BlackBox

Aquaprobe data converter

The Aquaread BlackBox is a data converter that allows any model of Aquaread water quality probe to be interfaced directly to a third party processing, control or logging device. With a choice of industry standard digital and analogue interfaces, the BlackBox offers a versatile and cost effective data conversion solution utilising the advanced range of Aquaread multiparameter probes.

Features

- Compatible with all ten Aquaprobes and the AquaPlus Optical DO Probe
- Integral barometric pressure sensor for depth and DO correction
- Outputs Depth, Turbidity, pH, ORP, EC, RES, DO, TDS, SAL, SSG, Temperature and Barometric Pressure[†]
- SDI-12 Digital Interface
- Modbus (RS485) Digital Interface
- Programmable 4-20mA current loop output
- Eight programmable analogue voltage outputs*
- Low current consumption
- Wide operating voltage range
- Rugged aluminium construction with strong fixing flange
- LED status indicator
- Sealed to IP67
- Suitable for long term unattended deployment

Specification

Input Voltage	8V – 28V DC
Input Current	28mA (includes current drawn by attached Probe)
Protection Class	Ip67 (must not be submerged due to barometric pressure sensor)
Dimensions	140mm x 65mm x 30mm (5.5" x 2.6" x 1.2")
Weight	400g (14oz)
Connections	Waterproof Probe socket & 2x1M (3ft) screened power/data cables**
Fixing	Aluminium flange with four 5mm (3/16") mounting holes
Digital Interface	User selectable between SDI-12 and Modbus (RS485)[‡]
Analogue interface	Eight programmable voltage outputs and one 4-20mA current loop*
Update rate	All data is refreshed every 2 seconds

Aquaread reserves the right to alter specifications without notice.
[†] Dependent upon specification of Aquaprobe selected.
[‡] SDI-12 and Modbus interfaces do not support probe calibration protocols. Probes must be calibrated using an Aquaread Aquameter prior to use with the BlackBox.
* Analogue outputs are factory programmable and must be specified at the time of ordering.
** Custom cable lengths up to 100M (300ft) are available at the time of order.

Water Quality Data Logging, Transmission and Retrieval Options Using Aquaread Equipment

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1. Introduction

This document is intended as a guide to the various options available for logging, transmitting and retrieving water quality data using Aquaread Aquaprobes. It starts with the simplest options and progresses through more complex solutions. Please see individual product brochures for detailed information.
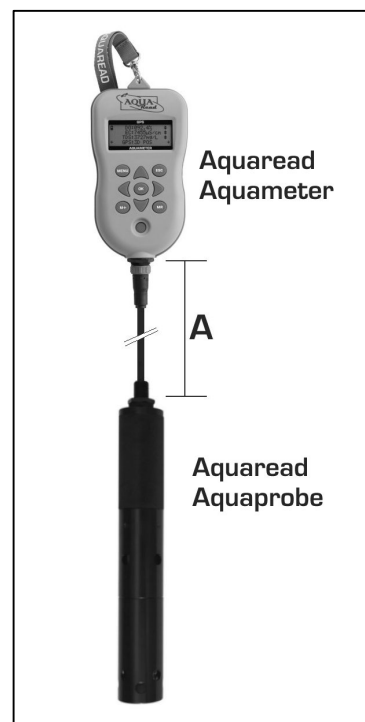
2. Logging using an Aquameter

The simplest way to log water quality data is with an Aquameter and Aquaprobe combination. There are ten different models of Aquaprobe and two models of Aquameter to choose from. The AquaPlus optical DO/EC probe can also be used in this configuration. The distance between the Aquameter and the Aquaprobe 'A' can be up to 100 meters.

Data can be logged manually by pressing the M+ key on the Aquameter or by switching the automatic data logging function on. In auto logging mode, the logging interval can be set between 1 minute and 99 minutes.

The maximum number of data sets that can be logged in 1900. The maximum logging duration is dependent upon the batteries selected. The AM-200 GPS Aquameter can run for up to 40 hours on a single set of batteries. The AM-100 non-GPS Aquameter can run for up to 60 hours on a single set of batteries.

Data is retrieved to a PC via a USB cable using AquaLink software. See section 6 for details of AquaLink.

Aquaread Aquameter

A

Aquaread Aquaprobe

3. Logging using an AquaLogger

For serious long term data logging, the AquaLogger, used in conjunction with any model Aquaprobe or the AquaPlus optical DO/EC probe, is the answer. The distance 'A' between the AquaLogger and the Aquaprobe can be up to 100 meters. The AquaLogger is the same diameter as the Aquaprobe and can be suspended in a well or bore hole above the Probe.

The AquaLogger is powered by two standard alkaline 'C' cells that can give up to 6 months continuous logging, dependent upon logging and event testing rates set. One set of alkaline batteries will log approximately 12,000 complete sets of data. The full memory capacity is 32,000 complete sets of data.

The logging rate can be set between 1 minute and 120 hours. An event trigger can also be set that will increase the logging rate if a selected parameter changes rapidly.

Dependent upon the specification of Aquaprobe selected, the following can be logged: Depth, Turbidity, pH, ORP, EC, RES, DO, TDS, SAL, SSG, Temperature and Barometric Pressure.

Setup of the AquaLogger and data retrieval is done via a USB cable on a PC running LoggerLink utility software. See section 6 for further details.

Aquaread AquaLogger

A

Aquaread Aquaprobe
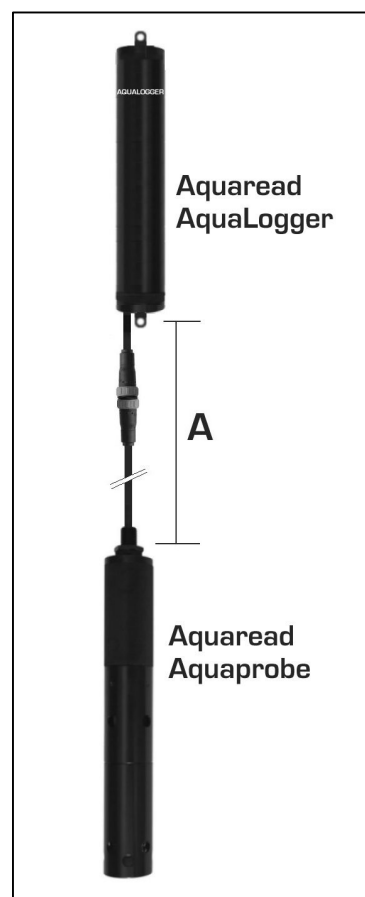
4. Logging using a third party Data Logger

The Aquaread BlackBox is a data converter that allows any model of Aquaread water quality probe to be interfaced directly to a third party processing, control or logging device. The distance 'A' between the BlackBox and the Aquaprobe can be up to 100 meters.

With a choice of industry standard digital and analogue interfaces, the BlackBox offers a versatile and cost effective data collection solution utilising any of the advanced range of Aquaread multiparameter probes.

The BlackBox features an integral barometric pressure sensor for automatic depth and DO correction and can output Depth, Turbidity, pH, ORP, EC, RES, DO, TDS, SAL, SSG, Temperature and Barometric Pressure on an SDI-12 or Modbus (RS485) Digital Interface. Data is refreshed every two seconds.

In addition, the BlackBox provides eight analogue voltage outputs that can be programmed to the customer's own specification.

Low current consumption, a wide operating voltage range and a rugged aluminium case make the BlackBox particularly suitable for long term unattended deployment.
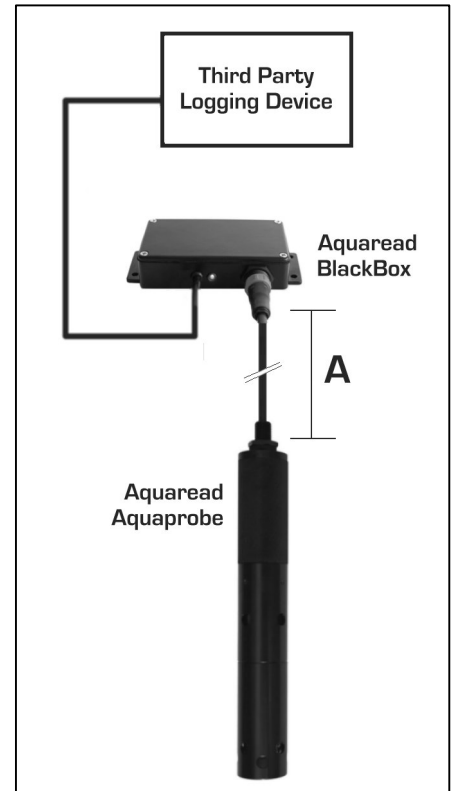
5. Data collection and transmission using a third party Telemetry Device

For those applications where water quality data needs to be collected remotely, the BlackBox is again the answer.

As with the solution featured in section 4 above, the BlackBox can be used in conjunction with any of the Aquaread water quality probes. The distance 'A' between the BlackBox and the Aquaprobe can be up to 100 meters.

In this configuration, data is collected and transmitted by a third party telemetry device to a remote monitoring station anywhere in the world.

The third party telemetry device can collect fresh data from the BlackBox every two seconds, and either transmit the data live, or store it for batch transmission on request from the remote monitoring station.

At the remote monitoring station, the data can be either logged or viewed in real time, dependent upon the equipment in use.

Again, the low current consumption and wide operating voltage range of the BlackBox make it particularly suitable for this remote, unattended application.
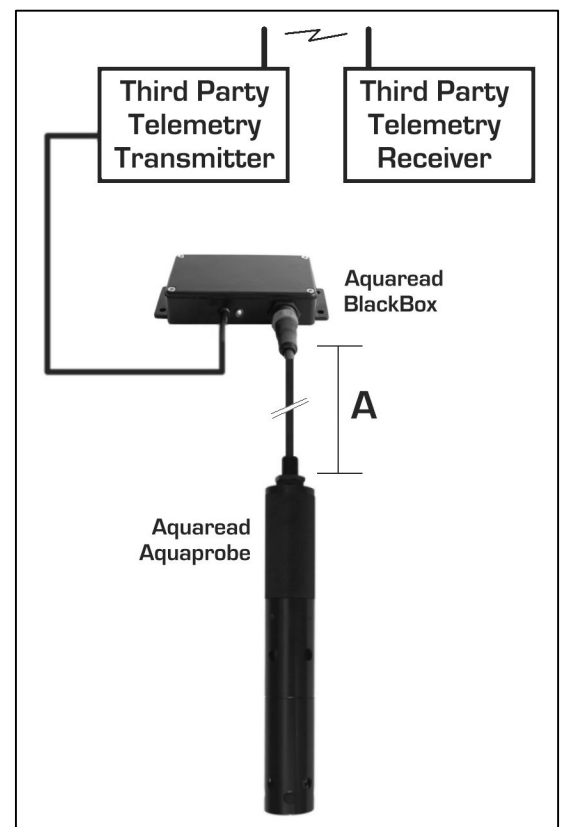
6. Data Retrieval

Once data has been logged on either an Aquameter or an AquaLogger, it can be easily retrieved using one of the Aquaread PC utilities (AquaLink or LoggerLink). Simply connect the Aquameter or AquaLogger to your PC with the USB cable provided, then click the 'Upload Data' button. All the available logged data will be transferred to your PC. A progress bar and file counter is 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' box on the left of the screen.

To view any of the logged data records, simply click on the desired Tag, date and time label in the left-hand 'Uploaded Data' box as shown above. The data for the highlighted label will be displayed in the individual data boxes, which are grouped by electrode function. To move up and down the list in the 'Uploaded Data' box, use either your mouse or the cursor up/down keys.

The PC Utilities can export data in three different formats: Microsoft® Excel® (for use in spreadsheets, a Text Report (for use in any word processor) and for data logged using an AM-200 GPS Aquameter, Google™ (for use in Google™ Maps and Google™ Earth).

Before exporting data, the actual data to be exported is selected by checking the relevant check-boxes in the 'Uploaded Data' box. Next, individual data classes are selected for export by checking or un-checking the check-boxes next to each individual data box.

Finally, clicking one of the three 'Export' buttons will export the selected data. It's as simple as that!

Sample outputs are shown on the following pages.

The Text Report exported by AquaLink and LoggerLink includes an analytical cover page as well as all the selected individual readings. A typical Text Report cover page is shown below.

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°21.4989' 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	Time: 15:51:00
Baro:	1020mb	Tag: 0315	Date: 25-Jul-2009	Time: 12:19:00
Turb:	05.8 NTU	Tag: 0560	Date: 26-Jul-2009	Time: 08:46:00
pH:	7.63	Tag: 0565	Date: 26-Jul-2009	Time: 09:09:00
pHmV:	-36.3mV	Tag: 0009	Date: 24-Jul-2009	Time: 10:49:01
ORP:	365.7mV	Tag: 0320	Date: 25-Jul-2009	Time: 12:44:00
DO:	79.4% Sat	Tag: 0742	Date: 27-Jul-2009	Time: 01:46:00
EC:	810uS/cm	Tag: 0588	Date: 26-Jul-2009	Time: 10:51:00
RES:	1,445 Ω•cm	Tag: 0285	Date: 25-Jul-2009	Time: 09:49:00
TDS:	526mg/L	Tag: 0588	Date: 26-Jul-2009	Time: 10:51:00
SAL:	0.40ppt	Tag: 0001	Date: 24-Jul-2009	Time: 10:09:33
SSG:	0.0st	Tag: 0001	Date: 24-Jul-2009	Time: 10:09:33

Lowest readings

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

Aquaread Data Logging Options

AquaLink can export data logged on the AM-200 GPS Aquameter to both Google™ Maps and Google™ Earth. The images below show the same logged data displayed in Google™ Maps, then in Google™ Earth.
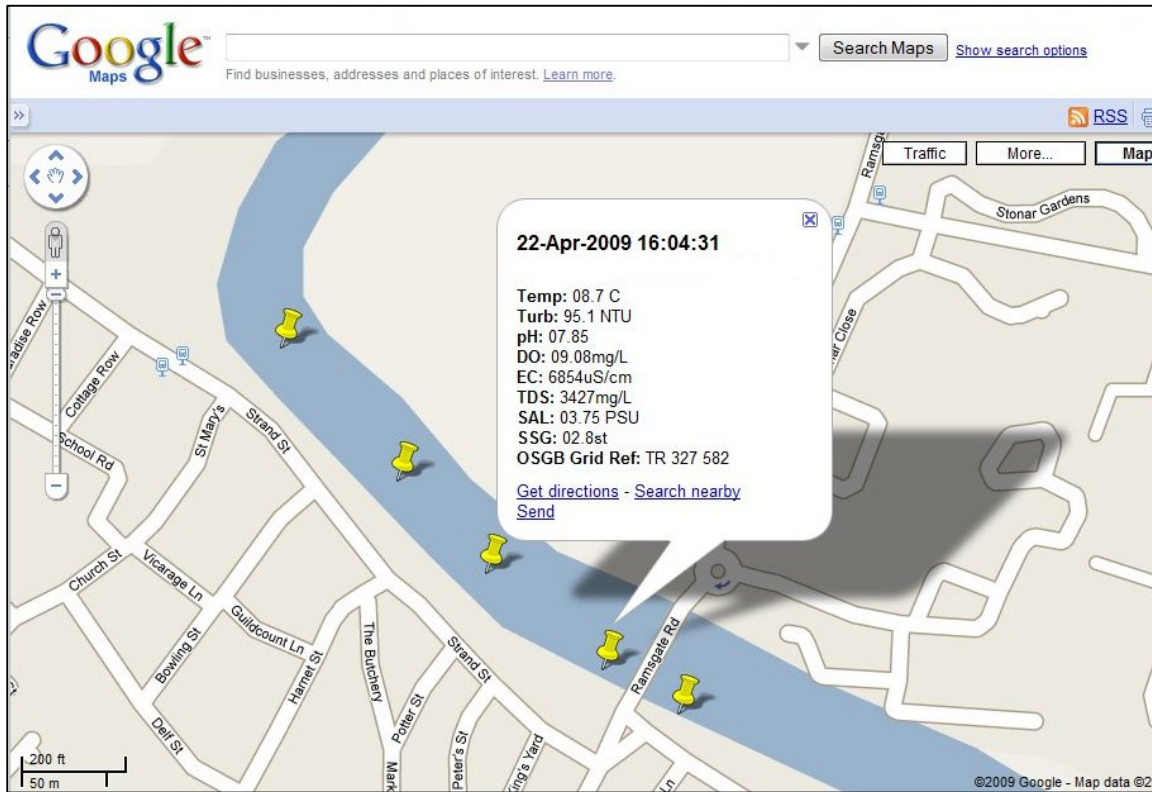
The data displayed on Google™ Maps is useful, but for real detail, Google™ Earth (below) is better.

Zooming in on the satellite photos in Google™ Earth is a great way to spot potential sources of pollution. If the readings you have taken start to show abnormalities, 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!