on the Aquaprobe is made in two parts, which separate by unscrewing to allow cleaning of the individual electrodes.

After every use, remove the protective Sleeve End Cap (if fitted) then unscrew the lower half of the sleeve as shown.

With the lower Sleeve removed, the individual electrodes are very vulnerable, so please handle the Probe with extreme care. If you drop it, it's going to break!

Rinse the exposed electrodes and the insides of the upper and lower Sleeve under a running cold tap.

Alternatively, agitate the Aquaprobe vigorously in a bucket or jug of fresh water using an up and down movement.

Shake the water from inside the top and bottom halves of the Sleeve, then reattach the two halves. Dry the outside of the Probe using a soft cloth.

If the Aquaprobe you are using includes a pH/ORP electrode, **remember to replace the storage cap after use.**

Failure to do so will damage the electrode. For more details, see [Keeping the Electrodes Moist](#) in section 13.

Never clean the Probe with solvents, alcohol or concentrated acid/alkaline based cleaning products such as Decon 90. These products can strip the anodised finish from the Probe and damage the plastic and rubber components. Damage caused by the use of aggressive cleaning agents or solvents is not covered by your warranty.

Store the Probe without the protective Sleeve End Cap fitted in order to allow free air circulation around the individual electrodes.

TIP: Occasional application of a smear of silicone grease or similar lubricant to the Sleeve thread, the protective Sleeve End Cap O ring and the inside rim of the lower Probe Sleeve will make fitting and removal of the Cap and Sleeve easier.



12. General Probe Maintenance

Each Aquaprobe is constructed with a two-part protective aluminium sleeve surrounding the more delicate sensing electrodes. To gain full access to the individual electrodes for periodic maintenance and thorough cleaning, first unscrew the lower half of the sleeve. Next, remove the four small black countersunk screws from around the top of the upper sleeve, then gently slide the upper sleeve off the Probe body being careful not to damage the individual electrodes.

TIP: If you find one of the sleeve screws to be excessively tight, turn the Probe over and undo the screw directly opposite it. This will release the tension on the tight screw and allow its easy removal.

With the sleeve removed, the individual electrodes are very vulnerable, so please handle the Probe with extreme care. If you drop it, it's going to break!

Once any maintenance and cleaning has been carried out, replace the upper Probe sleeve. **Before inserting the sleeve screws, apply a little silicone grease or similar lubricant to each screw hole and screw.** This will ensure that next time you remove the screws, they will come out easily. If you do not grease the screws, they may corrode into the Probe body and snap off when you try to remove them. **This is not covered by your warranty.**

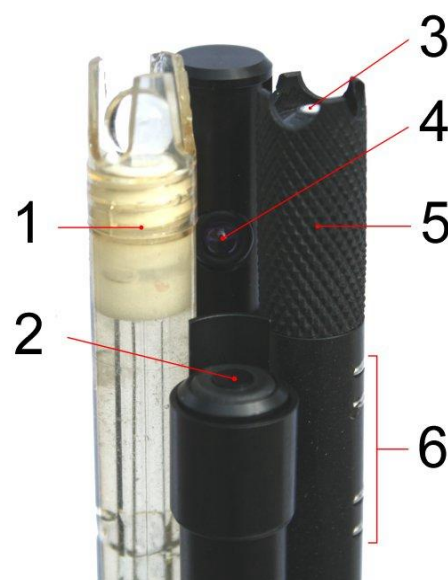
Finally, tighten the screws and re-attach the lower sleeve. The Probe Sleeve must be absolutely rigid with respect to the Probe Body. If you can move the Probe Sleeve to and fro whilst holding the Probe Body, tighten the four screws further before re-calibration.

The complete Probe sleeve forms an integral part of the Probe and is essential for correct operation. Removing and replacing the upper Probe sleeve will alter the Probe's characteristics, so **full re-calibration is essential** after removal and replacement.

12.1. Identifying The Individual Electrodes

The photograph on the right shows an AP-600. If you have purchased an alternative model, some of the electrodes shown may not be fitted.

1. pH (shown) or ORP or combined pH/ORP Electrode (see note below).
2. Turbidity Receiver Electrode. The polished, 4mm diameter centre section is the lens.
3. Galvanic Dissolved Oxygen (DO) electrode. The clear plastic sheet stretched across the tip is the membrane. DO NOT TOUCH!
4. Turbidity Transmitter electrode. The domed, 4mm diameter section is the lens.
5. Replaceable DO Membrane Cap.
6. Electrical Conductivity (EC) sensing contacts.



Aquaprobe Models AP-100, AP-400, AP-500 or AP-600 may be fitted with either a pH electrode or an ORP electrode. ORP Electrodes can be identified by a single platinum wire in place of the glass bulb on the tip. Aquaprobe Models AP-700 and AP-800 are fitted with a combined pH/ORP electrode, which has both a glass bulb and a platinum wire sitting side by side. Aquaprobe models AP-900 & AP-1000 are fitted with optical DO electrodes.

13. pH/ORP Electrode Calibration and Maintenance

13.1. Recognising the pH/ORP Electrode

The pH, ORP and combined pH/ORP electrodes are easy to recognise because they are the only electrodes that are not black. These electrodes have a clear, gel filled body.

13.2. Electrode Removal and Replacement

The pH, ORP and combined pH/ORP electrodes are the only electrodes that are replaceable. To remove an electrode, first remove the Probe sleeve as detailed in section 12: [General Probe Maintenance](#).

The pH/ORP electrode can now be unscrewed from the Probe body by rotating it anti-clockwise. When replacing an electrode, apply a little silicon grease or similar lubricant to the thread and O ring, then screw fully in.

Gripping the black collar at the top of the electrode, tighten until the O ring is fully compressed. **Do not twist the clear section of the electrode whilst tightening.**

Useful Tip: The red lanyard that is attached to the pH/ORP storage cap makes a very useful belt wrench for tightening and loosening the pH/ORP electrode.



Slide the lanyard over the electrode and use it to grip the knurled body.

Never immerse an Aquaprobe with the pH/ORP electrode removed. This will cause serious damage to the electrode socket. **This is not covered by your warranty.**

On Aquaprobe Models AP-100, AP-400, AP-500 or AP-600, if you replace the pH electrode with an optional ORP electrode, **you MUST set the Meter to display ORP rather than pH or pHmV.** See section 9: [Setting Units of Measurement](#).

On Aquaprobe Models AP-700 and AP-800, a dual pH/ORP electrode is always fitted and this setting is automatic.

13.3. Keeping the Electrodes Moist

It is very important that the pH/ORP electrode is kept moist when not in use. This is achieved by always fitting the storage cap, which incorporates a sponge that should be soaked in a special storage solution.

The sponge within the storage cap should be moistened with a few drops of pH Electrode Storage Solution each time it is removed and replaced. If a pH/ORP electrode is inadvertently allowed to dry out, it must be re-hydrated by soaking in storage solution for at least one hour prior to use.

13.4. Calibrating pH

pH electrodes should be calibrated fully at least once a week to ensure optimum accuracy. Full calibration involves calibrating at pH 7.00 first, then at pH 4.01. Although the Aquaprobe allows only two point pH calibration, the pH electrodes are extremely linear and once calibrated, will read accurately over the full range of 0 – 14.

On Aquaprobe Models AP-100, AP-400, AP-500 or AP-600 you must have a pH electrode fitted and the Aquameter must be set to read pH or pHmV. If your Aquameter is set to read ORP, access to pH calibration will be barred.

Due to the way in which pH calibration works, **the Probe must be calibrated at pH7.00 before calibrating at pH 4.01**. Never calibrate at pH 4.01 before first calibrating at pH7.00.

For best results, calibrate as close to 25°C as possible. The probe will compensate for temperature variation in the calibration buffer and pH electrode during calibration.

To calibrate the pH electrode follow these steps:

1. Fill a 300mL calibration bottle with fresh pH 7.00 solution or RapidCal, remove the storage cap from the pH electrode, wash the Probe in distilled water, then drop the Probe in all the way. The Sleeve End Cap should not be fitted.
2. Switch the Aquameter on and wait until the temperature and pH measurements are completely stable.
3. Ensure the temperature of the solution is between 5°C and 40°C (41°F - 104°F).
4. Press the **MENU** key then select **Calibration**. The following screen will be displayed.

```
Calibration
→RapidCal
DO 100%
Full Cal
```

5. Select **Full Cal**. The screen will change to:

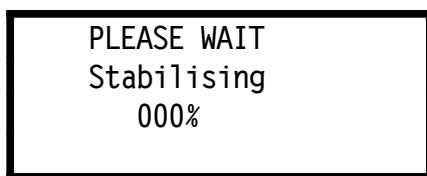
```
Calibration
>pH/ORP
DO/EC
Turb
```

6. Select **pH/ORP**. The screen will change to:

```
Calibration
→pH7.00?[01/Jan/09]
pH4.01?[01/Jan/09]
ORP? [01/Jan/09]
```

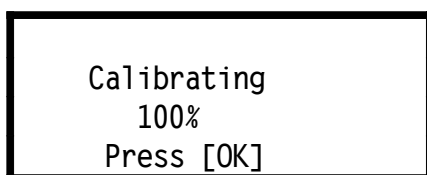
The dates shown to the right of the screen are the dates of the last successful calibration. If no ORP electrode has ever been fitted, the ORP date will be dashed out.

7. Select pH7.00. The screen will change to:



PLEASE WAIT
Stabilising
000%

The Meter will wait until the readings are stable, then it will send the calibration command to the Probe, where the calibration takes place. During calibration, the Calibrating screen is displayed and the progress counter counts up. If the calibration is successful, the counter will reach 100% and the following screen will be displayed.



Calibrating
100%
Press [OK]

When calibration is complete, press the **OK** key then the **ESC** key repeatedly to return to normal operating mode.

Remove the Probe from the calibration bottle, rinse thoroughly in de-ionised water, shake off any excess and dry the outer sleeve with a soft cloth.

Now fill a 300mL calibration bottle with fresh pH 4.01 solution and drop the Probe in all the way. Follow the procedure detailed above, but at step 6, select pH4.01. Wait while the Meter stabilises and calibrates. When the 'Calibrating 100%' screen (shown above) is displayed, press **OK** then press the **ESC** key repeatedly to get back to the main display.

Remove the Probe from the calibration bottle, rinse thoroughly in fresh water, shake off any excess and dry the outer sleeve with a soft cloth. Dampen the sponge in the storage cap with storage solution and fit it to the pH/ORP electrode. pH calibration is now complete.

13.5. Errors During Calibration

If a problem occurs during calibration, an error message will be displayed. Refer to [Calibration Error Codes](#) in section 10 for error message handling.

13.6. pH Electrode Efficiency

If the pH electrode becomes worn or clogged, its efficiency and response time can be reduced. The efficiency of the pH electrode is constantly monitored and in the event of the efficiency dropping below 85%, 'ERROR 01' will be flashed on the bottom line of the display. If this occurs, or if the pH reading response becomes slow, recondition the electrode as described below.

1. Remove the pH or combined pH/ORP electrode from the Probe body (see [Electrode Removal and Replacement](#)).
2. Rinse with methyl alcohol.
3. Replace the electrode.
4. Re-calibrate.

Never place the entire Aquaprobe in methyl alcohol, as this will cause irreparable damage to the DO/EC electrode. Damaged caused in this way is not covered by the warranty.

If the methyl alcohol rinse does not restore the electrode, perform the following actions:

1. Remove the electrode from the body again.
2. Soak in 0.1M HCl for 5 minutes.
3. Rinse in de-ionised water.
4. Soak in 0.1M NaOH for 5 minutes.
5. Rinse in de-ionised water.
6. Soak in pH4.01 buffer for 10 minutes.

If the above procedure still does not restore performance, replace the electrode.

13.7. Calibrating ORP

ORP electrodes should be calibrated at least once a month to ensure optimum accuracy. Full calibration involves calibrating at a single point, either 231mV (at 25°C) for Aquaprobes running software versions 2.00, 2.01, 2.02, 2.03, 3.00 and 3.01, or 250mV (at 25°C) for Aquaprobes running software version 2.04 or 3.02 and above.

To calibrate at 231mV, use Zobell ORP calibration solution. To calibrate at 250mV, use a 250mV ORP calibration standard such as **Reagecon RS250 Redox Standard**, or similar.

Zobell OPR Calibration solution is hazardous to your health. Be sure to handle with care and to read and comply with all health and safety advice.

On Aquaprobe Models AP-100, AP-400, AP-500 or AP-600 you must have an ORP electrode fitted and the Aquameter must be set to read ORP. If your Aquameter is set to read pH or pHmV, access to ORP calibration will be barred.

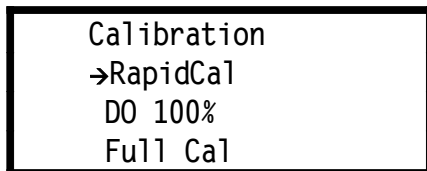
On Aquaprobe Models AP-700, AP-800, AP-900 and AP-1000, a dual pH/ORP electrode is always fitted and this setting is automatic.

For best results, calibrate as close to 25°C as possible. The probe will automatically compensate for temperature variation in the calibration solution during calibration.

To calibrate the ORP electrode follow these steps:

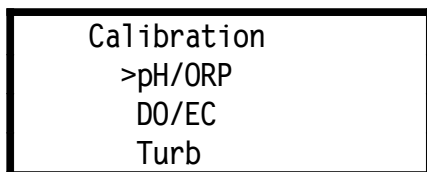
1. Make a note of your Aquaprobe's software version (displayed on the Aquameter screen shortly after switch on) and obtain the appropriate calibration solution (either 231mV or 250mV standard). **You must use the appropriate calibration solution for your software version or a 19mV offset will be introduced to all your ORP readings.**
2. Fill a 300mL calibration bottle with fresh calibration solution, remove the storage cap from the pH/ORP electrode, wash the Probe in distilled water, then drop the Probe in all the way.
3. Switch the Aquameter on and wait until the temperature and ORP measurements are completely stable.

4. Ensure the temperature of the solution is between 5°C and 40°C (41°F - 104°F).
5. Press the **MENU** key then select **Calibration**. The following screen will be displayed.



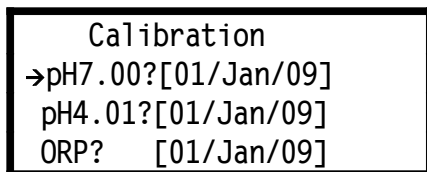
Calibration
→RapidCal
DO 100%
Full Cal

6. Select **Full Cal**. The screen will change to:



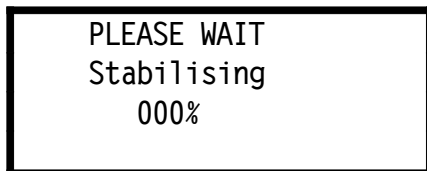
Calibration
>pH/ORP
DO/EC
Turb

7. Select **pH/ORP**. The screen will change to:



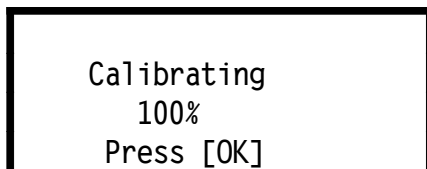
Calibration
→pH7.00?[01/Jan/09]
pH4.01?[01/Jan/09]
ORP? [01/Jan/09]

8. Select ORP. The screen will change to:



PLEASE WAIT
Stabilising
000%

The Meter will wait until the readings are stable, then it will send the calibration command to the Probe, where the calibration takes place. During calibration, the Calibrating screen is displayed and the progress counter counts up. If the calibration is successful, the counter will reach 100% and the following screen will be displayed.



Calibrating
100%
Press [OK]

When calibration is complete, press the **OK** key then the **ESC** key repeatedly to return to normal operating mode.

Remove the Probe from the calibration bottle, rinse thoroughly in fresh water, shake off any excess and dry the outer sleeve with a soft cloth. Dampen the sponge in the storage cap with storage solution and fit it to the pH/ORP electrode. ORP calibration is now complete.

13.8. Converting ORP Readings to the Hydrogen Scale

Electrochemical measurements are ultimately referred to the so-called hydrogen scale, the convention for which is that the electrochemical potential of a hydrogen electrode in contact with hydrogen gas at one atmosphere partial pressure and a solution containing hydrogen ions at unit activity is zero at all temperatures.

The ORP reference electrode used in Aquaread combination electrodes is a 3MPK1 silver chloride type, and exhibits potentials on the hydrogen scale of:

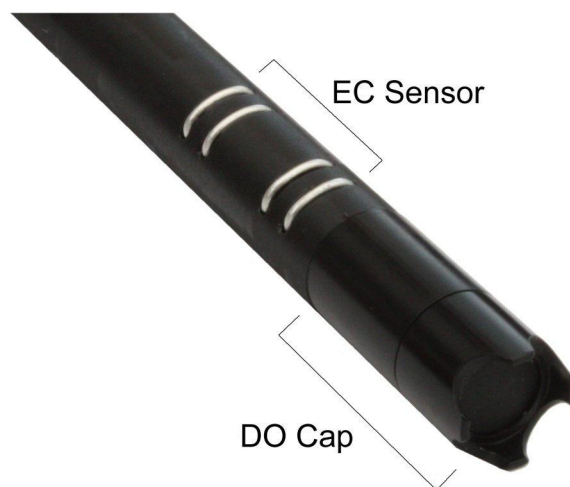
Temperature	Potential
5°C	221 mV
10°C	217 mV
15°C	214 mV
20°C	210 mV
25°C	207 mV
30°C	203 mV
35°C	200 mV
40°C	196 mV

Thus, to refer an ORP potential value measured with the Aquaprobe to the hydrogen scale, the appropriate value above should be added to the measured value.

14. DO/EC Electrode Calibration and Maintenance

14.1. Recognising the DO/EC Electrode

The DO/EC electrode is easy to recognise because it has a screw-on cap and four stainless-steel EC sensor contacts on the side (see photograph). Dissolved Oxygen (DO) is measured at the end of the electrode by the components behind the removable cap. Electrical Conductivity (EC) is measured on the side of the electrode by the four stainless steel contacts.



14.2. DO Measurement Techniques

Aquaprobe models AP-300, AP-500, AP-600, AP-700 & AP-800 utilise a Galvanic DO sensor. This consists of an electrolyte filled DO sensor cap with a clear, gas-permeable membrane stretched across a silver electrode.

Aquaprobe models AP-900 & AP-1000 utilise an optical DO sensor. This sensor does not use a liquid electrolyte and has a black rubber gas-permeable membrane. See [Appendix 1. The Tech Behind Aquaread's Optical DO Measurement System](#) for further details.

14.3. Precautions During Use

In order to achieve accurate Dissolved Oxygen readings with the Galvanic DO sensor, the Probe needs to be either placed in flowing water, or needs to be stirred or raised and lowered continuously to ensure a constant flow of fresh water over the DO Electrode. **If there is no water flow across the Probe, the oxygen in the immediate area of the DO Electrode will be consumed and the reading will start to fall.**

Aquaprobe models AP-900 & AP-1000 featuring the Optical DO sensor do not suffer from this restriction. No water flow is necessary when using these probes.

EC measurement is not possible with the lower Probe sleeve removed as the sleeve forms an integral part of the measurement system.

Never immerse the Probe without the DO Cap fitted or with a damaged membrane. If the components at the end of the DO/EC electrode come into contact with the liquid being tested, serious damage can occur to both the DO/EC electrode circuitry and the pH/ORP electrode.

14.4. Calibrating the DO/EC Electrode

Calibration of the EC section of the electrode is normally carried out during RapidCal (see [RapidCal Calibration Method](#)). EC can be calibrated separately using different EC Calibration Standards, this is covered after the DO calibration section ([Calibrating EC](#)).

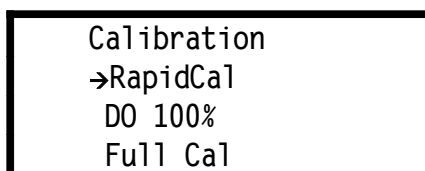
The DO section of the electrode should be calibrated at the Zero saturation point at least once a month. Before each day's use, the 100% saturation point should be checked in moist air and re-calibrated if necessary. For optimum accuracy, calibrate the DO100% point as near to your sample temperature as possible (within the calibration temperature limits of 5°C - 40°C).

If you are going to calibrate both the Zero and 100% points at the same time, **ALWAYS calibrate the Zero point first**, then the 100% point.

To calibrate the DO/EC electrode follow these steps:

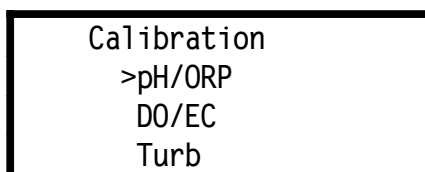
14.5. Calibrating the DO Zero Point

1. Remove the lid from a 150mL bottle of DO Zero calibration solution, remove the storage cap from the pH electrode if fitted, wash the Probe in distilled water, then drop the Probe in all the way. The Sleeve End Cap should not be fitted.
2. Switch the Aquameter on and wait until the DO reading is completely stable.
3. Ensure the temperature of the solution is between 5°C and 40°C (41°F - 104°F).
4. Press the **MENU** key then select **Calibration**. The following screen will be displayed.



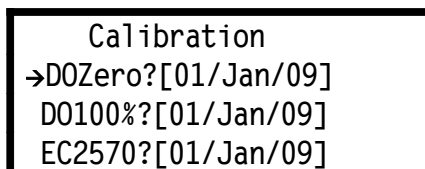
```
Calibration
→RapidCal
DO 100%
Full Cal
```

5. Select **Full Cal**. The screen will change to:



```
Calibration
>pH/ORP
DO/EC
Turb
```

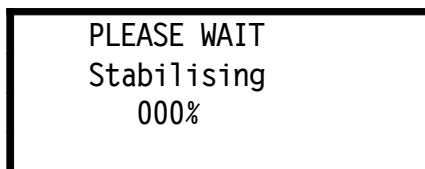
6. Select **DO/EC**. The screen will change to:



```
Calibration
→DOZero?[01/Jan/09]
DO100%?[01/Jan/09]
EC2570?[01/Jan/09]
```

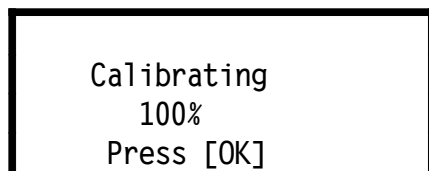
The dates shown to the right of the screen are the dates of the last successful calibration.

7. Select **DOZero**. The screen will change to:



```
PLEASE WAIT
Stabilising
000%
```

The Meter will wait until the readings are stable, then it will send the calibration command to the Probe, where the calibration takes place. During calibration, the Calibrating screen is displayed and the progress counter counts up. If the calibration is successful, the counter will reach 100% and the following screen will be displayed.



When calibration is complete, press the **OK** key then the **ESC** key repeatedly to return to normal operating mode.

If a problem occurs during calibration, an error message will be displayed. Refer to [Calibration Error Codes](#) in section 10 for error message handling. If Error 09 persists when calibrating a Galvanic DO sensor, replace the DO Electrode Membrane Cap.

If Error 02 persists when calibrating an Optical DO sensor, replace the Optical DO Electrode Cap.

Remove the Probe from the calibration bottle, rinse thoroughly in fresh water, shake off any excess and dry the outer sleeve with a soft cloth.

14.6. Calibrating the DO 100% Saturation Point in Moist Air

1. Wash the probe in fresh water, then shake off ensuring there are no droplets adhering to the DO membrane.
2. Take an empty calibration bottle, rinse with fresh water, then empty it leaving the inside wet but with no standing water.
3. Insert the Probe and wait until the temperature measurement is **completely stable**. **This is very important**. Temperature must be between 5°C and 40°C (41°F - 104°F).
4. Referring back to the screens shown in items 4 or 6 above (dependent on software version), select **DO100%**
5. Wait while the Aquameter carries out the calibration procedure.
6. When the 'Calibrating 100%' screen (shown above) is displayed, press OK then ESC repeatedly to return to normal reading mode.

If a problem occurs during calibration, an error message will be displayed. Refer to [Calibration Error Codes](#) in section 10 for error message handling. If Error 09 persists when calibrating a Galvanic DO sensor, replace the DO Electrode Membrane.

14.7. Replacing the Galvanic DO Electrode Membrane Cap

The Galvanic DO electrode membrane is a very thin sheet of special plastic, which is permeable to oxygen. Oxygen molecules pass through this membrane into the Oxygen sensor. The membrane is extremely delicate and is factory fitted into the DO Membrane Cap. To ensure optimum performance, the DO Membrane Cap must be replaced every 1-2 months.

Never touch the plastic membrane as the oils in your skin will block the pores in the membrane and stop it from working correctly.

To replace the DO Membrane Cap, follow these simple steps.

1. Remove the lower Probe sleeve.

2. Unscrew the DO Membrane cap from the end of the DO/EC electrode by rotating it anti-clockwise.
3. Gently brush away any scaly grey deposits from the coiled wire section of the electrode with a soft toothbrush, taking care not to damage the coil in the process.
4. After removing the deposits, rinse the electrode with DO Electrode Filling Solution.
5. Rinse a new DO Membrane Cap with DO Electrode Filling Solution then tap it out so that it is completely empty.
6. Using the DO Electrode Filling Solution dropper bottle, half fill the DO Membrane Cap. Gently tap the cap to ensure any trapped air bubbles are released.
7. Holding the Probe so that the DO electrode is facing downwards, **slowly** screw the half-filled DO Membrane Cap back onto the DO electrode then tighten the cap. **Do not over-tighten**. Finger tight is fine. Some solution will overflow. This is normal.
8. Wash the DO/EC electrode with fresh water then replace the lower Probe sleeve.
9. Wait at least six hours (preferably over-night) to allow any oxygen dissolved in the filling solution to be consumed.
10. Carry out both Zero point and 100% point DO calibration as described earlier.

Do not re-install a Galvanic DO Membrane Cap once it has been fully tightened. The membrane will be stretched and will not seal properly over the silver cathode a second time. If the membrane does not create a proper seal over the silver cathode, the DO sensor will not operate correctly and any readings given will be erroneous.

14.8. Replacing the Optical DO Cap (AP-900 & AP-1000 only)

The Optical DO Cap contains a lens, which is coated with an oxygen sensitive luminophore, which is in turn coated with a black rubber compound that provides optical isolation but is permeable to oxygen. Oxygen molecules pass through the rubber into the luminophore.

Never touch the black rubber end of the DO electrode as the oils in your skin can block the pores in the rubber coating and stop it from working correctly.

The luminophore within the DO Cap will need replacing ever 1 – 2 years, as it is a consumable item. Since the luminophore is an integral part of the DO Cap, the entire DO Cap is replaced. An Optical DO Cap can last up to two years dependent upon the amount of use it gets. See [Sensor Cap Life](#) in Appendix 1 for further details.

Caution: The inside of the Optical DO Cap is very sensitive to light and can be ruined (bleached) if it is exposed to bright light for any length of time. Never remove the Optical DO Cap from the Probe unless you intend to replace it with a new one. When replacing an Optical DO Cap, do so under subdued light.

To replace the Optical DO Cap, follow these simple steps.

1. Remove the Probe sleeve.
2. Unscrew the Optical DO Cap from the end of the DO/EC electrode by rotating it anti-clockwise. **Do not touch the exposed optical components.**
3. Apply a light smear of silicone grease to the thread and O ring.
4. Remove the new Optical DO Cap from its light-proof bag and quickly screw it onto the end of the DO/EC electrode.
5. Carry out both Zero point and 100% point DO calibration as described earlier.

Please Note: It is essential when replacing the Optical DO Cap to calibrate the Zero point BEFORE calibrating the 100% point.

14.9. Calibrating EC

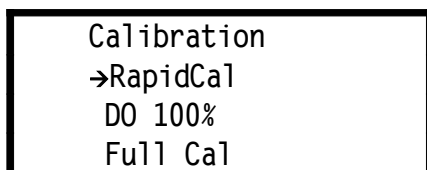
EC calibration is always carried out at a single point. There is a choice of three single points. These are: 1413 μ S/cm, 2570 μ S/cm (using Aquaread RapidCal solution) and 12,880 μ S/cm. These values have been chosen to allow accurate readings to be taken in a variety of water types.

For taking measurements in fresh surface or ground water, use Aquaread RapidCal solution. If this is not available, use a third party 1413 μ S/cm EC Calibration Standard. For taking readings in brackish or salt water, use a third party 12,880 μ S/cm (12.88mS/cm) EC Calibration Standard.

Both halves of the Probe sleeve form an integral, working part of the Probe's EC measurement system, and MUST be fitted during calibration and measurement for correct operation. If you try to calibrate the Probe without the both halves of the sleeve fitted, you will get error message 09.

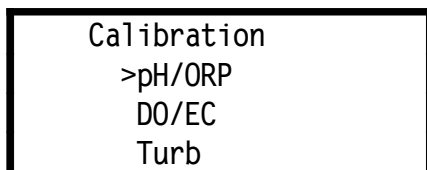
For best results, calibrate as close to 25°C as possible. The probe will compensate for temperature variation in the Calibration Standard during calibration.

1. Remove the storage cap from the pH electrode if fitted, wash the Probe in distilled water, then drop the Probe into a calibration bottle filled with your chosen EC Calibration Standard. The Sleeve End Cap should not be fitted. **Ensure the liquid level is all the way up to the threaded part of the bottle. Low liquid level will result in erroneous EC calibration.** Refer to the photograph in section 10 [Using RapidCal](#).
2. Switch the Aquameter on and wait until the temperature and EC measurements are completely stable.
3. Ensure the temperature of the solution is between 5°C and 40°C (41°F - 104°F).
4. Press the **MENU** key then select **Calibration**. The following screen will be displayed.



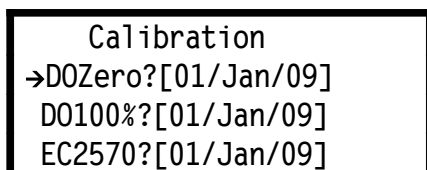
```
Calibration
→RapidCal
DO 100%
Full Cal
```

5. Select **Full Cal**. The screen will change to:



```
Calibration
>pH/ORP
DO/EC
Turb
```

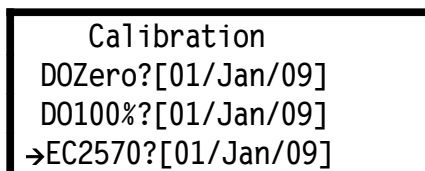
6. Select **DO/EC**. The screen will change to:



```
Calibration
→DOZero?[01/Jan/09]
DO100%?[01/Jan/09]
EC2570?[01/Jan/09]
```

The dates shown to the right of the screen are the dates of the last successful calibration. The value shown on the bottom line next to 'EC' is the value the EC electrode was last calibrated to.

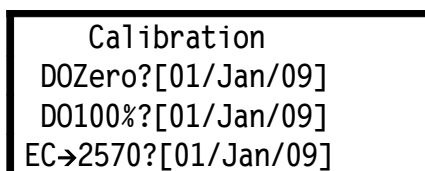
7. Move the pointer down to the bottom line using the down arrow key.



```
Calibration
DOZero?[01/Jan/09]
DO100%?[01/Jan/09]
→EC2570?[01/Jan/09]
```

If the Calibration Standard value you are using is already displayed, press the **OK** key to start calibrating. Remember, if you are using RapidCal solution, the EC value on this line should be 2570.

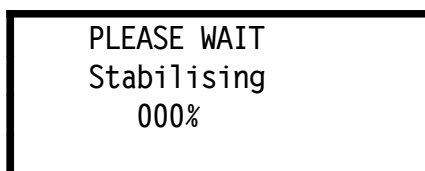
If the value of the EC Calibration Standard you are using is not displayed, press the right arrow key. The bottom line will change to:



```
Calibration
DOZero?[01/Jan/09]
DO100%?[01/Jan/09]
EC→2570?[01/Jan/09]
```

You can now use the up and down arrow keys to select one of three EC Calibration Standard values (1413, 2570 or 12880).

8. Once the correct Calibration Standard value is being displayed, press the **OK** key. The screen will change to:



```
PLEASE WAIT
Stabilising
000%
```

9. When the 'Calibrating 100%' screen is displayed, press OK.

Special Notes:

- If you have selected a Calibration Standard value other than 2570 (RapidCal), then you subsequently use the RapidCal calibration technique described in section 10, the Calibration Standard value will automatically be reset to 2570.
- The Calibration Standard value is stored in the Probe, **not** the Meter. If you use one Meter with several different Probes, you will have to set the Calibration Standard value for each probe individually during calibration.
- If you select a Calibration Standard value but do not press **OK**, the information will not be sent to the Probe and the change will not be registered.

14.10. Verifying EC Calibration

Due to the fact that debris and air bubbles can adversely affect EC calibration, it is essential to verify calibration has been properly achieved. To do this, follow item nine above with this procedure.

1. Remove the probe from the calibration bottle, shake it off, then reinsert.
2. Press the **ESC** key repeatedly to get back to the Main Menu.
3. Go into settings and make sure EC is set to read with reference to 25°C. If it's not, set it that way. See section 9: [Setting Units of Measurement](#).
4. Go back to the main screen, wait until the temperature and EC readings are stable, then check that the EC is reading +/- 1% of the Calibration Standard value.
5. If the EC reading is outside the 1% limit, recalibrate, this time leaving more time for stabilisation.

If you can not successfully verify the EC calibration after several attempts, replace the Calibration Standard. If the problem persists, strip the probe down as described below and thoroughly clean the EC contacts.

14.11. Errors During Calibration

At the beginning of the calibration routine, a sanity check is done. If the probe detects that the Calibration Standard value set and the Calibration Standard being used differ, Error 09 will be reported. If any other problems occur during calibration, an error message will be displayed. Refer to [Calibration Error Codes](#) in section 10 for error message handling.

14.12. Cleaning the EC Contacts

On a regular basis, remove the lower Probe sleeve and thoroughly clean the four stainless steel EC contacts situated on the side of the DO/EC electrode with a soft cloth or toothbrush and non-abrasive detergent. **Never use solvent or alcohol based products to clean the DO/EC electrode.** After cleaning, replace the lower Probe sleeve and recalibrate.

15. Turbidity Electrodes Calibration and Maintenance

Turbidity is measured by the Aquaprobe using a dual electrode, optical, Nephelometric technique in accordance with ISO 7027, which uses Formazin as a reference standard. The Aquameter displays turbidity in Nephelometric Turbidity Units (NTU) which are nominally equivalent to Formazin Turbidity Units (FTU).

A Turbidity Transmitter electrode emits a high energy, narrow beam of pulsed infrared light across the centre of the Probe. Light scattered at 90° to the beam axis by suspended solids within the water is collected by a Turbidity Receiver electrode on the opposite side of the Probe.

Turbidity can be calibrated with either Formazin Turbidity Standards or Suspended Polymer Turbidity Standards, depending upon your preferred turbidity reference. Factory calibration is carried out with a 1000 NTU Stabilised Formazin Turbidity Standard in accordance with ISO 7027.

15.1. About Turbidity

Turbidity is a measurement of the light scattering properties of solids suspended within a liquid and is therefore an **indirect** measurement of clarity. Turbidity is not a direct measurement of suspended solids, clarity or colour.

Particle size relative to the wavelength of the transmitted light, particle shape and refractive index modify the distribution of scattered light. Sample colour, (particularly dark colours) can also reduce a certain portion of the scattered light by varying degrees.

Combined, these effects result in wide variability in the distribution and intensity of light scattering from a turbid water sample. As a result, different combinations of particle shape, size, colour and refractive index can produce similar turbidity effects.

By contrast, changing only the incident light wavelength and detector distance can dramatically change the measured turbidity of a given sample. As a result, different model sensors from different manufacturers can measure different turbidity values for the same sample. This highlights the qualitative nature of turbidity measurements.

Integrated monitoring programs, where turbidity measurements from different locations are to be compared, **must** use a single model of sensor and maintain a strict QA and calibration program to accurately characterise, compare, and interpret observed turbidity values.

15.2. Precautions During Use

In common with all other submersion type Turbidity Probes, air bubbles can be a problem when trying to measure turbidity values below 5NTU. In order to avoid air bubbles, keep the Turbidity electrodes clean, and agitate the Probe after submersion in order to dislodge any air bubbles which may be clinging to the lenses.

When taking Turbidity readings in a flask or beaker, ensure the Aquaprobe is at least 25mm (1") away from the bottom of the vessel in order to avoid reflections which may affect accuracy. This **does not apply** to the purpose-made 300mL Aquaread calibration bottles, which have non-reflective pads fitted, the Aquaread Flow-Through Cell or when a protective Sleeve End Cap is fitted to the Probe.

The lens system in the Turbidity Electrodes is designed to focus correctly in water. When the Probe is not submerged, the system will be out of focus and random readings will occur. This is normal.

The Probe sleeve forms an integral part of the turbidity measurement system. **Turbidity measurement will not work correctly if the lower Probe sleeve is not fitted.**

15.3. Calibrating the Turbidity Electrodes

Turbidity calibration must be carried out in the purpose made, 300mL, amber calibration bottle with the protective Sleeve End Cap removed.

Both halves of the Probe sleeve form an integral, working part of the Probe's turbidity measurement system, and MUST be fitted during calibration and measurement for correct operation.

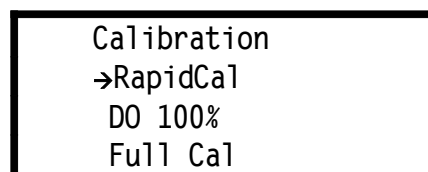
Calibration of the Turbidity electrode Zero NTU point is normally carried out during RapidCal (see [RapidCal Calibration Method](#)).

The Turbidity electrodes should be calibrated at the Zero NTU point before each day's use, and at least once a month at 1000 NTU to ensure optimum accuracy. To avoid air bubbles in the calibration solutions, **never shake the bottles.**

15.4. Turbidity Zero Point Calibration

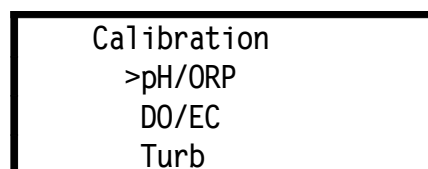
To calibrate the Turbidity zero point, follow these steps:

1. Fill a 300mL calibration bottle with de-ionised water or fresh RapidCal solution, remove the storage cap from the pH electrode if fitted, wash the Probe in distilled water, then drop the Probe in all the way. The Sleeve End Cap should not be fitted. Bang the Probe against the pad in the bottom of the bottle several times in order to remove any air bubbles that may be clinging to the Turbidity electrodes.
2. Switch the Aquameter on and wait until the temperature and turbidity readings are stable. If the turbidity reading is very high, there are probably air bubbles adhering to the lenses. Bang the Probe against the pad to remove.
3. Ensure the temperature of the solution is between 5°C and 40°C (41°F - 104°F).
4. Press the **MENU** key then select **Calibration**. The following screen will be displayed.



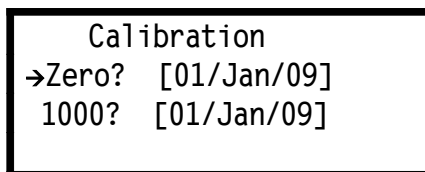
```
Calibration
→RapidCal
DO 100%
Full Cal
```

5. Select **Full Cal**. The screen will change to:



```
Calibration
>pH/ORP
DO/EC
Turb
```

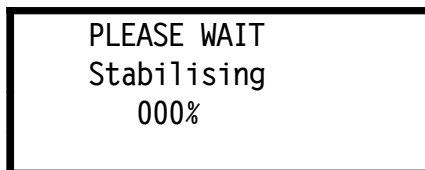

6. Select **Turb**. The screen will change to:



Calibration
→Zero? [01/Jan/09]
1000? [01/Jan/09]

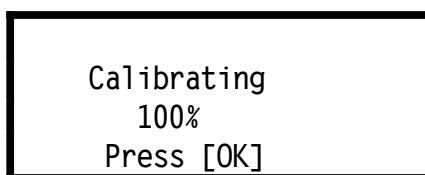
The dates shown to the right of the screen are the dates of the last successful calibration.

7. Select Zero. The screen will change to:



PLEASE WAIT
Stabilising
000%

The Meter will wait until the readings are stable, then it will send the calibration command to the Probe, where the calibration takes place. During calibration, the Calibrating screen is displayed and the progress counter counts up. If the calibration is successful, the counter will reach 100% and the following screen will be displayed.



Calibrating
100%
Press [OK]

When calibration is complete, press the **OK** key.

15.5. Verifying Turbidity Zero Point Calibration

Due to the fact that debris and air bubbles can adversely affect Turbidity calibration, it is essential to verify calibration has been properly achieved. To do this, follow calibration with this procedure.

1. Remove the probe from the calibration bottle, shake it off, then reinsert. Bang the probe to remove any air bubbles.
2. Press the **ESC** key repeatedly to get back to the main screen.
3. Wait until the temperature and TURB readings are stable, then check that the TURB reading is less than 01.0 NTU (this represents 1% of the low scale).
4. If the reading is above this limit, recalibrate, this time leaving more time for stabilisation.

If you can not successfully verify the TURB calibration after several attempts, replace the RapidCal solution / de-ionised water. If the problem persists, strip the probe down as described below under Lens Maintenance and thoroughly clean the Turbidity electrode lenses.

15.6. Calibrating the Turbidity 1000 NTU Point

Remove the Probe from the calibration bottle, rinse thoroughly in fresh water (if using RapidCal solution), shake off any excess and dry the outer sleeve with a soft cloth.

Gently invert, **do not shake**, a bottle of **StablCal® Standard 1000 NTU Stabilised Formazin Turbidity Standard** solution (manufactured by the **HACH Company** and available from most lab supply companies) several times to thoroughly mix.

Formazin Turbidity Standard is hazardous to your health. Be sure to handle with care and to read and comply with all health and safety advice.

Fill a 300mL Turbidity calibration bottle with the solution and drop the Probe in all the way. Again, bang the Probe against the pad in the bottom of the bottle several times in order to remove any air bubbles that may be clinging to the Turbidity electrodes.

Follow the procedure detailed above for Zero point calibration as far as step 6, then select 1000. Wait while the Meter stabilises and calibrates.

When the 'Calibrating 100%' screen (shown above) is displayed, press the **OK** key.

15.7. Verifying Turbidity 1000 NTU Point Calibration

Due to the fact that debris and air bubbles can adversely affect Turbidity calibration, it is essential to verify calibration has been properly achieved. To do this, follow calibration with this procedure.

1. Remove the probe from the calibration bottle, shake it off, then reinsert. Bang the probe to remove any air bubbles.
2. Press the **ESC** key repeatedly to get back to the main screen.
3. Wait until the temperature and TURB readings are stable, then check that the TURB reading is between 990 NTU and 1010 NTU (this represents 1% of the high scale).
4. If the reading is outside these limits, recalibrate, this time leaving more time for stabilisation.

If you can not successfully verify the TURB calibration after several attempts, replace the 1000 NTU Turbidity Standard. If the problem persists, strip the probe down as described below under Lens Maintenance and thoroughly clean the Turbidity electrode lenses.

Turbidity calibration is now complete.

15.8. Errors During Calibration

If a problem occurs during calibration, an error message will be displayed. Refer to [Calibration Error Codes](#) in section 10 for error message handling.

15.9. Recognising the Turbidity Electrodes

The two Turbidity electrodes can be distinguished by their 4mm diameter polished lenses. The Turbidity Receiver electrode is the shortest of the electrodes and its flat lens faces towards the open end of the Probe. The Turbidity Transmitter electrode is directly opposite the Receiver and has a dome shaped, side mounted lens that points towards the centre of the Probe (see [Identifying The Individual Electrodes](#) in section 12).

15.10. Lens Maintenance

On a monthly basis, the lenses on the Turbidity Transmitter and Receiver electrodes should be wiped over with a soft damp cloth and **non-abrasive** detergent.

Always re-calibrate after cleaning the electrodes.

15.11. References

The summary on turbidity at the beginning of this section is based on information from the following sources.

- National Field Manual For the Collection of Water-Quality Data, Turbidity section 6.7, Revised by Chauncey w. Anderson, USGS, 2004.
- Environmental Instrumentation and Analysis Handbook, Randy D. Down and Jay H. Lehr, Chapter 24 Turbidity Monitoring, John Downing, John Wiley & Sons, Inc. 2005
- Turbidity Science, Michael J. Sadar, Hach Company 1998.
- Guidelines and Standard Procedures for continuous Water-Quality Monitors: Site Selection, Field Operation, Calibration, Record Computation and Reporting, Richard J. Wagner et al., USGS Reston VA Meeting, 2000.

16. AquaLink PC Software

AquaLink is a utility program designed to run under Microsoft® Windows® XP®, Vista® or 7 on a stand-alone PC with a minimum screen resolution of 800 x 600, a CD drive and an available USB 2.0 socket.

16.1. Software Installation

These instructions describe installation on a PC running Windows® Vista®. Other versions of Windows® may vary slightly.

IMPORTANT: Install the software BEFORE plugging your Aquameter into your PC.

Place the AquaLink CD in your PC's CD drive. Browse your CD drive and click on 'setup.exe'. You will be given the usual Windows® security warnings. Allow the software to install. Once installed, AquaLink will run automatically. **Leave the CD in your drive.** To communicate with the Aquameter, two further software 'drivers' need to be installed.

16.2. Driver Installation

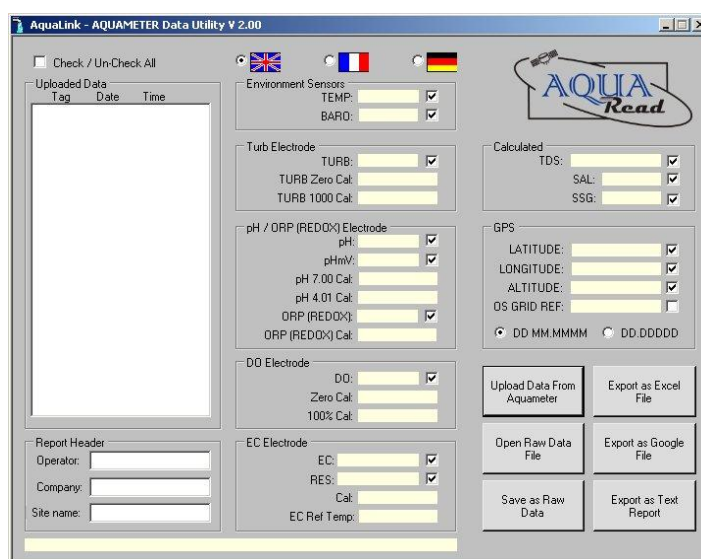
Ensure your Aquameter has batteries installed but is switched off. Connect the Aquameter to your PC using the USB cable supplied. The Aquameter will switch itself on automatically and display 'USB CONNECTED' on its screen as you plug into your PC.

The 'Found New Hardware' wizard on your PC will automatically activate. Select the recommended option: '**Locate and install driver software**'. If given the option, **do not** allow Windows® to search the Internet for drivers. The next screen will ask you to '**Insert the disk that came with your Aquameter**'. The CD should still be in your drive. Click on the '**Next**' button. Wait while the first driver is installed.

The next screen will ask you to '**Insert the disk that came with your USB Serial Port**'. The CD should still be in your drive. Click on the '**Next**' button. Wait while the second driver is installed. When this has completed, AquaLink is ready to use. The CD can now be removed and is not required for subsequent operation.

16.3. Running AquaLink

Select AquaLink from your Programs menu. After an introductory splash-screen has been displayed, the following screen will appear:



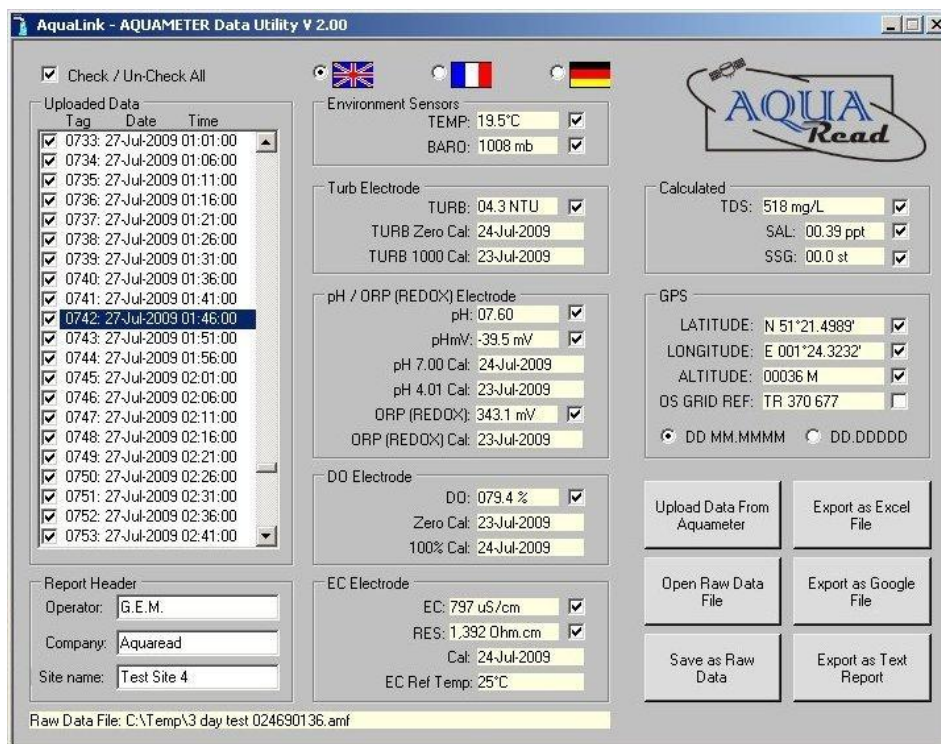
Select your preferred operating language by clicking on one of the national flags.

16.4. Uploading Data From Your Aquameter

Ensure your Aquameter has batteries installed but is switched off. Connect the Aquameter to your PC using the USB cable supplied. The Aquameter should switch itself on automatically and display 'USB CONNECTED' on its screen.

Click the 'Upload Data From Aquameter' button. AquaLink will search for the Aquameter then upload all the available logged data from the Meter to your PC. A progress bar and file counter will be displayed during this process.

Once upload is complete, the memory Tag, date and time for all the logged data that has been uploaded will be displayed in the **Uploaded Data** column on the left of the screen.



To view any of the logged data records, simply click on the desired Tag, date and time label as shown above. The data for the highlighted label will be displayed in the individual data boxes, which are grouped by electrode function. Any data that is unavailable or out of range will be displayed as dashes. To move up and down the Tag/date/time column, use either your mouse or the cursor up/down keys.

Remember, the Aquameter stores all logged data in a raw Probe format, so can be made to output logged data in several different forms, dependent upon the Meter's current settings. See [Important Information About Memory Mode](#) in section 8 for more information.

16.5. pH/ORP Electrode Data Logged Using an AP-100, AP-400, AP-500 or AP-600

If your data was logged using an AP-100, AP-400, AP-500 or AP-600, the data displayed in the pH/ORP group of data boxes depends upon the setting in the Meter. If the Meter is set to display pH or pHmV, the **pH** data box will display pH, the **pHmV** box will display pHmV and the **ORP** box will display dashes. If an ORP electrode was fitted to the Probe and the Meter is set to display ORP, the pH box and pHmV box will display dashes. The box labelled **ORP** will display ORP in mV. See section 9: [Setting Units of Measurement](#) for more details.

16.6. pH/ORP Electrode Data Logged Using an AP-700 - AP-1000

If your data was logged using an AP-700, AP-800, AP-900 or AP-1000, all the boxes within the pH/ORP group will be populated as shown in the example above.

16.7. Displaying GPS Co-ordinates

On the right of the screen, the position at which the data was logged is displayed in the GPS boxes (when logged using an AM-200 GPS Aquameter only). Latitude and longitude can be displayed as Degrees and decimal Minutes (DD MM.MMMM) or as decimal Degrees (DD.DDDDD). Select one format or the other by clicking one of the two options at the bottom of the GPS box. Positional accuracy of lat/lon co-ordinates is +/- 10 meters with a 3D Position fix.

GPS position is also displayed as an Ordnance Survey Great Britain (OSGB) grid reference, (if the position falls within the United Kingdom) and UTM (Universal Transverse Mercator) co-ordinates. Positional accuracy of OSGB co-ordinates is +/- 1 digit (i.e. +/- 100 metres). Positional accuracy of UTM co-ordinates is +/- 10 metres with a 3D Position fix.

16.8. On Screen Help

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

16.9. Saving Logged Data

Once a set of logged data has been uploaded from the Aquameter, it can be saved on your PC as a Raw Data file. These files use a proprietary Aquaread format and are saved with a .amf (aquameter file) extension.

To save the uploaded data, click the '**Save as Raw Data**' button. You will be asked for a file name in the normal Windows® format. The file name you choose will automatically be given the .amf extension.

Useful Tip: Once you have saved the logged data, it is a good idea to clear the Aquameter's memory so next time you log data, you don't get both your old data and new data uploaded to your PC. See [Clearing the Memory](#) in section 8.

16.10. Retrieving Logged Data

Once a Raw Data file has been saved using the above technique, it can be easily retrieved by clicking on the '**Open Raw Data**' button. When a raw data file is opened, it will appear exactly as uploaded data and the file name will be displayed in the box below the Report Header box.

16.11. Exporting Data

AquaLink can export data in three different formats. Before exporting data, the actual data to be exported must be selected.

First, select which data records you want to export by checking the relevant check-boxes in the Uploaded Data column. You can check or un-check all data records simultaneously by checking or un-checking the 'Check / Un-Check All' box above the Uploaded Data column.

Next, select which individual data classes you want to export by checking or un-checking the check-boxes next to each individual data box. You are now ready to export your data.

16.12. Exporting Text Reports

To export a text report, first fill in the boxes in the group marked **Report Header** on the left of the screen. This information will be used at the beginning of your report. Next, click on the '**Export as Text Report**' button. You will be asked to specify a file name. A .txt extension will automatically be added.

A report will be generated that consists of a cover page giving the start and end date, time and position, the total number of readings, an analysis of the highest and lowest readings, the variance between the highest and lowest readings, the average readings and the GLP data. Each block of individual readings, laid out in chronological order, follows this page.

This report can be imported into any text editor or word processor package.

Useful Tip: Of the two text editors supplied with Windows®, Microsoft® WordPad is the preferred text editor for viewing AquaLink Text Reports as this handles text file formatting better than Microsoft® Notepad.

A typical report cover page follows.

16.13. Typical Text Report Cover Page

AquaLink REPORT			

File name:	C:\Test\3 day test 024690136.txt		
Operator name:	G.E.M.		
Company name:	Aquaread Ltd		
Site name:	Test Site 4		
Start date and time:	24-Jul-2009 10:09:33		
Start position:	Lat: N 51°21.4988' Lon: E 001°24.3232' OSGB: TR 370 677		
End date and time:	27-Jul-2009 13:01:00		
End position:	Lat: N 51°21.4988' Lon: E 001°24.3233' OSGB: TR 370 677		
Total number of readings:	877		

Highest readings			

Temp:	19.8C	Tag: 0648	Date: 26-Jul-2009
Baro:	1020mb	Tag: 0315	Date: 25-Jul-2009
Turb:	05.8 NTU	Tag: 0560	Date: 26-Jul-2009
pH:	7.63	Tag: 0565	Date: 26-Jul-2009
pHmV:	-36.3mV	Tag: 0009	Date: 24-Jul-2009
ORP:	365.7mV	Tag: 0320	Date: 25-Jul-2009
DO:	79.4% Sat	Tag: 0742	Date: 27-Jul-2009
EC:	810uS/cm	Tag: 0588	Date: 26-Jul-2009
RES:	1,445 Ω•cm	Tag: 0285	Date: 25-Jul-2009
TDS:	526mg/L	Tag: 0588	Date: 26-Jul-2009
SAL:	0.40ppt	Tag: 0001	Date: 24-Jul-2009
SSG:	0.0st	Tag: 0001	Date: 24-Jul-2009
Time:	15:51:00		
Time:	12:19:00		
Time:	08:46:00		
Time:	09:09:00		
Time:	10:49:01		
Time:	12:44:00		
Time:	01:46:00		
Time:	10:51:00		
Time:	09:49:00		
Time:	10:51:00		
Time:	10:09:33		
Time:	10:09:33		

Lowest readings			

Temp:	17.9C	Tag: 0254	Date: 25-Jul-2009
Baro:	1005mb	Tag: 0838	Date: 27-Jul-2009
Turb:	04.1 NTU	Tag: 0830	Date: 27-Jul-2009
pH:	7.55	Tag: 0003	Date: 24-Jul-2009
pHmV:	-40.8mV	Tag: 0556	Date: 26-Jul-2009
ORP:	354.4mV	Tag: 0820	Date: 27-Jul-2009
DO:	30.1% Sat	Tag: 0427	Date: 25-Jul-2009
EC:	782uS/cm	Tag: 0149	Date: 24-Jul-2009
RES:	1,358 Ω•cm	Tag: 0651	Date: 26-Jul-2009
TDS:	508mg/L	Tag: 0145	Date: 24-Jul-2009
SAL:	0.39ppt	Tag: 0017	Date: 24-Jul-2009
SSG:	0.0st	Tag: 0001	Date: 24-Jul-2009
Time:	07:14:01		
Time:	09:46:00		
Time:	09:06:00		
Time:	10:19:01		
Time:	08:24:00		
Time:	08:16:00		
Time:	21:39:00		
Time:	22:29:01		
Time:	18:11:13		
Time:	22:09:01		
Time:	11:29:01		
Time:	10:09:33		

	Variance	Average values	

Temp:	1.9C	18.81C	
Baro:	15mb	1013mb	
Turb:	1.7 NTU	4.87 NTU	
pH:	0.08	7.60	
pHmV:	4.5mV	-39.09mV	
ORP:	11.3mV	358.45mV	
DO:	49.3% Sat	59.10% Sat	
EC:	28uS/cm	792.2uS/cm	
Res:	87 Ω•cm	1,415.4 Ω•cm	
TDS:	18mg/l	514.4mg/l	
SAL:	0.01ppt	0.391ppt	
SSG:	0.0st	0.00st	

Calibration (GLP) data			

Turb Zero:	24-Jul-2009	Turb 1000:	23-Jul-2009
pH 7.00:	24-Jul-2009	pH 4.01:	23-Jul-2009
DO Zero:	23-Jul-2009	DO 100%:	24-Jul-2009
EC:	24-Jul-2009	ORP:	23-Jul-2009

Blocks of individual readings, laid out in chronological order, follow this cover page. The readings picked out on the cover page can be cross-referenced to the blocks of individual readings using the Tag numbers.

16.14. Exporting Excel® Files

To export an Excel® file, click on the '**Export as Excel File**' button. You will be asked to specify a file name. A .xls extension will automatically be added. Excel® files are exported in a Tab delimited text format. This means that each data field is separated by a Tab, and each data record appears on a new line.

Excel® files are saved with a .xls extension and can be opened directly in Microsoft® Excel®. When opening a .xls file created by AquaLink for the first time, Excel® may automatically run a 'Text Import Wizard'. Follow the three simple steps to import the file. Save the file afterwards as a 'Microsoft Excel Workbook'.

16.15. Exporting Google™ Files

To export a Google™ file, click on the '**Export as Google File**' button. You will be asked to specify a file name. A .kml extension will automatically be added. **Please note: only data logged with a valid GPS position can be exported to Google™ files.**

Google™ files are exported in Google's proprietary Keyhole Markup Language with a .kml extension, and can be directly imported into either Google™ Maps or Google™ Earth, where the data is overlaid on maps or satellite images respectively.

Google™ Maps has a maximum import limit of 200 data records per file. If you intend to view your data in Google™ Maps, you must select 200 or less records for export in each file. If you select more than 200 records, Google™ Maps will truncate your file as it is loaded. If you have selected more than 200 data records for export, AquaLink will warn you of this limitation.

Google™ Earth does not suffer from the same limitation, so you can export a full set of records in your file.

16.16. Importing Files into Google™ Maps

To view your files in Google™ Maps, you will need to log on to the Google™ website, select the Maps tag then create a Google™ Account. This is free of charge at present. Once you are signed in, follow these steps:

1. Click on '**My Maps**'.
2. Click on the '**Create New Map**' button.
3. Click on '**Import**'.
4. An Import KML box will appear. Click on '**Browse**'.
5. Browse for the file you exported from AquaLink, and select it.
6. Back in the Import KML box, click the '**Upload from file**' button.
7. Once the file has been imported, click on '**Done**'

You will now be able to view your data overlaid on Google™ Maps. Each data point is represented by a yellow pushpin, and all the data points are listed in a column on the left of the map. To view the data associated with each pin, either click on the pin, or click on the data point in the list.

16.17. Importing Files into Google™ Earth

To view your files in Google™ Earth, you will need to log on to the Google™ website and install the Google™ Earth application on your computer. This is free of charge at present.

Once you have downloaded Google™ Earth and have it running, follow these steps:

1. Click on '**File**'.
2. Select '**Open**' from the list.
3. Browse for the file you exported from AquaLink, and select it.

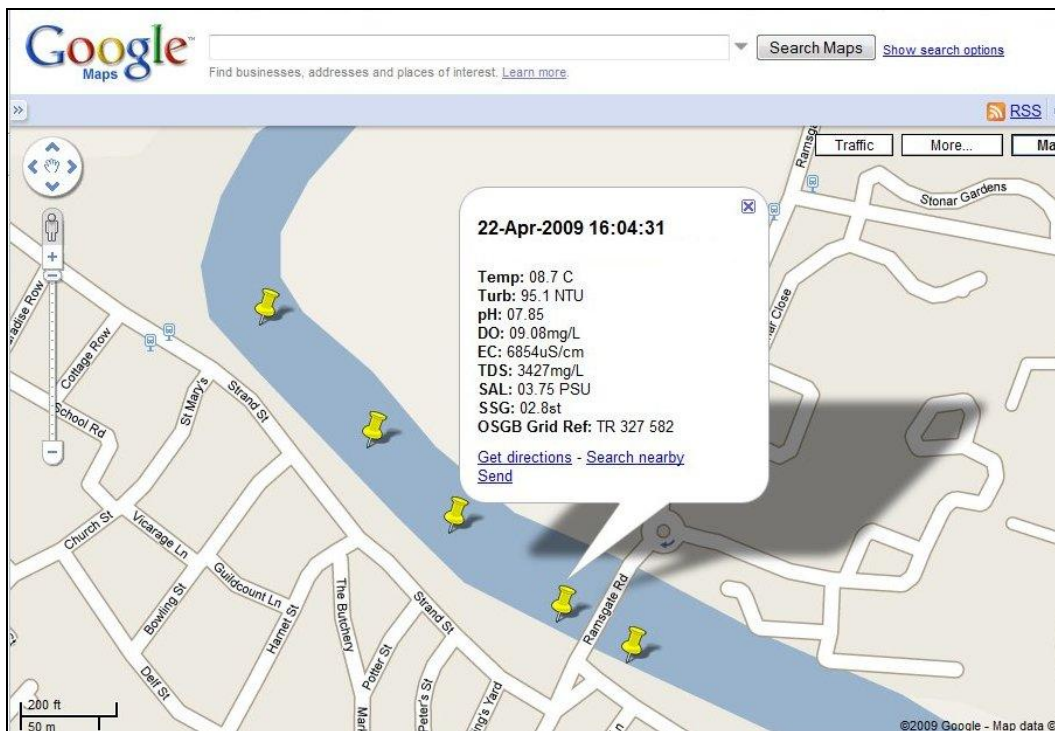
You will now be able to view your data overlaid on Google™ Earth Satellite images. Each data point is represented by a yellow pushpin, and all the data points are listed in a column on the left of the screen. To view the data associated with each pin, either click on the pin or click on the data point in the list.

Please note: Although you have downloaded the Google™ Earth application and are running it from your PC, you still need to be connected to the Internet in order for the application to access satellite images.

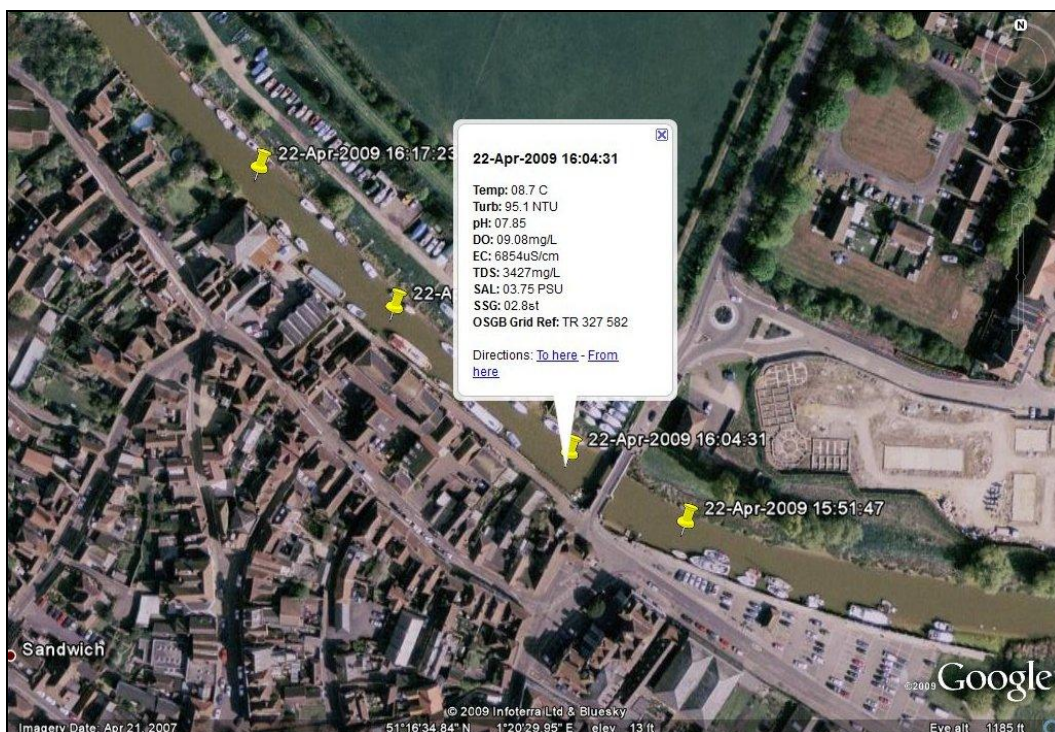
Typical Google™ Maps and Google™ Earth images follow.

16.18. Google™ Examples

The following two images show the same logged data displayed first in Google™ Maps, then in Google™ Earth.



The data displayed on Google™ Maps is useful, but for real detail, Google™ Earth is the answer.



Zooming in on the satellite photos in Google™ Earth is a great way to spot potential sources of pollution. If one of the readings you have taken shows an abnormality, the chances are that you will be able to spot the possible source of the problem (a riverside factory for example) directly on the satellite photo.

17. Specification

17.1. METERS (V3.XX software)

Meter Model	AQUAMETER-200™	AQUAMETER-100™
Dimensions (W x H x D)	90mm x 180mm x 39mm (3.5" x 7" x 1.5")	90mm x 180mm x 39mm (3.5" x 7" x 1.5")
Weight (including batteries)	450g (15.9oz)	440g (15.5oz)
Display	80 character FSTN LCD with backlight	80 character FSTN LCD with backlight
Data Memory	1900 full sets including GLP data	1900 full sets including GLP data
GPS Receiver	12 channel, internal antenna	—
GPS Accuracy	+/- 10 metres in all 3 dimensions	—
Atmospheric Pressure	150mb – 1150mb Accuracy +/- 1mb	150mb – 1150mb Accuracy +/- 1mb
Languages	English / French / German	English / French / German
PC Interface	USB (cable provided)	USB (cable provided)
Power Supply	5 x AA cells. Alkaline or Ni-MH rechargeable	5 x AA cells. Alkaline or Ni-MH rechargeable
Battery Life	Alkaline > 20 hours. Ni-MH > 40 hours	Alkaline > 40 hours. Ni-MH > 60 hours
Operating Temperature	-20°C to +70°C	-20°C to +70°C
Protection Class	IP67	IP67

17.2. PROBES GENERAL

Protection Class	IP68 (permanent immersion)
Immersion Depth	Min 75mm (3"). Max 30m (100')*
Operating Temperature	-5°C – +50°C (23°F – 122°F)
Dimensions (L x Dia)	290 mm x 42 mm (11.4" x 1.65")
Weight (including cable)	725g (25.6oz)

17.3. *Notes Concerning Maximum Probe Immersion Depth

Aquaprobes are supplied as standard with a 3M cable. Extension cables with in-line connectors are available in 5M, 10M and 30M lengths, but are limited to a maximum of 10M immersion depth by the integrity of the connectors.

Custom cable lengths up to 30M can be fitted at the time of ordering to eliminate extension cables and in-line connectors, thereby allowing use of the Probe down to 30m depth.

17.4. PROBES SPECIFIC

Probe Model

			AP-1000	AP-900	AP-800	AP-700	AP-600	AP-500	AP-400	AP-300	AP-200	AP-100
Turbidity	Range	0 – 1000 NTU										
	Resolution	2 Auto-range scales: 0.0 - 99.9 NTU, 100 - 1000 NTU	●	●	●	—	●	—	●	—	●	—
	Repeatability	± 2% of auto selected range										
Galvanic Dissolved Oxygen	Range	0 – 500.0% / 0 – 50.00 mg/L										
	Resolution	0.1% / 0.01mg/L	—	—	●	●	●	●	—	●	—	—
	Accuracy	± 1% of reading or ± 0.1 unit if greater										
Optical Dissolved Oxygen	Range	0 – 500.0% / 0 – 50.00 mg/L										
	Resolution	0.1% / 0.01mg/L	●	●	—	†	†	†	—	†	—	—
	Accuracy	0 - 200%: ± 1% of reading. 200% - 500%: ± 10%										
Conductivity	Range	0 – 200 mS/cm (0 - 200,000 µS/cm)										
	Resolution	3 Auto-range scales: 0 – 9999 µS/cm, 10.00 – 99.99 mS/cm, 100.0 – 200.0mS/cm	●	●	●	●	●	●	—	●	—	—
	Accuracy	± 1% of reading or ± 1µS/cm if greater										
TDS	Range	0 – 100,000 mg/L (ppm)										
	Resolution	2 Auto-range scales: 0 – 9999mg/L, 10.00 – 100.00g/L	●	●	●	●	●	●	—	●	—	—
	Accuracy	± 1% of reading or ± 1mg/L if greater										
Resistivity	Range	5 Ω•cm – 1 MΩ•cm										
	Resolution	2 Auto-range scales: 5 – 9999 Ω•cm, 10.0 – 1000.0 KΩ•cm	●	●	●	●	●	●	—	●	—	—
	Accuracy	± 1% of reading or ± 1 Ω•cm if greater										
Salinity	Range	0 – 70 PSU / 0 – 70.00 ppt (g/Kg)										
	Resolution	0.01 PSU / 0.01 ppt	●	●	●	●	●	●	—	●	—	—
	Accuracy	± 1% of reading or ± 0.1 unit if greater										
Seawater Specific Gravity	Range	0 – 50 σ _t										
	Resolution	0.1 σ _t	●	●	●	●	●	●	—	●	—	—
	Accuracy	± 1.0 σ _t										
pH	Range	0 – 14 pH / ± 625mV										
	Resolution	0.01 pH / ± 0.1mV	●	●	●	●	●	●	●	—	—	●
	Accuracy	± 0.01 pH / ± 0.5mV										
ORP	Range	± 2000mV										
	Resolution	0.1mV	●	●	●	●	○	○	○	—	—	○
	Accuracy	± 0.5mV										
Depth	Range	0 – 30 Meters (0-100 Ft)										
	Resolution	0.01M (0.4")	●	†	†	†	†	†	†	†	†	†
	Accuracy	+/- 0.1M (4")										
Temperature	Range	-5°C – +50°C (23°F – 122°F)										
	Resolution	0.1° C/F	●	●	●	●	●	●	●	●	●	●
	Accuracy	± 0.5° C										

Key: ● = Standard Function ○ = Optional, replaces pH electrode — = Not available † = Available to Special Order

The accuracy figures quoted above represent the equipment's capability at the calibration points at 25°C. These figures do not take into account errors introduced by variations in the accuracy of calibration solutions and errors beyond the control of the manufacturer that may be introduced by environmental conditions in the field.

18. Part Numbers

18.1. Aquameters & Aquaprobes

Item No.	Name	Description
AM-200	GPS AQUAMETER	GPS Aquameter shipped complete with 5AA Alkaline Cells, Lanyard, USB cable, 'Getting Started' cards and CD containing AquaLink software, USB drivers and full Manual.
AM-100	AQUAMETER	Non-GPS Aquameter shipped complete with 5AA Alkaline Cells, Lanyard, USB cable, 'Getting Started' cards and CD containing AquaLink software, USB drivers and full Manual.
AP- 1000	AQUAPROBE-1000	Aquaprobe with Depth, Temperature / pH / ORP / Turbidity / Optical Dissolved Oxygen / Conductivity Electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 900	AQUAPROBE-900	Aquaprobe with Temperature / pH / ORP / Turbidity / Optical Dissolved Oxygen / Conductivity Electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 800	AQUAPROBE-800	Aquaprobe with Temperature / pH / ORP / Turbidity / Dissolved Oxygen / Conductivity Electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, 1 spare DO Electrode Membrane Cap, a 25mL bottle of DO Electrode Filling Solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 700	AQUAPROBE-700	Aquaprobe with Temperature / pH / ORP / Dissolved Oxygen / Conductivity electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, 1 spare DO Electrode Membrane Cap, a 25mL bottle of DO Electrode Filling Solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 600	AQUAPROBE-600	Aquaprobe with Temperature / pH / Turbidity / Dissolved Oxygen / Conductivity Electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, 1 spare DO Electrode Membrane Cap, a 25mL bottle of DO Electrode Filling Solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 500	AQUAPROBE-500	Aquaprobe with Temperature / pH / Dissolved Oxygen / Conductivity electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, 1 spare DO Electrode Membrane Cap, a 25mL bottle of DO Electrode Filling Solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 400	AQUAPROBE-400	Aquaprobe with Temperature / pH / Turbidity electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 300	AQUAPROBE-300	Aquaprobe with Temperature / Dissolved Oxygen / Conductivity electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, 1 spare DO Electrode Membrane Cap, a 25mL bottle of DO Electrode Filling Solution, a calibration / rinse bottle and a 'Getting Started' card.
AP- 200	AQUAPROBE-200	Aquaprobe with Temperature / Turbidity electrodes. Shipped with a 3 meter cable, 2 calibration / rinse bottles and a 'Getting Started' card.
AP- 100	AQUAPROBE-100	Aquaprobe with Temperature / pH electrodes. Shipped with a 3 meter cable, 300mL RapidCal solution, a pH Electrode Storage Cap, a 25mL bottle of Storage Solution, a calibration / rinse bottle and a 'Getting Started' card.

Aquaread Ltd reserves the right to change specifications without notice

18.2. Accessories

Flow Cell	Flow-through Cell	Heavy duty Flow-Through Cell (can be used with any model Aquaprobe)
EX- 5	Extension Cable	5 Meter Aquaprobe extension cable (connectors submersible to 10m).
EX-10	Extension Cable	10 Meter Aquaprobe extension cable (connectors submersible to 10m).
EX-30	Extension Cable	30 Meter Aquaprobe extension cable (connectors submersible to 10m).
MK-5	DO Membrane Kit	5 replacement Galvanic DO Electrode Caps complete with pre-fitted membranes. Shipped with a 25mL bottle of filling solution.
DO-CAP	Optical DO Cap	Replacement Optical DO Sensor Cap (two year shelf life) Fits AP-900 & AP-1000 only.
BLK-BOX	Black Box Data Converter	Data converter to allow stand-alone Aquaprobe operation. Outputs analogue and SDI-12 serial data (see separate brochure for full specification).
PH-SC	Storage Cap	pH/ORP Electrode Storage Cap complete with warning lanyard & Storage Solution.
AM-LAN	Meter Lanyard	Aquameter Lanyard.
AR-BAG	Shoulder Bag	Aquaread fabric shoulder carrying bag complete with internal dividers.
AR-CASE	Hard Carrying Case	Aquaread hard carrying case with foam inserts (includes space for a Flowcell).
AR-RCASE	Rugged Carrying Case	Aquaread rugged Explorer hard carrying case with foam inserts (includes space for a Flowcell).
PH-EL	pH Electrode	Replacement pH Electrode shipped complete with protective storage cap and a 25mL bottle of Storage Solution (will fit AP-100, AP-400, AP-500 & AP-600 only).
ORP-EL	ORP Electrode	Optional ORP Electrode shipped complete with protective storage cap and a 25mL bottle of Storage Solution (will fit AP-100, AP-400, AP-500 & AP-600 only).
COMBI-EL	pH/ORP Electrode	Replacement pH/ORP Electrode shipped complete with protective storage cap and a 25mL bottle of Storage Solution (will fit AP-700 & AP-800 only).
AP-CAP	Sleeve Cap	Replacement protective probe sleeve end-cap.
AP-BKT	Probe Hanger	Probe hanger bracket allows suspension of probes on steel cables, comes complete with stainless-steel carabiner clip

18.3. Calibration & Maintenance Solutions

RC-300	RapidCal Solution	300mL RapidCal solution shipped in a wide neck bottle for direct probe insertion.
RC-600	RapidCal Solution	600mL bottle of RapidCal solution.
PH-700/300	pH7.00 Buffer	300mL pH 7.00 Buffer Solution shipped in a wide neck bottle for direct probe insertion.
PH-700/600	pH7.00 Buffer	600mL pH 7.00 Buffer Solution.
PH-401/300	pH4.01 Buffer	300mL pH 4.01 Buffer Solution shipped in a wide neck bottle for direct probe insertion.
PH-401/600	pH4.01 Buffer	600mL pH 4.01 Buffer Solution.
ZO-150	Zero Oxygen Solution	150mL Zero Oxygen Solution shipped in a wide neck bottle for direct probe insertion.
ZO-600	Zero Oxygen Solution	600mL Zero Oxygen Solution.
DO-25	DO Filling Solution	25mL Oxygen Electrode filling solution.
SS-25	Storage Solution	25mL pH / ORP Electrode Storage Solution.
BOT-300	Calibration Bottle	300mL Wide neck calibration / rinse bottle for direct probe insertion.

To order accessories or solutions, contact your local Aquaread™ Dealer.

19. Limited Warranty

All Aquaread Meters are guaranteed for three years, Probes, Flow-Through Cells and individual electrodes are 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. You must return your warranty card within 30 days of purchase to activate your warranty.

This warranty is limited to repair or replacement free of charge. Accidental damage, misuse, tampering, lack of prescribed maintenance, water ingress through unprotected Meter and Probe sockets, 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.co.uk). Report the model number, date of purchase, serial number and problem. You will be given a Returns Authorisation number by our Service Department. You should then return the equipment, **thoroughly cleaned**, properly packaged, carriage paid, to the address you are given. If the equipment is within warranty, any necessary repairs will be carried out and your equipment will be returned free of charge.

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

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

19.1. Cleaning Prior To Return

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

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

19.2. Decontamination Certificate

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

Decontamination Certificate	
Company Name:	_____
Address:	_____ _____ _____
Postal code:	_____
Country:	_____
Phone:	_____
email:	_____
Product:	_____
Serial No.:	_____
Contaminant (if known):	_____
Decontamination Procedure:	_____ _____
Certified by (print name) :	_____
Title:	_____
Date:	_____
Signature:	_____

20. TROUBLESHOOTING

This section details some of the common difficulties you may encounter when using the Aquameter, Aquaprobes and AquaLink software. Try all the suggested remedies. If your problem is still unresolved, contact our Service Department (service@aquaread.co.uk).

Problem	Cause / Remedy
The Aquameter will not turn on when the on/off key is pressed.	✓ Batteries are probably dead or incorrectly fitted. Check you have fresh batteries fitted and that they are inserted the correct way round.
The Aquameter turns on but turns off again almost immediately.	✓ Batteries are probably nearly dead or incorrectly fitted. Check you have fresh batteries fitted and that they are inserted the correct way round.
The Aquameter can not find the Aquaprobe.	✓ Probably a poor connection. Switch the Aquameter off, disconnect the Aquaprobe plug, ensure there is no debris or moisture in the plug, then re-connect the plug ensuring it is fully inserted and that the screw collar is fully tightened.
The GPS Aquameter will not show a position fix.	✓ The Aquameter probably does not have a good enough view of the available satellites. Ensure there are no obstructions between the Aquameter and the open sky. Remember, GPS does not work indoors.
The AquaLink software can not find the Aquameter.	<ul style="list-style-type: none"> ✓ The USB drivers may not be properly installed. Reinstall the USB drivers carefully following the instructions. ✓ There may be a problem with the USB socket on the PC, try an alternative socket.
The 'USB CONNECTED' message does not appear on the Aquameter when it is connected to a PC.	<ul style="list-style-type: none"> ✓ The batteries in the Aquameter may be dead or incorrectly fitted. Check you have fresh batteries fitted and that they are inserted the correct way round. The USB cable does not power the Aquameter. ✓ There may be a problem with the USB socket on the PC, try an alternative socket.
ERROR 01 appears on the Aquameter screen.	✓ This indicates that the pH electrode has dropped below 85% efficiency. Try cleaning the pH electrode and re-calibrating as described in the relevant section of this manual. If that does not cure the problem, replace the electrode.
ERROR 02 appears on the Aquameter screen (AP-900 & AP-1000 only).	✓ This indicates that the Optical DO electrode needs calibrating or the cap needs replacing. Perform a full DO calibration, first at DO Zero then at 100% DO. If that does not cure the problem, replace the Optical DO Cap
ERROR 07 appears on the Aquameter screen.	✓ This indicates that the Aquaprobe has stopped responding to requests for data from the Aquameter. Check the Aquaprobe plug is fully inserted. Cycle the power to reset the Aquaprobe.
Battery electrolyte leakage detected in the battery compartment.	✓ Remove and discard the batteries immediately. Thoroughly clean the battery compartment and terminals. If the battery terminals are corroded, contact our Service Department for return instructions.
Dissolved Oxygen readings are inaccurate or unstable.	<ul style="list-style-type: none"> ✓ There may be insufficient flow across the Galvanic DO membrane. Ensure a constant water flow whilst taking readings (does not apply to AP-900 & AP-1000). ✓ The DO electrode may need calibrating. Recalibrate. ✓ The DO membrane may be dirty. Clean the DO membrane. ✓ The DO membrane may be worn out or damaged. Replace the DO membrane cap. ✓ Calibration may have been carried out at an extreme temperature. Recalibrate at a temperature as close to the sample temperature as possible.

Troubleshooting Continued ...

Problem	Cause / Remedy
pH and/or ORP readings are slow, inaccurate or unstable or calibration is impossible.	<ul style="list-style-type: none"> ✓ The electrodes may need re-calibrating. Recalibrate. ✓ The electrodes may need cleaning. Clean as described in the relevant section of this manual. ✓ The electrodes may have been allowed to dry out. Re-hydrate as described in the relevant section of this manual. ✓ The electrodes may be damaged. Replace the electrodes. ✓ The electrode may be loose allowing water to enter the electrode socket. Remove the electrode, blow out the socket with compressed air then leave the probe and electrode in a warm place for at least 48 hours to dry out.
EC readings are inaccurate or unstable. Error 09 shows during calibration of EC.	<ul style="list-style-type: none"> ✓ Have you got both halves of the Probe Sleeve fitted? EC will not work without the whole Probe Sleeve fitted. ✓ The Aquaprobe may not be inserted deep enough into the sample being measured. Ensure the sample level reaches the minimum depth line on the outside of the Aquaprobe. ✓ Trapped air bubbles may be causing problems. Tap and swish the Aquaprobe to dislodge them. ✓ The Probe Sleeve may be loose. The Probe Sleeve must be absolutely rigid with respect to the Probe Body for correct EC operation. If you can move the Probe Sleeve to and fro whilst holding the Probe Body, tighten the four screws then recalibrate. ✓ The EC electrode may need recalibrating. Recalibrate. ✓ The EC electrode may be dirty. Clean the EC electrode then recalibrate.
Turbidity readings are inaccurate or unstable.	<ul style="list-style-type: none"> ✓ Have you got both halves of the Probe Sleeve fitted? Turbidity will not work without the whole Probe Sleeve fitted. ✓ Trapped air bubbles may be causing interference. Tap and swish the Aquaprobe to dislodge them. ✓ The sample being measured may contain air bubbles. Under these conditions, optical turbidity measurements can not be taken. ✓ The Aquaprobe may not be inserted deep enough into the sample being measured. Ensure the sample level reaches the minimum depth line on the outside of the Aquaprobe. ✓ The Probe Sleeve may be loose. The Probe Sleeve must be absolutely rigid with respect to the Probe Body for correct turbidity operation. If you can move the Probe Sleeve to and fro whilst holding the Probe Body, tighten the four screws then recalibrate. ✓ The Turbidity electrodes may need recalibrating. Recalibrate. ✓ The lenses on the turbidity electrodes may be dirty. Clean the lenses then recalibrate.

21. DECLARATION OF CONFORMITY

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

22. Appendix 1. The Tech Behind Aquaread's Optical DO Measurement System

22.1. Principle of Operation

The Aquaread™ AquaPlus™ Optical DO measurement system works on the principle of Dynamic Luminescence Quenching. A gas-permeable chemical known as a luminophore is excited with short bursts of blue light, which causes molecules in the luminophore to emit red photons. The presence of oxygen in contact with the luminophore causes the emission of the red photons to be quenched or delayed. By measuring the delay of the returned red photons with respect to the blue excitation, it is possible to determine the level of dissolved oxygen present.

Whilst this sounds very simple in principle, the optical system and the high-speed electronics required to obtain good accuracy are extremely complex. Calling on many years' experience designing military Night Vision Goggle (NVG) compatible optics, Aquaread engineers have produced an amazingly small and elegant solution.

Housed in a resin filled, marine grade aluminium body that measures just 8mm (0.3") diameter by 13mm (0.5") long, the fully waterproof AquaPlus Sensor Module contains blue excitation and red reference LEDs, optical filters, a photon detector, temperature sensor, driver circuitry and high gain amplification circuitry.



The nano-engineered AquaPlus™ Sensor Module

The incredibly small size of the Sensor Module allows it to fit comfortably into the end of a standard 12mm diameter DO electrode in place of a traditional Clark Cell. The addition of a replaceable cap containing a lens coated with the luminophore material completes the DO section of the electrode.

22.2. Sensor Cap Life

All optical dissolved oxygen sensors work on the same principle, and all must have the sensor cap containing the luminophore replaced periodically due to a phenomenon known as photo bleaching.

When a sensor cap is new, the luminophore will return a large number of red photons when excited. As time goes on, a bleaching effect takes place and the number of red photons returned reduces to a point where they are no longer detectable.

The amount of photo bleaching that the luminophore suffers is in direct proportion to the amount of time it is excited by the sensor's blue light source. It therefore follows that the faster a reading can be taken, the less time the luminophore needs to be excited and the longer it will last.

The high-speed circuitry within the AquaPlus™ module requires just eleven milliseconds to take a reading. This incredibly fast reading time increases the useful life of the luminophore considerably.

Another technique used to prolong the life of the luminophore in the AquaPlus™ module is variable excitation brightness. When the luminophore is new, the brightness of the excitation is reduced to a minimum in order to prevent unnecessary photo bleaching. As the output from the luminophore gradually reduces, the brightness of the excitation is increased in order to squeeze the maximum possible life from the sensor cap.

The combination of low duty cycle and variable excitation brightness can stretch the useful life of a sensor cap as far as two years.

23. Appendix 2. Flow Through Cell

23.1. Introduction

The Aquaread Flow Through Cell (Flowcell) is designed for use with any model of Aquaread Aquaprobe and most third party pumping device.

The Flowcell allows sample water to flow up through the Aquaprobe, passing over all the individual electrodes simultaneously. This eliminates air contact with pumped samples from groundwater boreholes allowing truly representative measurements to be obtained.

Made from marine grade aluminium and 6mm wall thickness acrylic, the Flowcell is ruggedly constructed for hard use in the field. The base flange includes four holes to allow the unit to be pegged down if necessary.

23.2. Spigot Installation

The Aquaread Flowcell is supplied with two pairs of spigots, one pair to fit 6mm (1/4") ID tube and one pair to fit 10mm (3/8") ID tube.

The spigots have a tapered thread so should be screwed into the inlet and outlet holes of the Flowcell until they are tight. At this point, they should seal due to the taper. If a spigot will not seal properly, remove it then re-insert with some PTFE plumber's tape wrapped around the thread.

23.3. Aquaprobe Preparation Prior to First Use

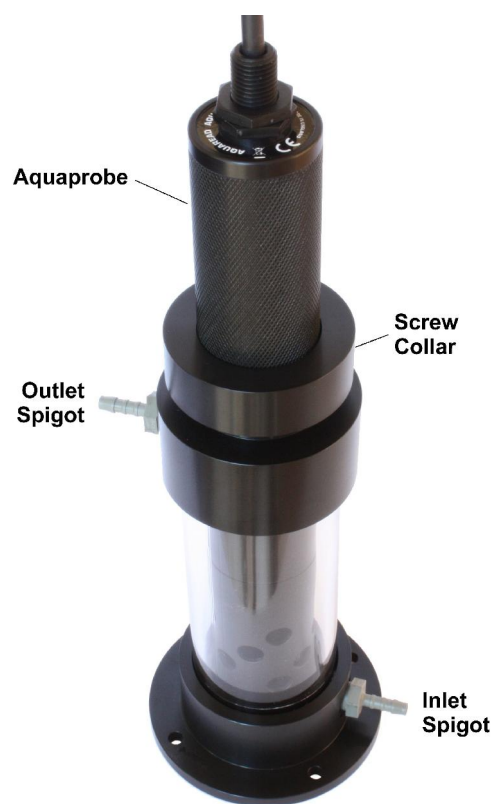
If you are using an early Aquaprobe with a single part Sleeve, the Sleeve should be removed and a good layer of silicon grease or a few turns of PTFE tape should be applied to the mating surfaces where the Probe Sleeve slides onto the Probe Body. This will prevent sample water being forced up between the Sleeve and body when the Flowcell is under pressure. When the grease or tape has been applied, refit the Sleeve then recalibrate.

If your Aquaprobe has a two-part Sleeve, there is no need to apply grease or tape as the upper Sleeve is fitted with an O-ring seal.

23.4. Aquaprobe Installation

The lower Sleeve must be fitted to the Aquaprobe, but **the protective Sleeve End Cap must not be fitted** as this will reduce flow and cause turbulence.

Loosen the screw collar located at the top of the Flowcell and slide the Aquaprobe in all the way, ensuring it is properly seated in the recess where the clear tube enters the base. Tighten the collar to clamp the Aquaprobe in place.



23.5. Operation

Connect the Flowcell to a pumping device so that sample water enters at the bottom and exits at the top. Adjust the flow rate so that there is no visible turbulence or cavitation within the Flowcell. Connect an Aquameter and monitor the readings. If the readings are jumpy or erratic, reduce the flow rate. The ideal flow rate is around 30 litres/hour (8 US gallons/hour), although the Aquaprobe is capable of operating at flow rates as low as 15 litres/hour (4 US gallons/hour). Flow rates above 60 litres/hour (16 US gallons/hour) are not recommended.

23.6. Caution

The maximum operating pressure of the Flowcell is 300mb (4.4 PSI). Select your pumping device accordingly. If necessary, use a three-way bypass valve so that this limit is not exceeded.

23.7. Cleaning

After use, rinse the Flowcell thoroughly with fresh water. To remove stubborn deposits, scrub the inside of the Flowcell with a bottlebrush and non-abrasive detergent, then rinse thoroughly.

Never clean the Flowcell with concentrated acid or alkaline based cleaning products such as Decon 90. These products can strip the anodised finish from the Flowcell and damage the plastic components.

23.8. Flowcell Troubleshooting

Problem	Cause / Remedy
DO readings are abnormally high or are fluctuating wildly.	Aeration of sample water. Check all joints for air leaks. Reduce flow rate to avoid cavitation.
Turbidity readings are abnormally high.	Air bubbles adhering to the Turbidity Electrode lenses. Agitate Flowcell to dislodge. Aeration of sample water. Check all joints for air leaks. Reduce flow rate to avoid cavitation.
Sample water is leaking from around the top of the screw collar.	Screw collar is not tight enough. Tighten up. Grease / PTFE tape has not been applied to the joint between the Probe Sleeve and Probe Body (single part sleeves only). See 'Aquaprobe Preparation Prior to First Use' on previous page. Operating pressure is too high. Reduce pressure / flow rate.
Probe is forced up out of the Flowcell during use.	Operating pressure is much too high. Reduce pressure / flow rate.

24. Appendix 3. Probe Hanger

Aquaprobes can be used with up to 100m of cable. When using long cable lengths, especially down boreholes, it is advisable to support the Probe on a separate steel cable using a Probe Hanger.

To attach a Probe Hanger to an Aquaread Probe, first loosen the top plastic nut that is attached to the top of the Probe and slide it a little way up the cable. Ensure the bottom nut is tight against the top of the probe.

Slide the Probe Hanger over the cable then down onto the threaded part of the Probe.

Bring the top nut down onto the thread, then use the Probe Hanger as a spanner to tighten the nut. The final assembly should be as shown below.



Attach your steel support cable to the Probe Hanger with the snap ring provided.