Sonardyne
SOUND IN DEPTH

OM-8295

Operation Manual for the AMT Monitor Software

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SECTION 1 – INTRODUCTION

1. Introduction

This Operations Manual describes the safe operation of the Monitor Software. The information and procedures within this manual are based on Sonardyne's experience and knowledge.

To make sure the safety of the installer and operator is maintained it is important that all Warnings, Cautions and Safety Section in this manual, and the Warnings, Cautions and Safety Section of any additional manuals are read and understood.

1.1 Related Publications

To make sure the system is operated safely, a Safety Manual is supplied with this User Manual. It is important the Safety Manual is read and understood before proceeding with any activity on the equipment.

The related publications are:

Table 1 – Related Publications

Publication	Title
Safety Manual	Safety Manual

SECTION 2 – SAFETY

2. Introduction

Before any activity is carried out using this software, it is recommended that the included Safety Manual and all Warnings and Cautions in this manual are read and understood.

It is recommended the operator complies with the Health and Safety Regulations applicable to the vessel and the region before operating this equipment.

Operators and service personnel must be familiar with the normal operating and safety procedures for Subsea Equipment.

The equipment documentation must be consulted whenever a ⚠ Warning symbol is found on the equipment, in order to determine the nature of the potential hazard and any actions which must be taken.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

SECTION 3 – TECHNICAL DESCRIPTION

3. Introduction

This manual is intended to provide users with guidance on the set-up and use of Sonardyne's Autonomous Monitoring Transponders (AMTs) for a range of subsea applications using the Monitor software.

Sonardyne recommends that all users attend a system training course to gain experience with the system and background knowledge of acoustic position and communication theory and practice.

3.1 Description

To provide flexibility of operation the Monitor software enables an AMT to be setup and operated by either a serial or an acoustic connection.

The AMT is an integrated acoustic position, communications and sensor platform based on Sonardyne's Compatt 6. It contains additional autonomous functionality enabling it to operate without human or system intervention, making it ideal for continuous long term monitoring without the additional requirements of a surface vessel or subsea ROV.

AMTs are synchronised to a common PC time, then programmed to carry out a pre-determined sequence of measurements for durations of many years if required. The data acquired can include range measurements (14 per cycle), sound velocity, temperature, pressure, inclinations battery usage as well as a range of custom sensors which can be interfaced as customer applications require. It is logged internally and time-stamped at acquisition; and can be retrieved without the need for a cable or recovery by ROV, via high wireless acoustic telemetry.

The AMT can be described as a long-life multi-sensor instrument, with integrated time synchronised data logger and acoustic modem.

Figure 3-1 – AMT

To configure, test and retrieve data from the AMTs, the Monitor software provides full control at every stage of the project and guides the operator through the set-up and diagnostics should problems arise.

The sequence of measurements or 'logging' regime' can be configured at surface or once the AMTs are deployed using the acoustic telemetry from the surface acoustic transceiver on the vessel 'dunker' or ROV.

The system can comprise:

Table 2 – System Components

A PC	
A HPT	
A Dunker 6 (including Cable Drum)	
Surface Interface Unit (SIU)	

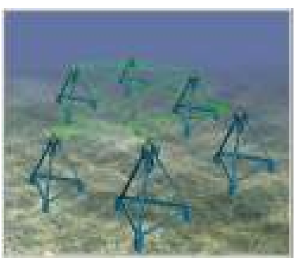
3.2 Operational Scenarios

The different operational scenarios for the AMT configuration are detailed below:

Tide Gauge

- Pressure
- Pitch & Roll
- Optional Release Mechanism

Long Term Environmental Monitoring



- Baseline distance
- Sound Velocity
- Pressure
- Pitch & Roll
- Battery Life

Structure Settlement

- Heading
- Pitch & Roll
- Pressure
- Baseline distance
- Sound Velocity
- Temperature

Pipeline Movement

- Heading
- Pitch & Roll
- Pressure
- Baseline distance
- Sound Velocity
- Temperature

SECTION 4 – INSTALLATION

4. Pre-Use Checks

Before operation of the AMT's can be carried out efficiently, various set up procedures must be carried out.

4.1 Time Synchronisation

The data logger inside each AMT has a real-time clock which is used to time stamp observations. To schedule the data with external events and to align data from multiple AMT's the clocks should be synchronised to a known and common time base.

The software uses the Greenwich Mean Time (GMT) from the PC that it is running on. It is therefore necessary to make sure the PC time is correct. The accuracy, with which the PC time must be set, is dependent on the accuracy of synchronisation required for the particular application and data post processing. If very accurate time synchronisation is required then an external source (e.g. GPS receiver or network time) can be used to automatically set the PC time.

Figure 4-1 – Date and Time Properties

If another time zone – such as Central America (GMT-6) is selected on the PC, the software will calculate GMT based on this.

Figure 4-2 – GMT Time Synchronisation

❶ GMT ❷ Calculated time

4.2 Installing the Software

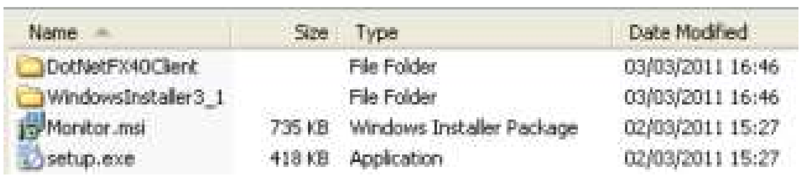
The Monitor software has been tested on Windows XP and Windows 7 operating systems. It is recommended that the designated computer is at least 1GHz processor and 1GHz RAM. The prerequisite Windows XP updates and .Net Framework 4.0 are on the installation CD and evoked automatically.

NOTE

Make sure previous versions of the software are removed using 'add and remove programs'. This manual covers the use of software version 1.0.0.130 onwards.

1. Open CD and double click on the setup .exe application.

Figure 4-3 – Setup .exe application



2. Once installation is complete an icon will appear on the desktop. Double click on icon to run the software.

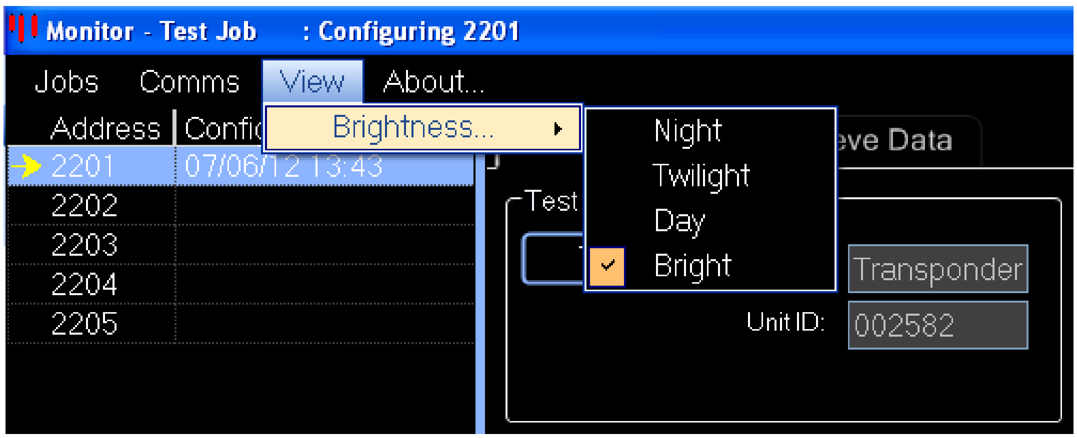
Figure 4-4 – Monitor Software Icon

4.3 Display

The software colour scheme is designed to provide a high contrast display for use in conjunction with a Sonardyne USBL tracking system. The dark background is to reduce unnecessary light on the ships bridge / survey control room.

The contrast can be changed using the 4 colour schemes.

Figure 4-5 – Brightness settings



Night

Twilight

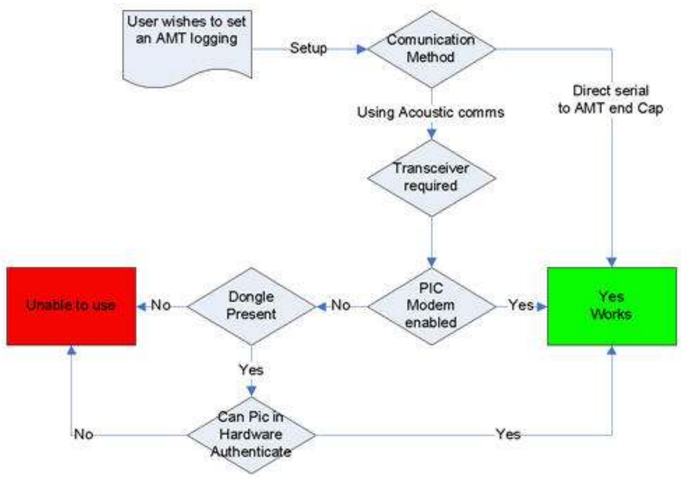
Daylight

Bright

4.4 Security

There are two controls of hardware functionality programmed at the factory at the time of purchase (transponder functionality and transceiver functionality). Should the equipment require upgrade, then contact Sonardyne for further details.

Figure 4-6 – Security flow chart

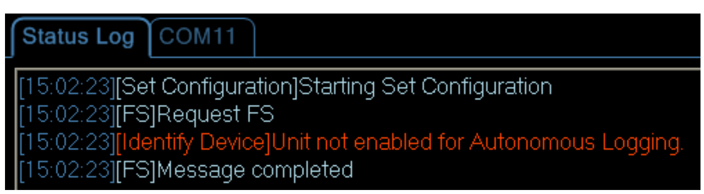


1. The Transponder functionality is controlled by an internal PIC Code.

Figure 4-7 – PIC Code for an AMT – Function Level 105A

If the transponder does not support the required operation then an error will be raised during the configuration process.

Figure 4-8 – Error during Configuration Process



2. The Transceiver functionality is controlled by an internal PIC Code

   If the transceiver does not support Modem functionality then a dongle can be used to authenticate the hardware and increase the functionality. If the user connects to a transceiver that does not have the required functionality and a valid dongle is not present, then the following message will be displayed:

Figure 4-9 – No Dongle

Once a dongle is inserted the test can be re-performed. If at any point during operation the transceiver resets, e.g. power failure, the test button can be pressed again to authenticate functionality.

Figure 4-10 – Error Message

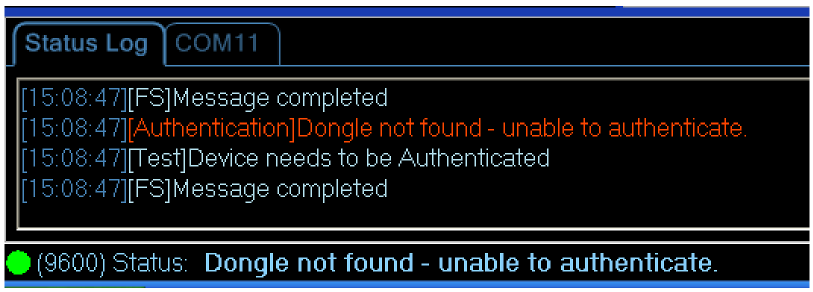
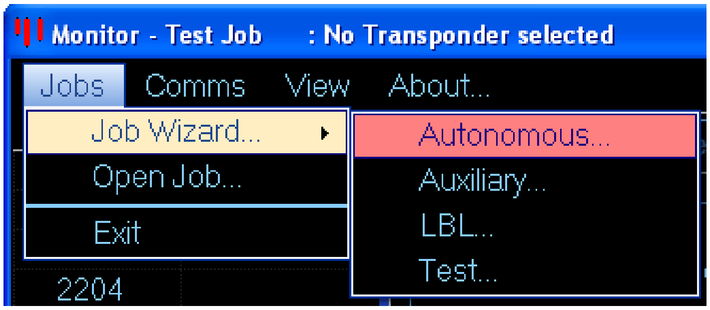


Figure 4-11 – Transceiver being activated by dongle

4.5 New Job Wizard

To guide the user through the correct initial configuration the job wizard will run a few questions to generate appropriate parameters for the operation. The user must choose a predefined template from the list. Custom templates can be created by Sonardyne for bespoke jobs. Template files appended *tpl.xml will be displayed in the drop down list if they are copied into the template folder.

Figure 4-12 – Job Wizard – Autonomous



Autonomous – Standard transponder logging job.

Auxiliary – Custom job using secondary modem port to download CPU memory.

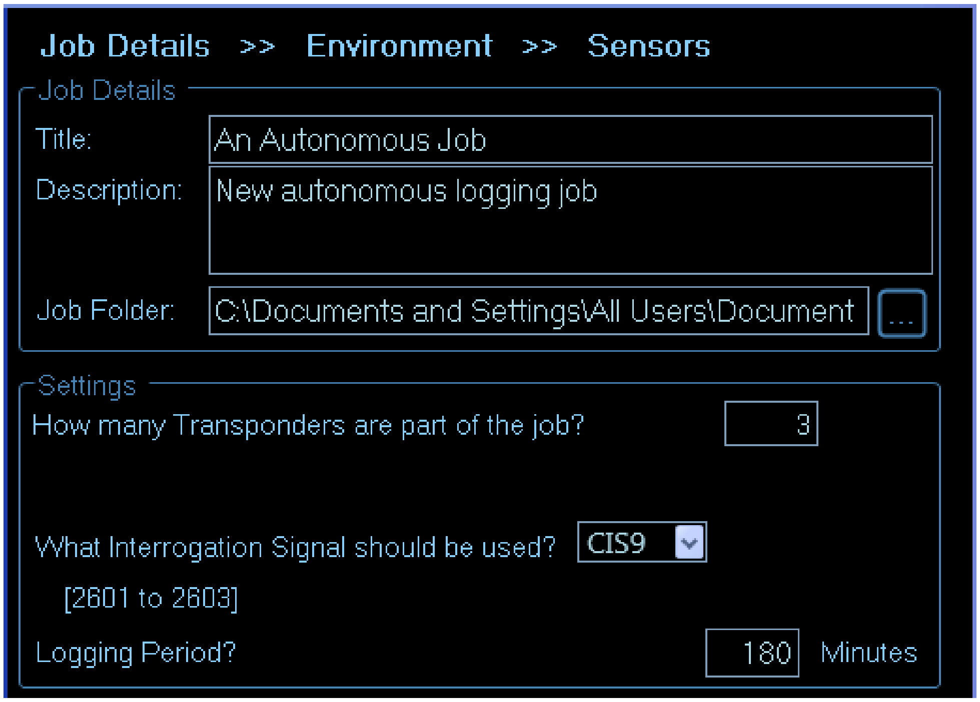
LBL – previously created custom job using an LBL.

Test – previously created custom job using a bespoke instrument.

4.5.1 Job Details

After completing the job details (title, description, job folder), set the number of transponders planned to be used within the job and adjust the default 'Logging Period' (in minutes).

Figure 4-13 – Job Details

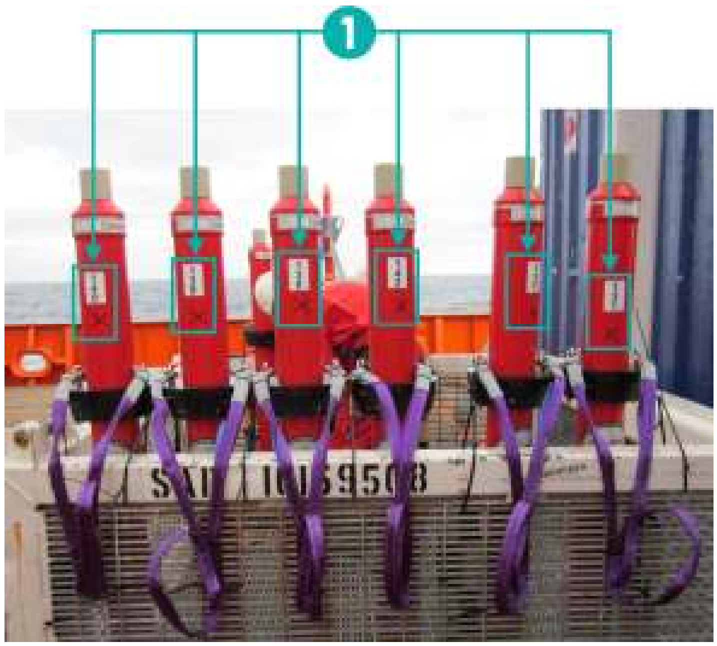


To avoid acoustic interference with other users, a different Common Interrogation Signal (CIS) between 0 to 14 is generated each time the job wizard is used. This can be changed if another system is already active or the user requires specific transponder addresses to be used. For simplicity the CIS is linked to the addresses of the transponders and summarised in **Appendix B**. The CIS is used only for applications requiring baseline ranges to be measured between AMT's and is therefore not used when only logging sensor data.

Irrespective of the factory set address on the transponder housing the software will re-programme the new addresses defined in the job. It is recommended the factory addresses are taped over and given a sequential number to avoid confusion during deployment.

If a unit requires swapping out, for one with a new battery, the software can clone a new unit from the job using the same address. It is important to clear the unique identity details of the old transponder from the job. This is done by right clicking on the address and clicking clear.

Figure 4-14 – Transponder Address Change



1 New Addresses

4.5.2 Environment

The next stage of the job wizard requires the expected operational environment the equipment will be deployed in. Knowledge of the AMT acoustic transducer type is required so the correct transmit power can be computed.

Figure 4-15 – Omni-Directional Transducer

Figure 4-16 – Directional Transducer

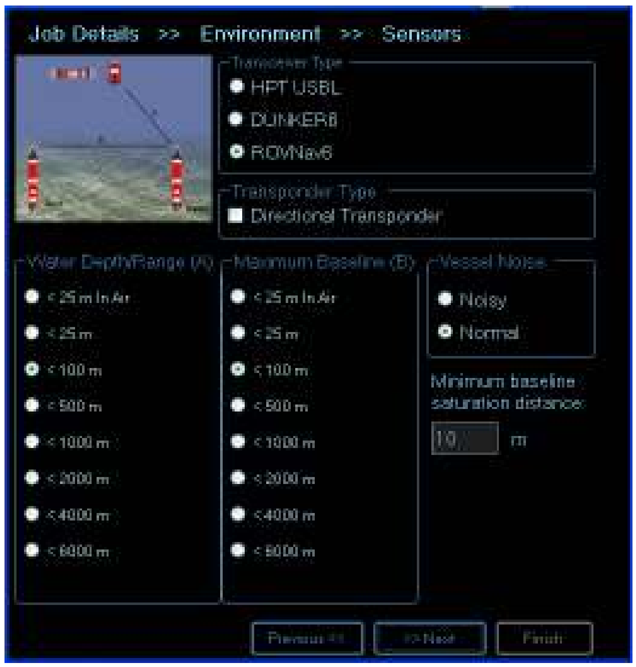
The approximate distances are required from the surface transceiver to the transponder (Water Depth / Range (A)) and distance between subsea transponders (Maximum Baseline (B)). The distance B is only applicable if baseline measurements are being made. If baseline measurements are not required then set the baseline to the same as the water depth range A.

If testing the system in air, set the units 30 cm apart preferably on foam mats.

NOTE

It is recommended not to use directional transponders for baseline measurements as energy is focused upwards rather than horizontally.

Figure 4-17 – Environmental Setup



The transponder has one receive gain control, therefore if working in deep water, but require a short baseline, it is possible the signal could become saturated which could result in irregular ranging. To help mitigate against this the software will provide the user with an estimated minimum separation value based on approximate signal attenuation figures.

NOTE

While testing in air the saturation distance in the software can be ignored because the equation uses the figures for water therefore still place the units 30 cm apart.

By indicating that a noisy vessel is expected the wizard will increase the telemetry transmit power by the equivalent of one range step for the AMT.

Noisy vessels are typically those with active thrusters (particularly variable near zero pitch propellers) and potential acoustic interference acoustic positioning systems (low frequency echo sounders etc.). Deploying the transceiver away from noise sources will improve the signal to noise ratio.

The range boundaries are designed to provide guidance on enabling signal detection without causing signal saturation.

Figure 4-18 – Distance between Transponders

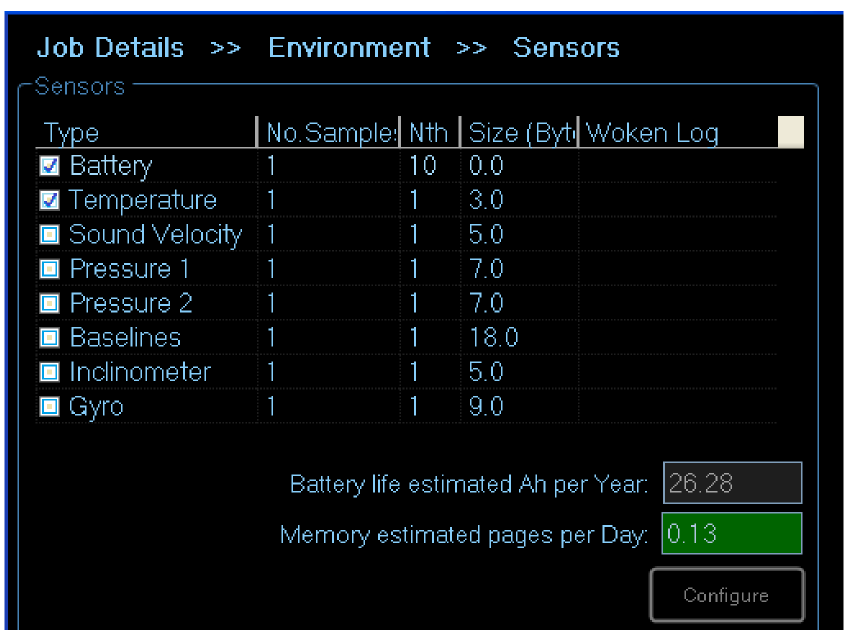
Further details on signal metrics are described in Appendix D.

4.5.3 Sensor Data Logging

During manufacturer the AMT is fitted with different sensors depending on the survey requirements during purchase. Please refer to the UM-8300 Wideband Transponder Manual for information regarding the end-cap. The label on the end-cap denotes what sensor has been fitted to the AMT.

The available sensors listed are dictated by the template used during the job wizard. When selecting the sensors, consideration must be given to the baseline usage and the directional requirements.

Figure 4-19 – Listed Sensors available



Advanced logging parameter information can be found in **Appendix A**. Features modified during the job wizard are applied to all beacons. If unique settings for each transponder are required then the same information can be accessed for each AMT on the main page once the job wizard is finished.

4.6 Battery Life

Battery life is a complex function dependent on a number of factors. These include:

4.6.1 Battery Pack Fitted

There are a number of different battery pack sizes and chemistry available, these include the following:

- Alkaline 40 x D cell (60 Ah)
- Lithium 40 x D cell (100 Ah)
- Lithium 70 x D cell pack (180 Ah)
- Double Lithium 80 x D cell (200 Ah)

Other battery packs are also available.

4.6.2 Sensors Selected

Sensors are maintained in a low power state and only powered up for a short period of time when the measurements are being made. Some sensors require longer periods of being powered to make sure the sensor is stable before measurements are made.

NOTE

The greater the number of sensor samples selected the shorter the battery life will be.

4.6.3 Ranges Measured

The greater the number of ranges measured to other AMT's, the shorter the battery life due to the number of transmissions made, and the greater the amount of data that needs to be sent by acoustic telemetry. The higher the acoustic source level used during baseline measurements the shorter the battery life.

4.6.4 Memory Used

The greater the amount of data acquired, the greater the amount of battery needed for transmission of that data. Equally, the type of acoustic telemetry used – dependent on the acoustic transceiver or dunker used from the vessel or ROV – effects the battery used to transmit the data. Less battery energy is required to transmit data at the highest data rate (less time taken) but this is only available on the HPT.

4.6.5 Transmit Power

Increased separation between acoustic devices requires an increase in signal transmit powers resulting in more energy consumption.

Distance between acoustic devices <2000 m = Low

Distance between acoustic devices >2000 m = High

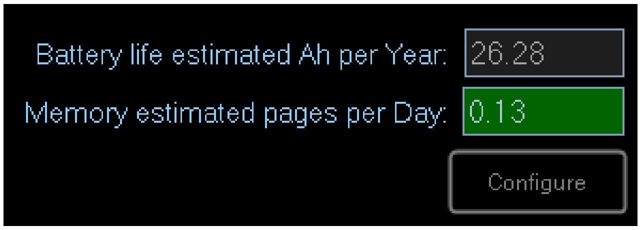
4.6.6 Water Temperature

Battery capacity is also affected by water temperature. The complexity of this means the software provides a best estimate of total battery capacity that will be required. The logging regime can be modified if this exceeds the battery capacity.

4.6.7 Excessive Software Logging

The software will indicate if the logging regime is considered excessive. However if an HPT transceiver is being used, the data can support speeds of 6000 bps, see **Appendix C**.

Figure 4-20 – Example of Ampere per Hour Estimation



Refer to **Figure 4-20** – the number of ampere hours required per year is shown as 26.28 Ah. This means an Alkaline 40 x D cell (60 Ah) pack would last an estimated 26 to 27 months including the energy required to telemeter the data to the surface.

Once the operator is satisfied with the logging regime selected, press **Finish** on the software.

SECTION 5 – CONFIGURATION

5. Introduction

Configuration of an AMT using the Monitor software can be done either serially or acoustically.

To reduce and remove any risks during deployment, it is recommended the AMTs are pre-configured and tested prior to deployment using the cabled serial interface.

Refer to the AMT manual to identify any safety warnings on the equipment.

5.1 Connecting the Dual Test Lead (820-6713)

Use the following instructions to connect the Dual Test Lead (820-6713) to the AMT.

1. Using the special tool, remove the protective cover from the Dual Serial Cable connection on the end-cap.

Figure 5-1 – Remove the Dual Serial Cable Connection Cover

1 Special Tool   2 Connector Cover

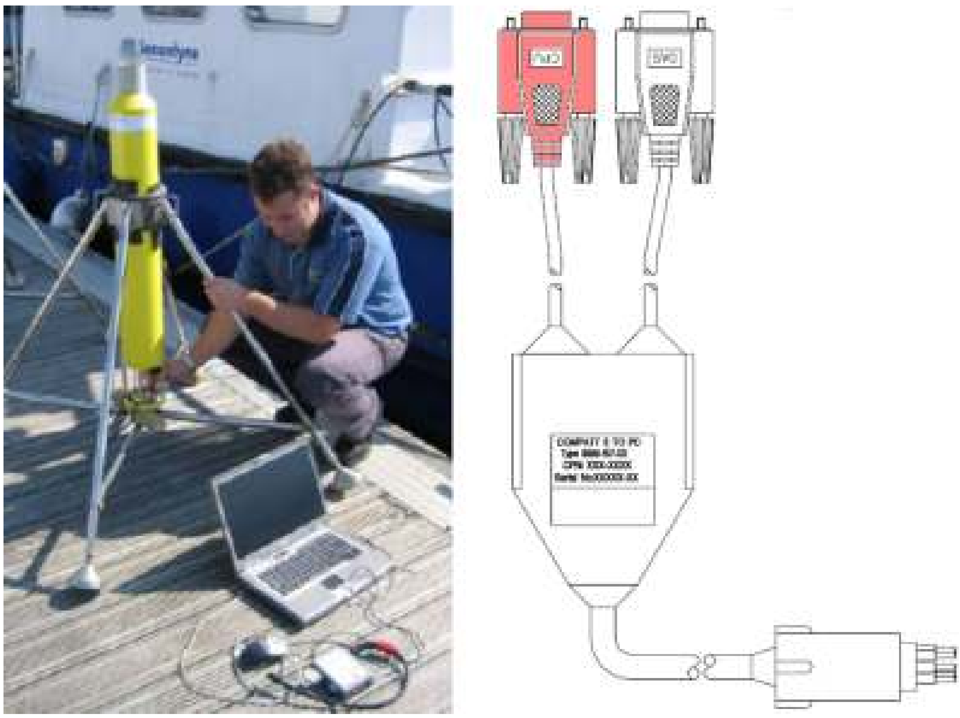
1. Check the connection point is clean and clear of obstructions.
2. Position the Dual Serial Cable in the correct orientation and insert into the connection point.
3. Secure the Dual Serial Cable in place by screwing in the red protective cover.
4. The other end of the Dual Serial Cable has a CPU and DAS connector.
5. Connect the CPU lead to an RS232 comms port on the PC.

5.2 Serial Configuration

To serial configure the AMT proceed as follows:

1. Make sure the Dual Test Lead is connected correctly, refer to **5.1 - Connecting the Dual Test Lead (820-6713)**.

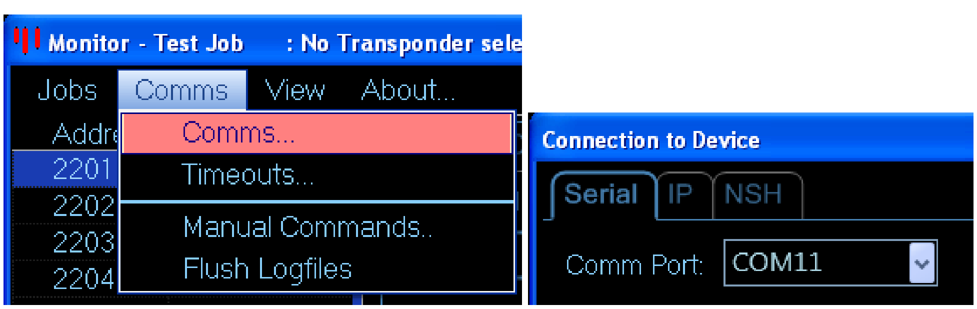
Figure 5-2 – Dual Serial Cable (820-6713)



2. Open the Monitor software by clicking on the icon.

3. From the Comms tab select the **Comms** setting to allocate the correct port. The baud rate is automatic and obtained by the software during the test sequence.

Figure 5-3 – Comms Settings



4. In the **Connection to Device** window, select the correct **Comm Port** from the available list.

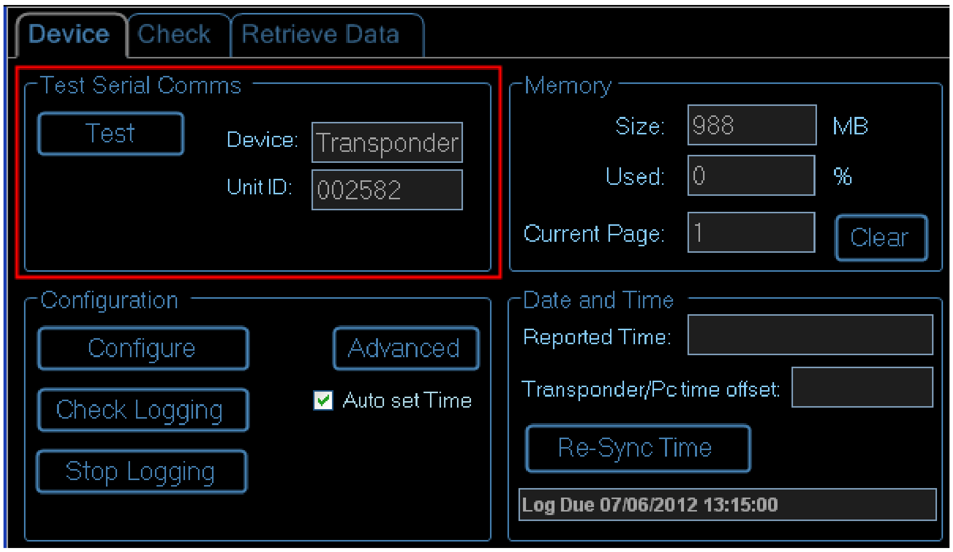
5. Click **OK** to revert to the Device tab and proceed with the configuration.

5.2.1 Device

5.2.1.1 Test Serial Comms

1. On the **Device** tab click **Test** to connect to any Sonardyne 6G instrument attached to the previously selected Comm Port.

Figure 5-4 – Test Serial Comms Test Option



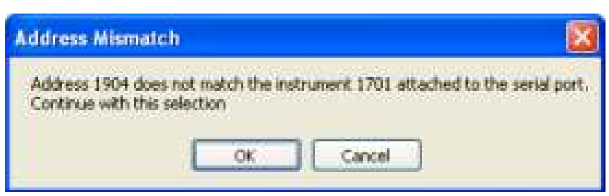
2. Successful connection will populate the **Unit ID** field. Confirm the AMT Unit ID label matches the Unit ID on the software.

3. If at any point the instrument is changed on the serial port, then press **Test** again to verify the connection device.

4. If a transponder is detected, then serial set up will be permitted. If a transceiver is detected the setup will be via acoustic telemetry. Refer to **5.3 - Acoustic Transceiver Configuration**.

5. If the address on the transponder does not match the selected unit, an **Address Mismatch** warning will be displayed.

Figure 5-5 – Address Mismatch



6. This gives the option to continue and change the address or select another from the list.

7. Selecting **OK** will change the units address; pressing cancel will permit the user to choose an alternate address.

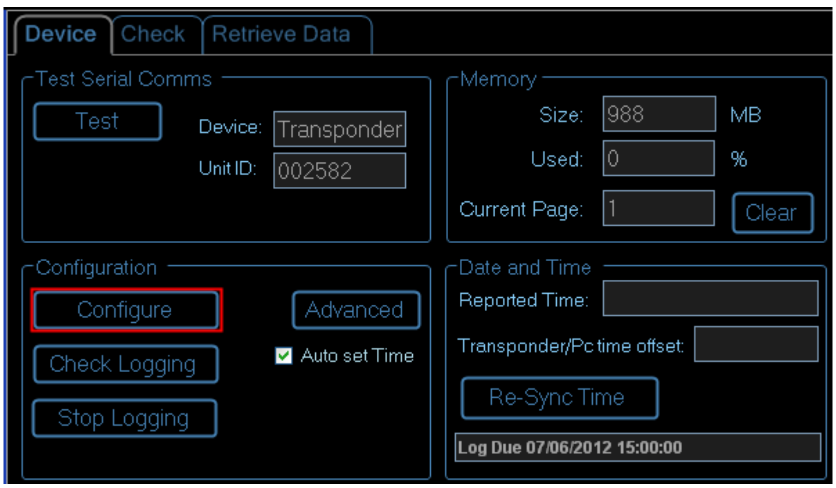
5.2.1.2 Configuration

1. On the Device tab, press **Configure** to program the job settings into the transponder. Refer to **Figure 5-6**.

NOTE

It is advisable the user makes regular synchronisation of the PC clock to GMT. To bypass clock synchronisation of the AMT to the PC, the Auto Set Time check box should be unselected. This may be useful if the user needs to program a new logging regime but does not alter the AMT internal clock.

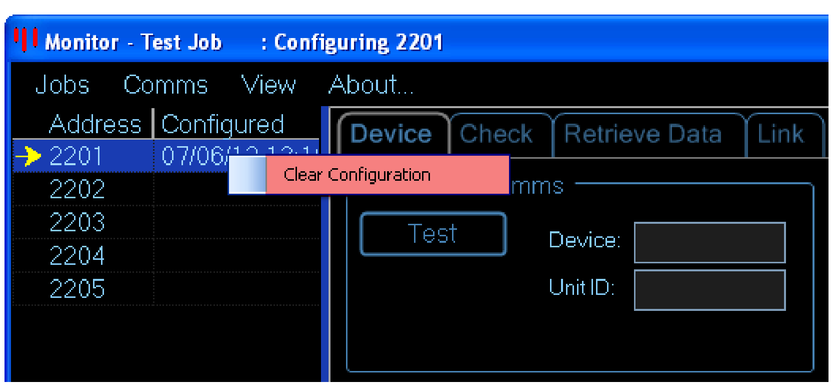
Figure 5-6 – Configure the Job Settings



2. Once the configuration is sent through the serial connection to the transponder, the additional information will be populated and confirmation of clock synchronisation will be shown.

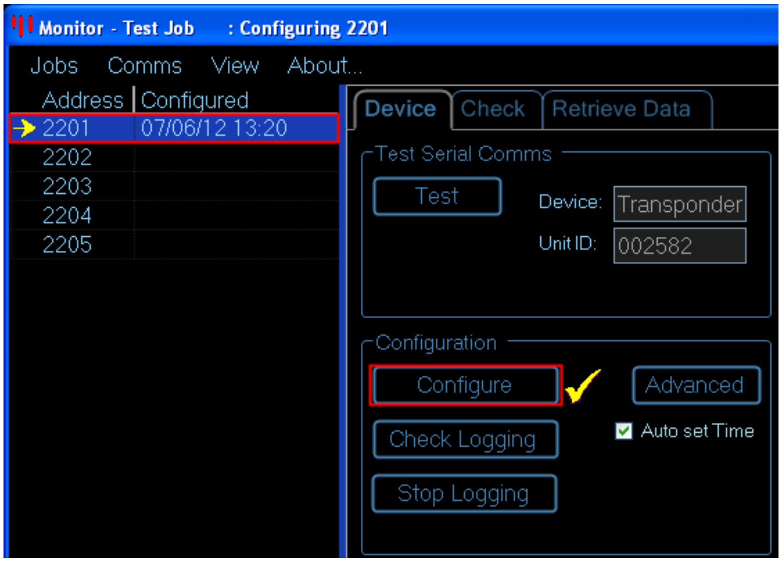
3. The transponder unique identity information is stored in the job to prevent duplication of addresses in the field. If a mistake is made or a clone of an existing unit is required, the information can be cleared from the database by right clicking on the specific address and selecting **clear configuration**.

Figure 5-7 – Clearing Configuration



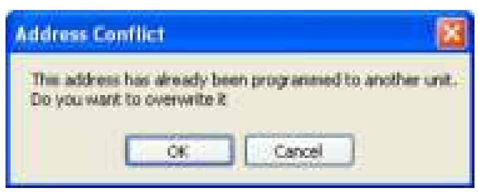
4. Once configuration of the transponder is complete, a tick will appear next to **Configure** and a time stamp will appear next to the address to help identify which transponders are already programmed.

Figure 5-8 – Complete Configuration



5. If the user tries to reprogram 2 units to the same address a warning will be given. If a clone is required then click **OK**.

Figure 5-9 – Address Conflict



6. The process can be repeated for each transponder or reprogram with advanced settings - **Appendix A**.

7. Make sure **Test** is pressed each time a different transponder is connected, otherwise the software will revert to the selected address that has the Unique identity associated

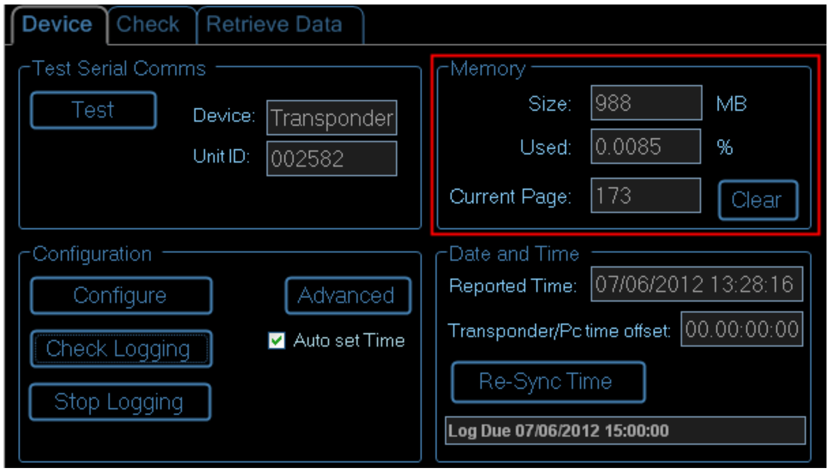
5.2.1.3 Memory

The 1GB memory capacity far exceeds that required to log every sensor at 5 minute intervals. The unit has enough memory for 2 million pages which is over 50 years at this rate. To recover 1GB of data at the fastest telemetry scheme 5 (refer to **Appendix C**), with an HPT, would take 20 days to recover. This emphasises the importance of choosing the appropriate logging regime for a long deployment job.

When connected via serial or acoustic link it is possible to clear the memory card. Although the bookmark capability helps prevent users downloading the same data twice it is good housekeeping not to have data from an old survey.

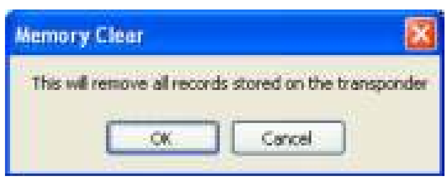
1. Navigate to the Device tab for clearing the memory.

Figure 5-10 – Memory used following months of data collection



2. In the Memory section, press **Clear** to clear the memory. A **Memory Clear** confirmation window will appear.

Figure 5-11 – Memory Clear



3. Once a clear has been carried out, check the **Current Page** has returned to 1.

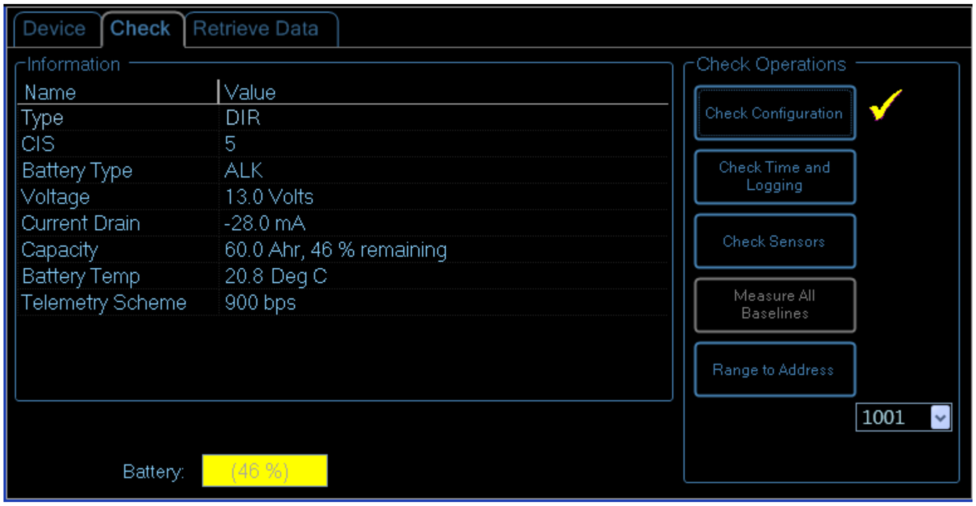
5.2.2 Check Set Up

After configuration is completed, the operator can check the AMT configuration directly via the serial port or through the water via acoustic telemetry.

5.2.2.1 Check Configuration

Selection of the **Check Configuration** button will confirm the settings sent to the transponder agree with those held in the job database. Battery information is also displayed as part of the check configuration; deck check using Wideband Test Terminal also captures this information.

Figure 5-12 – Check Configuration



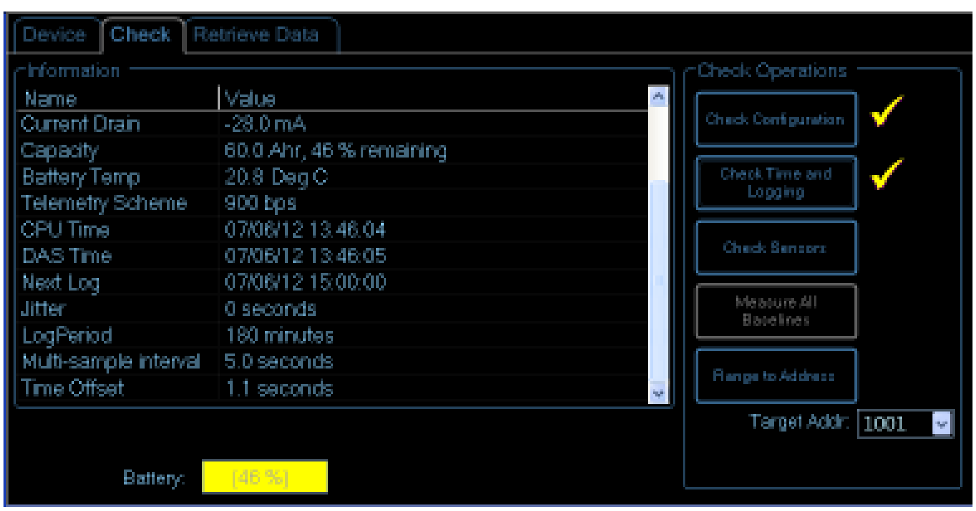
5.2.2.2 Check Time and Logging

Selection of the **Check Time and Logging** option will indicate if the PC clock has drifted or the AMT has not had the time originally set since battery reconnection.

NOTE

The AMT has 2 clocks; one in the Digital acquisition system where sensors are logged (essential to operation) and another in the central processor unit. Both times are displayed during the check time process.

Figure 5-13 – Check Time



5.2.2.3 Check Sensors

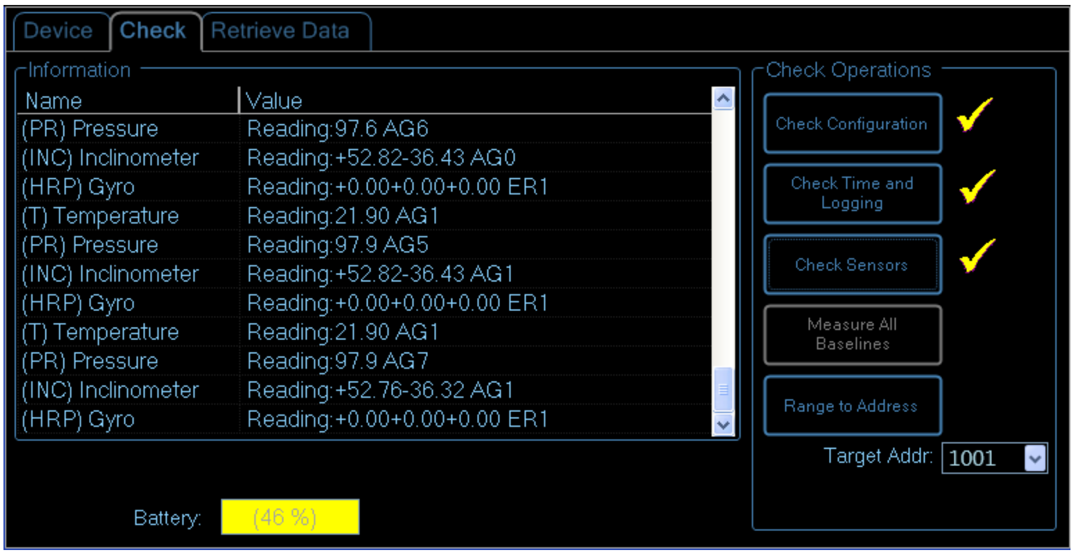
The **Check Sensors** option will initiate acquisition of sensor data and display the results. As some sensors have long warm-up times (>20 seconds) it is advisable to limit operation of this button.

ER1 at the end indicates old readings.

AG2 is the age of the reading in seconds

Make sure when recording observations the age (**AGXX**) is displayed.

Figure 5-14 – Check Sensors



It is important to confirm the 'as-laid' sensor data and that the transponder is communicating correctly prior to a long-term operation. Additional diagnostic signal information is reported at this stage which is not available in the logged data.

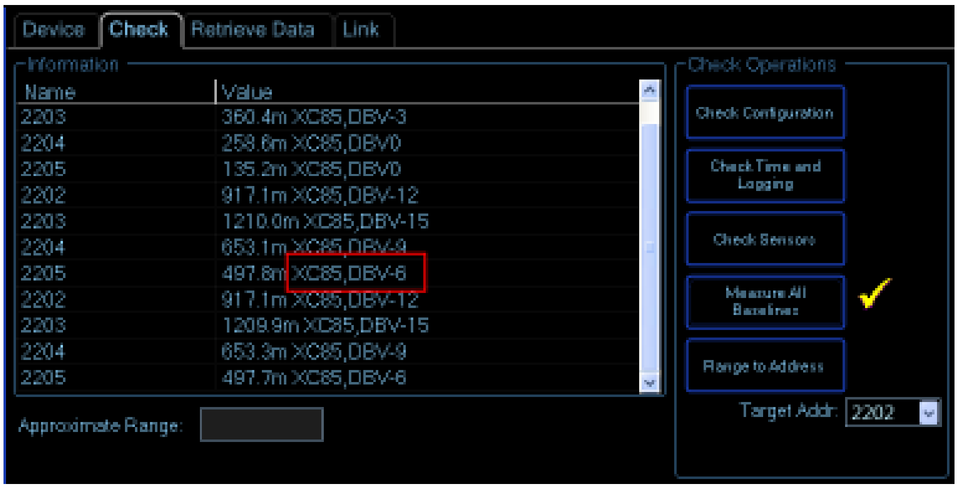
The baseline signal quality and level when ranging between transponders should be cross checked against the table in **Appendix D**.

5.2.2.4 Measure All Baselines

The **Measure All Baselines** is greyed out when serially connected due to functionality restrictions.

During acoustic mode this button will request the particular transponder to range to all programmed neighbouring transponders and report the ranges.

This ranging process is conducted using the Common Interrogated Signal (CIS). Signal metrics are displayed for each range which can be quantified using **Appendix D**.



NOTE

The tick indicates receipt of at least one signal from the commanded transponder. It does not indicate receipt of validation from all neighbouring transponders. If there is no reply from any transponder a tick will not be indicated.

5.2.2.5 Range to Address

Verify the ranging to one unit and confirm a valid response. Any target address can be used including the transceiver. The range is individual so only the specific requested address will respond to the signal. This is a useful function when testing the system on deck prior to deployment as any address can be typed in the box when using direct serial connection to the AMT. On deck using direct serial OK is displayed whereas once deployed a single range will be quantified with signal metrics and an approximate range based on the Sound velocity entered.

Figure 5-15 – Range to target address using direct serial

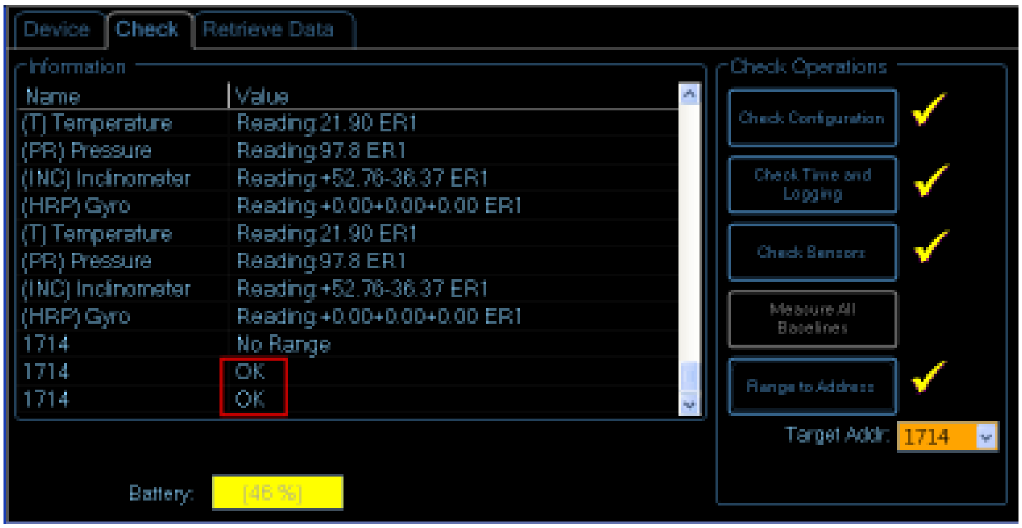
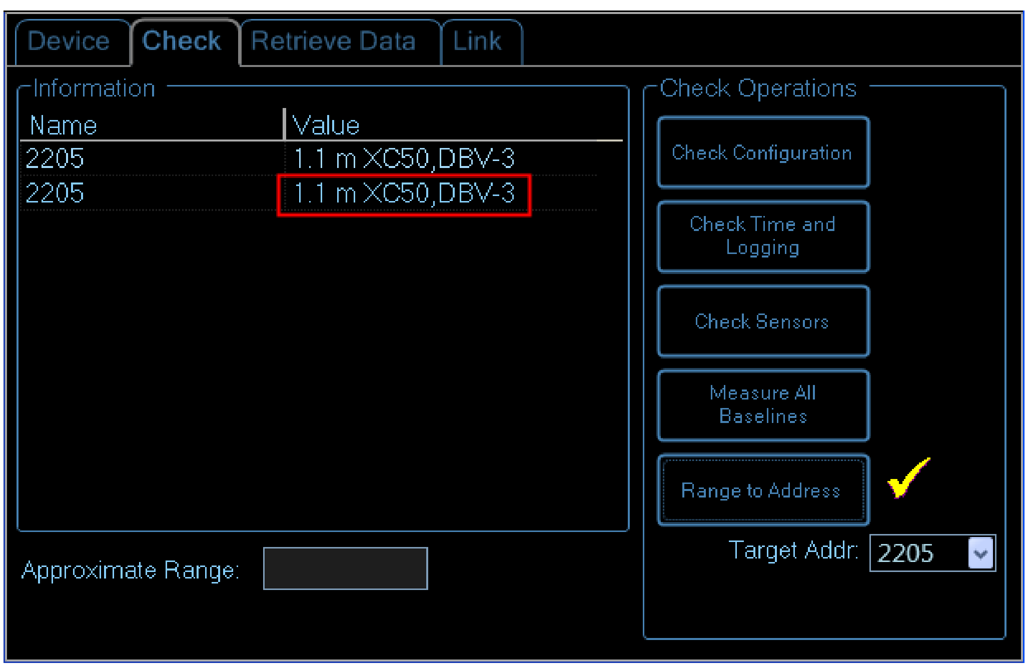


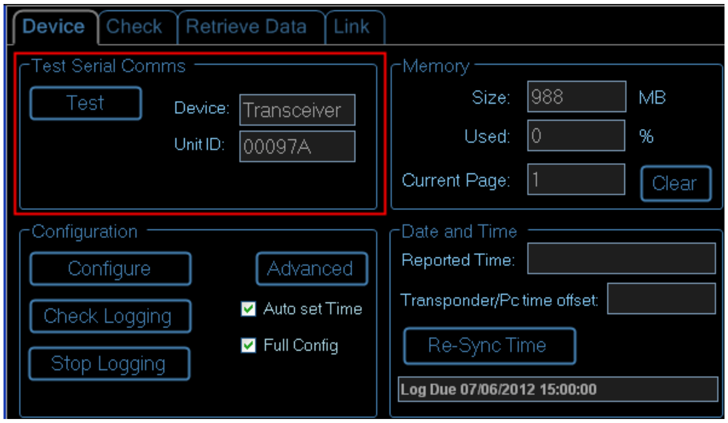
Figure 5-16 – Range to between transponders



5.3 Acoustic Transceiver Configuration

All configuration of the AMT can be carried out acoustically via a transceiver. If a transceiver is connected to the PC, press **Test** to reset and initialise the transceiver to the appropriate configuration.

Figure 5-17 – Transceiver Configuration Test



NOTE

Acoustic connection to the AMT will create a new link tab.

It is advisable to set the transceiver baud rate to 38400 to reduce congestion between the modem data transfer and the upload process.

1. After a connection to a transceiver is confirmed, check the detected baud rate at the bottom left of the window.

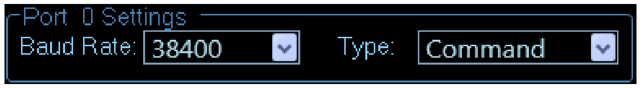
Figure 5-18 – Check Transceiver Baud Rate

2. To change the baud rate the instrument is using, open the **Link** tab then press **Advanced**.

Figure 5-19 – Advanced Option

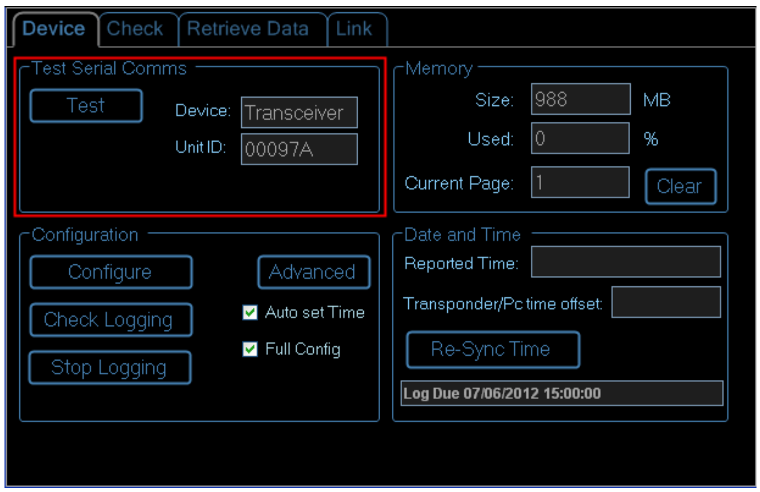
3. In the Port 0 Settings, select a baud rate of 38400, then press **Send**.

Figure 5-20 – Selecting Baud Rate



4. After changing the baud rate, it is important to press **Test** to establish the new connection. The parameters determined by the template and job wizard will be sent to the transceiver upon reboot.

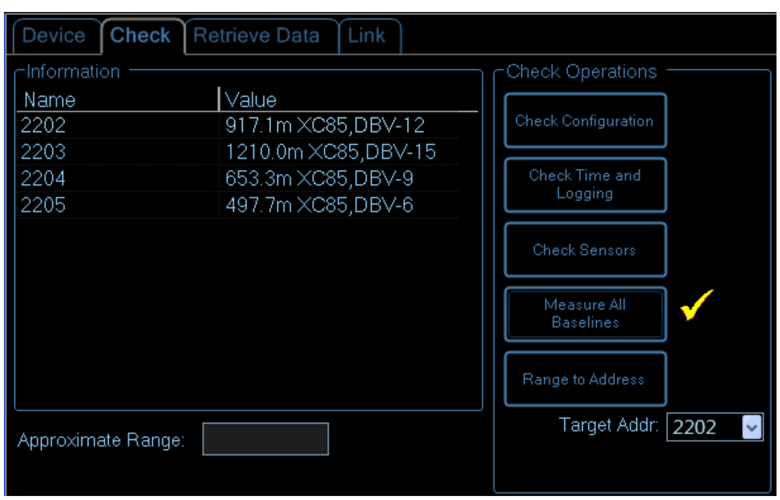
Figure 5-21 – Establish New Connection



5.3.1 Acoustic baseline checks

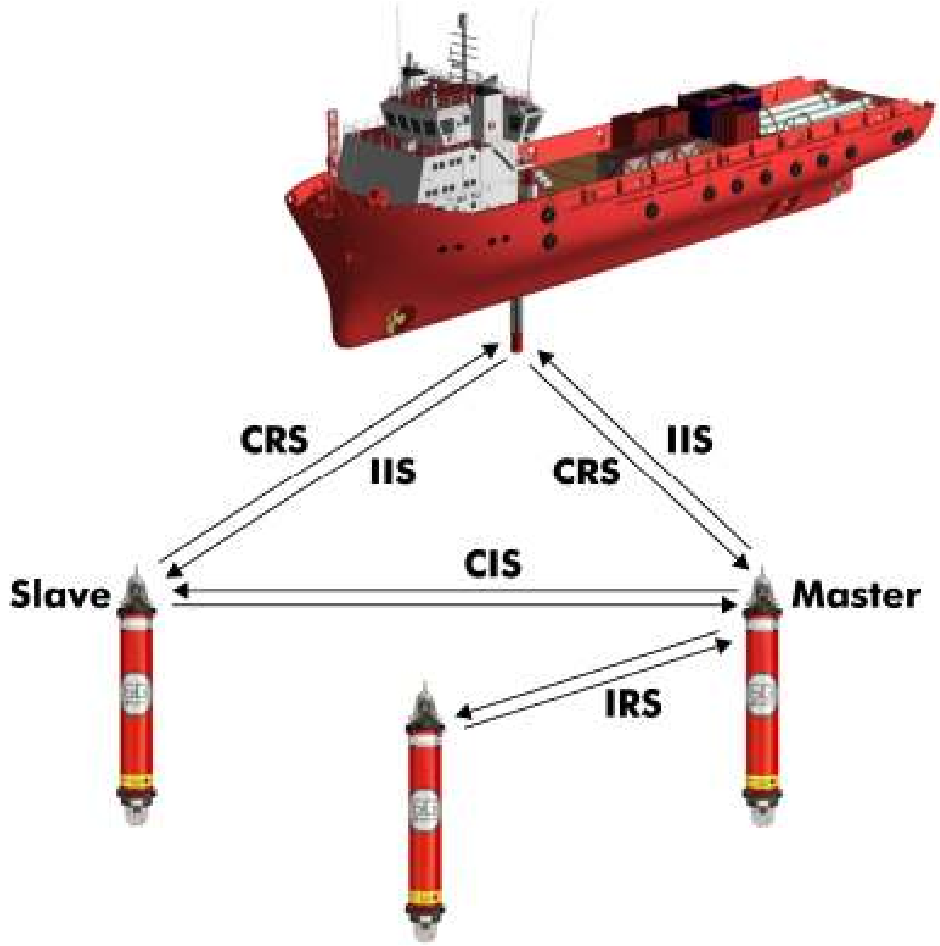
As the system is connected to a transceiver, the **Measure All Baselines** option will now be available on the **Check** tab.

Figure 5-22 – Measure All Baselines



Before leaving a system logging baselines it is paramount the gains are checked using the **Measure All Baselines** button. If this fails it is likely the unit will continue to fail when running autonomously.

Figure 5-23 – Summary of Acoustic Ranging between Master and Slave Transponders



IIS	Individual interrogate signal (Range to address)
CRS	Common reply signal
CIS	Common interrogate signal (Measure all baselines)
IRS	Individual reply signal

This could be because of indirect line of sight, signal saturation or clashing replies with another transponder. Sonardyne can provide advice on array planning which should be conducted well before the deployment.

5.4 Transceiver Communication using a Navigation Sensor Hub (NSH)

If a transceiver is used in conjunction with another Sonardyne system then the connection must be made using an Ethernet to permit access to both systems. It is important the software such as Marksman or HPT Terminal are already connected and communicating with the transceiver before running the Monitor software.

Monitor will capture the Ethernet comms and run alongside other software. It is important the other software is not trying to communicate at the same time as data retrieval. This is achieved in Marksman by selecting ‘Disabled’ under the transceiver settings.

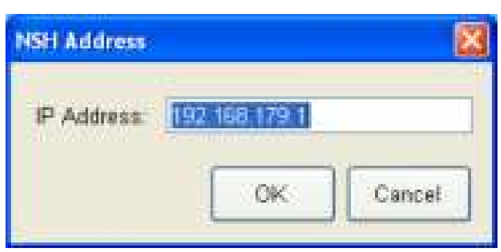
Figure 5-24 – Disable Transceiver Setting in Marksman

1. From the Monitor home screen, select **Comms**, then **Use NSH** from the list.

Figure 5-25 – Select Use NSH

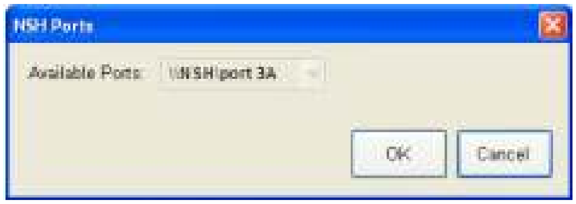
2. From the NSH Address window select the corresponding NSH **IP Address**.

Figure 5-26 – NSH Address



3. Under comms, select the appropriate NSH port that has the transceiver connected, e.g. 3A. This will be the same connection as the other software also running on the PC.

Figure 5-27 – NSH Ports



4. After connecting to a valid instrument click **Test** to check the transceiver connection and automatically configure it to the correct settings specified in the job.

5. If problems are experienced, it is possible to connect to the same NSH IP Address using HyperTerminal and typing Port. This will list the available ports and verify the Ethernet connectivity.

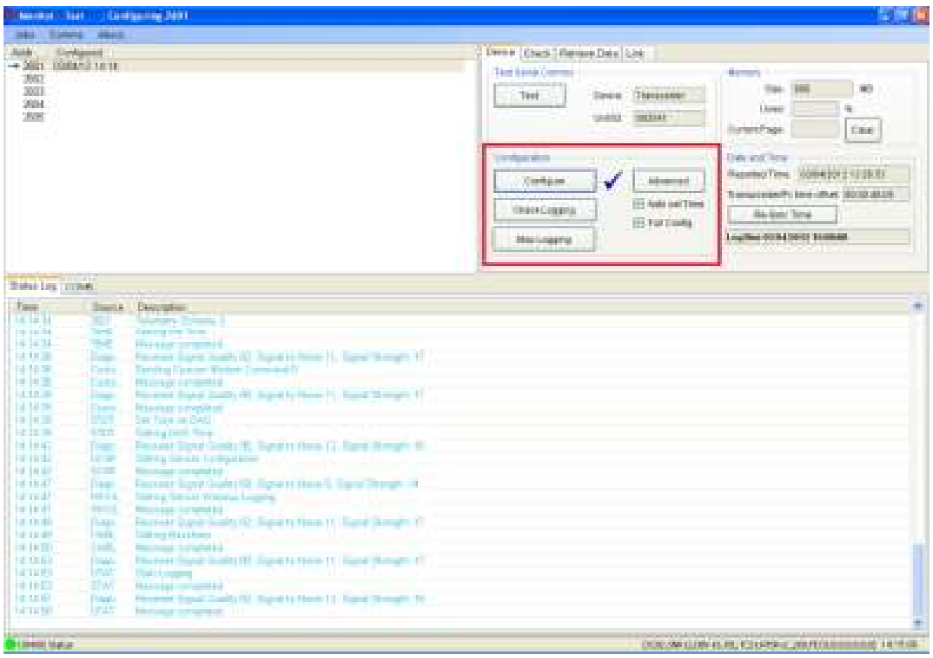
SECTION 6 – OPERATION USING THE ACOUSTIC TRANSCEIVER

6. Using an Acoustic Transceiver

Once the software has successfully connected to a transceiver the system is ready to communicate using acoustic commands to the transponders.

1. To send the settings to a desired transponder the user must select a transponder from the available list and press **Configure**.

Figure 6-1 – Select a Transponder

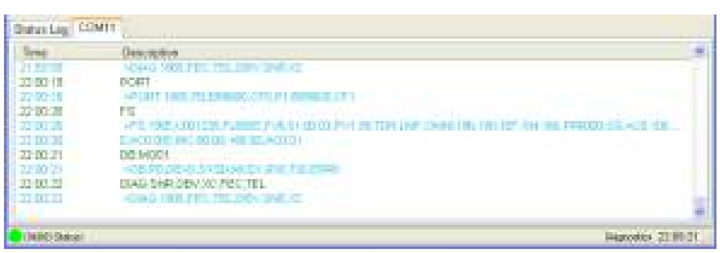


Settings will now be sent to the transponders. The status log at the bottom of the window keeps the user informed of the progress.

All status communications are automatically stored as a text file on the PC for QC purposes; *C:\Documents and Settings\All Users\Documents\Sonardyne\Monitor*

The raw communications are also displayed and logged for reference should support be required.

Figure 6-2 – Raw communications



Any failed acoustic communications will be resent once again by default. If more are required then the comms settings can be altered.

The user has the option to continue from where the last command failed or send the complete configuration again by selecting or deselecting the **Full Config** option. Deselecting will allow the configuration to begin at the point where it was last stopped. If **Full Config** is ticked then configuration will begin at the beginning on each selection.

Figure 6-3 – Send Configuration

If the user is experiencing lots of interference then it is advisable to unselect send full configuration. It is also possible to not synchronise the clock during the set stage.

The user can unselect the Set Time option to prevent re-synchronising the AMT clock again during setting the AMT configuration routine.

SECTION 7 – TESTING

7. Testing Procedures

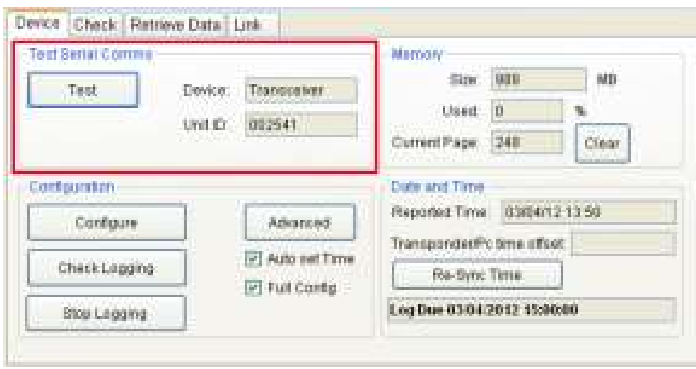
7.1 Testing the Acoustic Link

At any point the transceiver can be used to verity the link between the AMT and the transceiver and report the quality metrics.

NOTE

Make sure the transceiver is connected to the serial port and press test.

Figure 7-1 – Testing Acoustic Link



A simple range check can be performed at this stage by pressing the Ping button - on the Link tab, this will individually interrogate the AMT and compute a range based on the sound speed.

Figure 7-2 – Range Check

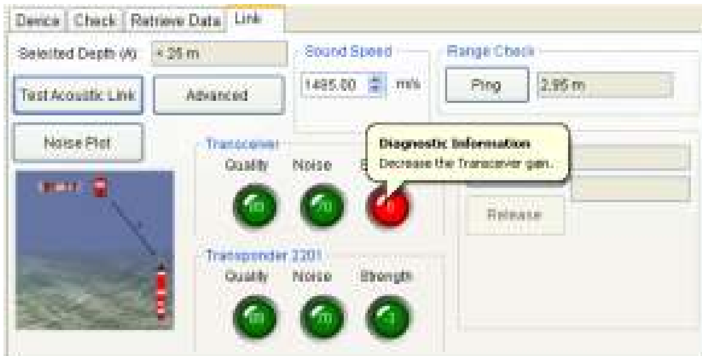
For signal quality refer to Appendix D.

Information on advanced acoustic settings can be found in **Appendix F** – Adjusting these values incorrectly could cause loss of communications with the transponder.

The traffic lights will indicate to the user if the acoustic environment is OK; green is good, yellow is marginal, red will often result in failed data transmission.

By hovering the mouse over the lights information will be displayed suggesting what the user can do to improve the acoustic link.

Figure 7-3 – Suggestions to improve acoustic link



7.2 Testing the Release Mechanism

During check configuration, any unit discovered as having a release mechanism fitted will have the following interface made available; this is a two stage process where the user has to arm the unit before sending the release command. After arming the unit, the user has 30 seconds to send the open command before the armed status is reset.

Figure 7-4 – Arming the Release Mechanism

Figure 7-5 – Checking the transponder

If a transponder was not programmed using the software but the address is known the user must run a check so the software can obtain information about the transponder such as whether a release is fitted and the unique identity code to permit a release command.

Once the release button is pressed the unit will be commanded to open the release mechanism.

Figure 7-6 – Opening the Release Mechanism

NOTE

The AMT is designed to run for as long as possible and will continue to log until the battery has run flat. Therefore it is important that if release mechanism is fitted there is sufficient energy left to communicate with the transponder at the end of a deployment.

Acoustic baseline ranging will stop at 10% but the sensors will continue to 0%.

SECTION 8 – DATA RETRIEVAL AND EXPORT

8. Introduction

Once the AMT has acquired and stored data locally it can be recovered via either acoustic telemetry or direct serial connection. For acoustic telemetry there must be a clear line of sight from the acoustic dunking transceiver deployed from the vessel or ROV to the AMT.

It is advisable to use the fastest / highest possible telemetry scheme (100 to 6000 bps) to speed up operations and reduce battery consumption when sending the data from the remote unit. However should the user have continual failures due to noise then download speeds should be reduced.

The default setting is telemetry scheme 3 which is 900 bps and the highest supported by single element dunkers (Dunker 6 or ROVNav 6).

HPT USBL systems support a much faster rate of data transfer of approximately 6000 bps.

Information on data speed can be found in Appendix C.

8.1 Acoustic Recovery

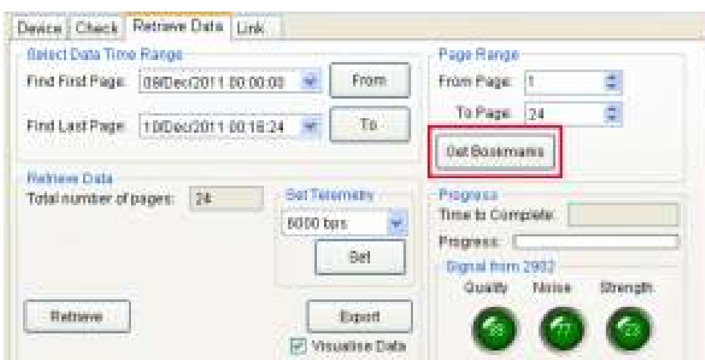
For acoustic recovery carry out the following procedure:

1. Press **Get Bookmarks**. This will display the last page previously retrieved by the last user.

NOTE

The first and last pages can also be selected based on dates however getting the bookmark of the last download is easier.

Figure 8-1 – Get Bookmarks



2. The bookmark facility gives the user the option to only download data that has been logged from a previous data retrieval operation.

For example, if 3 weeks previous pages 1 – 79 have been downloaded, page 79 on the next download will be flagged as a '**From Page'** bookmark and a revised '**To Page**' will be displayed for the most recent data.

During acoustic retrieval it is advisable to initially recover one page of data then increase to multiple pages once the user is confident with the process. The signal quality will give an indication on the progress during data recovery. The table in **Appendix D** can be referred to for signal metric advice.

NOTE

If a request is made for pages 1 – 300 but then aborted, a bookmark will be placed at page 300 on the AMT although a data may not have been collected. The system will set a flag based on the last page requested.

The telemetry speed can be altered if required on a unit by unit basis.

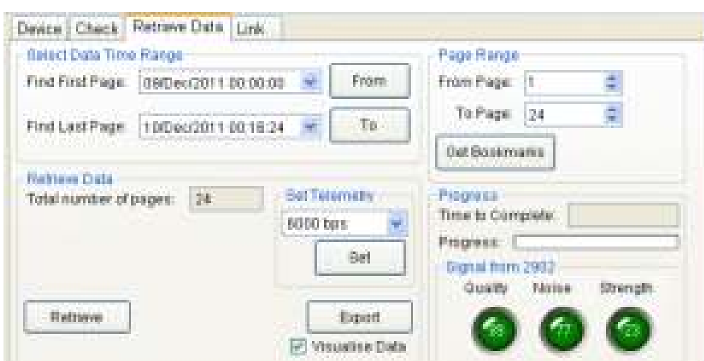
8.2 Serial Recovery

On connection to each transponder, the user must press the test button to validate which AMT is connected to the serial port. The software will automatically jump to the highlighted AMT after a test.

Figure 8-2 – Serial Recovery Test

After successful connection the user should navigate to the **Retrieve Data** tab.

Figure 8-3 – Navigate to Retrieve Data Tab for Acoustic Recovery

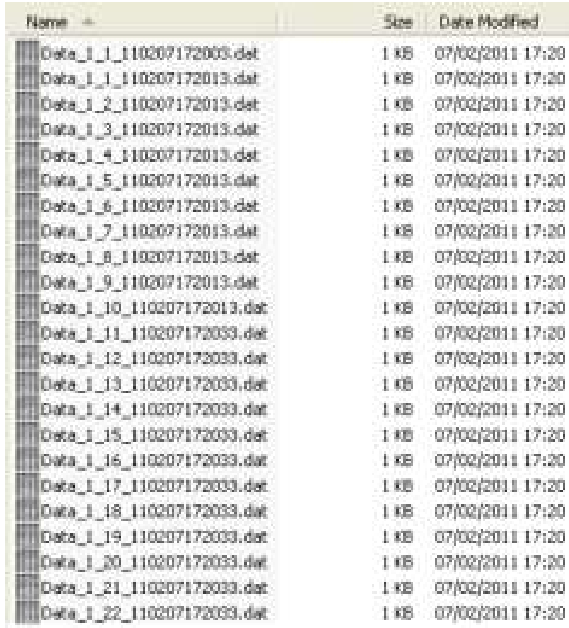


After selecting Retrieve Data, all data stored in the AMT will be retrieved. A green progress bar will indicate progressive and successful retrieval with an estimated time for completion.

NOTE

For acoustic retrieval of data traffic lights will indicate strength of signal.

Figure 8-4 – Retrieved Binary Data Files

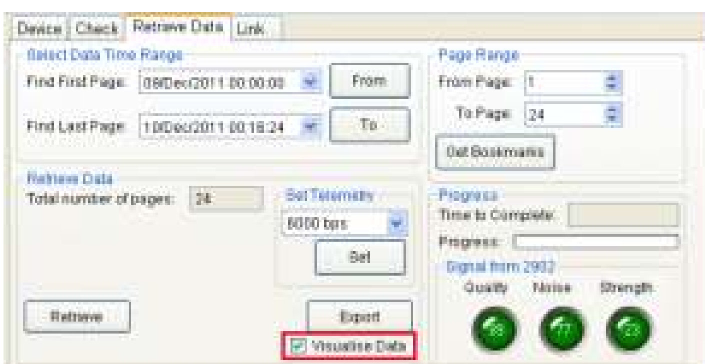


8.3 Data Export

Each page recovered is always stored in raw *.dat binary data on the PC disk drive. When the user presses export, all data files are merged to form one *.CSV for each transponder. If duplicate data files are found only the most recent is used during export. The CSV file format is given in the header lines to the file. Example can be found in **Appendix F**.

During Acoustic Recovery, the information recovered can be previewed if the 'Visualise Data' option is selected.

Figure 8-5 – Visualise Data



The recovered Page Number Data, Baseline Data, Sound Speed Data and Second Pressure Data can all be viewed as graphs:

Figure 8-6 – Page Number Data

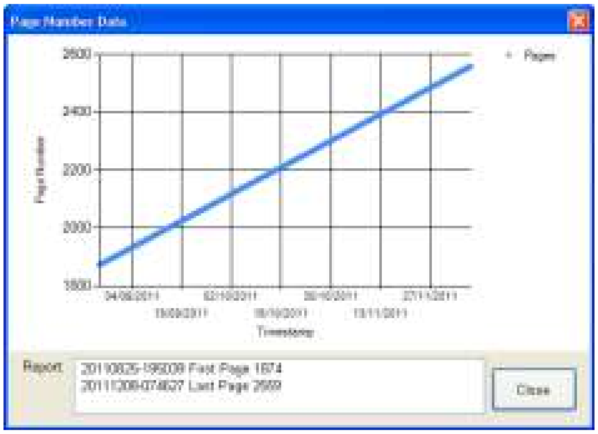


Figure 8-7 – Baseline Data

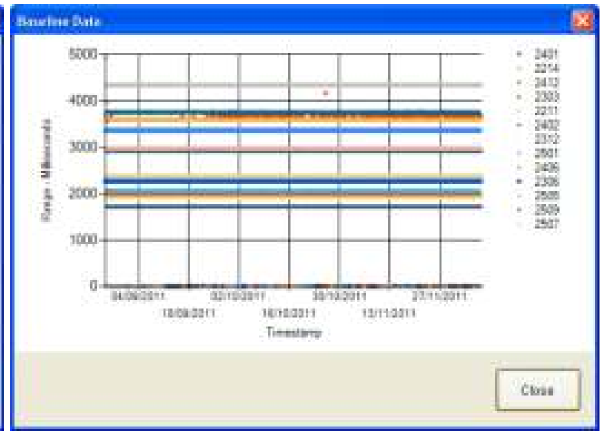


Figure 8-8 – SoundSpeed Data

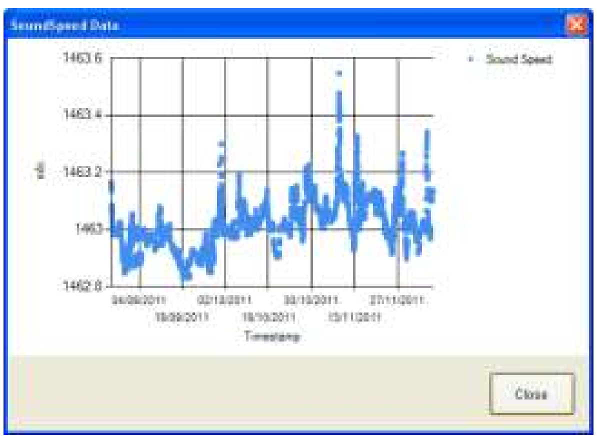
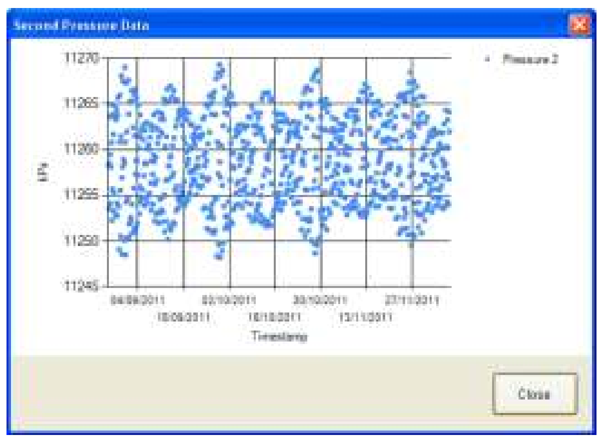


Figure 8-9 – SecondPressure Data

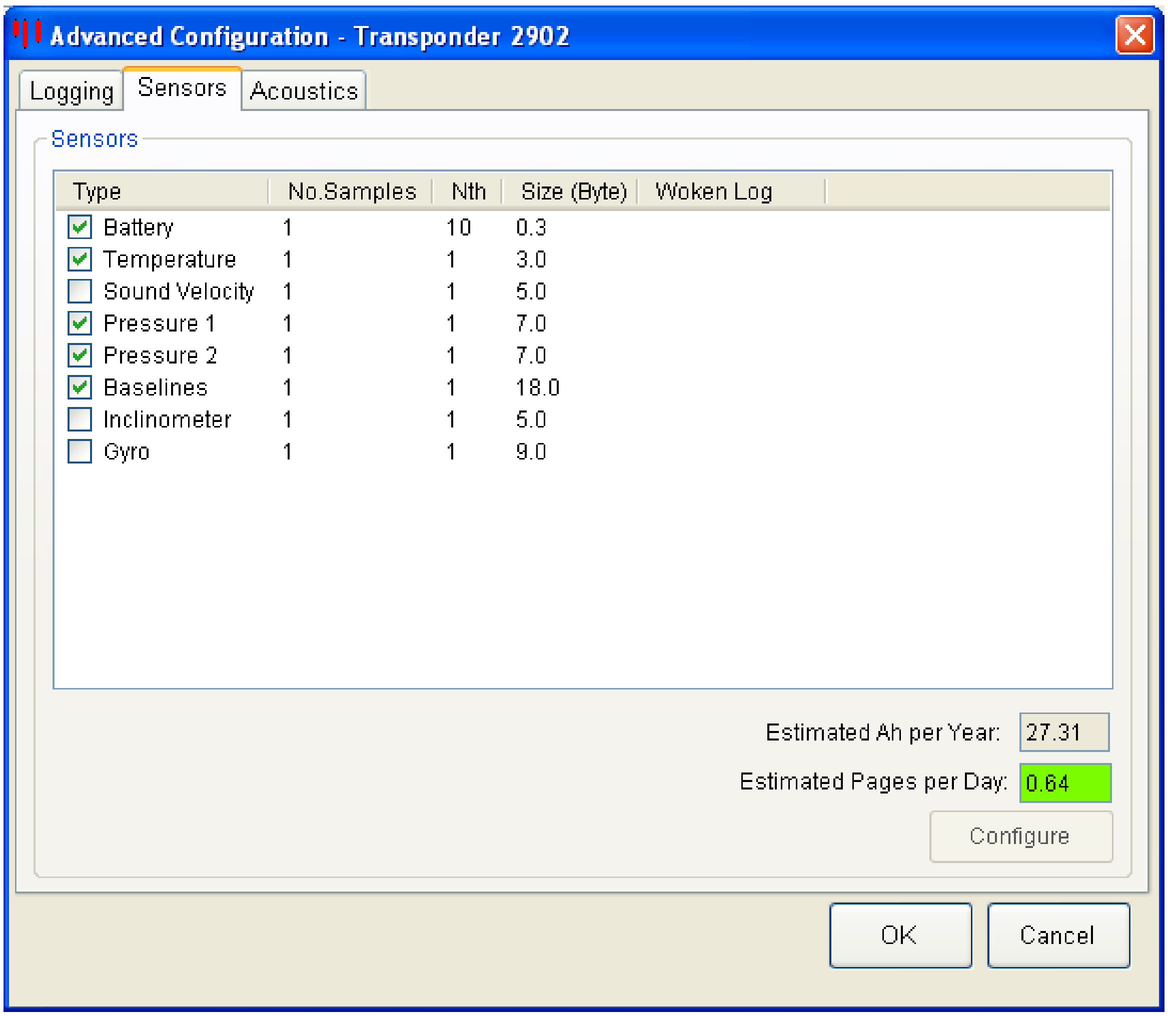


APPENDIX A – ADVANCED LOGGING PARAMETERS

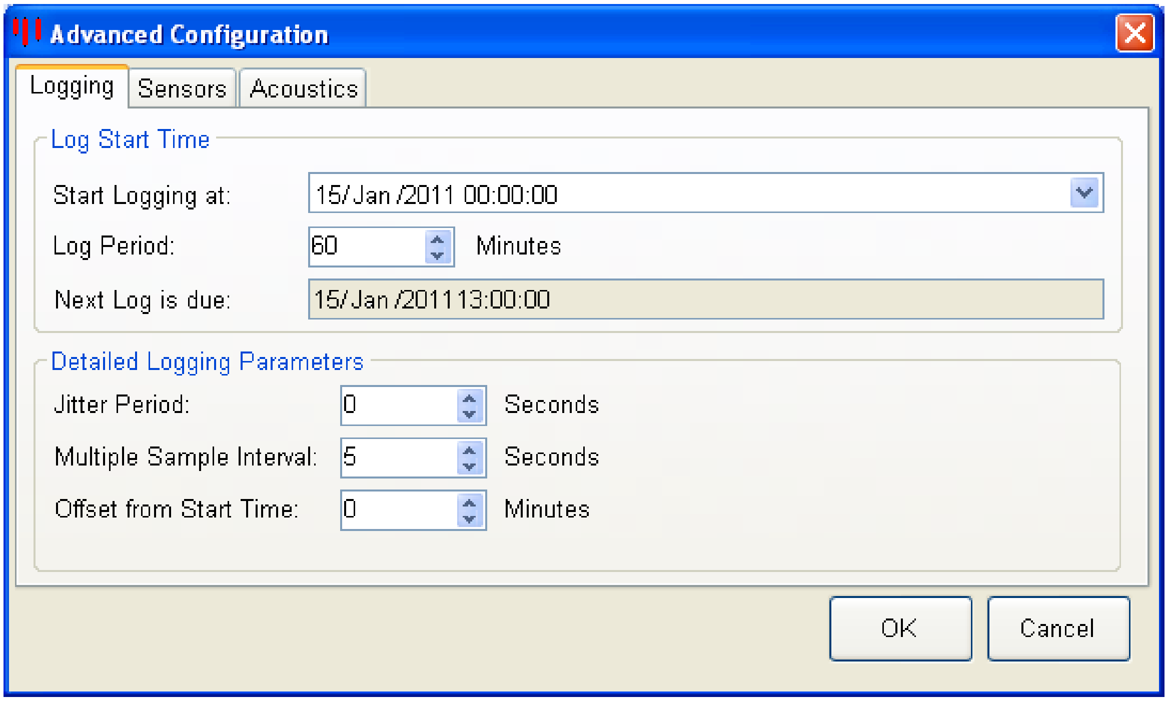
A Advanced Logging Parameters

This shows the size of each record, number of samples, sub log interval and the log when interrogate is received. For each type the specific logging configuration can be edited per sensor.

Appendix A Figure 1 – Advanced Configuration Sensors



Appendix A Figure 2 – Advanced Configuration Logging



A.1 Start Logging

By default the software commences logging one log period in the future when the transponder is set-up. This can be adjusted if required for a specific start time.

A.2 Log Period

The log period would have been chosen during the job wizard and applied to all transponders. However each transponder can be configured to have different logging intervals.

A.3 Jitter Period

When acoustic baselines are being measured it is not advisable to set the AMT's acoustically interrogating each other at exactly the same time. If this were to happen continuously then baseline data would routinely not be measured. This is unlikely to happen with small numbers of AMT's, however to protect against this the start time can be randomised within the Jitter Period which is always positive between 0 and the selected value.

A.4 Multiple Sample Interval

The logging interval can be set for repeated sensor observations at each log interval. The user must highlight the specific sensor and click advanced.

A.5 Offset from Start Time

This gives the opportunity to delay the start time by different times for each transponder. This is ideal to prevent baseline measurement clashing.

A.6 Samples

At each log multiple samples can be recorded for specific sensors if the user wants 2 baselines measure then enter 2 samples.

A.7 Log every n'th period

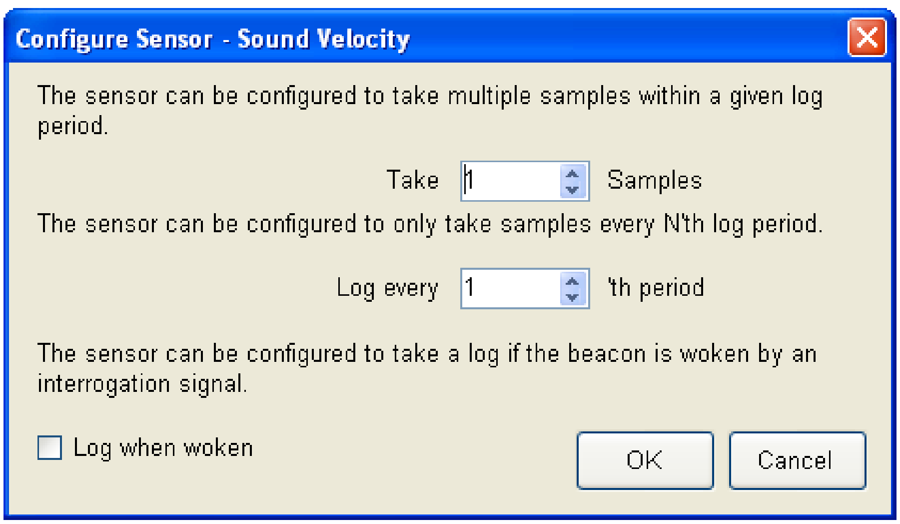
This is particularly useful for observations such as battery capacity which may not be required every log and unnecessarily filling the memory. The user can specify 8 which would only record a specific sensor reading every 8 log periods. If recording every 3hours that equates to only one battery capacity reading every day.

A.8 Log when woken

With baseline measurements AMT's can also log sensor data when common interrogated from a neighbouring AMT. This is particularly useful for sound velocity data so each end of the baseline can be logged at the same epoch. During post processing this information can be averaged to give a more representative sound velocity for the particular baseline.

The acoustic settings determined during the job wizard for an AMT can be altered on a unit by unit basis, refer to **Appendix F** for details of acoustic settings.

Appendix A Figure 3 – Advanced Configuration Logging



APPENDIX B – RELATIONSHIP OF ADDRESSES

B Relationship of Addresses to Common Interrogate Signal

Relationship of addresses to Common Interrogate signal automatically configured by the software.

All addresses listed are Sonardyne Wideband®2 scheme

Appendix B Table – 1 – Addresses to Common Interrogate Signal

CIS	Bcn1	Bcn2	Bcn3	Bcn4	Bcn5	Bcn6	Bcn7	Bcn8	Bcn9	Bcn10	Bcn11	Bcn12	Bcn13	Bcn14
0	1701	1702	1703	1704	1705	1706	1707	1708	1709	1710	1711	1712	1713	1714
1	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814
2	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
3	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
4	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114
5	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214
6	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314
7	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414
8	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514
9	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614
10	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714
11	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814
12	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914
13	3001	3002	3003	3004	3005	3006	3007	3008	3009	3010	3011	3012	3013	3014
14	3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	3111	3112	3113	3114

This table is just for ease of use and with a user defined template could have more than 14 beacons in one array and use a different CIS to a variety of addresses.

APPENDIX C – MEMORY INFORMATION ON DATA RECOVERY

C Memory Information

Memory information on data recovery.

Each data record has a fixed size. Each page of data logged is 512 Bytes and the memory card holds 1 GB:

Appendix C Table – 1 – Data Record

Record	Bytes
BLS	6
PRS	7
INC	5
SSP	5
TMP	3
TIM	5
BAT	3

The telemetry schemes supported.

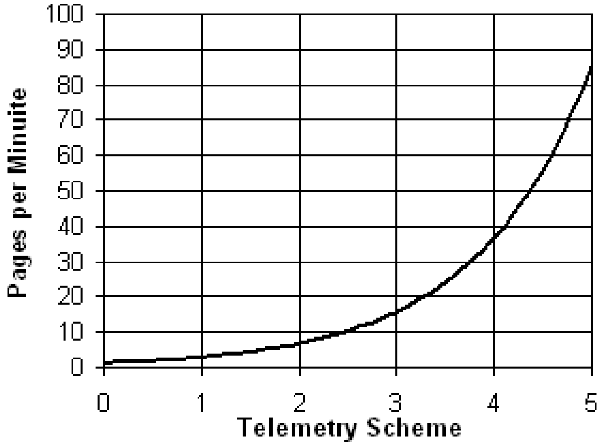
NOTE

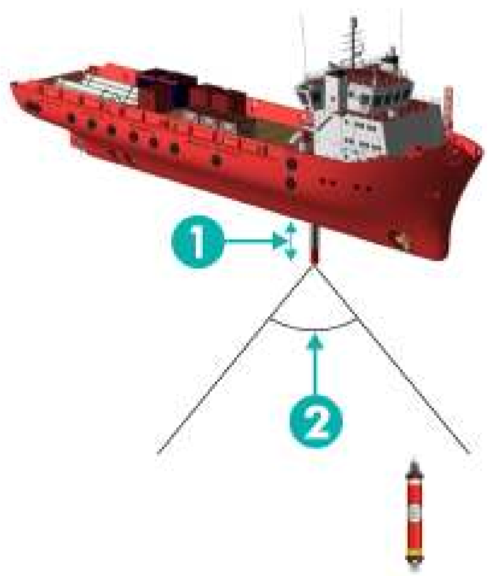
Only the HPT can decode speeds >3

Appendix C Table – 2 – Telemetry Schemes

Telemetry Speed	Bits per second
0	100
1	200
2	400
3	900
4	3000
5	6000

Approximate time to retrieve data in optimal acoustic conditions.





1. 2 m below hull away from thrusters and multipath
2. Beam width directional or omni-directional

To guarantee good communications it is essential to have the transceiver correctly installed on the vessel away from aeration and thruster noise. Care must be taken to make sure the direction type of the transceiver is correct for the survey.

APPENDIX D – SIGNAL METRICS FOR ACOUSTIC COMMUNICATIONS

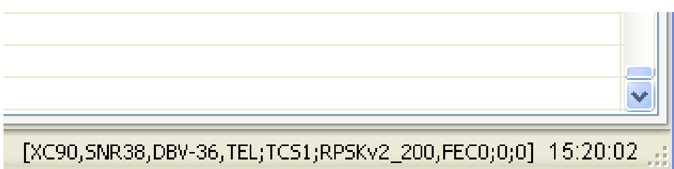
D Signal Metrics

Appendix D Figure 1 – Signal Metrics for Acoustic Communications

Parameter	Good	Okay	Difficult	Description
XC	>60	>45	<45	Setting the DET <45 will increase the probability of false detection.
DBV	-3 to -26	>-36	<-36 or >-3	If the signal is either too large (>-3dB) or too small (<-36) then the system is not optimal.
SNR	>20	>12	<12	Signal to noise, higher the better, ensure that the system is not saturating (DBV) as this will degrade the SNR
IFL	<20	<40	>40	Interference level, maximum correlation level prior to detection. Depends on the DET setting in the CS.
FEC	<2	<4	<5	Number of telemetry code symbol errors corrected by the forward error correction algorithm

XC	Cross correlation	Signal quality
DBV	Decibels Volts	Signal level
SNR	Signal to noise ratio	How strong the signal is compared to background noise
IFL	Interference Level	The higher the value the more interference
FEC	Forward error correction	How many errors are being corrected for

[XC93, SNR38, DBV-36]



	Omni			Directional			HPT			All
	NPL	TPL	LG	NPL	TPL	LG	NPL	TPL	LG	RXW
In Air	187	187	6	190	190	6	187	187	26	800
25 m	166	166	14	169	169	14	169	169	34	800
100 m	187	187	0	190	190	0	187	187	20	800
500 m	187	187	6	190	190	6	190	187	26	1600
1000 m	187	187	20	190	190	20	190	187	40	2000
2000 m	190	190	26	196	196	26	196	190	46	3600
4000 m	196	190	34	199	196	34	199	190	54	6400
6000 m	196	190	40	199	196	40	199	190	60	8800

Diagnostic information reported by the transceiver, in the bottom right of the screen, is produced for every signal reply. However to diagnose the signal quality received by an AMT the user must use the test acoustic link button. Signals are displayed as traffic lights to help cross reference the table above. It is worth noting that if the transceiver does not hear the reply then the diagnostic information from the remote AMT will also be lost.

The diagnostics can indicate information directly and indirectly. Acoustic differences on signal reception at one instrument may indicate that the problem is local. Whereas if the signal is problematic in both directions then the path may be globally obstructed or influenced by background noise.

XC - Multipath and reverberation can reduce the ability of the instrument to correlate the signal as duplicate signals are simultaneously arriving.

SNR - Signal to noise becomes lower as background noise increases. By observing SNR at both transceiver and transponder can identify if the noise is a local or global problem. Thrusters and aeration usually cause low SNR at the transceiver and therefore care must be taken on placing the instrument away from these sources.

DBV - Week distant signals or indirect acoustic paths tend to reduce the overall signal level. An instrument can either transmit louder or increase the gain of the received signal (Although this will also amplify background noise.

APPENDIX E – CSV EXPORT FILE FORMAT

E CSV Export File Format

Inclination in Radians

MP,Record Time, Retrieval Time, Node ID,Temperature

PRS,Record Time, Retrieval Time, Node ID,Pressure, Temperature

SSP,Record Time, Retrieval Time, Node ID,SoundSpeed

INC,Record Time, Retrieval Time, Node ID, Pitch, Roll

ACC,Record Time, Retrieval Time, Node ID, Sway, Surge, Heave

ANA,Record Time, Retrieval Time, Node ID, Analogue

HRP,Record Time, Retrieval Time, Node ID, Status, Heading, Pitch, Roll

HSS,Record Time, Retrieval Time, Node ID, Status, Heading, Pitch, Roll, Heave, Surge, Sway

BAT,Record Time, Retrieval Time, Node ID, UsedPercentage, Volts

BSL,Record Time, Retrieval Time, Node ID, RangeNode, RangeAddress, RangeMilliSeconds, TAT

SLG,Record Time, Retrieval Time, Node ID, StartLogging,LogInterval,Jitter,SubLogInterval,Wake Up Block

SNS,Record Time, Retrieval Time, Node ID, SensorNum, MainLogCount, SecondaryLogCount, CountToFirstLog, LoggingFlags

BAS,Record Time, Retrieval Time, Node ID, CombinedCISandWktCIS, RXWait, Baseline 1, Baseline 2, ...

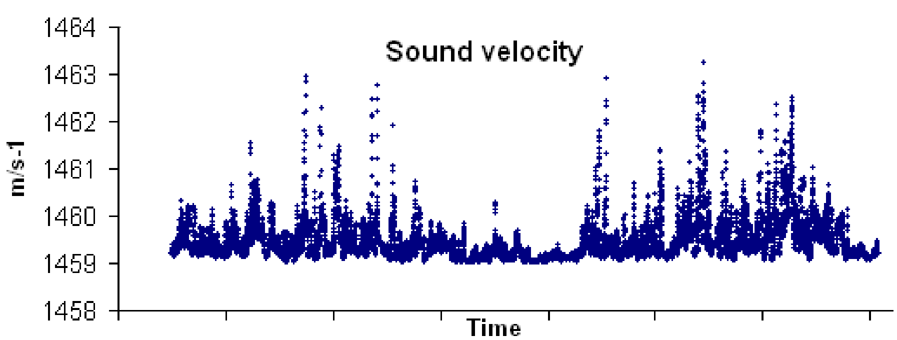
STP,Record Time, Retrieval Time, Node ID

PAG,Record Time, Retrieval Time, Node ID, PageNum

TIM,Record Time, Retrieval Time, Node ID

OFF,Record Time, Retrieval Time, Node ID, Offset

Appendix E Figure 1 – Example Plot of SV data collected by AMT



APPENDIX F – ADVANCED ACOUSTIC SETTINGS

F Introduction

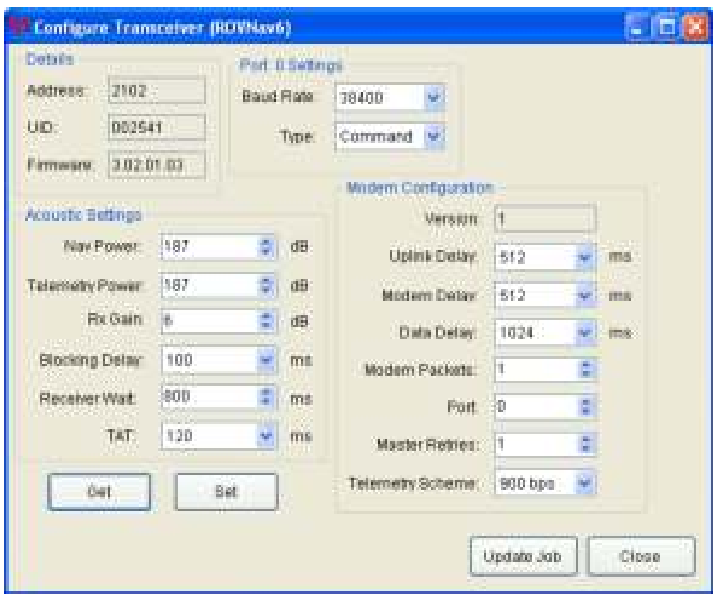
Knowledge and understanding of advanced acoustic settings requires a training course.

Press **Get** before changing parameters so the display is synchronised to the instrument. If the user presses **Update Job** the revised parameters will be stored and sent to the instrument rather than those defined in the initial job wizard.

Changes must be sent before the job file can be updated.

Transponder settings in blue will be identical between units whereas values in green are variable.

Appendix F Figure 1 – Transceiver Configuration Settings



F.9 Configuration Status

>CS:2805,TAT200,BLK180,RXW4900,TXW180,NPL187,TPL187,LG34,CIS9,AT0,EC1,EU0,RSP0,TRP0,PPR0

Address	Variable
TAT	Variable
Blocking period	Fixed
Receive Wait	Fixed
Transmit Wait	Fixed
Navigation Power Level	Fixed
Telemetry Power Level	Fixed
Linear Gain	Fixed
Common Interrogation	Fixed
Activity Time	Fixed
Enable Common Interrogate	Fixed
Responder	Fixed
Transpinger	Fixed
Pulse Position replies	Fixed

F.10 Modem Status

>MS:2805,MV1,DD1024,MD4096,UD512,TS5,P2,MR1,SM1,THR0,ICT32,FQ0,MST0,B512/0.0

Address	Variable
Modem Version	Fixed
Download Delay	Fixed
Modem Delay	Fixed
Upload Delay	Fixed
Telemetry Scheme	Fixed
Data Storage Port	Fixed
Master Retries	Fixed
Threshold Data	Fixed
Inter Character Time	Fixed
Forward Queue	Fixed
Master Mode	Fixed
Buffer Size	Fixed

GLOSSARY OF TERMS

Term	Definition
Acoustic Responder	An instrument that emits an acoustic signal in response to an electrical signal carried to it by cable.
Acoustic Signal	Information carried by sound pressure waves through water. The Sonardyne acoustic signal has a finite length.
Acoustic Synchronous / Precision Pinger	An instrument that emits signals regularly without an interrogating signal. A SYNCHRONOUS Pinger can be synchronised to an external master signal. A PRECISION Pinger has an accurate internal time standard.
Acoustic Transceiver	An instrument that emits and receives acoustic signals, and extracts information from them. Transceivers can measure the time it takes a signal to travel from its transducer to a transponder and return. Some can encode and send data in a message and extract digital data from a message (Acoustic Telemetry). Used on a surface vessel or to mark a point on the seabed, or fixed to a mobile for tracking or positioning.
Acoustic Transducer	A device that converts electrical signals into acoustic signals and vice versa.
Acoustic Transponder	An instrument that emits an acoustic signal when it detects an interrogating acoustic signal.
Acoustic Transponder (Intelligent Transponder)	A type of transponder that is managed by a micro-controller. Examples include the COMPATT (COMPuting And Telemetry Transponder) and the WMT (Wideband Mini Transponder). Depending on supported functionality it can: Decode acoustic telemetered commands from a transceiver and can send telemetered data to the transceiver. It can measure the distance between itself and other transponders and then telemeter the data to a transceiver. It can be capable of measuring its depth and the temperature of the water. It can be used to measure a variety of underwater parameters and telemeter these back to the surface. It can be used, as an intelligent angle-measuring device, in a Riser Angle Monitoring System. It can be fitted with a release mechanism so it can return, on command, back to the surface e.g. if battery power is low.
ANT	Acoustic Navigation Tester

Term	Definition
Attitude and Heading Reference System (AHRS)	An inertial sensor that provides outputs of heading, pitch and roll.
CIS	Common Interrogation System
COMPATT	COMPuting and Telemetry Transponder (see Acoustic Intelligent Transponder)
Common Reply Signal (CRS)	A reply signal common to a complete family of addressed transponders.
CPU	Central Processing Unit
CRS	Common Reply System
DAS	A micro-controlled data acquisition and logging sub-assembly located within a transponder.
Data Fusion Engine (DFE)	Acts as the system controller, generates the display signals for the monitor, processes the data from the transceiver for the display to the operator and output to a DP system and talks to various “attitude” sensors and other navigation systems.
Differential Global Positioning System (DGPS)	A 24 hour, world-wide radio navigation system. GPS receivers track and decode the data from satellites and calculate the position and speed of a vehicle.
Dynamic Positioning reference (DP Reference)	Several position inputs e.g. GPS receivers, taut wire sensors, LBL, SBL or USBL acoustic positioning sensors, wind speed indicators etc.
Dynamic Positioning System (DPS)	Automatically maintains a vessel with a constant heading, and in a fixed position without an anchor and provides more flexibility in operation.
Dynamic Positioning telegram (DP Telegram)	The report an acoustic positioning system sends to a DP system over a serial interface.

Term	Definition
Digital Signal Processing (DSP)	The representation of signals by a sequence of numbers or symbols and the processing of these signals. DSP includes subfields like: audio and speech signal processing, sonar and radar signal processing, sensor array processing.
Global Positioning System (GPS)	A multi-user, 24-hour, worldwide radio navigation system using the NAVSTAR constellation of satellites. GPS receivers are capable of tracking and decoding data from the satellites and using it to compute the position and velocity of a vehicle.
HPR	Hydro-acoustic Position Reference
Inertial Navigation System (INS)	A navigation aid that uses a computer, motion sensors and rotation sensors to continuously calculate the position, orientation and velocity of a moving object without the need for external references.
Long Base Line Positioning System (LBL)	A system where two or more transponders are on the seabed. The positions of the transponders are established by a calibration process in a seabed frame. The distances from a transducer to each transponder are measured using a transceiver. The position of the transducer can be computed in the seabed frame. The name comes from the “baselines” joining each transponder.
LUSBL	Long and Ultra Short Base-Line
PSU	Power Supply Unit
ROV	Remotely Operated Vehicle
SSM	Super Sub-Mini Transponder (WSM predecessor)
Ultra Short Base Line Positioning System (USBL)	A system similar to an SBL system except the system uses three or more elements in a single transducer array. The measurements it makes are the differences in “time-phase” of the signals from each element. The co-ordinate frame is fixed to the transducer array which must be oriented in the vessel frame to be equivalent to the SBL.
WSM	Wideband Sub-Mini Transponder

Term	Definition
Serial Communications Wait	The maximum time allowed for the Transponder to reply to an RS232 command.
Delay between commands	Provides a delay between adjacent commands.
Firmware	The firmware installed on the transponder. Firmware upgrades can be installed via WSM Terminal. The Tx firmware refers to the transmission signal synthesiser.
Depth Status	The transponder can be fitted with an optional depth sensor to send depth information at each interrogation.

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