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1. Introduction

This manual describes the operation of the AQUAlogger 520 series of data loggers. The logger is designed as a low-cost, high performance, standalone data logger device that can be deployed for periods of up to several years. Various sensor options are available including temperature and pressure. Data collected is stored in internal non-volatile storage, and is uploaded to a PC at the end of the logging period. Uploaded data is stored in a format suitable for viewing / analysis in any spreadsheet supporting CSV (comma-separated variables) file import.

1.1 About This Manual

This User Manual provides a detailed guide to the AQUAlogger 520 series hardware and the control software package. Topics covered include:

- System description
- Hardware interfacing
- Logging and control software description
- Installation of software
- Operation of software
- Maintenance, Handling, Parts Data, Safety, Fault Finding

Technical details, including system specification are described in appendixes.

2. The AQUAlogger 520 Series System

2.1 AQUAlogger 520 Series System Diagram

The system diagram is shown in Figure 1.

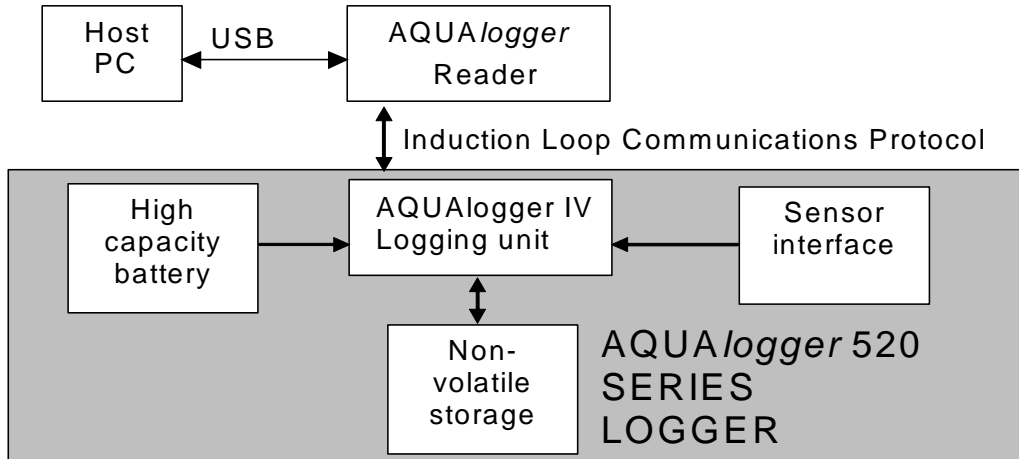


Figure 1 AQUAlogger 520 Series System Diagram

2.1.1 The Host PC

This is required to run the AQUAtalk application to communicate between the user and the logger. The Windows-based application controls the operation of the logger, and the display and storage of the data fed back. The host PC should be capable of running the Windows 98 Second edition or later operating system and have an available USB port.

2.1.2 AQUAlogger Reader

The AQUAlogger Reader acts as a translator to convert the PC serial data to a form the logger can detect and vice versa. The reader is a low-power device, and is powered directly from the USB port.

2.1.3 AQUAlogger 520 Series Logger

The AQUAlogger 520 series are completely self-contained units. There are a vast number of different logging regimes that can be configured using the simple AQUAtalk application on the host PC. The flexible configuration procedure of the logger allows data to be rapidly collected for short periods, or less frequently collected over very-long periods. A variety of averaging strategies is available to maximise the use of the logger storage space.

3. Making Connections to the AQUAlogger 520 Series System

3.1 Instrument Housing

The AQUAlogger 520 series electronics are packaged in a single housing with a non-contact (induction loop) communications connection. The actual packed housing appearance will vary depending on ordering options and sensor types. The AQUAlogger 520PT logger in the standard 1000m housing is shown in Figure 2. See the Appendices for details of other configurations.



Figure 2 AQUAlogger 520PT Pressure & Temperature Logger Housing

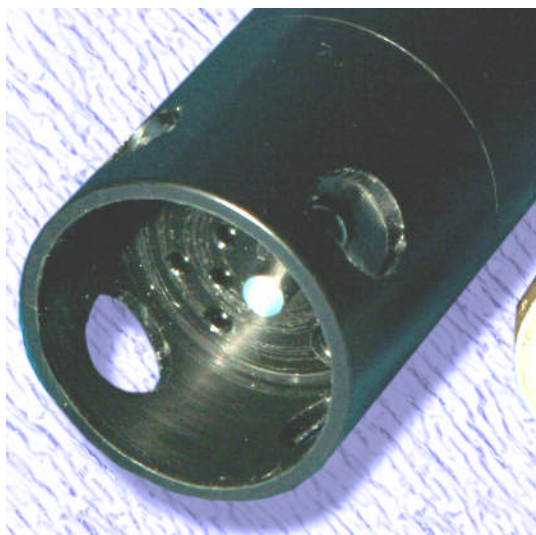


Figure 3 Logger sensors

3.2 Communication Connections

All communications to and from the logger must pass through the AQUAlogger 520 Reader unit. The reader requires only a single connection to the PC via the USB cable. The reader is self-powered by the USB interface, so no external power supply is required. The reader is shown in Figure 4.



Figure 4 AQUAlogger 520 Series Reader

Once the USB lead is plugged into the reader the green 'Power' LED should be lit. The green LED only indicates the reader has power. Once plugged into the computer, if being used for the first time the computer will request a driver to be installed. See Section 4.2 for details.

Once the driver has been loaded and the software has been installed, with the reader plugged into the PC the AQUA*talk* application can be loaded. Insert a logger into the reader and press 'Connect' – the user can now interrogate the logger.

During communication the red 'Comms' LED will periodically flash as data is transferred **from** the logger **to** the reader.

4. Software and Driver Installation

4.1 AQUAtalk for AQUAlogger Installation

The control software to configure and control the AQUAlogger is called AQUAtalk for AQUAlogger (AQUAtalk from here on) and will have been supplied on CDROM with the instrument.

On most systems the application should be directly installable on the desired PC running Windows 98 Second edition or later. It is possible that direct installation will not be possible due to administration rights on some corporate networks – contact your IT department for assistance.

By inserting the CDROM the web page should appear similar to below:



Click on the **Install AQUAtalk for AQUAlogger** link and choose to Run the application. The installation program will now start and the following screen should appear:



Follow the on-screen instructions to install the application to the desired location.

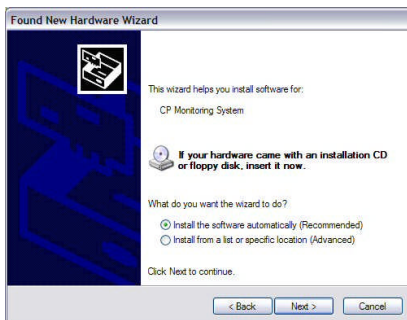
4.2 Driver Installation

To install the USB driver you will need administrator rights for the PC. The following example illustrates the process for a PC running Windows XP although this will be similar for other supported Windows operating systems. Follow the Hardware Wizard as explained below.



When the PC detects an AQUAlogger reader it will run the New Hardware Wizard. The first screen you will see is shown here.

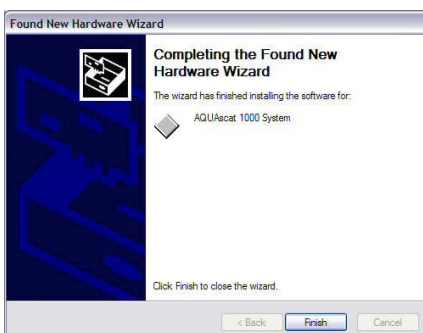
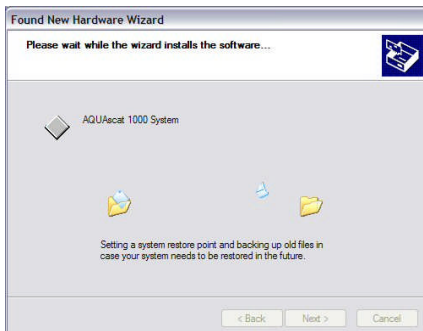
You should select the *No, not this time* option and press Next.



If it is the first time you have installed the USB driver on the PC you will get the following screen.

Select *Install from a list or specific location*

Select the CD and



Once successfully completed you should see a screen similar to that on the left. The device should appear as an AQUAlogger 520 Reader.

5. AQUAtalk for AQUAlogger Software

After installation the AQUAtalk application can be run from the Windows Start menu by selecting the AQUAtalk for AQUAlogger from the Aquatec folder. The following screen will be displayed.



Figure 5 AQUAtalk Startup Screen

The right hand side of the screen shows the connection toolbar which provides an easy interface to connect to any AQUAlogger instrument. Below is listed a description of the functionality provided by the controls on the connection toolbar.

| Control Description | Functionality |
|---------------------|--|
| Connect | Clicking this button attempts to connect to an AQUAlogger instrument via the USB bus. If a device is found then the software will automatically display a new interface allowing the user to view details and interact with the device. If no devices are found on the USB port then a prompt message will be displayed allowing the user to suggest a serial port to connect on. |
| Demo | Clicking on this button brings up a file select prompt. Demo files have a *.bin extension and once connected they mimic a real logger. |
| Search | Clicking on this button enables automatic searching of every COM port present on the PC. If AQUAlogger instruments are present they will be displayed in the tree control, these can be clicked on to connect to. |
| Hide | Clicking on this button will hide the connection toolbar. To restore the toolbar use the "Window->Connect View" menu option. |
| Autohide | This checkbox toggles whether the connection toolbar hides automatically when a connection to a device is made. By default this is enabled. |

5.1 Starting the AQUAtalk Application

Once connected to a device or a demo file, the following screen should appear:-

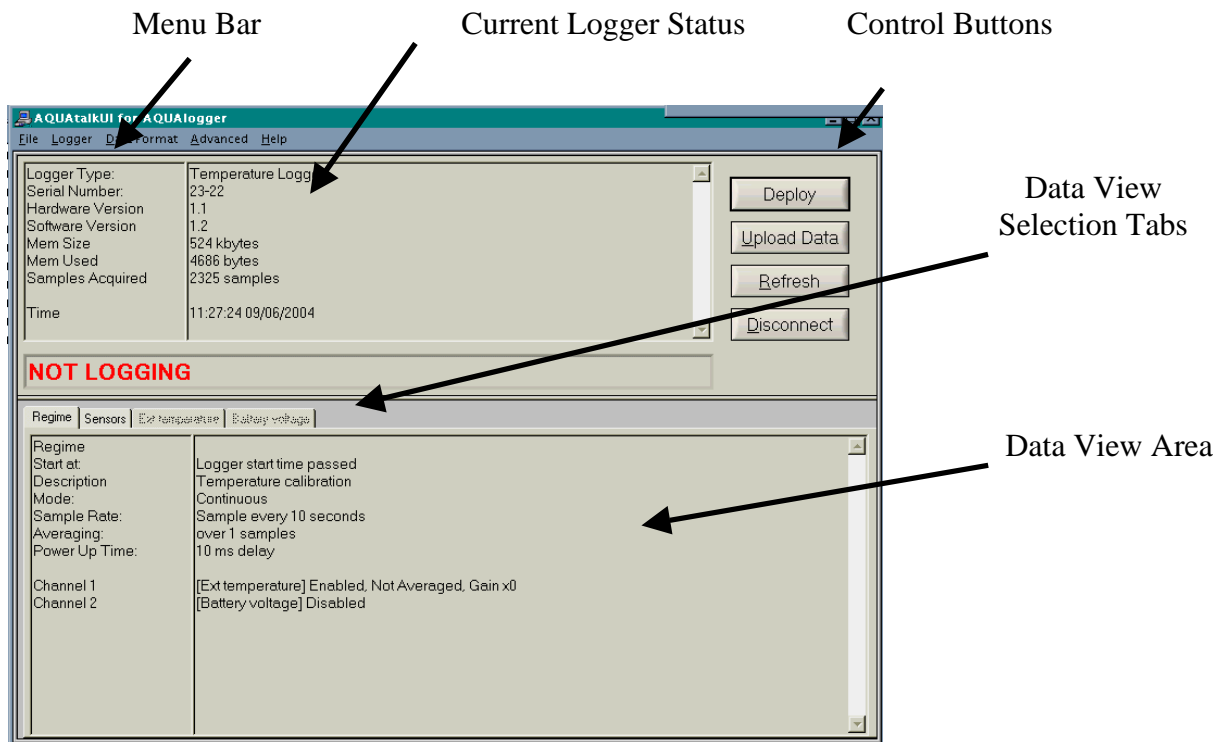


Figure 6 AQUAtalk Screen Layout (once connected to a device or demo file)

5.2 AQUAtalk Screen Sections

The sections of the screen are defined as follows:

- ❑ Current Logger Status – this holds all of the information about the current state of the logger. If the logger is placed in the reader while it is logging this information will be periodically updated in real time so the user can see the logger is operating.
- ❑ Control Buttons – these allow access to logger operations. On the screen after connection the buttons are:
 - ❑ Deploy – initiates the deployment wizard to initialise all logging parameters ready for the logger to be deployed.
 - ❑ Upload data – after the logger has been deployed the stored data is uploaded via this button and written to a user selected file.
 - ❑ Refresh – forces an update of all information about the logger.
 - ❑ Disconnect – once pressed all communications with the logger are stopped and the connection toolbar is restored.
- ❑ Data View Selection Tab – these allow different information about the logger to be displayed. The basic tabs are:
 - ❑ Regime – displays all information about the current setup of the logger.
 - ❑ Sensors – displays the current value of the logger channel(s). If the logger is not logging **all** channels (regardless of if they are enabled or not in the regime) will be acquired every 5 seconds. If the logger is logging the last set of samples acquired by the logger is uploaded every 5 seconds – only the channels enabled in the regime are updated – channels that are not enabled will have zero data and a gain of -1.

- ❑ Data channels tabs – each channel in the logger has a tab associated with it. When data is uploaded after a deployment, enabled channels will have their tabs become selectable so the graph can be viewed.
- ❑ Data View Area – each of the tabs have an associated screen to show the data selected. These have various formats dependent on the data being displayed.
- ❑ Menu Bar – provides access to the logging functions available from the control buttons and additionally access to advanced function
 - ❑ Logger – Calibrate – provides access to deploy the logger for a calibration procedure
 - ❑ Logger – Complete Calibration – provides access to allow a new set of calibration data to be calculated and downloaded to the logger
 - ❑ Data Format – Date Format – allows user selection of the data format used within the AQUAtalk program and in uploaded data files
 - ❑ Advanced – Update Logger Firmware – allows updating of the software in the loggers to provide future enhanced features. **This should ONLY be used under guidance from Aquatec.**
 - ❑ Advanced – Modify Logger Personality – allows access to the low-level descriptors in the logger. **This should ONLY be used under guidance from Aquatec.**

5.3 AQUAtalk Wizards

Setting of logger parameters prior to deployment is achieved via a sequence of wizard panels. Each wizard panel has the same basic functions:

- ❑ Help information: one or two lines of text are displayed on each panel to provide the user with guidance information about the current panel.
- ❑ Navigation buttons: the wizard details can be scrolled through using the 'BACK' and 'NEXT' buttons. At any time the user can exit the wizard with the 'CANCEL' button – no data will be written to the logger.
- ❑ Wizard controls: each wizard has its own set of controls to collect the required information from the user.

A typical wizard panel is shown in Figure 7.

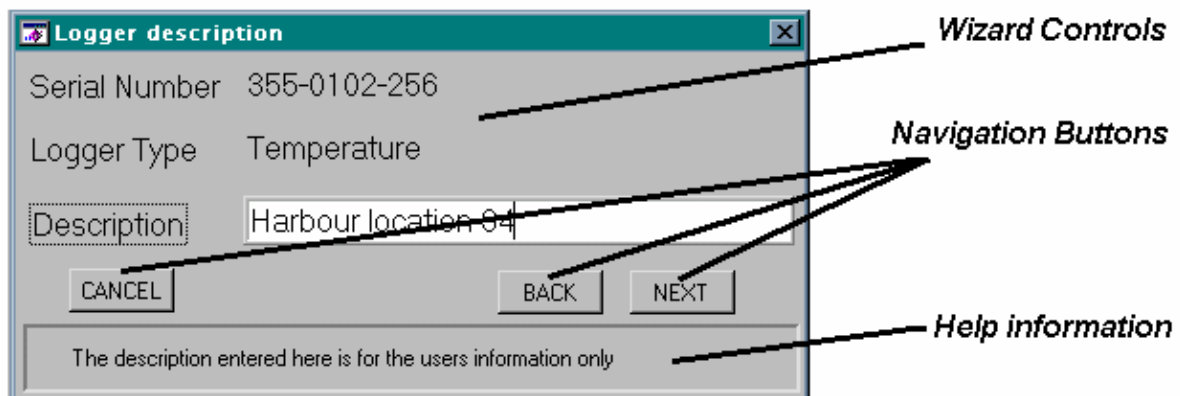


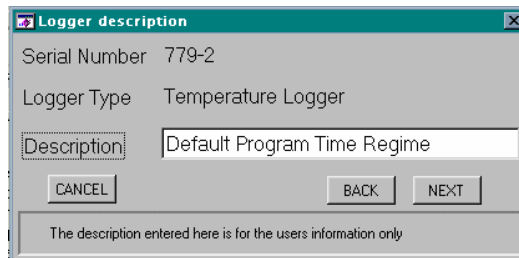
Figure 7 Typical 'Wizard' Panel

5.4 Deploying the logger

From the main screen click on the Deploy button to initiate the deployment wizard. The panels are as follows:

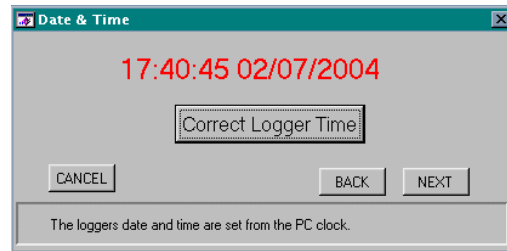
5.4.1 Logger Description

This is a simple 31 character (maximum) string solely provided to assist the user. This string is stored in the logger and can be read back at any time. It could be used to describe the location of the logger; the title of the experiment the logger was used in or any other description the user wishes.



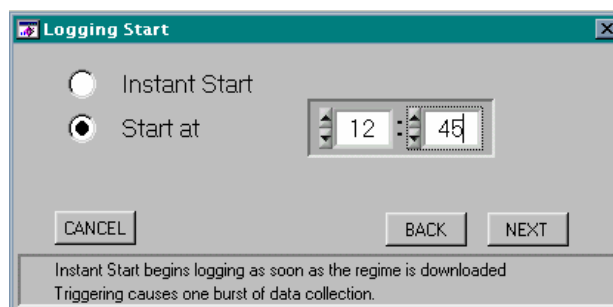
5.4.2 Date and Time

This panel allows the user to correct the PC real-time clock, if required. When the set-up information is downloaded to the logger, the PC clock is used to set the time of the clock on the logger. Therefore if the PC CLOCK IS WRONG THE LOGGER MAY NOT START LOGGING AT THE TIME THE USER EXPECTS IT TO. When deploying multiple loggers, it is recommended that they are all configured from the same PC (so they all have the same time to start off) or if multiple PCs are used, the user should ensure that all PCs read the SAME TIME. The time displayed is the current time read from the logger.



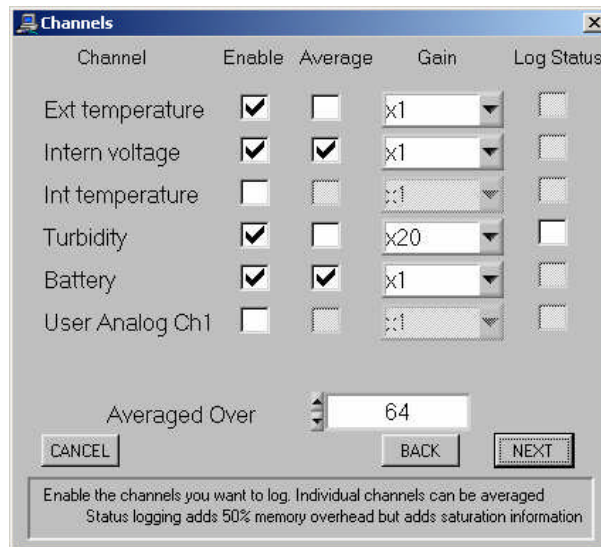
5.4.3 Logging Start

The logger can be started at any time within 24 hrs of being deployed. Alternatively it can be started 'immediately' from an Instant Start. An instant start will begin logging as soon as the wizard is completed. If the Instant Start is selected and the burst interval is set to minutes the logger will start on the next minute boundary (e.g. if the current time is 18:23:12 at the end of the wizard, the logger will actually start at 18:24:00) – the user will be informed of this.



5.4.4 Channels

It is possible to enable all or some of the sensors. Typically the logger will have a minimum of the main sensor channel (e.g. temperature) and a battery voltage channel. Channels can be enabled or disabled as required – disabling channels will reduce the data storage requirement, but disabled channels cannot be viewed in the real time sensor view after the logger has started logging.



(i) Channel Averaging

If the 'Average' check box for the channel is enabled then the channel will be averaged by the number of samples in the average over control. This will have no effect on the other channels.

(ii) Gain Setting

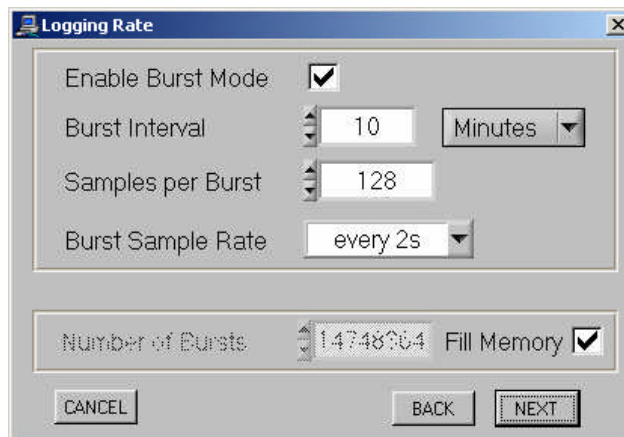
Channels that support multiple gain modes can have the gain set to a specific gain or switched to auto gain mode. In the Auto gain mode the logger will take a series of samples at the beginning of a burst to determine the best gain to be used for the whole burst. If in continuous mode the gain is determined at the start of each averaged data set.

(iii) Log Status

Some channels support status logging, which if enabled gives information about the gain used and whether the channel has exceeded a predefined threshold. This can be used when averaging data to determine if the sensor saturated during one of the samples in the averaged data set. Enabling status logging causes an extra byte each sample to be written for that channel. This is therefore a 50% overhead on the channel data requirement. In Auto gain mode the status logging is automatically enabled to store the gain value.

5.4.5 Logging Rate

The final panel controls the sampling rate for all the channels. The parameters are shown below:



The logger can operate in two modes burst and continuous. Burst mode is enabled by selecting the enable box, while continuous is used if this is not selected.

The software warns you if you define an invalid regime. This will be because either you have not made the samples per burst a multiple of the average over, or the time taken to collect the burst data is longer than the

burst interval. In continuous mode the sample rate will be limited by the sensor settling time in auto gain mode.

(iv) Burst Mode

Burst Mode – if this is selected then data is acquired in bursts with a time stamp for each burst. A burst can have multiple samples, or just one sample, but each burst has a time stamp in addition to the data – this produces an overhead in the amount of data required to store each sample, but allows the user to identify with confidence when each sample was taken. Each burst time stamp adds 12 bytes to the amount of data stored in the burst.

If any channel has auto gain enabled the gain is set at the beginning of the burst prior to writing the time stamp.

The burst interval defines the time between burst starts. The value can be in the range [1..255] and the time base is either minutes or seconds.

The number of samples per burst can be any number from 1 upwards, but the condition must be satisfied that the $(\text{Samples per Burst} * 1/\text{Burst Sample Rate}) < \text{Burst Interval}$, as this would mean the next burst would begin before the previous burst has completed. If auto gain is enabled then an additional time is required depending on the sensors settling time. The software warns you if you need to increase the settling time.

The Burst Sample Rate defines the frequency at which the samples in the burst are acquired – the software verifies this is met and will indicate if there is a problem.

The Number of Bursts parameter allows the user to stop logging after a defined number of bursts have been acquired. This can be useful if an application requires high rate logging over a short period – once the specified number of bursts have been collected the logger will stop logging and go to sleep. This can be useful in extending battery life and reducing the amount of data to upload. If the Fill Memory box is checked, the logger will log until the memory is full.

(v) Non-burst (Continuous) Mode

If the Enable Burst Mode is **not** checked the logger will run in continuous mode. This means that time stamps are not written and only one sample is stored per enabled channel per Burst Interval. In this mode there is not the data overhead associated with time stamps, so if logging is required for extended periods or short periods at high sample rates then this mode may be preferable.

You can define the number of samples that are collected or allow the logger to fill the memory. The number of samples should be a multiple of average over if fill the memory option is not used. The software will warn you if this is not the case.

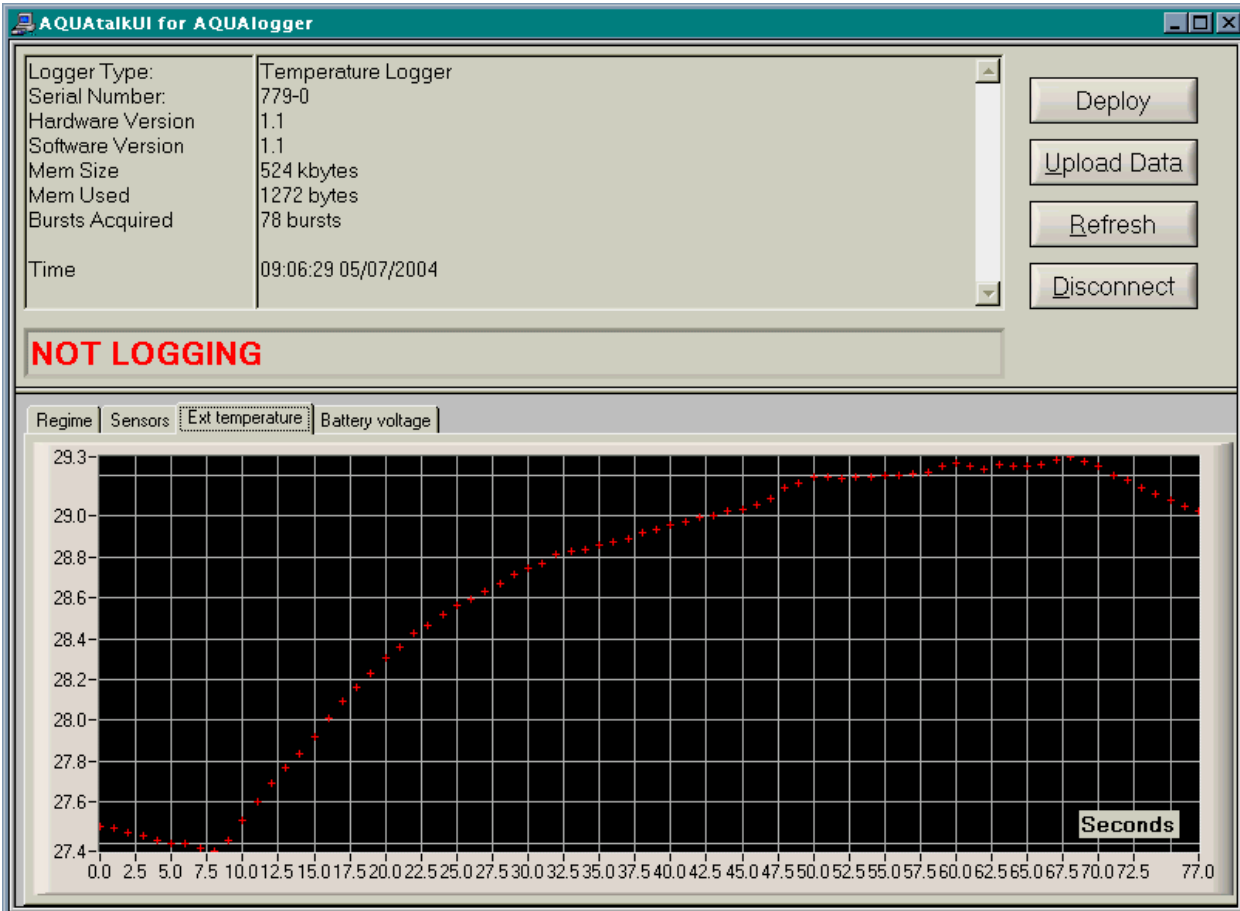
In continuous mode the gain is determined every sample or at the start of an averaged set (if the channel is averaged). This puts a limitation on the overall sample rate as the settling time of the sensor can be long. For example the turbidity sensor requires 1second to settle after a gain change. Therefore the maximum sample rate will be 5 seconds in auto gain mode.

5.4.6 Deployment

After the final channel selection has been made, the previous contents of the logger will be erased and the logger prepared for logging. If Instant Start has been selected, logging will begin as soon as the popup box closes – initialising the logger takes 5-10 seconds. **On completion of deployment the logger must be stopped by clicking on the 'Stop' button – otherwise the logger will continue to log even if it has been interrogated by the reader.**

5.5 Upload

Following a deployment logging must be stopped (if it hasn't stopped already) by clicking on the Stop button when the logger has been placed in the reader. The data can now be uploaded by clicking on the Upload Data button. This will prompt for a filename to store the data in and on completion the data for each enabled channel will be displayed under the corresponding channel tab in the data view section of the AQUA*talk* application:



A formatted .CSV file will be produced for direct import to any spreadsheet application.

5.6 Real-time View

The sensors tab of the AQUAtalk program allows viewing of the current state of the logger channels. If logging is not currently enabled, all channels will be sampled (approximately every 5 seconds) and the current value will be displayed. If logger has been started the real-time view will show the last sample set acquired by the logger as per the current regime – again this updates approximately every 5 seconds. As this updates as the logger regime, if channels are averaged they will update less often than unaveraged channels.

6. AQUAtalk Report Generator

6.1 Generating a New Report

To access the report generator, load the AQUAtalk for AQUAlogger software and from the menu bar select "Report->New Report->Blank". A file select popup will be presented. Select the *.bin file of the logger (created during the upload process) and click Load. The following screen should be presented.

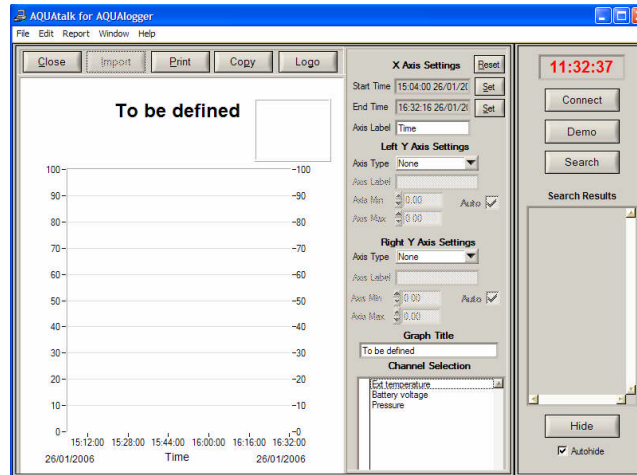


Figure 8 Blank Report Screen

6.2 Displaying Data on the Report

To add data to a report firstly choose a units value for either the left and/or right Y-axis using the dropdown boxes provided, then click on the channel you wish to display in the Channel Selection list box. Channels with the same units can be displayed on the same axis.

6.3 Axis Labeling and Scaling

To scale the y-axis manually, uncheck the Auto checkbox and manually enter minimum and maximum values in to the appropriate numeric controls. To scale the x-axis use the Set buttons to set the start and end time of the data to be displayed. The Reset button will reset the x-axis and y-axis scaling hence displaying all of the available data on the graph.

Labels can be added to each axis by typing into the Axis Label text control.

Add a title to the graph by typing in to Graph Title text control.

6.4 Additional Functionality

Clicking on the Logo button allows a logo (*.bmp format) to be displayed with the report.

Clicking on the Export Text button exports the current graph contents to a tab separated text file containing axis information followed by successive lines with the following template:-

| Timestamp | Data (left y axis) | Data (right y axis) |
|-----------|--------------------|---------------------|
|-----------|--------------------|---------------------|

Clicking on the Copy button copies the report the clipboard, from here it can be pasted into word processing software.

Clicking on the print button allows the report to be printed.

Clicking on the Close button closes the report.

7. AQUAlogger 520 Series System Maintenance

7.1 Introduction

This section covers the routine maintenance required for the AQUAlogger 520 Series.

7.2 Maintenance

The AQUAlogger 520 is housed in a two-part housing that can be opened to replace the battery – see Section 9.3 for the procedure. To maintain good performance the area around the temperature interface should be cleaned after each deployment. The logger should always be clean and dry before being placed in the reader.

After being deployed, the logger will continue to log until its memory is full, unless it is stopped. Normally the logging sits in a very low power 'sleep' mode. When the logger is logging at every sampling instant the internal electronics is powered up and places a relatively much higher drain on the battery, so the more frequent the sampling, the shorter the battery life. Logging is stopped when the logger is placed on the reader and told to stop logging with the Stop button in AQUAtalk application. Therefore, to get the absolute maximum life out of the logger:

- ❑ After a deployment stop logging as soon as possible
- ❑ When deploying the logger set the start time as close as practical to the start of the observation period.
- ❑ Never leave the logger logging when it will be sat on the shelf for extended periods.

Battery life is heavily dependent on the sampling regime employed – if the fastest rates are employed for every deployment, battery life will be SEVERELY REDUCED, so only sample as fast as is needed to observe the conditions present.

7.3 Deployment

Before deployment the battery voltage on the 'Sensors' view of the AQUAtalk screen should be observed. The nominal battery voltage of a lithium cell is around 3.6 volts – the reading should typically be between 3.5 and 3.7V. If the user enables the battery channel during deployment it will be seen that after logging has started the battery voltage will appear to fall – this will level off after a period, and is a characteristic of the lithium batteries used in the logger. When operating continuously (e.g. 15 minute logging) the logger battery should be expected to last for up to 10 years. If the battery does fail during a deployment, when the new battery is attached the regime and data should be retrievable from the logger.

8. AQUAlogger 520 System Packing, Handling, and Storage

8.1 Introduction

This section covers the requirements for packing, handling, and storing the *AQUAlogger 520 Series*.

8.2 Packing

When the *AQUAlogger 520 Series* is to be transported, it should be packed in such a way as to protect it from heavy impacts and sharp objects. Logger units should be protected from excessive shock (e.g. dropping onto hard surfaces).

8.3 Handling

The *AQUAlogger 520 Series* comprises delicate electronics. It should be handled with care. The pressure case should only be opened by suitably qualified personnel, observing the warning and instructions detailed in the following section.

8.4 Storage

The instrument may be stored in most environments, since it is waterproof. Care should be taken to allow it to acclimatise from cold or warm storage before opening in a laboratory environment. The user should ensure that logging has been stopped prior to storage for extended periods, to maximise battery life.

9. Parts Data

9.1 Introduction

This section provides information for all of the user changeable parts present for the *AQUAlogger 520* Series.

9.2 Piston Seal

Should replacements be required, these are available from Aquatec or any O-ring supplier. There are two parts for each of the two piston seals.

The O-ring, made from Nitrile, is a 19.1 mm x 1.6 mm O-ring manufactured by James Walker (part number 72-0191-16). The backup ring is a 19.1 mm spiral PTFE backup ring which is also manufactured by James Walker.

Both O-rings should be unscratched, clean from dust and debris and lightly smeared with silicone grease prior to closing the endcap.

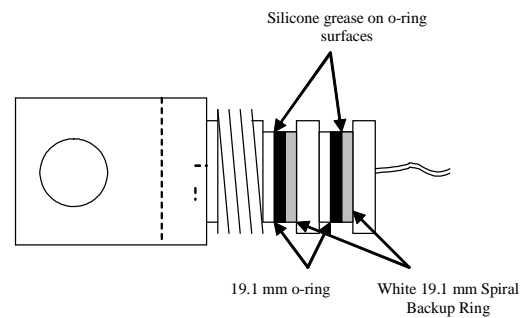


Figure 9

9.3 Battery

The battery is a lithium 'AA' size cell with flying leads – a suitable pack can be purchased from Aquatec. To change the battery the housing must be opened by holding the endcap and twisting the housing body – note the seal may be stiff so some force may be required. A small flat blade screwdriver is required to unscrew the terminal blocks on the PCB to disconnect the old and reconnect the new batteries. When fitting the new battery, ensure the battery is secured to the prongs sticking out of the PCB – this is to prevent the battery from twisting when the housing is closed. Refer to Section 10.4 for safety information when handling lithium battery packs.

IF IN DOUBT CONTACT AQUATEC.

10. Safety and the Environment

10.1 Introduction

This section highlights aspects of safety and effects on the environment.

10.2 Electrostatic Discharge

Components within the pressure housing are highly sensitive to damage from electrostatic discharge. Work should only be carried out on the open instrument in a static protected environment.

10.3 Pressure Cases

WARNING – Please follow the guidelines below when handling pressure cases:

- If a case leaks, it can prove hazardous when brought to the surface.
- If a hissing noise is heard, wait for it to cease before carefully opening the case.
- It is advisable to allow the cases to reach ambient temperature before opening.
- A cold case may have an internal pressure below the outside pressure which can cause water to be sucked in. Carefully dry the area near the endcap to be opened.

10.4 Lithium Batteries

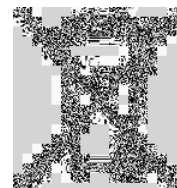
WARNING - Care should be taken when handling lithium batteries.

Do NOT under any circumstances:-

- Attempt to recharge
- Tamper with the assembly
- Heat
- Dispose of in fire
- Immerse in water
- Force discharge.
- Short circuit

10.5 WEEE Directive for Commercial Users

For commercial users of Aquatec products, at the end of product life, Aquatec will provide free recycling of all electronic equipment once the user has returned the equipment to an Aquatec designated collection point and where a replacement product is being supplied by Aquatec. Where a replacement product is not being supplied, recycling services can be provided on request at additional cost. A certificate of disposal will be supplied by Aquatec. Where national legislation dictates that other services should be offered, we will adapt our service to be compliant.



This service is offered in the European Union, Switzerland and Norway.

11. Fault Finding / Correction

11.1 Introduction

This section is intended to provide elementary fault diagnosis and rectification information. In the event that this does not provide a solution to the apparent problem, contact Aquatec with full details of the fault symptoms.

11.2 Possible faults

1. *The AQUAlogger reader has not been found by the AQUAtalk software*

- 1.1. Ensure the USB cable is plugged in correctly
- 1.2. Ensure the driver has been installed as per Section 4.2

2. *The AQUAtalk application responds with 'Logger not found' when logger is in reader*

- 2.1. If the last deployment was at a low battery voltage and was left for an extended period, the battery may have become flat. The RED communication LED will flash every time the logger transmits data to the reader – if this does not flash the logger is not receiving or transmitting data, which could indicate the battery is flat.

3. *Data upload is abnormally slow*

- 3.1. Data upload from a full logger will take around 9 minutes – **be patient**. If upload takes considerably longer than this check the following
 - 3.1.1. Ensure the area around the reader is clear of mains power and data cables
 - 3.1.2. If possible remove radio devices (mobile / cordless telephones) from the immediate vicinity

Appendix A Technical Specification

A.1 Logger Specification

| | |
|-----------------------------|---|
| Material | Black Delrin (acetal homopolymer) |
| Maximum depth | 1000 m, or twice pressure range if lower |
| Dimensions | 200 mm (7.9") long x 32 mm (1.3") diameter |
| Weight | 190 g (6.4 oz) in air; 41 g (1.5 oz) in water |
| Attachment | Single point attachment through mounting hole |
| Battery | 3.6V Lithium 'AA' Cell – User replaceable |
| Logging Lifetime | Typically 5 years, depending on regime |
| Data Storage | Non-volatile FLASH |
| Storage Capacity | > 250,000 parameter readings Option available for > 500,000 parameter readings |
| Data Retention | >10 years |
| Burst Sampling | Bursts every 1 – 255 seconds or 1 – 255 minutes |
| Within-Burst Rate | From 1 Hz to once every 30 seconds |
| Burst Averaging | Bursts may be averaged to a single data value |
| Logger Communication | Contactless inductive system via separate reader |
| Software | AQUAtalk for AQUAlogger (for configuration and download) |

A.1 Sensor Specification

| | Temperature | Pressure |
|----------------------|--|---------------------------------------|
| Sensor Type | Thermistor | Piezo-resistive Bridge, Absolute |
| Ranges | -2 to 30°C standard, others on request | 600 mBar ... 600 Bar available |
| Resolution | better than 0.0015°C | better than 0.005% full scale |
| Accuracy | ±0.05°C | typically better than 0.2% full scale |
| Time Constant | better than 5 seconds | N/A |

A.2 Product Identification

| | |
|-------------------------|--|
| AQUAlogger 520T | Std 1000m AQUAlogger without pressure (temperature only) |
| AQUAlogger 520PT | Std 1000m AQUAlogger with pressure and temperature |

Appendix B Data File Format

The AQUAlogger 520 Series exports data uploaded from the logger into a CSV file format for direct import into any spreadsheet. A typical file produced is shown below:

```

VERSION                               3
LOGGER TYPE                            Temperature Logger
LOGGER                                23-63                Temperature calibration
REGIME TITLE                           Mode                Interval                Samples          Per Sample Rate  Samples          Per
                                      Burst
REGIME                                  Continous Mode      10 seconds                1                0.1                1
[LOGGER CHANNEL 0] Ext temperature
COEFFS                                  112.84323          -0.007957464            2.86E-07         -5.47E-12         3.89E-17
AVERAGED                               No
GAIN MODE                               n/a
START TIME                             10:00:00 09/03/2004
STOP TIME                               16:37:08 09/03/2004
HEADING                                 Timecode            Ext temperature
UNITS                                   Timecode            Raw                    °C
BURSTSTART                             09/03/04 10:00      38244                 4.560319
DATA                                    09/03/04 10:00      37962                 4.940415
DATA                                    09/03/04 10:00      37972                 4.926936
DATA                                    09/03/04 10:00      37978                 4.918848
DATA                                    09/03/04 10:00      37980                 4.916152
DATA                                    09/03/04 10:00      37982                 4.913457

```

The first lines in the file contain all of the information to identify the logger – its serial number, description (entered at configuration time) if any, regime parameters and calibration coefficients. The rest of the information in the file is data from logging, and the fields are:

- ❑ **START TIME** – the time the logger actually started to log. On taking its first reading, the logger stamps the current time in it's real time clock into the logger data memory. This should always be the same as the time setup in the regime.
- ❑ **STOP TIME** – when the logger stops logging for any reason, the time is stamped into the data memory, so the user knows exactly when the last data was captured. Logging will stop when memory becomes full the logger is told to stop by the AQUA*talk* application.
- ❑ **TIMECODE** – this column is either extracted from the logger if burst mode is enabled (BURSTSTART identifier) or calculated by the AQUA*talk* application for each sample within a multi-sample burst or for all samples when burst mode is not enabled.
- ❑ **Data columns** – each enabled channel will have a raw and a calibrated column indicating the sample value at that time.

Appendix C NPT Pipeline Pressure Version

C.1 Mechanical Specification

| | |
|-----------------------------------|---|
| Material | Body - Black Acetal Homopolymer (DELFIN) End-cap – Stainless Steel 316 |
| Housing maximum depth | 2000m |
| Dimensions | 202 mm (8") long x 55 mm (2.2") diameter |
| Weight | 1120g (40oz) in air; 620g (22oz) in water |
| Pressure fitting | 1/4" NPT female pipe thread |
| Maximum sensor pressure | Sensor dependent (refer to delivery documentation) |
| M8 screw tightening torque | 12Nm |
| Other specification | See section A.1 for further details |

C.2 Connecting to Pressure Fitting

The pressure fitting is a 1/4" NPT female pipe thread. This is tapered and seals on the thread. PTFE or similar can be used to improve the sealing.

When connecting to the pressure fitting grip the stainless steel end-cap and not the Acetal body, turning the body will undo the housing and therefore stop the o-ring from sealing causing the logger to leak.

A 46mm spanner can be used to hold the end-cap securely.

Do not remove the M8 socket cap screws from the housing as these have been tightened to the correct torque.

DANGER: DO NOT USE AIR TO APPLY PRESSURE

C.3 Picture of Pipeline Logger





Declaration of Conformity

The underwater instruments and accessories

| | |
|--------|---|
| Type : | AQUAlogger 520T AQUAlogger 520P pp where pp is a pressure range AQUAlogger 520PT pp where pp is a pressure range AQUAlogger 520 Reader |
|--------|---|

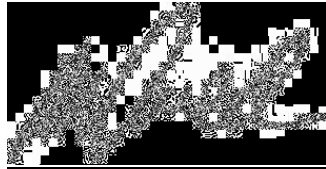
comply with the following EC directives:

| | |
|-------------------------------------|------------|
| Electromagnetic Compatibility (EMC) | 89/336/EWG |
|-------------------------------------|------------|

under harmonised norms:

| | |
|---------------------------|------------------|
| Electromagnetic Emissions | EN61000-6-3:2001 |
| Electromagnetic Immunity | EN61000-6-1:2001 |

This declaration ceases to be valid in the event of any change to the above apparatus that is not in accordance with Aquatec instructions or standards.

| | |
|-------------------------|---|
| Date: 20 September 2006 | Signature:  Aquatec Group Ltd Managing Director |
|-------------------------|---|