Sonardyne
SOUND IN DEPTH

UM-8295

User Manual for Monitor

Issue B Rev 2

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The Sonardyne 24-hour helpline is answered at the UK Headquarters during normal office hours (08:00 to 17:00). Outside these hours, your call is automatically transferred to an agency, which logs the details of your emergency and alerts the appropriate Sonardyne personnel.

Our aim is to make sure emergency requests are dealt with immediately during office hours, and are responded to within 30 minutes at all other times.

Please note the helpline is for emergency use only.

If you require NON-EMERGENCY product support, please contact your nearest Sonardyne office. Alternatively, contact the Sonardyne Head Office:

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Note

Email and telephone support is available during normal UK office hours (08:00 to 17:00).

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Amendment History

The amendment history records all amendments and additions made to this manual.

Issue	Revision	Date	Comments	Section	Page
A	1	07/02/2011	Software updates reflected	All	All
B	0	14/03/2013	Manual updated with new branding format and update of Monitor Software.	All	All
B	1	22/02/2015	Updates to reflect the changes made in V2 of the software including the new PIES and profile instruments. Updated throughout.	All	All
B	2	17/10/2015	Updated to reflect the changes made in V2.02 of the software.	All	All

Section 1 – Introduction

1.1 Scope of this Manual

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

1.1 Purpose of this Manual

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 personnel setting up an AMT attend a system training course to gain experience with the system and background knowledge of acoustic position and communication theory and practice.

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.

1.2 Related Publications

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

Table 1–1 Related Publications

Publication	Title
Safety Manual	*Safety Manual*
UM-8300-099	*User Manual for 6G Terminal Lite Software* (supplied on the 6G utilities DVD)

1.3 Conventions

Table 1–2 Conventions used in this Manual

Format	Convention
Boldface Type	User Input, Menu Options, Keys, e.g. Click **OK**
Italic Type	References to Figures, Tables, Sections and other internal/external source
Arrow (**>**)	Selection of an additional menu item e.g. **File > Save**

Section 2 – Safety

Before any activity is carried out on the equipment, it is recommended that the included *Sonardyne Safety Manual* and all warnings and cautions in this manual are read and fully 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.

Documentation must be consulted whenever a ⚠ or ⚠ 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 any additional equipment is used, any warnings and cautions in the equipment user manual must be read and fully understood and the equipment must only be used as specified by the manufacturer.

The safety of any system incorporating this equipment is the responsibility of the assembler of the system.

2.1 Safety Procedures

Before carrying out any procedure on the equipment, make sure that all of the following warnings and cautions are read and fully understood.

2.1.1 Warnings

⚠ **Personal protection. The appropriate protective equipment such as protective footwear, hard hat and gloves must be worn when handling or carrying out any procedures involving Sonardyne and other equipment.**

⚠ **Heavy Equipment. Many Sonardyne products and equipment types, such as transponders, transceivers, cable drums etc. require Manual Handling Equipment (MHE) for lifting due to their heavy weight. If MHE is not available, it is the responsibility of the operator to perform a manual handling risk assessment prior to carrying out manual lifting/handling. Refer to the individual equipment documentation for weight specifications.**

⚠ **High Internal Pressures Risk. Due to the high internal pressure risk, dismantling the sub-sea equipment must only be carried out by trained personnel.**

Section 3 – Technical Description

3.1 Introduction

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

The AMT is an integrated acoustic positioning, communications and sensor platform based on Sonardyne's Compatt 6 technology. 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. *Figure 3-1* shows an AMT.

Figure 3-1 Autonomous Monitoring Transponder

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

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

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 once the AMTs are deployed using the acoustic telemetry from the surface acoustic transceiver or the vessel 'dunker' or ROV.

Refer to the user manual *UM-8300 Wideband Transponder* for more information.

A system can comprise of the components shown in *Table 3-1*.

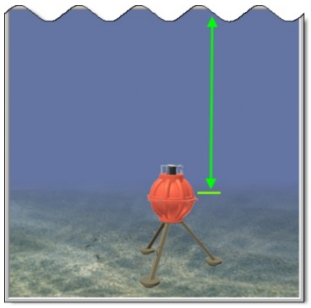
Table 3-1 System Components

A PC (running Windows XP/Windows 7)	
An HPT	
A Dunker 6 and Cable Drum	
A Surface Interface Unit (SIU)	

3.2 Operational Scenarios

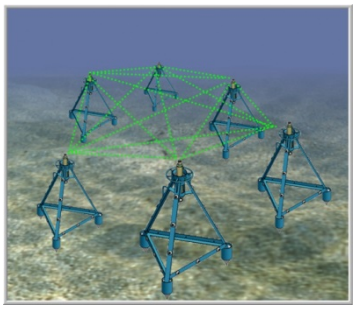
Typical operational scenarios for the AMT configuration are detailed below:

Tide Gauge



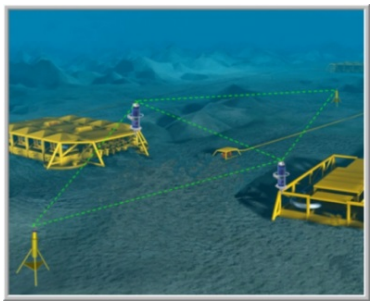
- Pressure
- Pitch & Roll
- Optional Release Mechanism

Long Term Environmental Monitoring



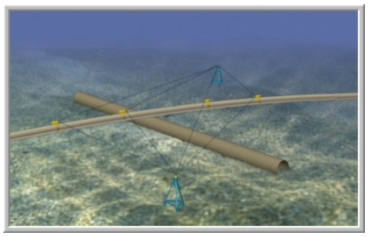
- Baseline distance
- Sound Velocity
- Pressure
- Pitch & Roll
- Battery Life

Structure Settlement



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

Pipeline Movement

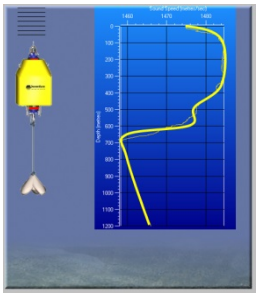


- Heading
- Pitch & Roll
- Pressure
- Baseline Distance
- Sound Velocity
- Temperature

Pressure Inverted Echo Sounder (P.I.E.S)

- Two-way Travel Time
- Pressure
- Sound Velocity
- Temperature

Sound Velocity Profile



- Pressure
- Sound Velocity

3.3 Data Application

Every operation scenario is different and the way the data is used will ascertain a variety of monitoring results. Baseline data is usually processed with sound velocity to derive distance between transponders. The temperature data can also be used to independently validate the sound velocity information and guard against erroneous data. Likewise the pitch and roll sensors can be used to indicate whether the movement is local to a transponder or global variation in distance between units.

The Pressure data most commonly observes the tidal cycle therefore to monitor subsidence the raw sensor data needs to be reduced for tide. Ideally a benchmark station could be used or predictions to remove the tide although atmospheric changes will also affect the pressure data.

PIES data is commonly used for reducing seismic and USBL data as this gives an accurate through water time of flight. By logging the time taken for a return signal to travel from the bed to the surface gives a figure for the whole water column. Using this data in conjunction with the pressure data can derive a single figure for the Sound velocity through the whole water column as function of time.

When deploying an AMT to the seabed, the sensor data from both the SV sensor and the pressure sensor can be logged simultaneously to derive the downcast through the water column. If the unit is fitted with a release mechanism it can be commanded to return to the surface which will form the uncast profile.

Section 4 – Installation and Setup

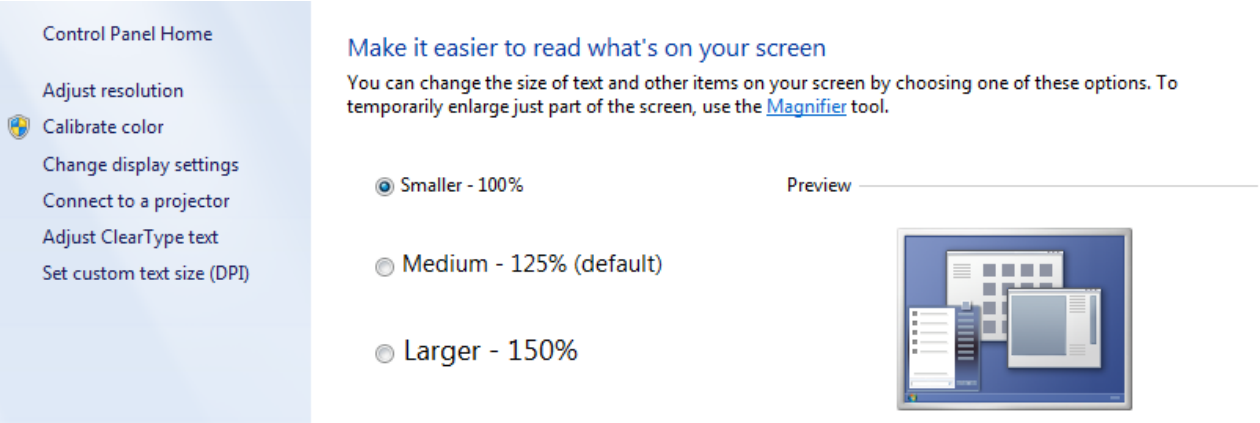
4.1 Installing Monitor Software

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

Notes

Before installing this software remove any previous versions using *Add and Remove Programs* (Windows XP) or *Programs and Features* (Windows 7).

Monitor Software is designed to display using an operating system text size of 100%. In Windows 7 this can be set as follows: Control Panel > Display > 100%

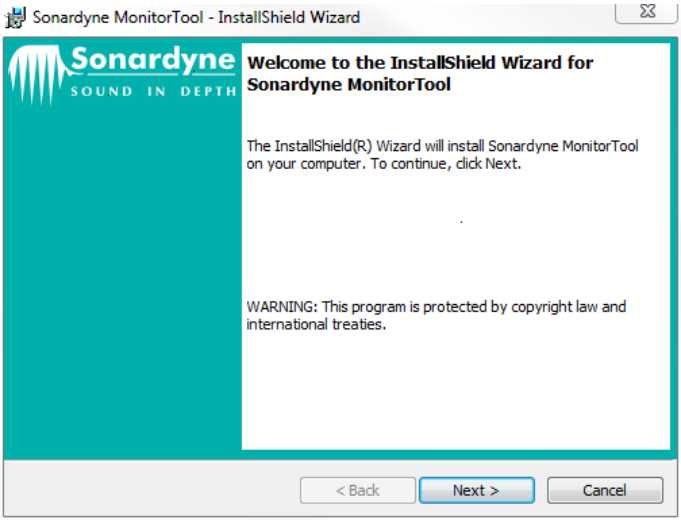


4.1.1 Installation Procedure

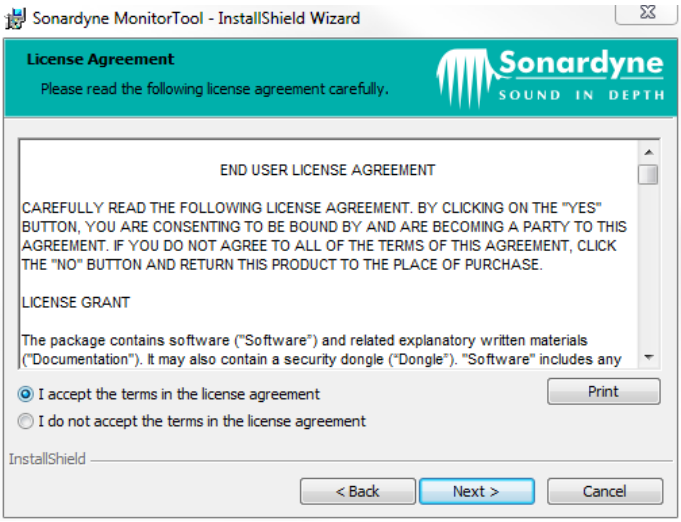
The Monitor software is supplied on a CD. To install the software:

1. Insert the CD into the CD/DVD drive.
2. Navigate to and double-click the **setup.e**xe file on the CD.

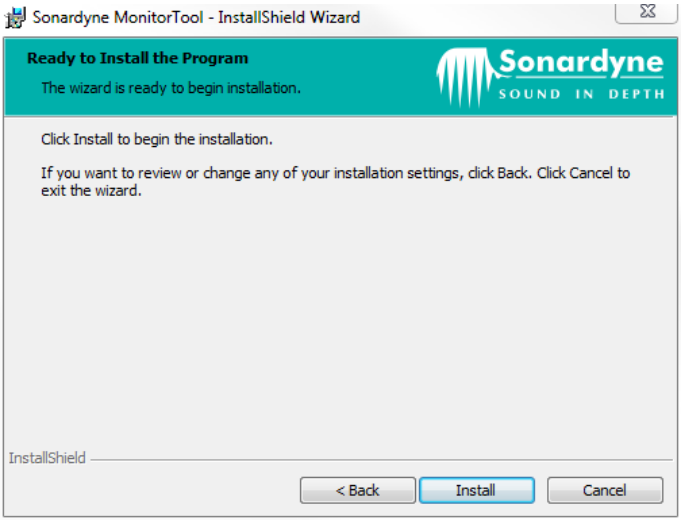
3. Click **Next** on the **InstallShield Wizard**.



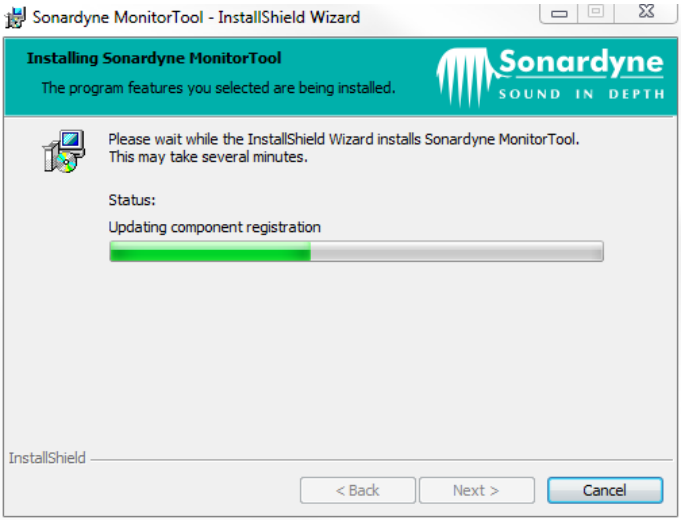
4. Click **Yes** to confirm agreement with the terms of the license.



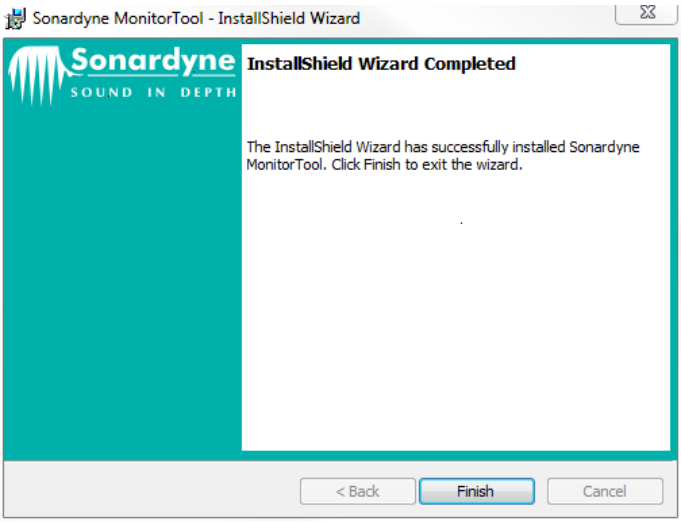
5. Click **Install** to start the installation.



6. A progress bar displays the status of the installation.



7. Click **Finish** to complete the installation.



8. Once installation is complete a **Sonardyne Monitor** icon will appear on the desktop. Double-click the icon to start the software.

4.2 Software Setup

Before using Monitor software the following sections describe how to setup the software:

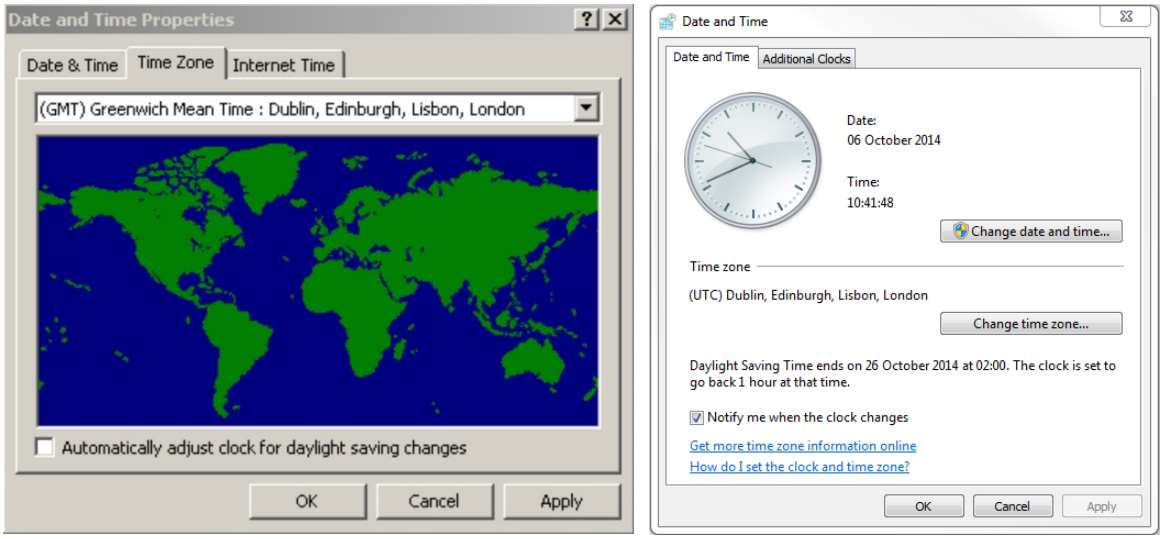
- Time Synchronisation
- Display
- Security

4.2.1 Time Synchronisation

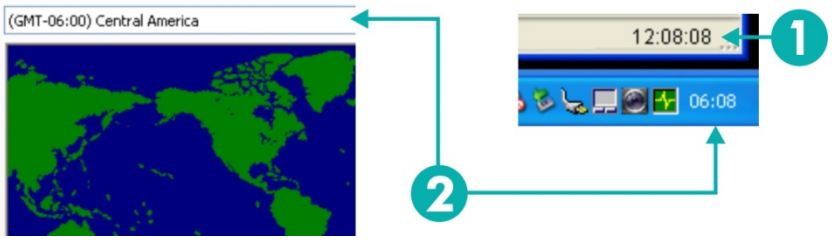
The data logger inside each AMT has a real-time clock which is used to time stamp observations. To schedule the data with external events and to align data from multiple AMTs the clocks should be synchronised to a known and common time base.

The software synchronises the Greenwich Mean Time (also known as UTC) 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 a 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 – Windows XP and Windows 7



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



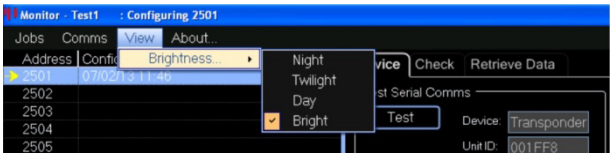
1 GMT 2 Local Time

4.2.2 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 used to reduce unnecessary light on the ship's bridge/survey control room.

The contrast can be changed using the four colour schemes shown in the figures below.

Figure 4-2 Brightness Settings



Night

Twilight

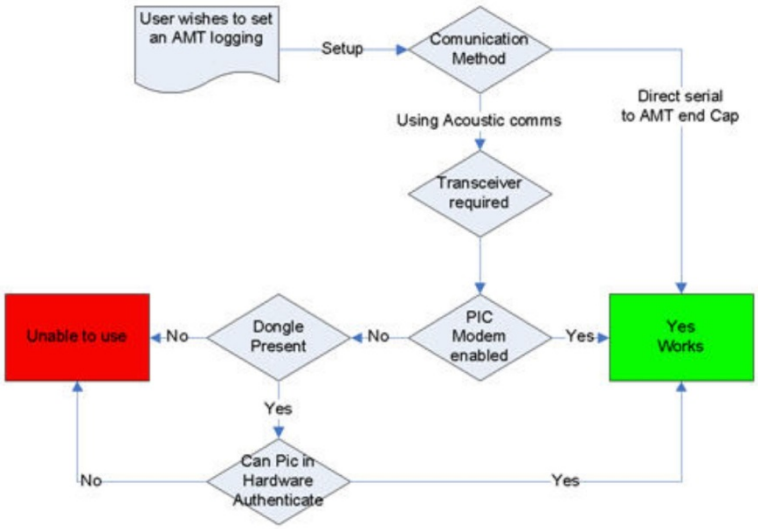
Daylight

Bright

4.2.3 Security

Two controls of hardware functionality (transponder functionality and transceiver functionality) are factory programmed when the product is shipped. Contact Sonardyne support for equipment upgrades.

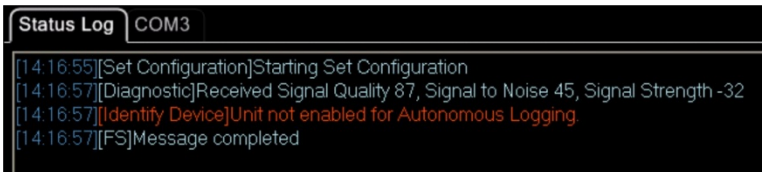
Figure 4-3 Security Flowchart



The transponder functionality is controlled by an internal PIC Code. The code is 10**5A** for an AMT 10**5E** and 1**01A** for a GyroCompatt and PIES.

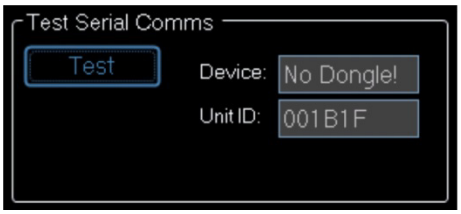
>FS:2504,U0024D7,FL105A,FV3.00.06.12,PV1.05,TDR;MF;OMNI;196;193;190;187;166,T-5;40;AC0.10,SV1400;1600;AC0.030,IN..

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



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, a **No Dongle!** message will be displayed as shown below.



Once a dongle is inserted, the test can be re-performed. If at any point during operation the transceiver resets, e.g. power failure, an error message will be displayed as shown below.

The test button can be pressed again to authenticate functionality as shown below.

Section 5 – Operation

5.1 Introduction

This section describes how to operate and configure AMTs using Monitor software including:

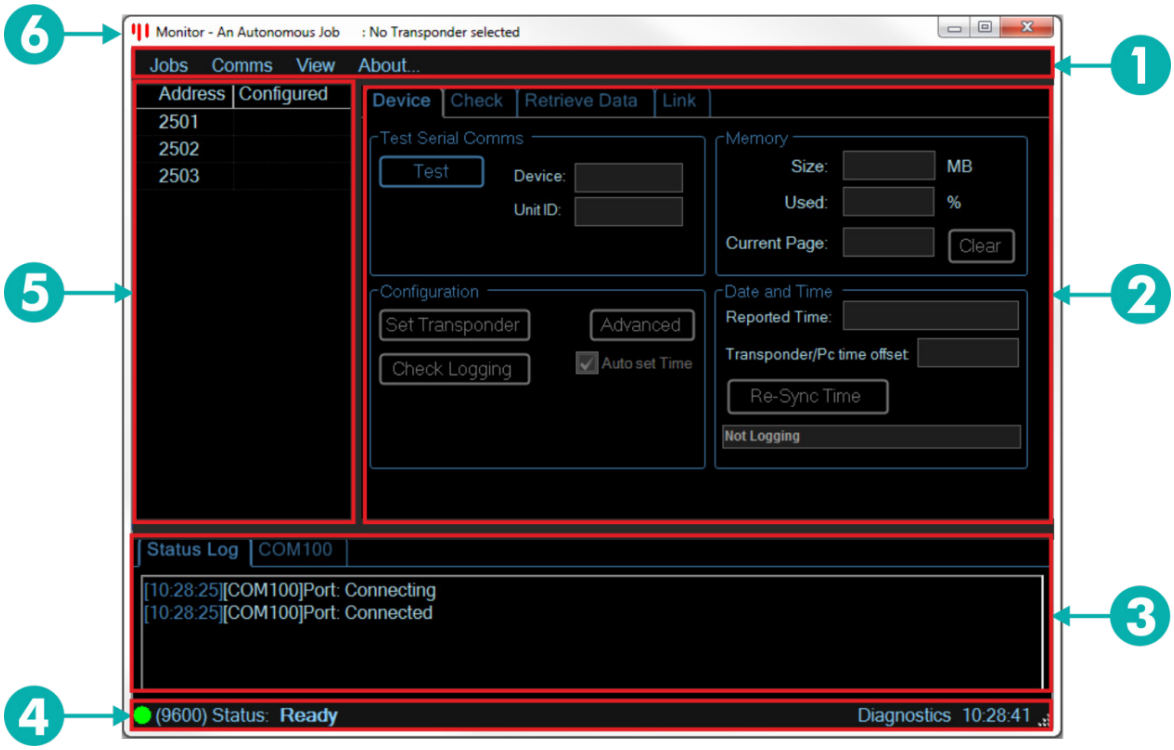
- A description of the Software Dialog Boxes.
- Using the Job Wizard to setup a new job.
- Battery Life Information.
- Configuring the AMT Serially and Acoustically.

5.2 Software Description

5.2.1 Monitor Main Window

The Monitor software main window is described in *Figure 5-1*.

Figure 5-1 Monitor Main Window



Item	Control	Description
1	Menus	**Jobs:** Starts the **Job Wizard, Open** files and **Exit** a job **Comms:** Displays **Comms** and **Timeout** information, input **Manual Commands** and **Flush Logfiles** **View:** Adjust **Brightness** levels **About:** Displays current software version

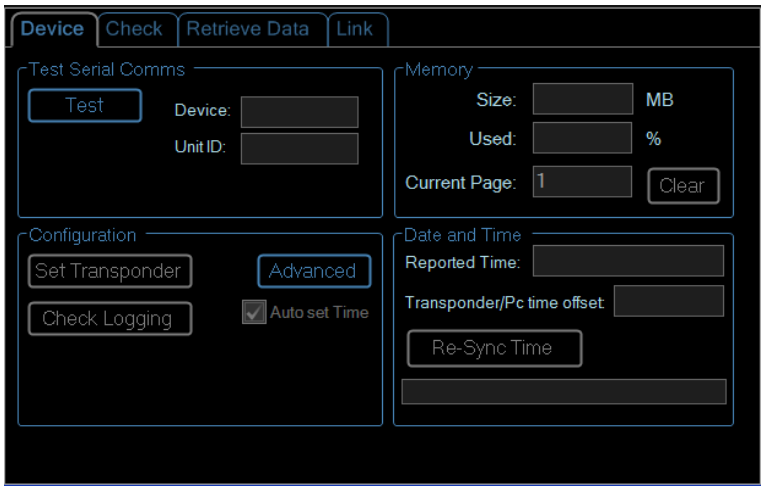
Item	Control	Description
❷	Tabs see *Sections 5.2.2* to *5.2.5*	**Device** (default): Allows testing of serial coms, displays memory usage, configuration of transponder and logging **Check:** Allows the operation of the deployed unit to be verified **Retrieve Data:** Allows data to be retrieved from the transponder **Link:** Displays acoustic link information and release function
❸	Coms Panel	**Status Log:** Displays current status **COM :** Displays raw communications with device
❹	Status Bar	Displays the current status and time
❺	Address Panel	Displays and allows selection of addresses and address configuration to be cleared
❻	Dialog Box Info	Displays the current job selected and the address being configured

5.2.2 Device Tab

The **Device** tab has the following options:

- **Test Serial Comms**: serial comms can be tested by clicking **Test**.
- **Memory**: memory parameters can be viewed and the memory card cleared.
- **Configuration**: configuration of transponder and logging can be set by clicking **Set Transponder** and viewed by clicking **Check Logging**. Advanced settings for Logging, Sensors and Acoustics details can be entered by clicking **Advanced**, see *Figure 5-3*, *Figure* 5-4 and *Figure 5-6*).
- **Date and Time**: displays the current Date and Time and allows the time to be re-synced.

Figure 5-2 Device Tab



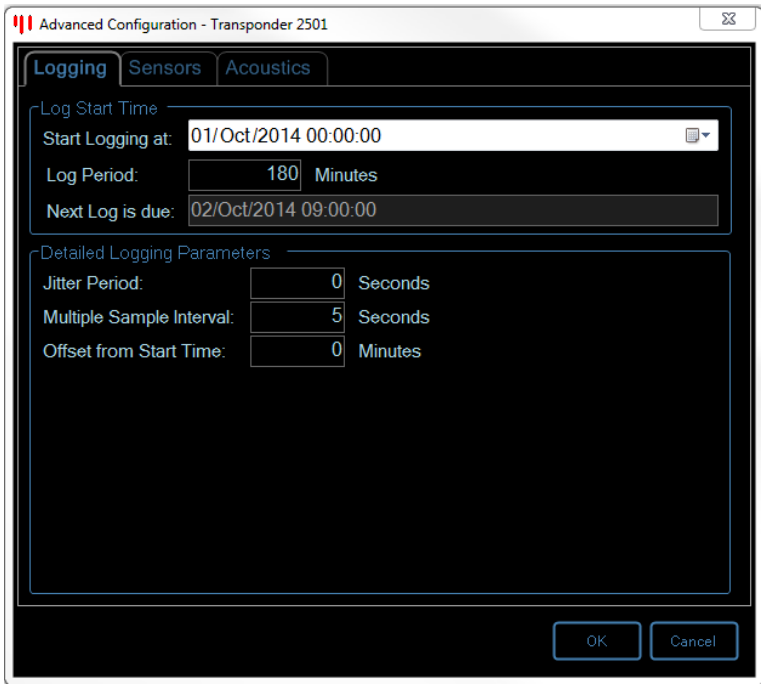
5.2.2.1 Device Tab Advanced Settings

The **Advanced** settings contains three tabs: **Logging**, **Sensors** and **Acoustics** which are described below. Refer to *Appendix A – Advanced* Configuration for more information on the advanced settings.

The **Logging** tab has the following options:

- **Log Start Time**: the log start time and period can be set.
- **Detailed Logging Parameters**: logging parameters can be set.

Figure 5-3 Logging Tab



The **Sensors** tab allows individual sensors to be selected and the resulting estimated battery life and memory pages per day displayed.

Each sensor **Type** can be selected and configured for taking samples by clicking **Configure**.

Figure 5-4 Sensors Tab

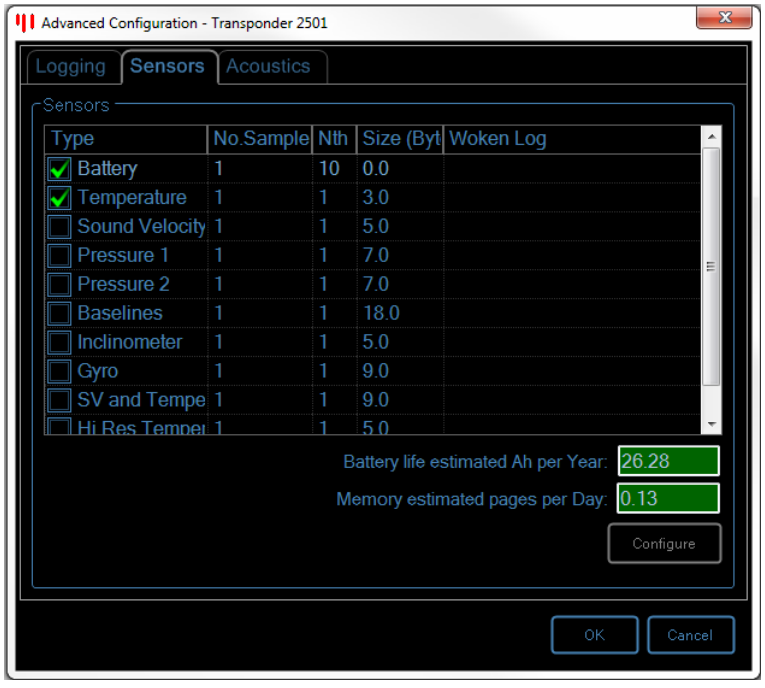
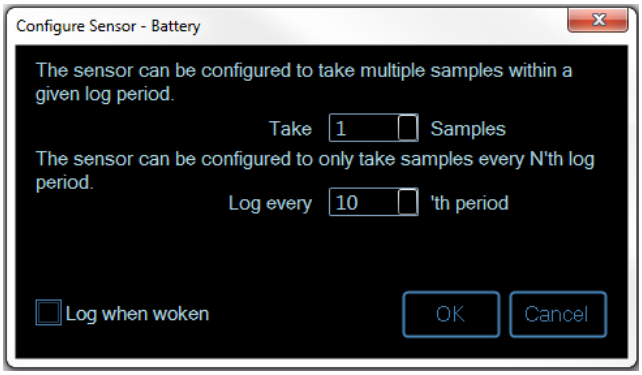


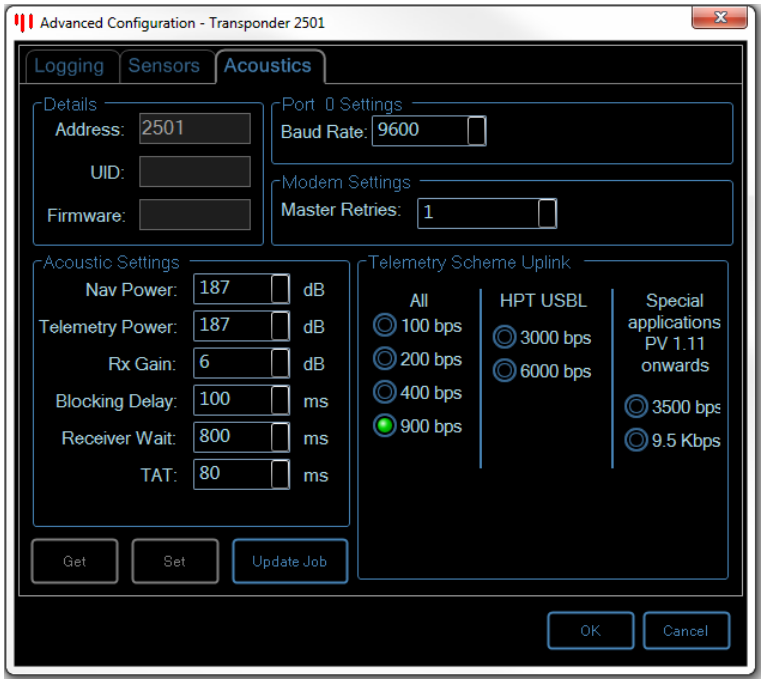
Figure 5-5 Configure Sensor Dialog Box



The **Acoustics** tab has the following options:

- **Details**: displays the **Address**, **UID** and **Firmware** details.
- **Port 0 Settings** and **Modem Settings**: sets the **Baud Rate** and **Master Retries**.
- **Acoustic Settings**: sets the acoustics.
- **Telemetry Scheme Uplink**: sets the telemetry scheme.
- The above settings can be retrieved, changed and the job updated by clicking **Get**, **Set** and **Update Job**.

Figure 5-6 Acoustics Tab

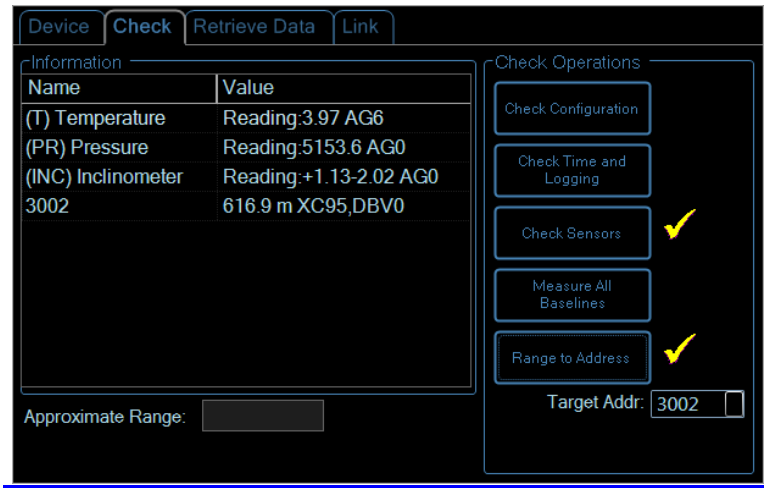


5.2.3 Check Tab

The **Check** tab has the following options:

- **Information**: displays the Name and Value of the sensor response.
- **Check Operations**: allows the following operations to be checked:
  - **Check Configuration**: confirms the settings sent to the transponder agree with those held in the job database.
  - **Check Time and Logging**: indicates if the PC clock has drifted or the AMT has not had the time set since battery reconnection.
  - **Check Sensors:** initiates acquisition of sensor data and display the results.
  - **Measure All Baselines**: uses the currently selected beacon to interrogate all other beacons in the job.
  - **Range to Address**: allows you to range to the selected beacon in the **Target Addr:** drop-down list.

Figure 5-7 Check Tab

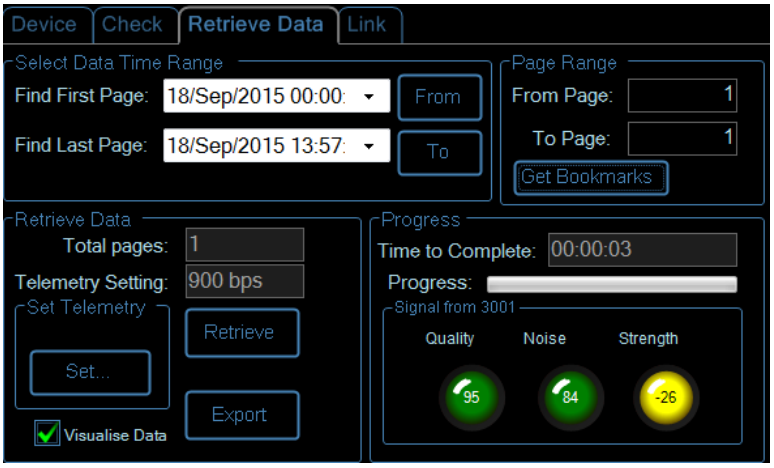


5.2.4 Retrieve Data Tab

The **Retrieve Data** tab has the following options:

- **Select Data Time Range**: sets the data to be selected using a time range.
- **Page Range**: sets the data to be selected using a page range.
- **Retrieve Data**: set the data retrieved and exported by clicking **Retrieve** and **Export.**
- **Progress**: displays the **Time to Complete** and a **Progress** bar.

Figure 5-8 Retrieve Data Tab



5.2.5 Link Tab

The **Link** tab is active only when a transceiver is connected and has the following options:

- **Test Acoustic Link**: allows the acoustic link to be tested.
- **Noise Plot**: displays a noise plot for the connected Transceiver.
- **Sound Speed**: displays the sound speed used for basic range calculations in m/s.
- **Range Check**: allows the target to be pinged and tracked.
- **Transceiver**: a series of traffic lights that displays the acoustic **Quality**, **Noise** and **Strength**. Transponder traffic lights are shown in *Figure 5-9*. These are updated via **Test Acoustic Link** or **Ping.**
- **Advanced**: to set advanced settings, see *Figure 5-10*.
- **Release Option**: any unit discovered as having a release mechanism fitted will have the **Release Option** displayed, refer to *Section 6.2*.

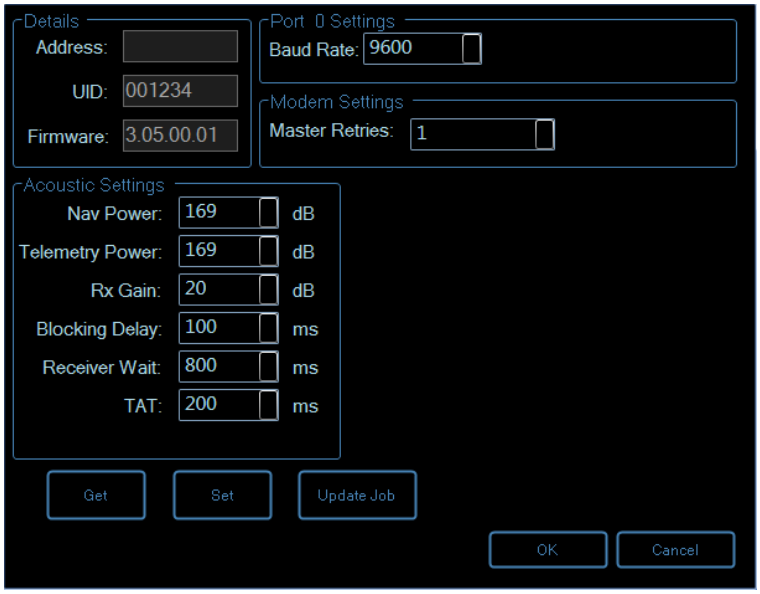
Figure 5-9 Link Tab

5.2.5.1 Link Tab Advanced Settings

The **Link** tab **Advanced** settings has the following options:

- **Details**: displays the Address, UID and Firmware.
- **Port Settings**: allows the Baud Rate to be selected.
- **Modem Settings**: allows the Master Retries to be set.
- **Acoustic Settings**: allows the acoustic settings to be set.
- The above settings can be retrieved, changed and the job updated by clicking **Get**, and **Set**.

Figure 5-10 Link Tab Advanced Settings



5.3 Setting up a New Job using Job Wizard

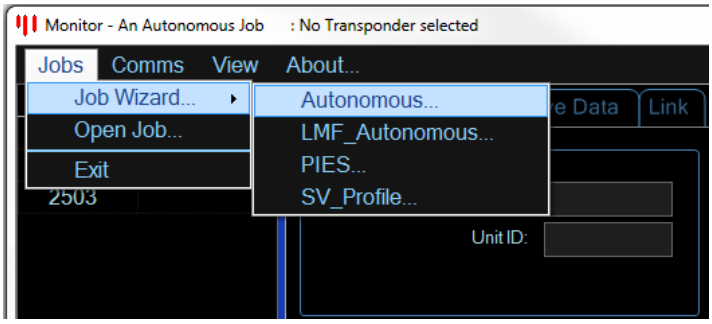
To ensure the correct initial configuration, the **Job Wizard** will ask a series of questions to generate appropriate parameters for the operation. Guidance and help is displayed in the left pane.

In the example shown below the template **Autonomous** is used.

5.3.1 Job Wizard

To start the Job Wizard:

1. From the Jobs menu click **Job Wizard** and then click one of the four standard templates, depending on the job type required **> Autonomous/ LMF_Autonomous/PIES/SV_Profile**.



Note

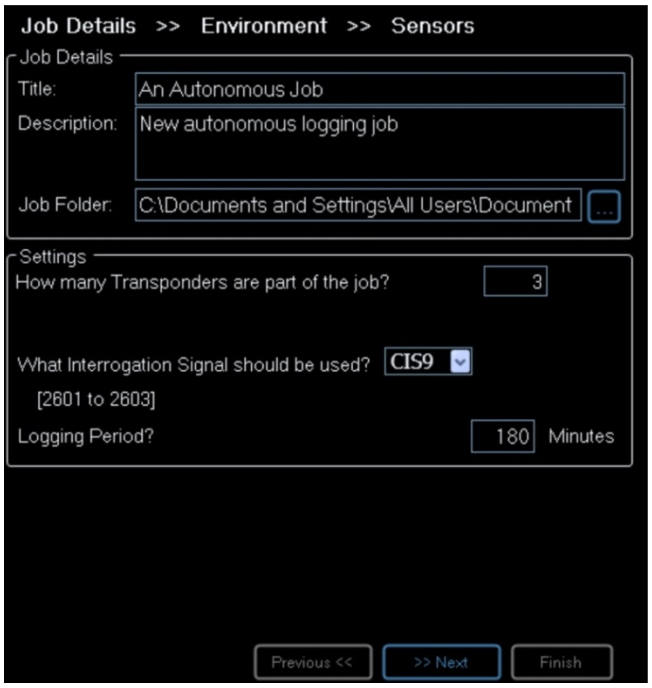
Monitor contains four standard templates:

Autonomous – Medium Frequency transponder logging (standard)
LMF_Autonomous – Low frequency transponder logging (for longer ranges)
PIES – Pressure Inverted Echo Sounder
SV_Profile – Collecting a through water SV profile

Template files appended *tpl.xml will be displayed in the Job Wizard drop-down list if they are copied into the template folder, located in
Windows XP: *C:\Documents and Settings\All Users\Documents\Sonardyne\Monitor\Templates*
Windows 7: *C:\Users\Public\Public Documents\Sonardyne\Monitor\Templates*

Custom templates can be created by Sonardyne for bespoke jobs. Contact Sonardyne support for more information.

2. On the **Job Details** dialog box enter the following details:
   - **Title**: the title of the job.
   - **Description**: a description of the job.
   - **Job Folder**: the job folder location on the PC.
   - **How many Transponders are part of the job?** (refer to *Step 3*).
   - **What Interrogation Signal should be used** (refer to *Step 3*)
   - **Logging Period**: the logging period in minutes.

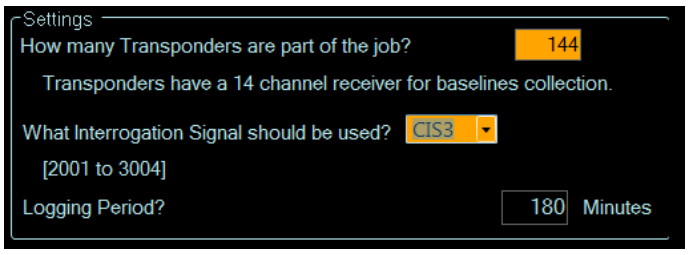


Note

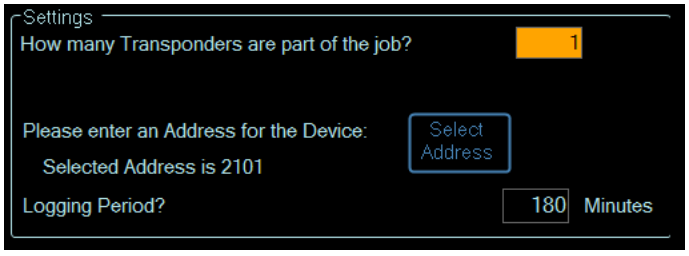
To avoid acoustic interference with other users, a Common Interrogation Signal (CIS) between 3 to 13 is generated each time the job wizard is used. This can be changed if another system is already active or the user requires specific transponder addresses to be used. For simplicity the CIS is linked to the addresses of the transponders and summarised in *Appendix B – Relationship of* Addresses.

The CIS is used only for applications requiring baseline ranges to be measured between AMTs and is therefore not used when only logging sensor data.

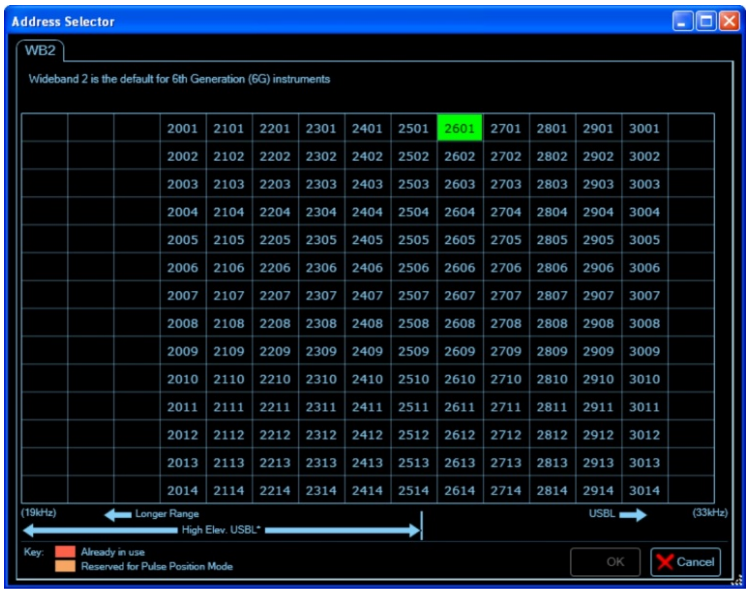
3. Enter the number of transponders. If more than 14 transponders are in an array, the message **Transponders have a 14 channel receiver for baselines collection** will be displayed and the **CIS** must be selected from the drop-down list.



If **1** is selected as the number of transponders, a **Select Address** option will be displayed.

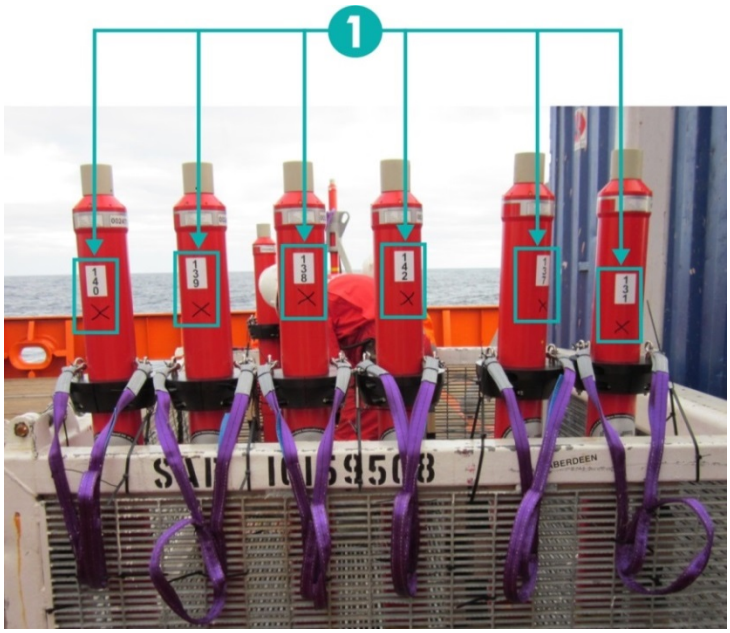


An address can be selected from a grid of available Wideband 2 addresses in the **Address Selector**.



Irrespective of the factory set address on the transponder housing, the software will re-programme the new addresses defined in the job.

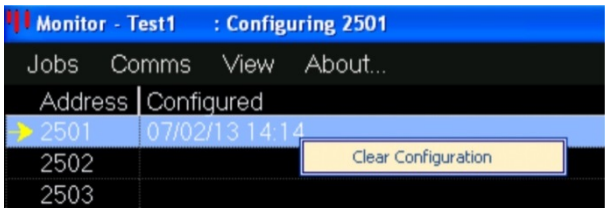
It is recommended that the factory addresses are hidden from view using tape and given a sequential number to avoid confusion during deployment.



1 New Addresses

If a unit requires swapping out, e.g. for a unit 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.

To clear the unique identity, on the **Monitor** dialog box right-click the address and click **Clear Configuration**.



4. Click **Next**.
5. On the **Environment** dialog box the following options for expected operational environment in which the equipment will be deployed must be set.
   - **Transceiver Type**
   - **Transponder Type**
   - **Water Depth/Range (A)**
   - **Maximum Baseline (B)**
   - **Vessel Noise**
   - **Minimum baseline saturation distance**

When making these settings, knowledge of the AMT acoustic transducer type is required so the correct transmit power can be computed. Omni-directional and directional transducer types are shown below.

Omni-Directional Transducer

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.

Notes

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

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

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

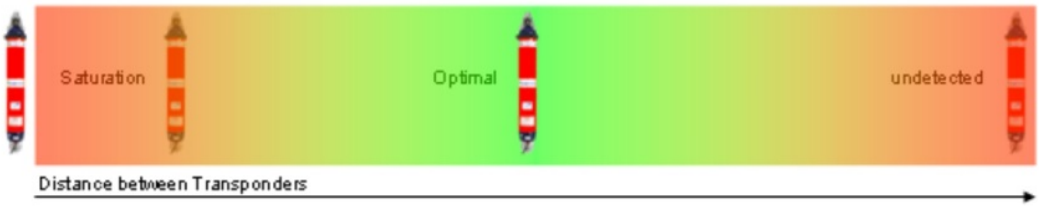
While testing in air, the saturation distance in the software can be ignored because the equation uses the figures for water, therefore the units can still be placed 30 cm apart.

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 from 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.

Distance between Transponders



Further details on signal metrics are described in *Appendix D – Signal Metrics for Acoustic* Communications.

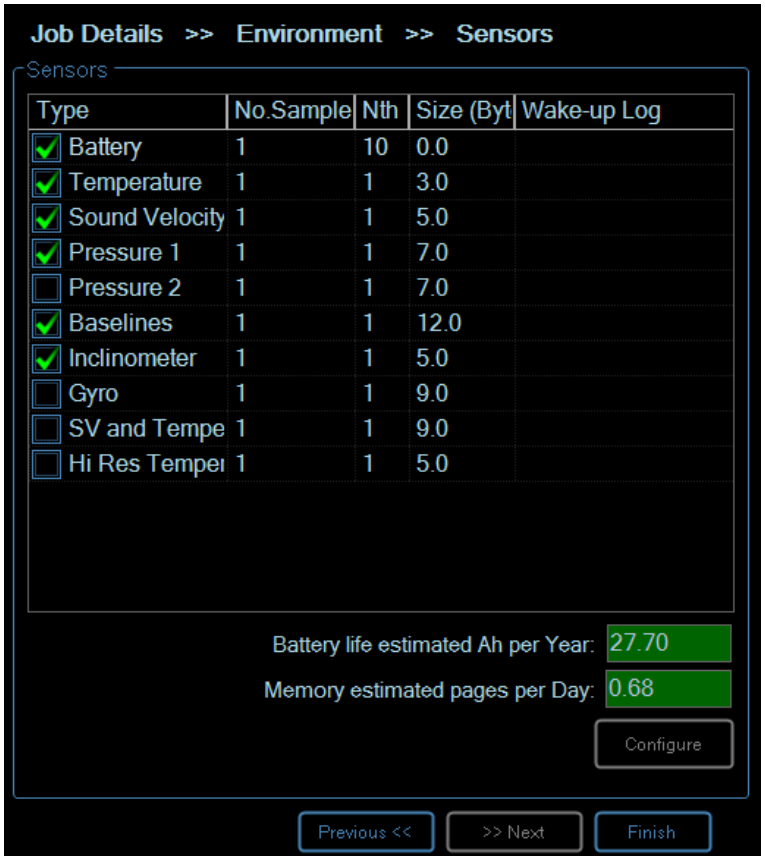
6. Click **Next**.

7. On the **Sensors** dialog box select the Sensors used in the job.

Notes

During manufacture the AMT is fitted with different sensors depending on the survey requirements specified. Refer to the *UM-8300 Wideband Transponder* manual for information regarding the sensor end-cap. The label on the end-cap denotes what sensor has been fitted to the AMT.
The available sensors displayed are dictated by the template used in the job wizard. When selecting the sensors, consideration must be given to the baseline usage, the directional requirements and the battery life.

See *Section 5.4, Battery Life* for information on how selected sensors can affect battery life.



8. When all required sensors have been established for the logging regime, click **Finish** to complete the Job Wizard.

Note

Features modified in 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 individual AMT on the Device tab once the job wizard is completed (refer to *Appendix A – Advanced* Configuration).

5.4 Battery Life

Battery life is dependent on a number of factors including the type and number of sensors selected on the Sensors tab. These factors include:

- Battery Pack Fitted
- Sensors Selected
- Ranges Measured
- Memory Used
- Transmit Power
- Water Temperature
- Excessive Software Logging

The above factors are described in detail in *Sections 5.4.1* to *5.4.7*.

5.4.1 Battery Pack

There are a number of different battery pack types and sizes available:

- 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 will become available as more varieties of product are designed.

5.4.2 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.

5.4.3 Ranges Measured

The greater the number of ranges measured to other AMTs, 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.

5.4.4 Memory Use

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) affects 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 possible using an HPT transceiver.

5.4.5 Transmit Power

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

- Distance between acoustic devices <2000 m = Low
- Distance between acoustic devices >2000 m = High

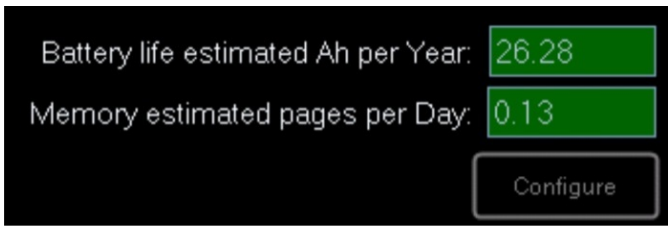
5.4.6 Water Temperature

Battery capacity is also affected by water temperature and 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.

5.4.7 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 – Memory Information on Data Recovery.*

In the example shown in the figure below 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 27 months (60 /26.28= 27 months) including the energy required to telemeter the data to the surface.



5.5 Serial AMT Configuration

Before proceeding with configuration of this equipment, make sure the Safety Manual and all warnings and cautions in *Section 2 – Safety* of this manual, are read and understood.

Configuration of an AMT using the Monitor software can be carried out serially or acoustically.

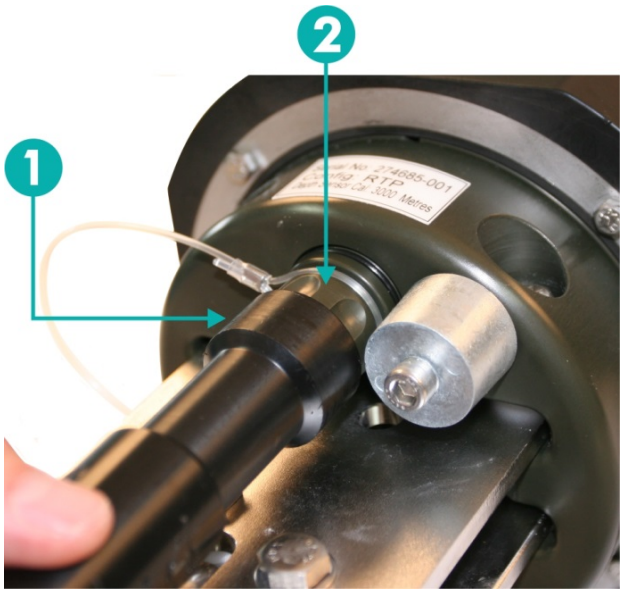
This section describes how to configure the AMT serially. To configure the AMT acoustically, refer to *Section 5.6.*

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 (serially).

5.5.1 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 (890-0026), remove the protective cover from the Dual Serial Cable connection on the end-cap as shown below.



1 Special Tool (890-0026) 2 Connector Cover

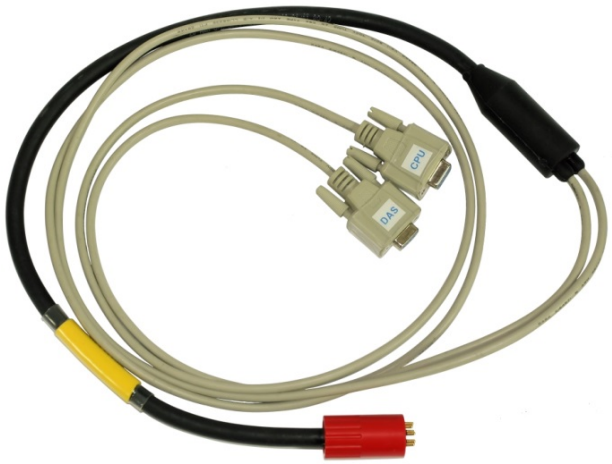
2. Check the connection point is clean and clear of obstructions.
3. Position the Dual Serial Cable in the correct orientation and insert into the connection point.
4. Secure the Dual Serial Cable in place by screwing in the red protective cover. The other end of the Dual Serial Cable has a CPU and DAS connector (see *Figure 5-11*).
5. Connect the CPU lead to an RS232 comms port on the PC.

5.5.2 Serial Configuration

To configure the AMT serially:

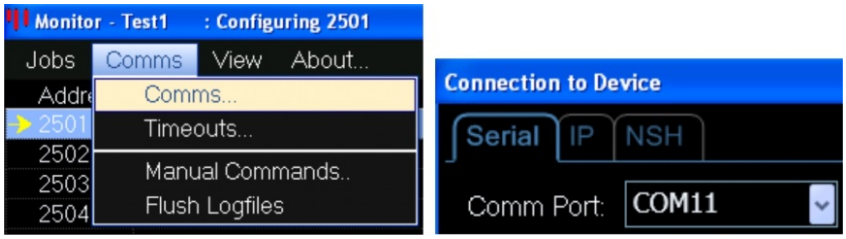
1. Make sure the Dual Test Lead is connected to the AMT, refer to *Section 5.5.1 - Connecting the Dual Test Lead (820-6713)*.

Figure 5-11 Dual Serial Cable (820-6713)

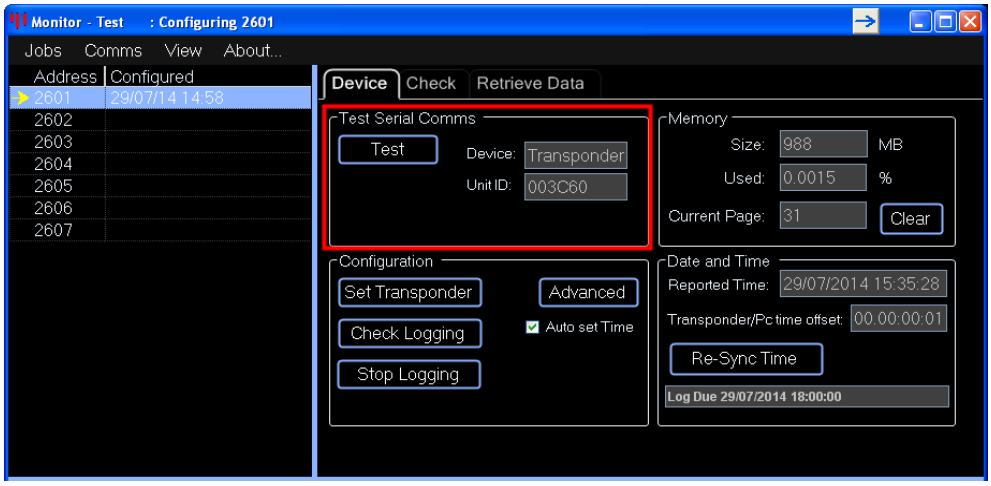


2. Start the **Monitor** software by double-clicking the **Sonardyne Monitor** icon.

3. On the **Comms** menu select the **Comms** setting to allocate the correct port (the baud rate is automatic and obtained by the software during the test sequence. First, 9600 is tried, then 38400 and then a reset is sent to read back the configured baud rate).
4. In the **Connection to Device** window, select the correct **Comm Port** from the drop-down list.

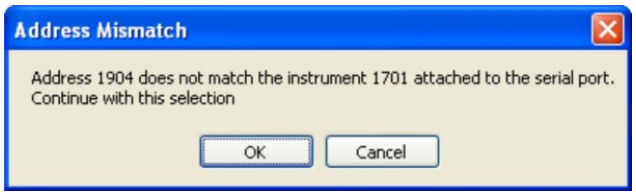


5. Click **OK** to revert to the **Device** tab and proceed with the configuration.
6. On the **Device** tab click **Test** to connect to any Sonardyne 6G instrument attached to the previously selected Comm Port.



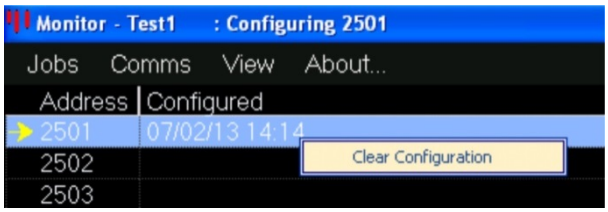
7. Successful connection will populate the **Unit ID** box. Confirm the AMT Unit ID label matches the Unit ID on the software.
8. If at any point the instrument is changed on the serial port, press **Test** again to verify the connection device.
9. If a transponder is detected, serial set up will be permitted. If a transceiver is detected the setup will be via acoustic telemetry, refer to *Section 5.6, Acoustic AMT Configuration*.
10. If the address of the connected transponder does not match the selected unit, an **Address Mismatch** warning will be displayed as shown below.

    This gives the option to continue and change the unit's address or select another address.



11. Click **OK** to change the unit's addressor click **Cancel** to choose an alternate address in the **Address** list as shown above.

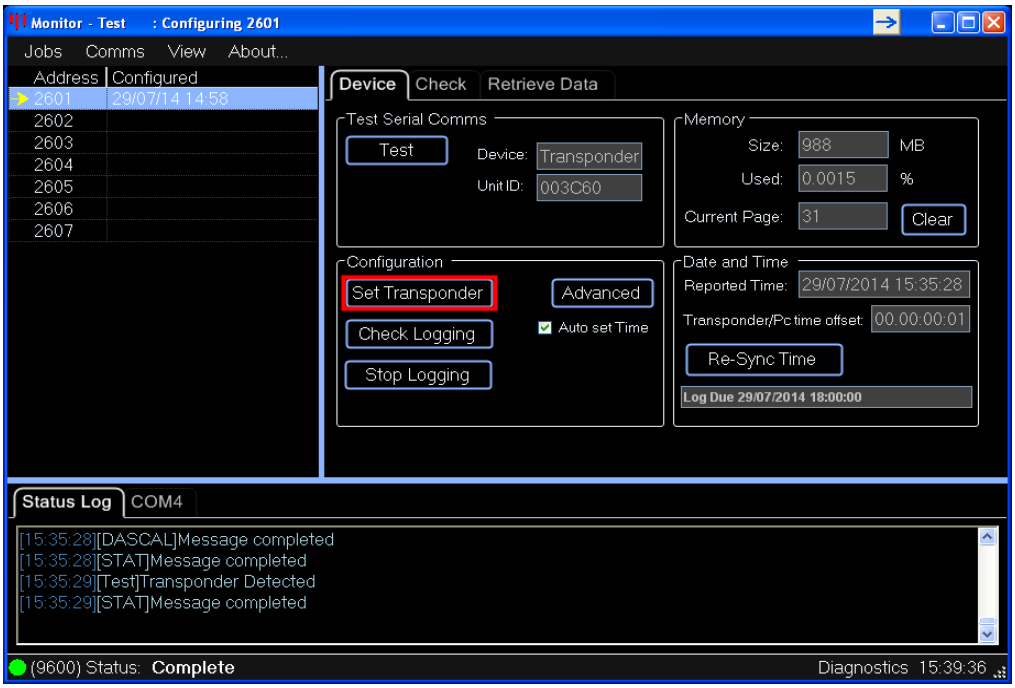
    To clear the unique identity; right-click the address and click **Clear Configuration**.



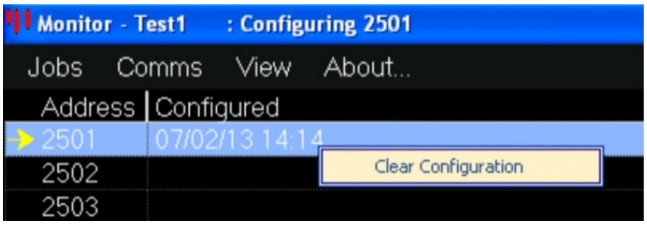
12. On the **Device** tab, click **Set Transponder** to send the configuration from the job to the transponder.

Note

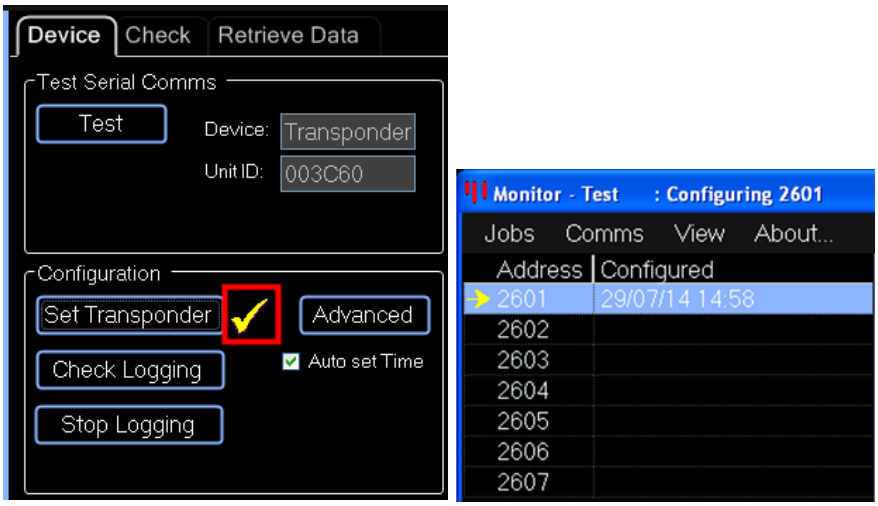
Clicking "Set Transponder" will also transfer the PC time to the AMT. It is advisable to perform regular synchronisation of the PC clock to GMT. To bypass clock synchronisation of the AMT to the PC, the Auto Set Time check box should be unselected. This may be useful if the user needs to program a new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



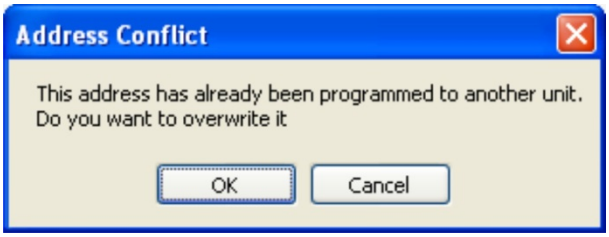
13. After the configuration is sent through the serial connection to the transponder, the additional information will be populated and confirmation of clock synchronisation will be shown.
14. The transponder Unit Identification Number (UID) information is stored in the job file to prevent duplication 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** in the left pane and selecting **Clear Configuration**.



15. Once configuration of the transponder is complete, a tick will appear next to **Set Transponder** and a time stamp will appear next to the **Address** on the left as a time **Configured** column to help identify which transponders are programmed as shown below. The unit is now logging and will display the next log event.



16. If the user tries to reprogram two units to the same address, an **Address Conflict** window will appear. If a clone is required, click **OK.**



17. The process can be repeated for each transponder or reprogramed with advanced settings; see *Appendix A – Advanced* Configuration.

Note

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

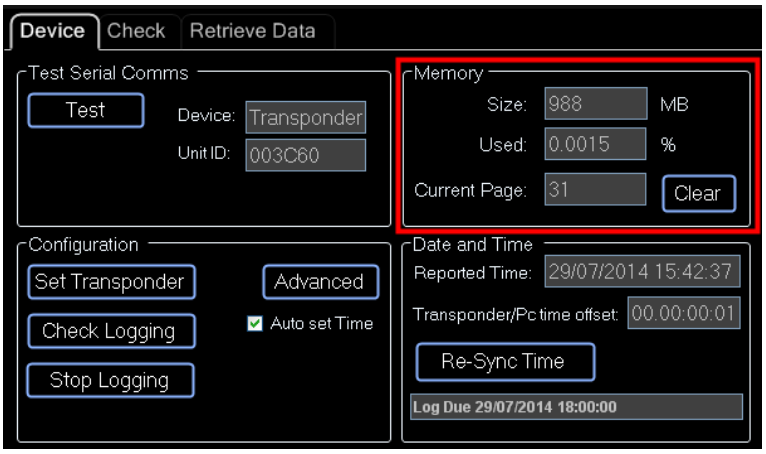
5.5.3 Memory

The 1 GB memory capacity far exceeds what is 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 1 GB of data at the fastest telemetry scheme 5 with an HPT, would take 20 days to recover; see *Appendix C – Memory Information on Data Recovery*. 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 to remove data from an old survey.

5.5.3.1 Clearing the Memory

1. On the **Device** tab click **Clear** in the **Memory** pane.

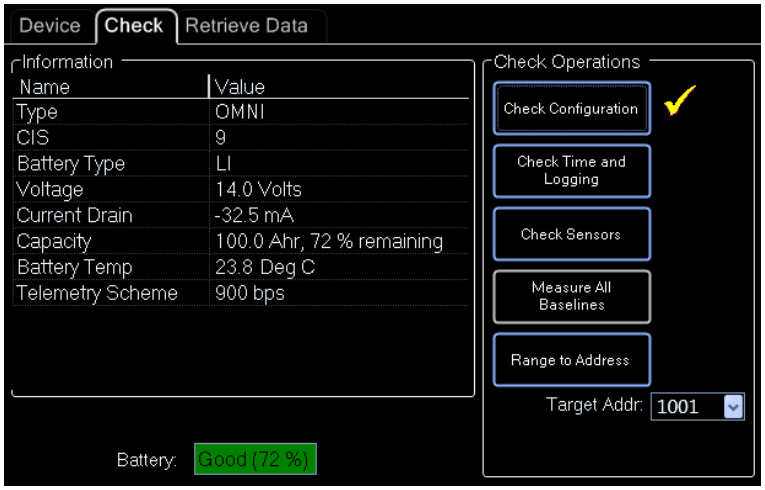


2. Click **OK** on the **Memory Clear** confirmation window.

3. Once the memory has been cleared, check the **Current Page** has returned to **1**.

5.5.4 Check Tab

After configuration is completed, click the **Check** tab to check the AMT configuration directly via the serial port or through the water via acoustic telemetry.



5.5.4.1 Check Configuration

On the **Check** tab, clicking 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.

Note

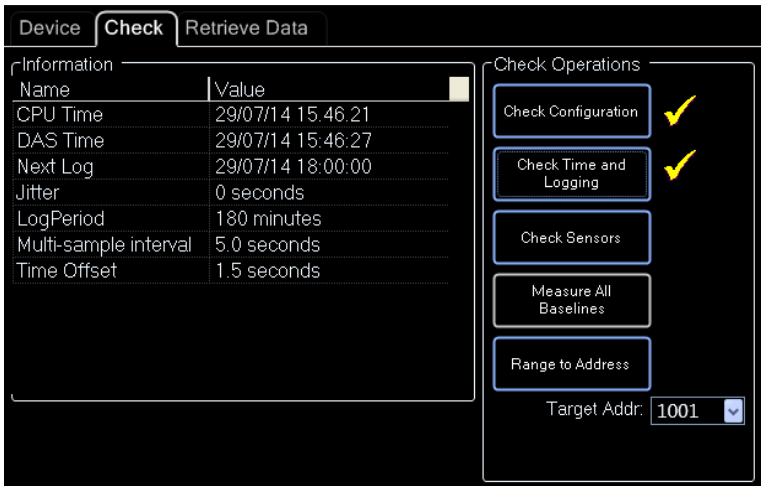
A deck check using 6G Terminal Lite software also captures this information.

5.5.4.2 Check Time and Logging

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

Note

The AMT has 2 clocks; one in the DAS (Digital Acquisition System) where sensors are logged (essential to operation) and another in the CPU (Central Processor Unit), for reference use only. Both times are displayed during the check time process. The CPU clock provides an independent check for drift but has no impact on logging or unit function. The DAS clock is critical to logged data.



5.5.4.3 Check Sensors

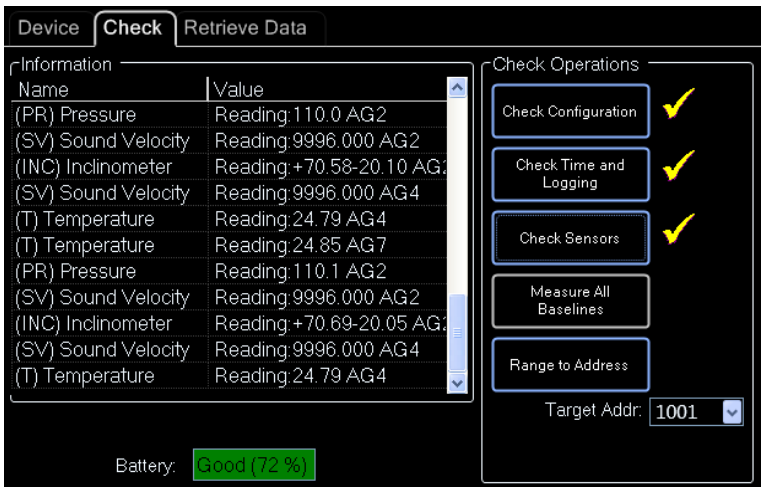
The **Check Sensors** option will initiate acquisition of sensor data and display the results. As some sensors have long warm-up times (>20 seconds) it is advisable to limit operation of this button.

ER1 at the end of the reading indicates old readings.

AG2 is the age of the reading in seconds

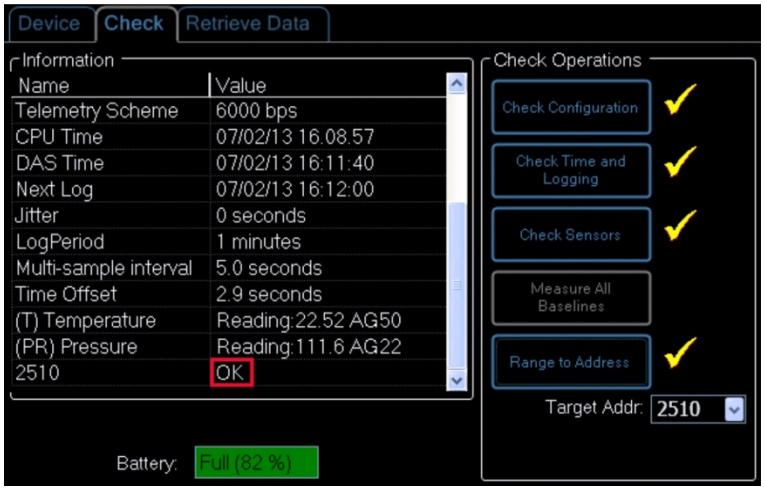
The sound velocity sensor reading of **9996** means it's in air whereas **9998** means SV sensor not functioning. Placing the endcap in a bucket of water will facilitate a valid reading so long as the sensor is fully immersed and the reflector plates are clear of small air bubbles.

Make sure when recording observations the age (**AGXX**) is displayed indicating the sensor has warmed up.



5.5.4.4 Range to Address

Verify the ranging to another preconfigured 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, an **OK** is displayed whereas once deployed a single range will be quantified with signal metrics and an approximate range based on an approximate Sound velocity.



Section 5.6 describes configuration of the AMT acoustically using a transceiver (rather than serial connection). If a transceiver is connected to the PC the range to address between transponders will be reported with signal metrics.

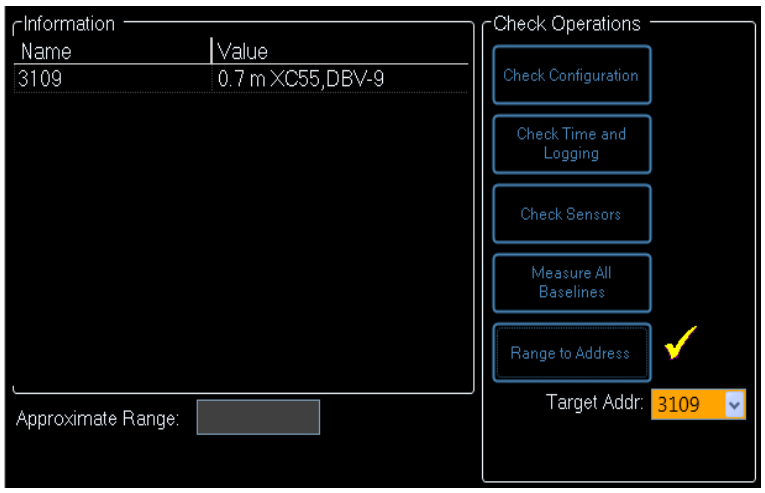
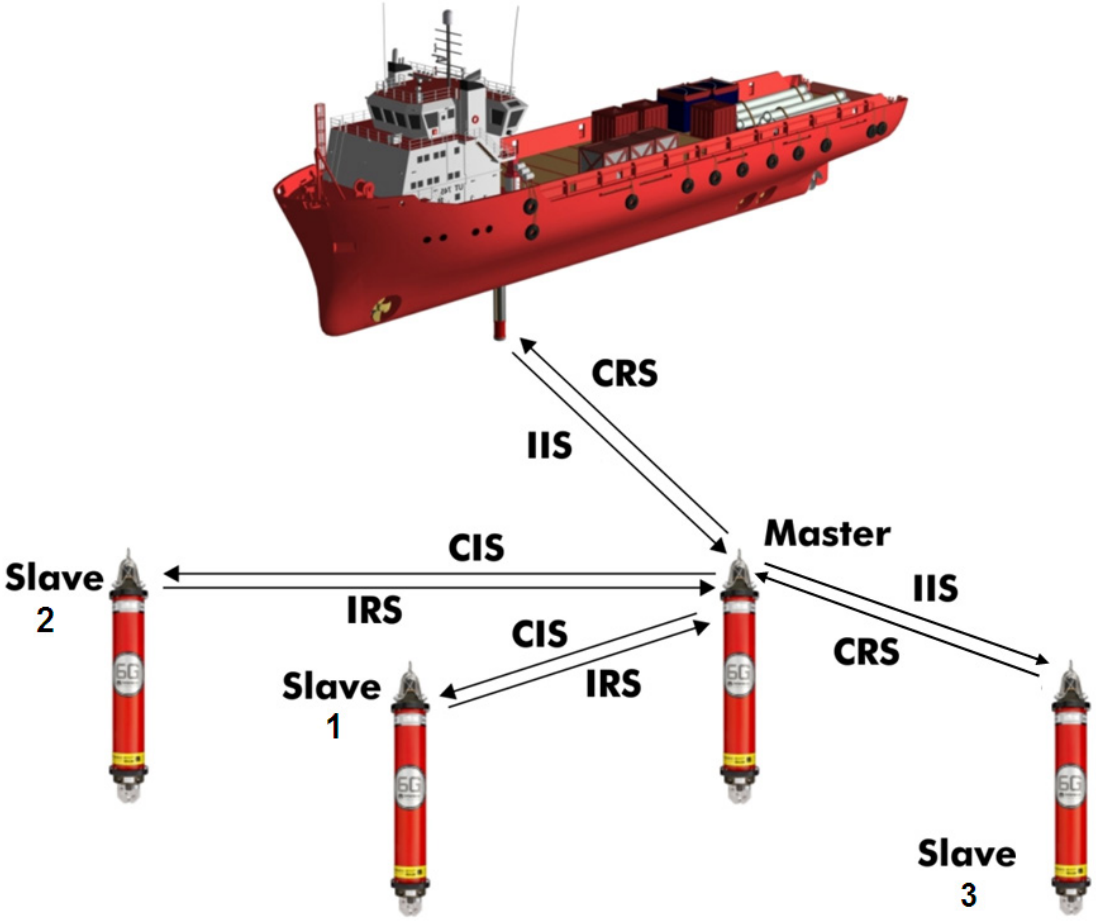


Figure 5-12 Summary of Acoustic Ranging between Master and Slave Transponder



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

Before leaving a system logging baselines it is paramount the gains are checked by clicking **Measure All Baselines** on the **Check** tab. If this fails it is likely the unit will continue to fail when running autonomously. 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 any deployment. Clicking **Range to address** will measure one range to just a single transponder, shown as Slave 3 in this example. By ranging to one specific address rather than a common broadcast means that only one reply will be generated. If this works where measure all did not will be indicative of pulse overlap where 2 replies, from Slave 1 & 2 in this example, are coincident.

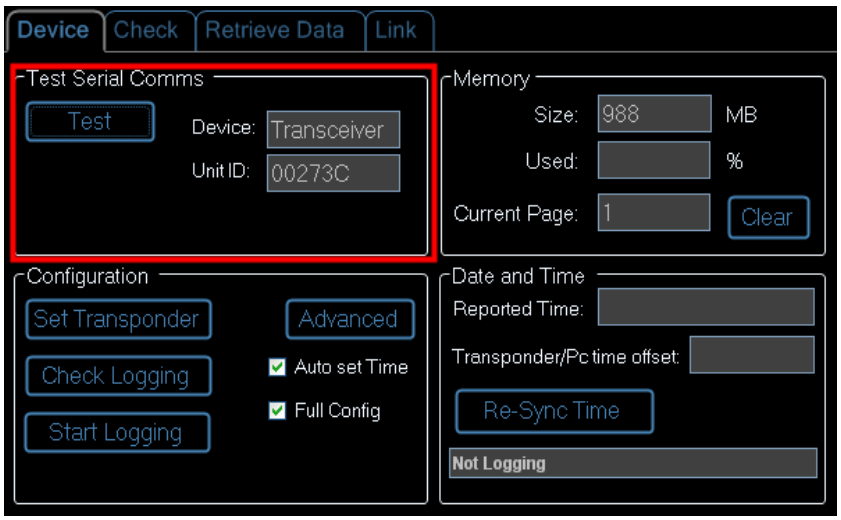
It is important to confirm the 'as-laid' sensor data and that the transponder is communicating correctly prior to a long-term operation. The additional diagnostic signal information is reported during the check stage is not part of the logged data when running autonomously.

The baseline signal quality and level when ranging between transponders should be cross checked against the table in *Appendix D– Signal Metrics for Acoustic* Communications.

5.6 Acoustic AMT Configuration

Configuration of the AMT can be carried out acoustically using a transceiver.

1. Connect the transceiver to the PC serial port and click **Test** on the **Device** tab to reset and initialise the transceiver to the appropriate configuration. If connected via a Ranger 2 system and using a NSH refer to *Section 5.6.1 "Transceiver Communication using a Navigation Sensor Hub (NSH)"*.



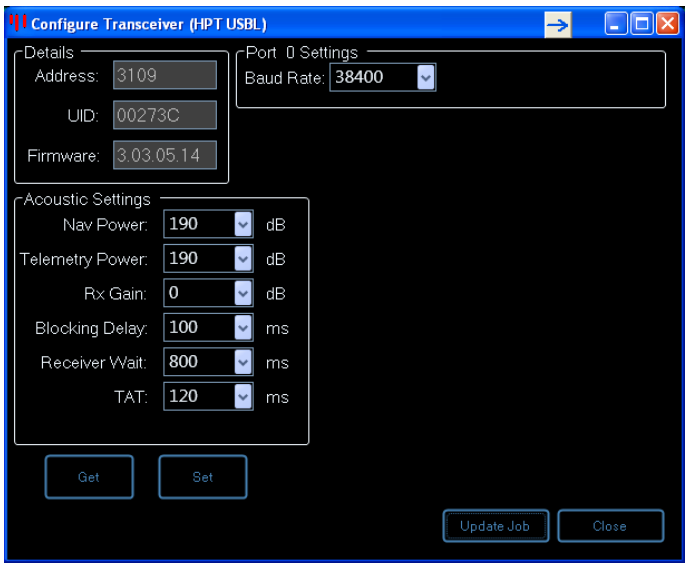
Notes

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

When a transceiver is connected the "Link" tab becomes active as acoustic communication is used to the AMT.

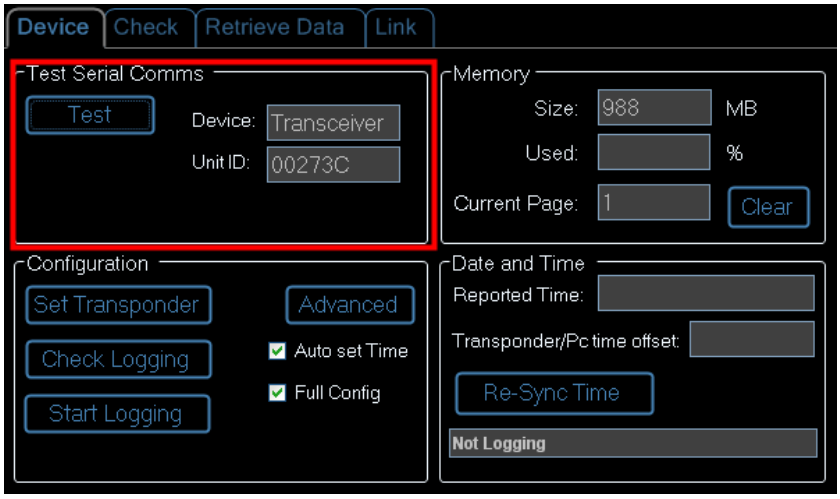
2. After a connection to a transceiver is confirmed, check the detected baud rate displayed on the bottom left of the dialog box.

3. To change the baud rate the instrument is using, click the **Link** tab and then click **Advanced**.



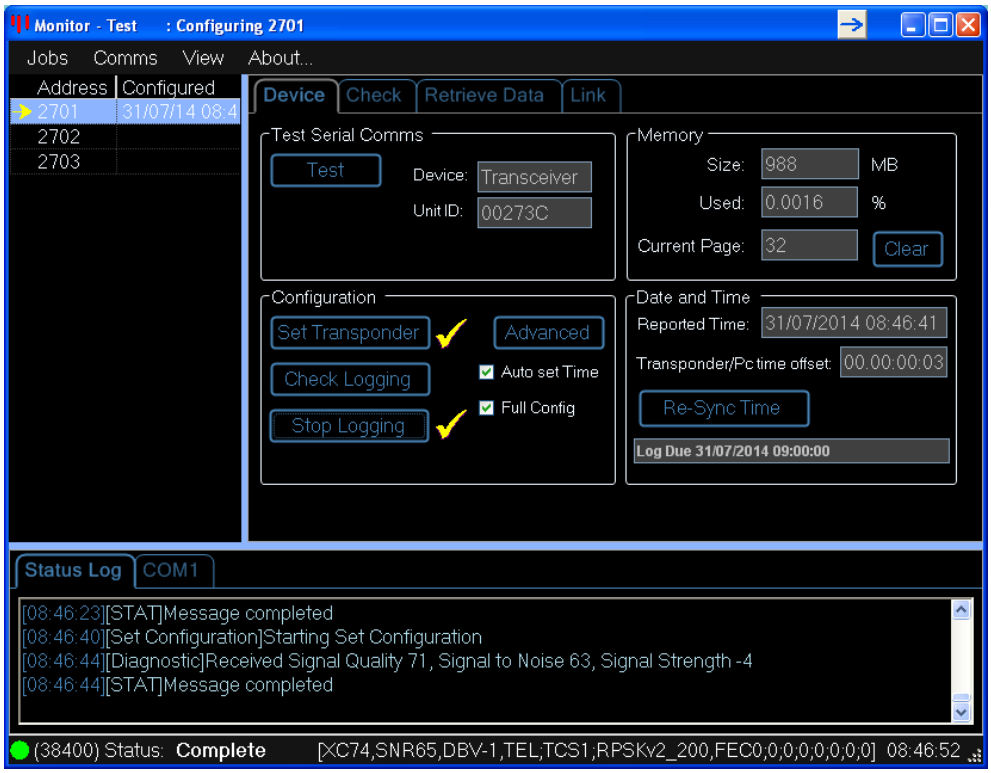
4. On the **Port 0 Settings** drop-down list, select a baud rate of **38400** and then click **Set**.

5. After changing the baud rate, it is important to click **Test** on the **Device** tab to establish the new connection. The parameters determined by the template and job wizard will be sent to the transceiver upon re-initialisation upon pressing test.

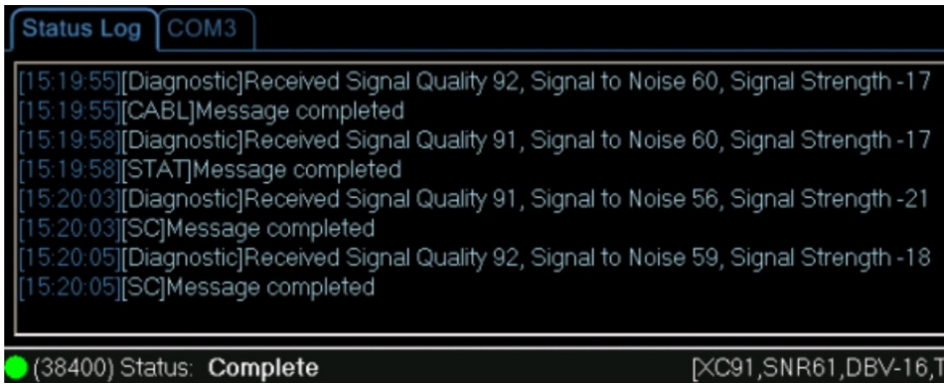


6. Once the software has successfully connected to a transceiver the system is ready to communicate to the transponders using acoustic commands. The process is the same as a serial connection except the commands are sent acoustically through the water to the transponder and thus slower.

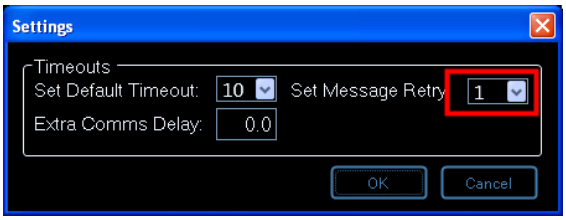
7. To send the settings to a desired transponder select a transponder from the available list and click **Set Transponder**. After this the transponder can start logging.



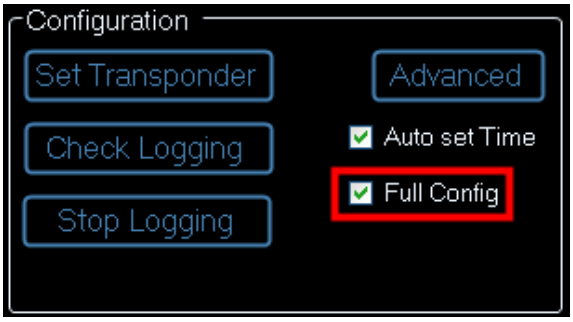
8. The status log at the bottom of the window displays the progress and the acoustic metrics as the transponders are updated.
9. All status communications are automatically stored as a text file on the PC for quality control purposes. The text files are located in the following **Logfiles** folder:
   Windows XP: *C:\Documents and Settings\All Users\Documents\Sonardyne\Monitor\Logfiles*
   Windows 7 *C:\Users\Public\Public Documents\Sonardyne\Monitor\Logfiles*
10. The raw communications are also displayed and logged for reference. These files can be used for support purposes.



11. Any failed acoustic communications will be resent once more by default. If additional attempts are required the comms settings can be altered. Rather than repeatedly retrying acoustic comms it is advisable to move geometry and improve the line of sight.



12. During configuration 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 start at the beginning again to make sure of a robust configuration.



13. If lots of interference is experienced it is advisable to deselect send **Full Config** as this will continue from the last accepted command during previous attempt.
14. The **Auto set Time** option can deselected to prevent re-synchronising the AMT clock during setting the AMT configuration routine.

5.6.1 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 NSH connection to permit access to both systems. It is important the software such as Marksman or 6G Terminal Lite are already connected and communicating with the transceiver before running the Monitor software on the same PC.

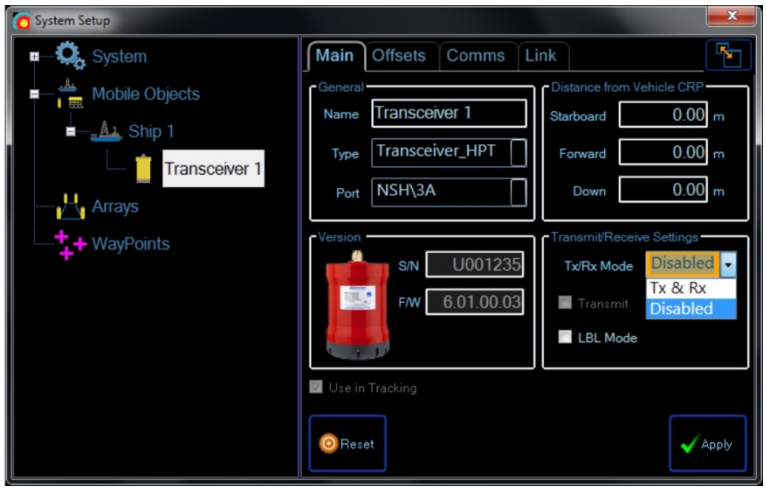
Monitor will capture the Ethernet comms and run alongside other software. It is important the other software is not trying to communicate at the same time as data retrieval. This is achieved in Marksman by selecting **Disabled** under the transceiver settings.

Note

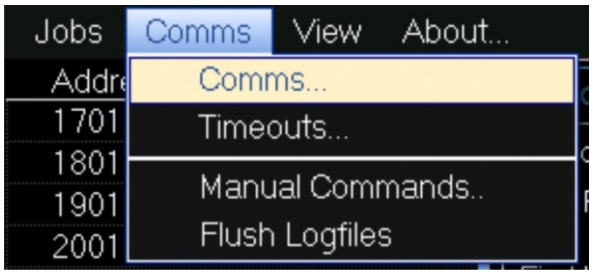
If the NSH is to be connected to a laptop or PC other than a standard Sonardyne Navigation Computer, it will be necessary to make sure the IP address of the PC is configured correctly for NSH operations – see *Appendix G – IP Address Configuration*.

5.6.1.1 Connecting the Transceiver

1. In Marksman software, disable the Transceiver by selecting **Disabled** from the **Transmit/Receive Settings** drop-down list.



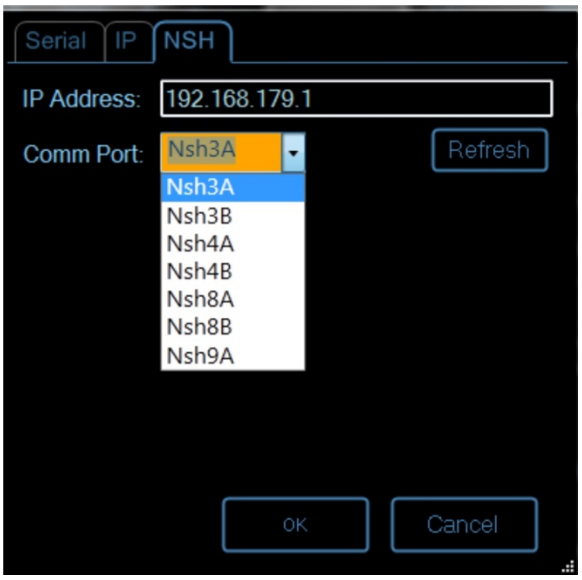
2. On the **Monitor** dialog box, on the **Comms** menu click **Comms**.



3. On the Comms window select the **NSH** tab and enter the NSH **IP Address** which by default is **192.168.179.1**

4. Click **Refresh**.
5. Select the appropriate NSH port that the transceiver is connected to, e.g. 3A. This will be the same connection as the other software also running on the PC.

6. Click **OK** to confirm selection and return to the main window.



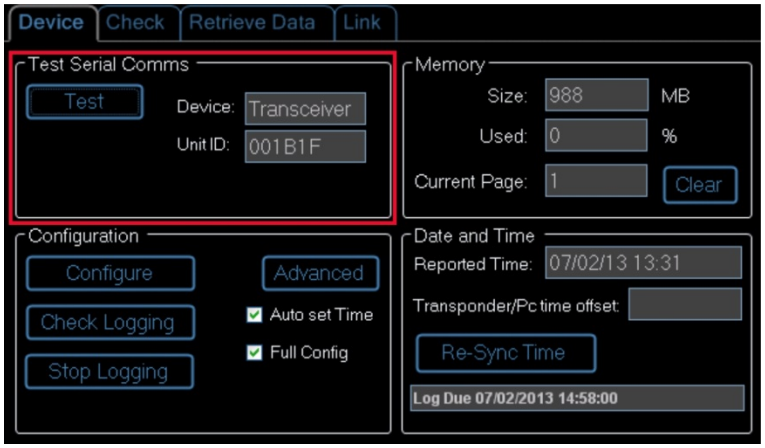
7. After connecting to a valid instrument click **Test** on the **Device** tab to check the transceiver connection and automatically configure it to the correct settings specified in the job.
8. If problems are experienced, it is possible to connect to the same NSH IP Address using HyperTerminal and typing **port**. The available ports will be listed and the Ethernet connection verified.

Section 6 – Testing

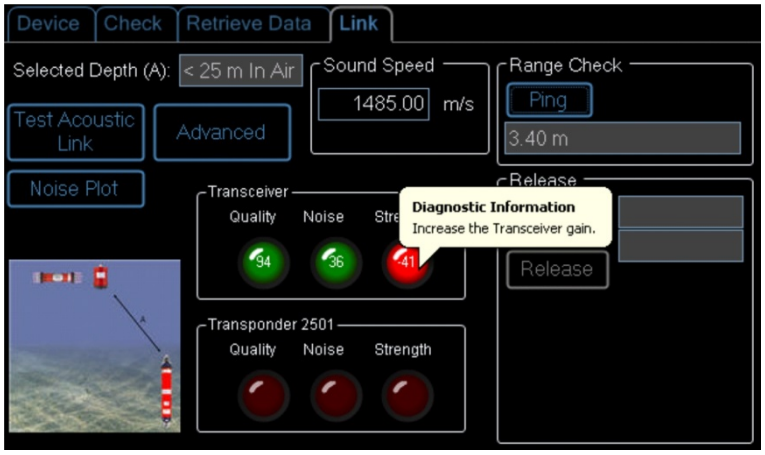
6.1 Testing the Acoustic Link

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

1. Make sure a transceiver is connected.
2. On the **Device** tab click **Test**.



3. A simple range check can be performed at this stage by clicking the **Ping** button on the **Link** tab, this will individually interrogate the AMT and compute a range based on the sound speed.
4. The traffic lights will indicate the signal information for the received reply at the transceiver only.



Notes

Adjusting these values incorrectly may cause loss of communications with the transponder.

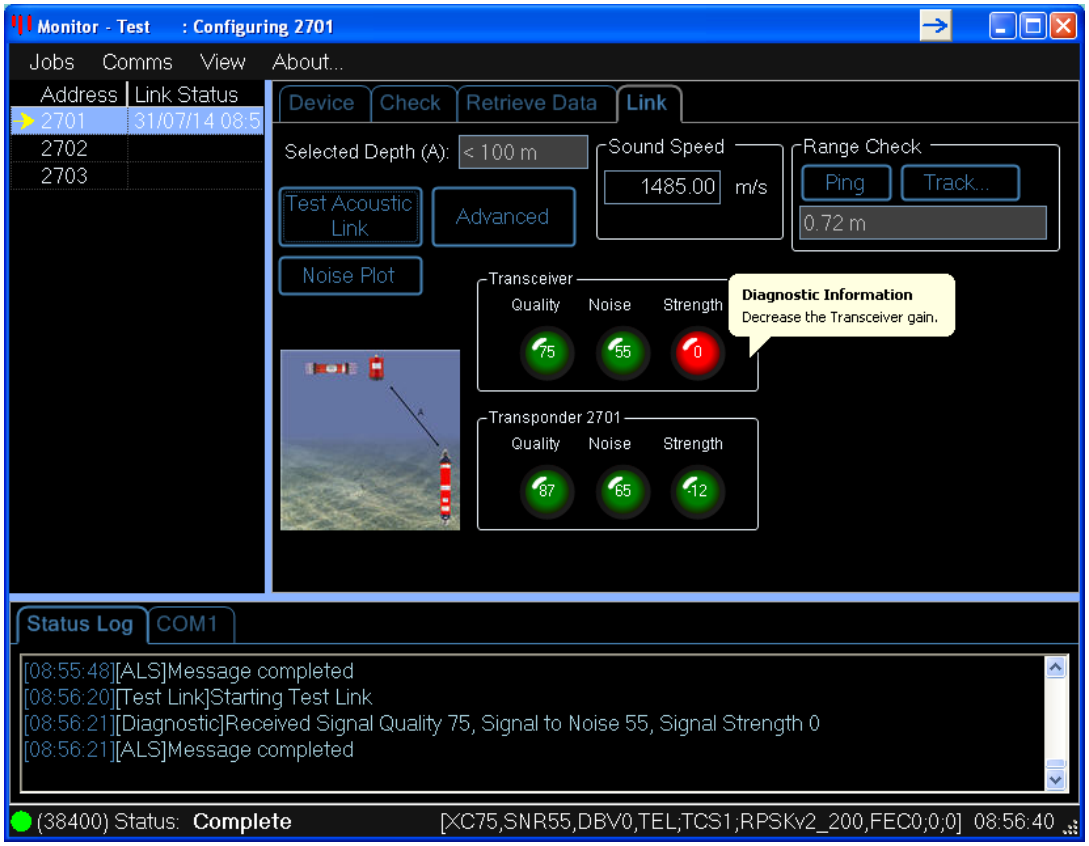
For signal quality metrics refer to *Appendix D – Signal Metrics for Acoustic Communications*

Information on advanced acoustic settings can be found in *Appendix F – Advanced Acoustic Settings*.

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

6.1.1 Suggestions to Improve Acoustic Link

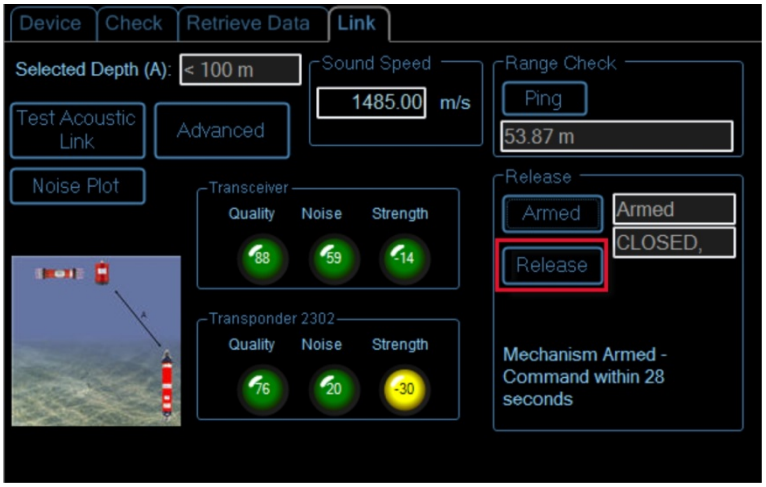
When you hover the mouse over the lights, information will be displayed suggesting how the acoustic link can be improved.



6.2 Release

During **Check Configuration** on the **Check** tab, any unit discovered as having a release mechanism fitted will have the **Release** option displayed; 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.

If a transponder was not programmed using the software but the address is known, the user must run a **Check Configuration** 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 clicked the unit will be commanded to open the release mechanism.

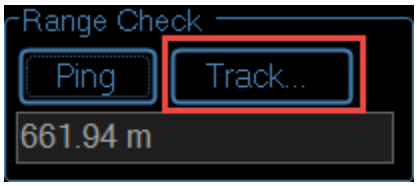
Note

The AMT is designed to run for as long as possible and will continue to log until the battery has 5% charge remaining. This will allow enough charge left to operate the release mechanism.

An override command can be sent to allow the unit to continue logging until the battery has been completely depleted.

6.3 Range Check

While a transponder is being deployed or released, the position can be approximated using the pressure sensor and the range to give a horizontal position by clicking **Track**.



The user can set the frequency of the updates by entering a value into the **Update Rate** box.

For units with inclinometers fitted, the roll and pitch of the unit can be monitored at the same time by ticking the **Use Inclinometer** check box.

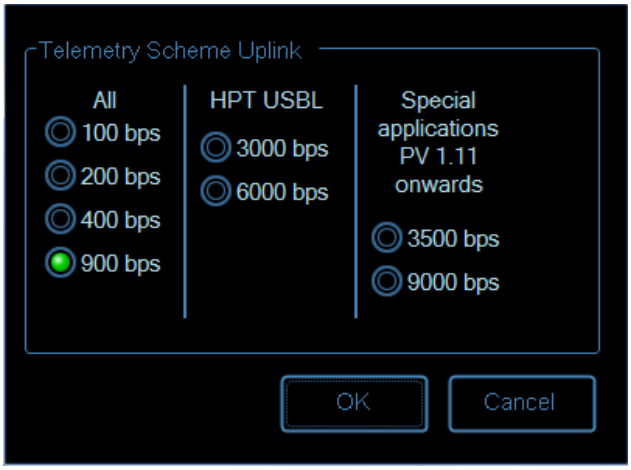
Section 7 – Data Retrieval and Export

7.1 Introduction

Once the AMT has acquired and stored data 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.

When sending data from the remote unit, it is advisable to use the fastest/highest possible telemetry scheme (up to 9000 bps) to speed up operations and reduce battery consumption as shown below. However, if there are continual failures due to noise then slower download speeds can be used.

The telemetry speed can be changed on an AMT under **Advanced Configuration** on the **Acoustics** tab (see *Figure 5-6*).



The default telemetry scheme is 900 bps and supported by all transceivers (Dunker 6 or ROVNav 6). HPT USBL systems support a faster rate of data transfer of approximately 6000 bps. Information on data speed can be found in *Appendix C– Memory Information on Data* Recovery.

New developments in the modem protocol make higher data speeds possible so long as Firmware in both systems supports it. If the correct firmware is detected, the two higher speeds are available to all transceivers.

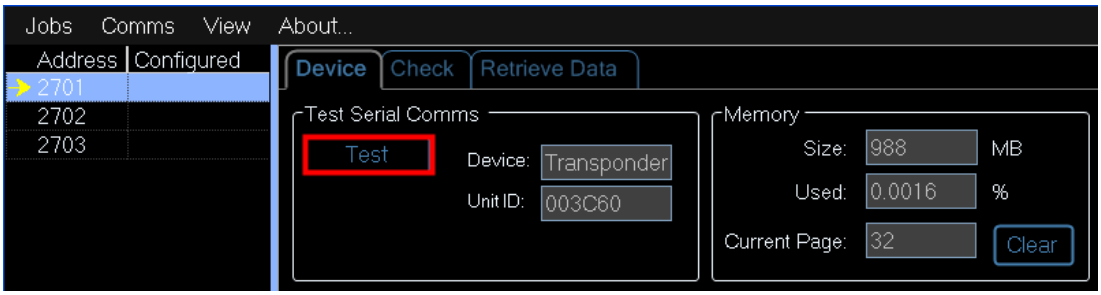
Note

The column labelled "Special applications PV1.11 onwards" refers to the latest firmware release that allows higher data transfer speeds. If you are unsure if your system supports these speeds contact Sonardyne Support.

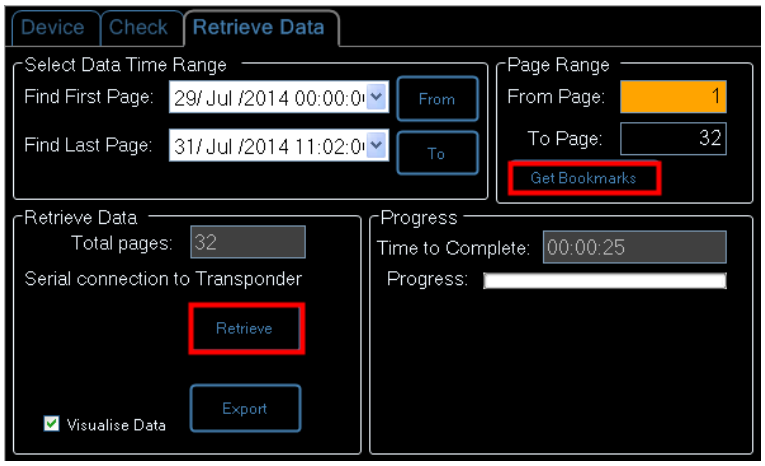
7.2 Serial Data Recovery

1. It is recommended to change the baud rate on the transponder to **57600** when recovering large qualities of data.

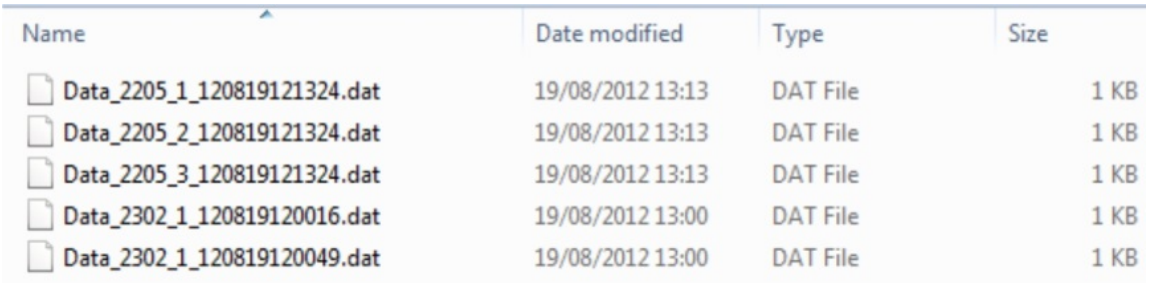
2. On connection of each transponder directly to a serial port, on the **Device** tab click **Test** to validate which AMT is connected to the serial port. The software will automatically jump to the highlighted AMT after a test.



3. After successful connection click the **Retrieve Data** tab.



4. Click **Retrieve**. 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

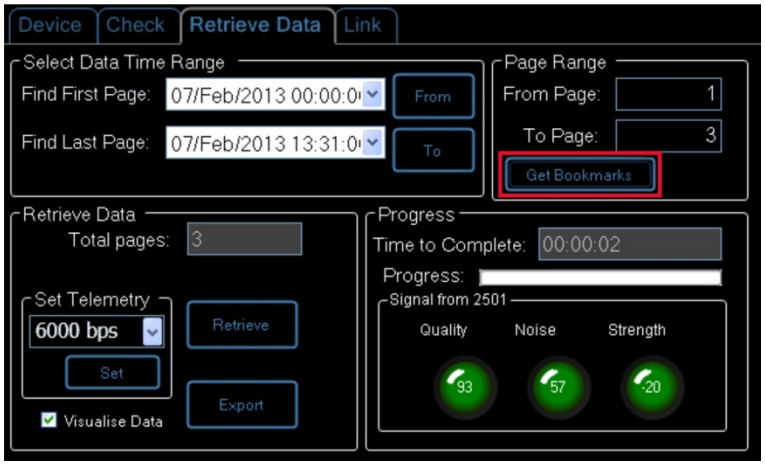
For acoustic retrieval of data, traffic lights will indicate strength of signal for each burst of data received by the transceiver.

7.3 Acoustic Data Recovery

1. On the **Retrieve Data** tab, click **Get Bookmarks**, as shown below. 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.



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

   For example, if three 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.

Notes

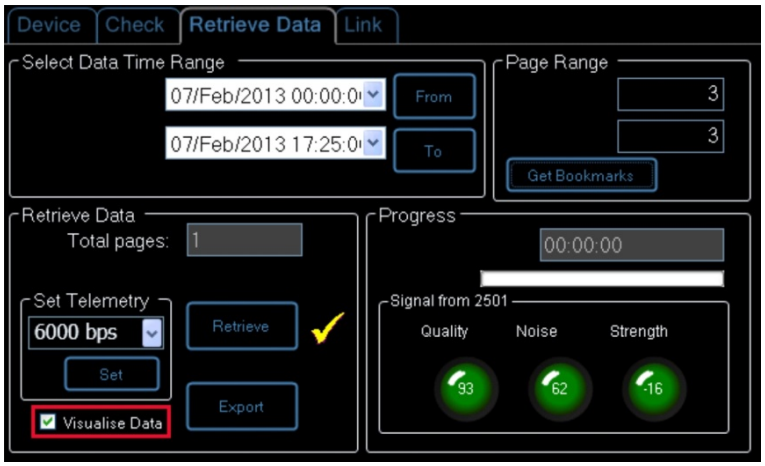
During acoustic retrieval it is advisable to initially recover one page of data by selecting the same page number in the "from" and "to" page range and then increase to multiple pages once the user is confident with the process. The signal quality will give an indication of the progress during data recovery. Refer to the table in *Appendix D– Signal Metrics for Acoustic* Communications for signal metric advice

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

7.4 Data Export

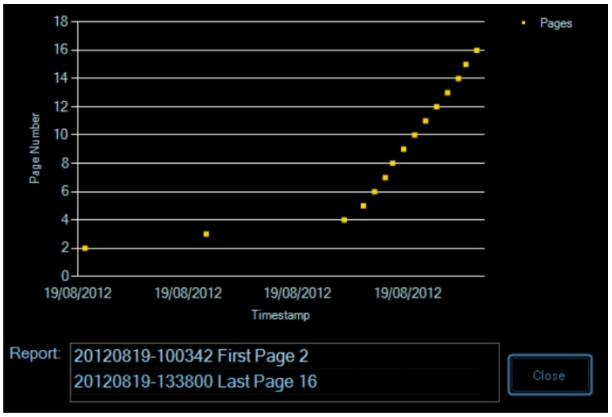
Each page recovered is always stored in raw *.dat binary data on the PC disk drive. When clicking **Export**, all data files are merged to form one *.CSV for each transponder. If duplicate data page files are found only the most recent is used during export. The CSV file format is given in the header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

After Acoustic data Recovery, the information recovered can be previewed if the **Visualise Data** option is selected.

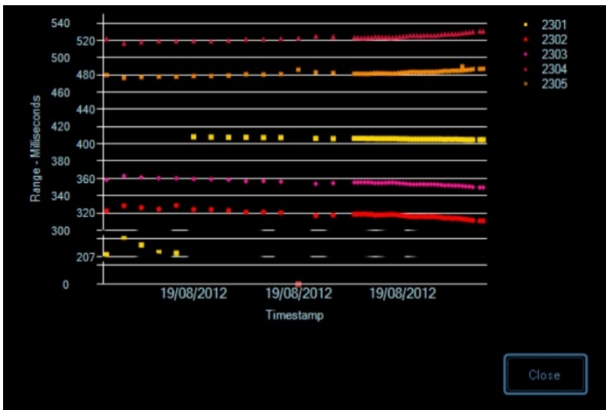


The recovered Page Number Data, Baseline Data, Sound Speed Data and Second Pressure Data can all be viewed as graphs:

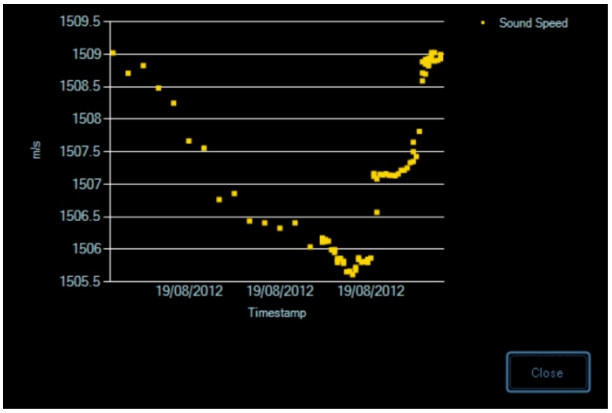
Page Number Data



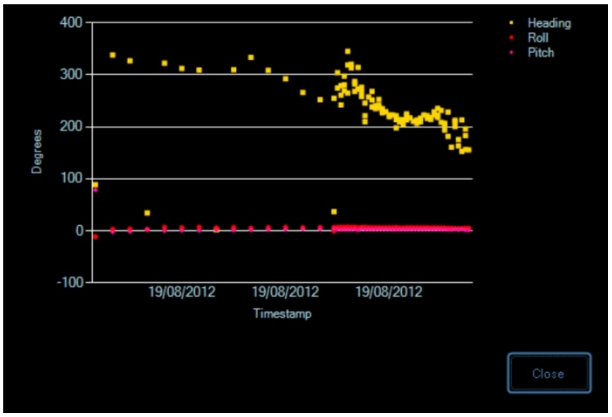
Baseline Data



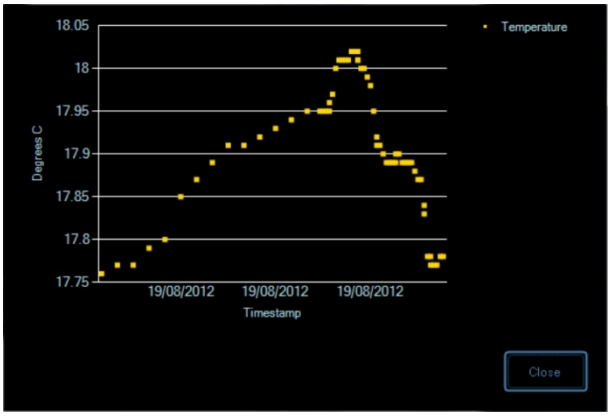
Sound Speed Data



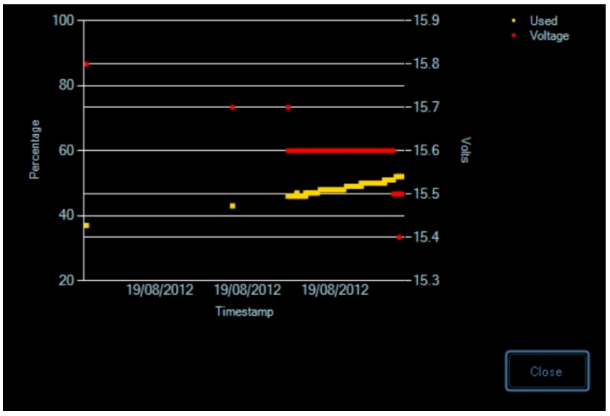
Inclinometer Data



Temperature Data



Battery Data



Appendix A – Advanced Configuration

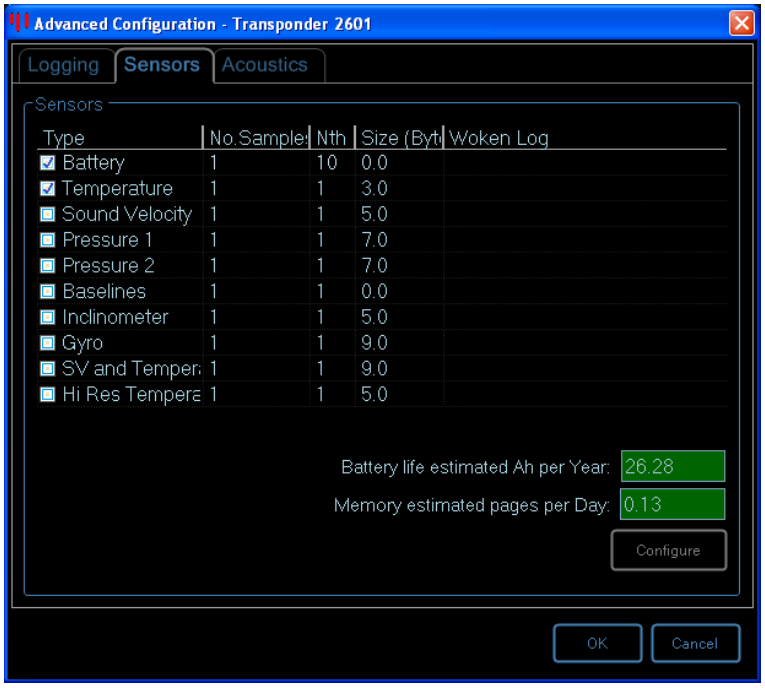
On the **Device** tab click **Advanced** to display the **Advanced Configuration** dialog box.

A.1 Advanced Configuration – Sensors

The **Sensors** tab displays the following logging configuration for each sensor:

- Number of samples.
- Sub log interval.
- The size of each record.
- The log when interrogate is received.

Figure A-1 Advanced Configuration Sensors



A.1.1 Configuring Sensors

To configure a sensor, select the sensor **Type** check box and click **Configure** (see *Figure A-1*). The Configure Sensor dialog box (see *Figure A-2*) allows each sensor **Type** to be individually configured as described below.

A.1.1.1. Samples

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

A.1.1.2. Log every n'th period

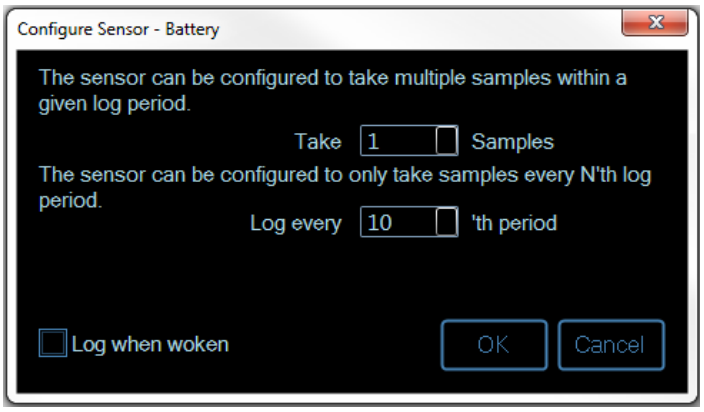
This is particularly useful for observations such as battery capacity which may not be required every log period and will waste memory. For example the user can specify 8, which would only record a specific sensor reading every 8 log periods. With a log period of 3 hours this equates to only one battery capacity reading every day.

A.1.1.3. Log when woken

With baseline measurements AMTs 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; see *Appendix F – Advanced Acoustic* Settings for details of acoustic settings.

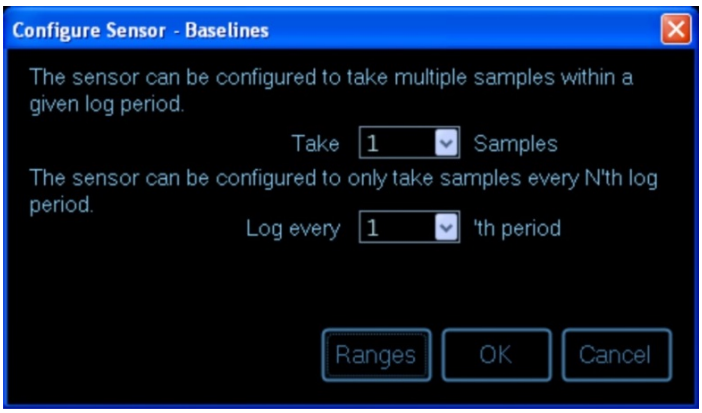
Figure A-2 Configure Sensor Dialog Box



A.1.2 Advanced Baseline Selection

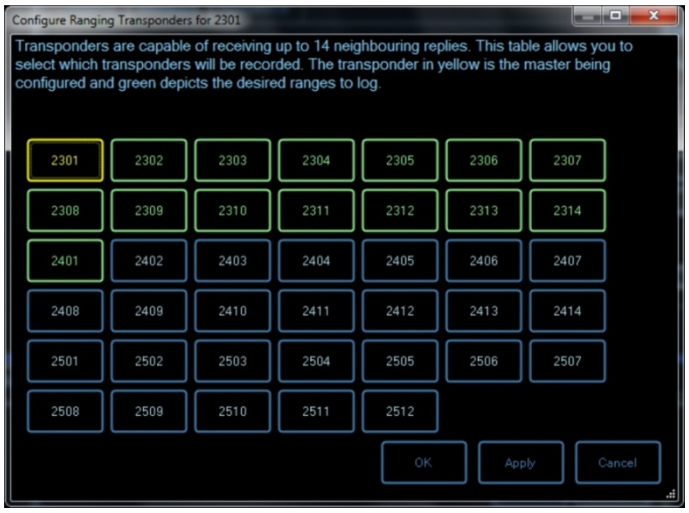
Each transponder can collect up to 14 simultaneous ranges. The addresses that each transponder listens to can be selected and set by selecting the **Baseline** Sensor **Type** and clicking **Configure > Ranges**.

Figure A-3 Configure Sensor – Baseline



The master transponder being configured is shown in yellow and the ranges being logged are shown in green.

Figure A-4 Configure Ranging Transponders



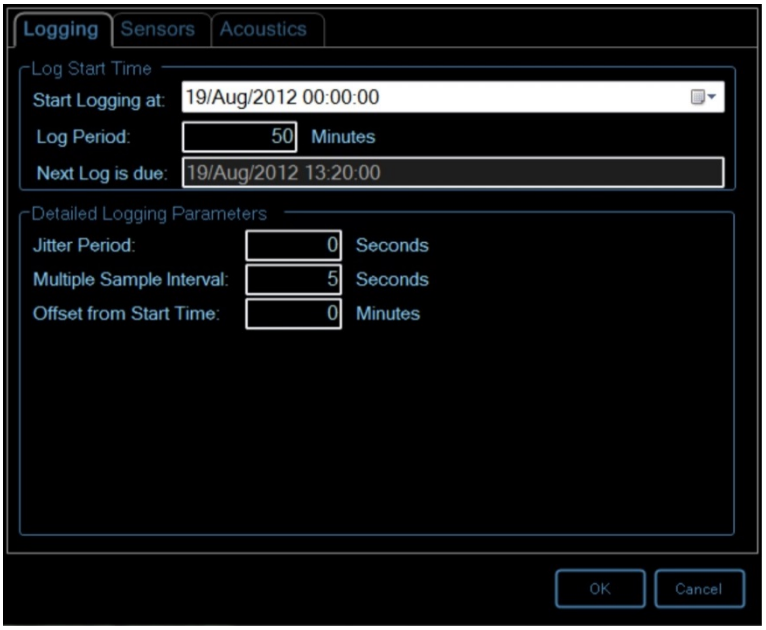
A.2 Advanced Configuration – Logging

The **Logging** tab sets the logging configuration for each sensor.

Note

Refer to *Section A.1.1* for Advanced Logging settings for "Samples" and "Log every n'th period".

Figure A-5 Advanced Logging



A.2.1.1. Start Logging at

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.2.1.2. Log Period

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

A.2.1.3. Next Log is due:

The date and time when the next log is due.

A.2.1.4. Jitter Period

When acoustic baselines are being measured it is not advisable to set the AMTs 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 AMTs, 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.2.1.5. 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.2.1.6. 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.2.1.7. Battery

Battery – All units log battery information. It is advisable to log this information infrequently so that the rate of depletion can be monitored throughout a campaign.

A.2.1.8. Temperature

This is the platinum resistance thermometer embedded in the endcap of most AMTs. Units that have glass spheres tend not to have a PRT as there is no metal endcap.

A.2.1.9. Sound velocity

This sensor is usually on the bottom end cap not to be confused with the combined SV and temperature sensor.

A.2.1.10. Pressure 1

The primary pressure sensor configured on the unit.

A.2.1.11. Pressure 2

The secondary sensor fitted to a unit if this is selected with no 2nd sensor than the first sensor will be logged twice.

A.2.1.12. Baselines

Initiates a common interrogate signal and measures the time of flight for each neighbouring transponder to respond. With more than 14 units it is recommended to select the transponders you require logged.

A.2.1.13. Inclinometer

This can be a high accuracy tilt sensor if fitted or a low cost MEMS inclinometer.

A.2.1.14. Gyro

The GyroCompatt6 can be used in autonomous mode where the Gyro can be switched on settle an observe the attitude of the unit.

A.2.1.15. SV and Temperature

This is a special combined SV and high precision temperature sensor.

A.2.1.16. Hi Res Temperature

This is a higher precision temperature sensor than the standard PRT sensor. This can be used to validate Sound velocity data to more precision assuming constant salinity.

Appendix B – Relationship of Addresses

B.1 Relationship of Addresses to Common Interrogate Signal

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

All addresses listed are Sonardyne Wideband 2 scheme.

The table below displays the relationship between the CIS channel and beacon addresses.

Figure 7-1 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

Note

Each transponder can only record up to a maximum of 14 replies from any address in the list.

Appendix C – Memory Information on Data Recovery

C.1 Memory Information

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

Table C–1 Data Record

Description	Record	Bytes
Baseline	BSL	6
Pressure	PRS & PR2	7
Inclinometer	INC	5
Sound velocity	SSP	5
Temperature	TMP	3
Event Time stamp	TIM	5
Battery	BAT	3
Gyro	HRP	9
Sound velocity & Temp	SVT	9
High Resolution Temp	HRT	5

The telemetry schemes supported are shown in *Table C–2*.

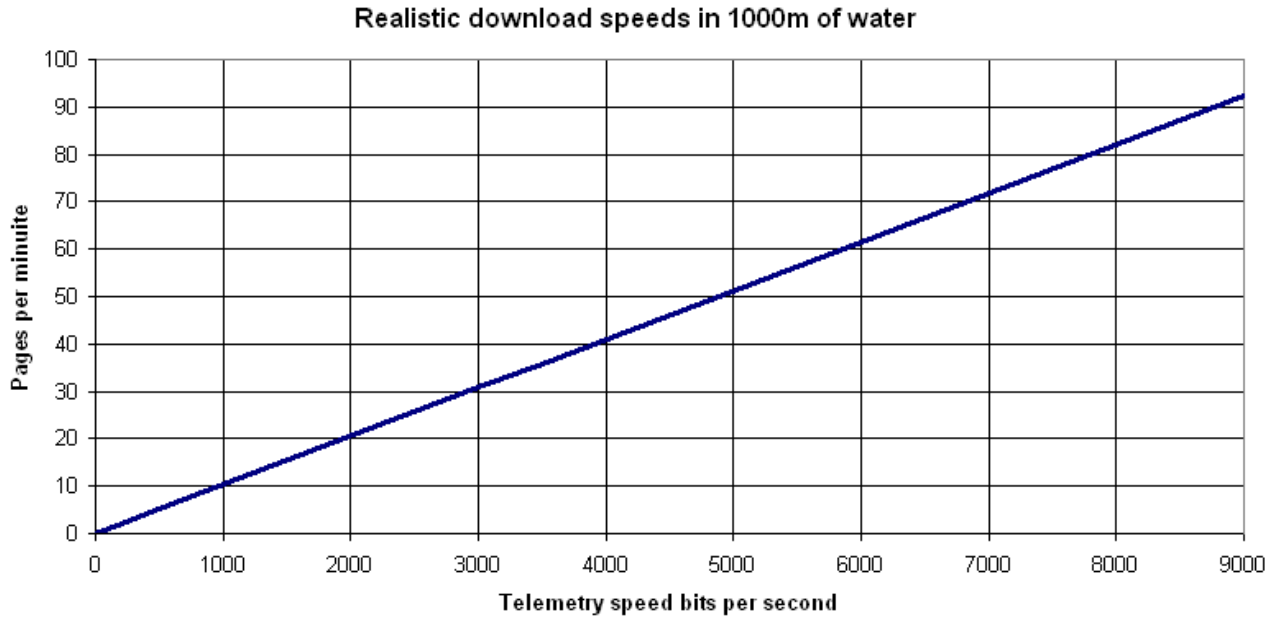
Note

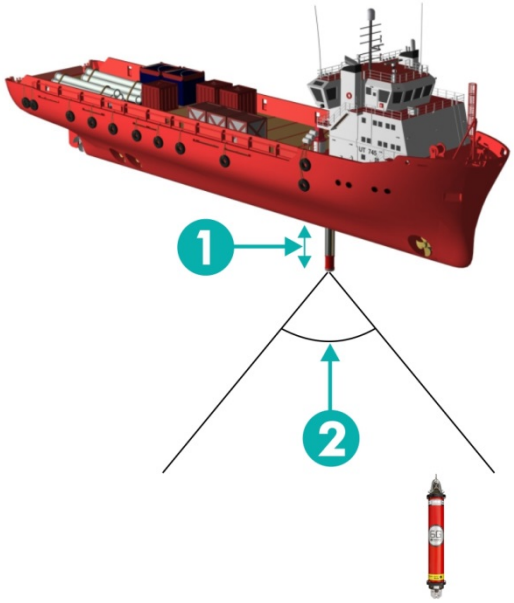
Only the HPT can decode speeds 4 & 5.

Table C–2 Telemetry Schemes

Telemetry Speed	Bits per second
0	100 – All
1	200 – All
2	400 – All
3	900 – All
4	3000 – Receive by HPT only
5	6000 – Receive by HPT only
6	3500 – Firmware 3.05 onwards
7	9000 – Firmware 3.05 onwards

The approximate time to retrieve data in optimal acoustic conditions is shown below.





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.1 Signal Metrics

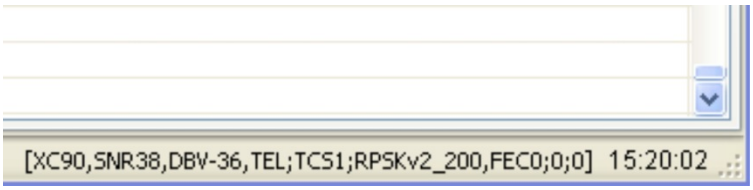
The signal metrics for acoustic communications are shown below.

Figure D-1 Signal Metrics for Acoustic Communications

Parameter	Good	Okay	Difficult
XC	>60	>45	<45
DBV	-3 to -26	>-36	<-36 or >-3
SNR	>20	>12	<12
IFL	<20	<40	>40
FEC	<2	<4	<5

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 click the **Test Acoustic Link** on the **Link** tab. Signals are displayed as traffic lights to help cross reference the table above. It should be noted 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 the user 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 - Weak 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.

RXW – Receiver wait time is the amount of time an instrument will wait for an acoustic response before the next transaction can be conducted.

Appendix E – CSV Export File Format

E.1 CSV Export File Format

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[1],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, ...

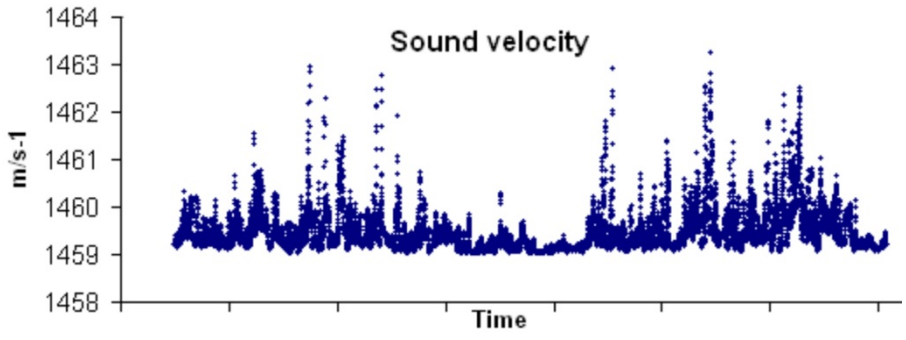
STP,Record Time, Retrieval Time, Node ID

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

TIM,Record Time, Retrieval Time, Node ID

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

Figure E-1 Example Plot of SV data collected by AMT



[1] Inclination in Radians

Appendix F – Advanced Acoustic Settings

F.1 Introduction

Note

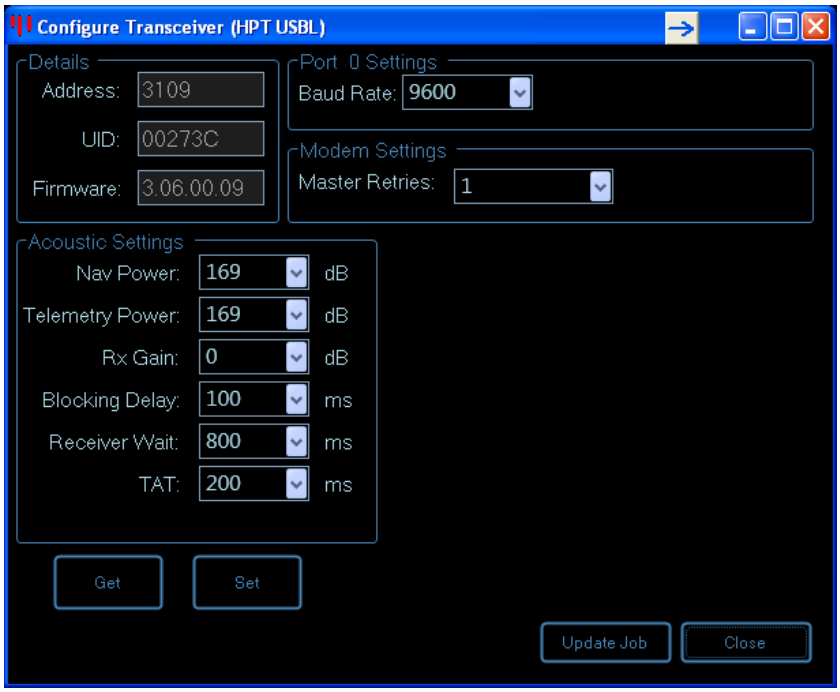
It is recommended that the appropriate training course is undertaken to achieve an adequate knowledge and understanding of advanced acoustic settings.

Click **Get** before changing parameters to synchronise the display with the instrument.

If **Update Job** is clicked, the revised parameters will be stored and sent to the instrument rather than those defined in the initial Job Wizard.

Changes must be **Set** before the job file can be updated.

Figure F-1 Transceiver Configuration Settings



F.2 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	Job Specific
Transmit Wait	Fixed
Navigation Power Level	Job Specific
Telemetry Power Level	Job Specific
Linear Gain	Job Specific
Common Interrogation	Job Specific
Activity Time	Fixed
Enable Common Interrogate	Fixed
Responder	Fixed
Transpinger	Fixed
Pulse Position replies	Fixed

F.3 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	Job Specific
Data Storage Port	Fixed
Master Retries	Fixed
Threshold Data	Fixed
Inter Character Time	Fixed
Forward Queue	Fixed
Master Mode	Fixed
Buffer Size	Fixed

Appendix G – IP Address Configuration

G.1 Configuring a PC IP Address for NSH Operations

In order to ensure the NSH connects successfully to a PC other than a standard Sonardyne Navigation Computer the IP address of the PC must be configured. The procedure for configuring the IP address for Windows XP and Windows 7 is detailed below.

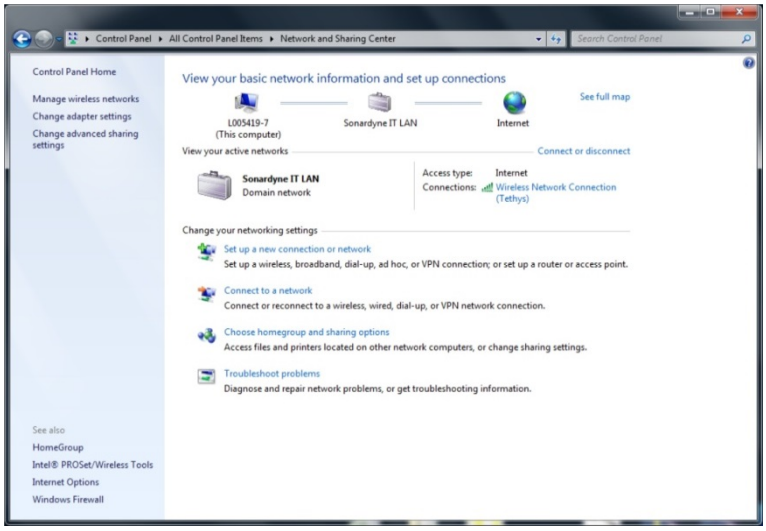
G.1.1 Windows 7

1. Click **Start > Control Panel**.
2. Click **Network and Sharing Centre**.

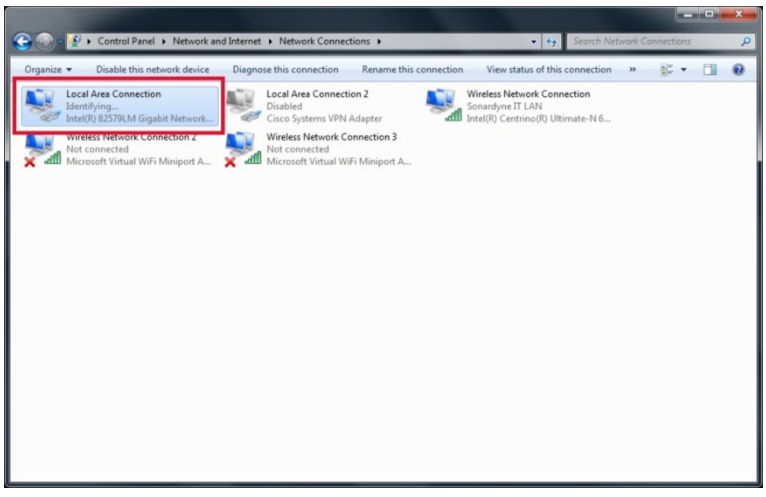
Note

Network and Sharing Centre may also be labelled as View Network Status and Tasks under the subheading Network and Internet if the control panel layout is set by Category.

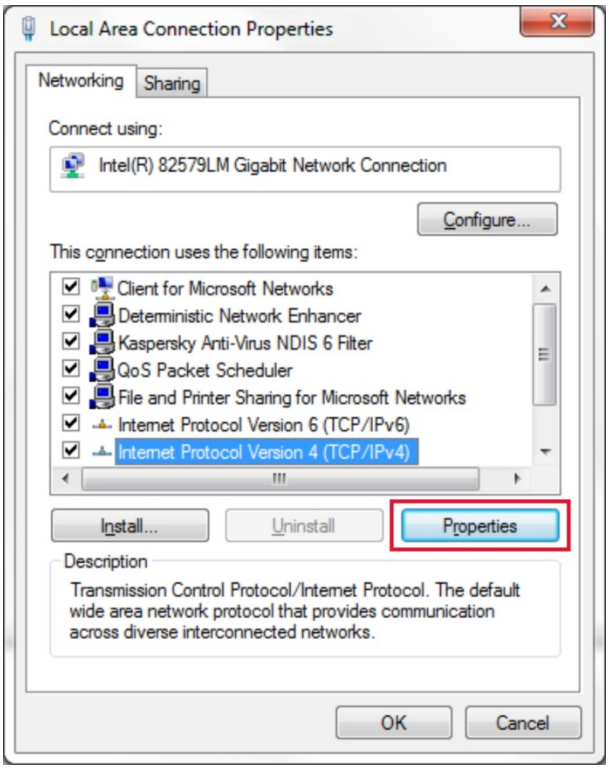
3. Click **Change Adapter Settings on** the **Control Panel**.



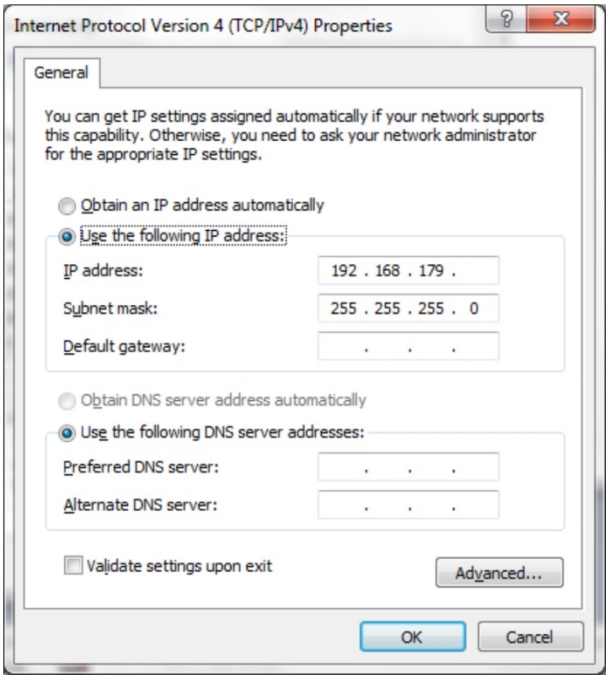
4. Connect the NSH to the PC using an Ethernet cable.
5. The **Local Area Connection** will display **Identifying…** the network.



6. Right-click on the **Local Area Connection** and click **Properties.**



7. Enter the IP address **192.168.179.X**, where **X** is a value between **2** and **255**.

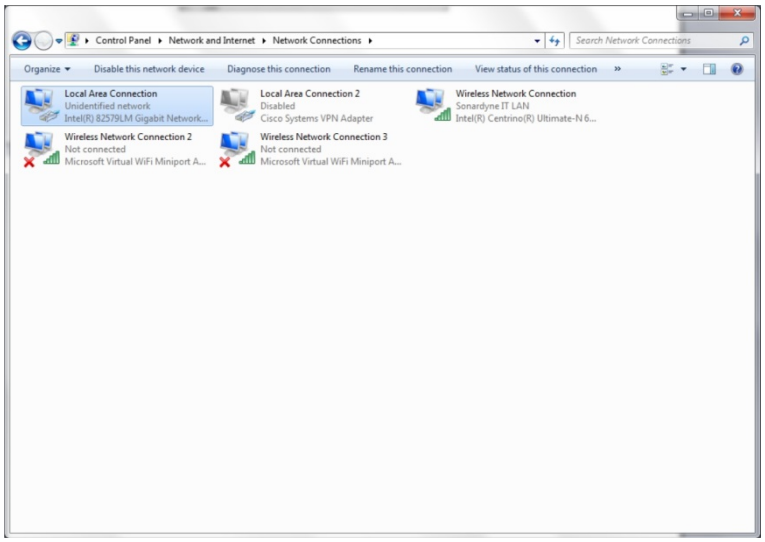


Note

Do not use values 1 or 50 as these addresses will clash with other equipment.

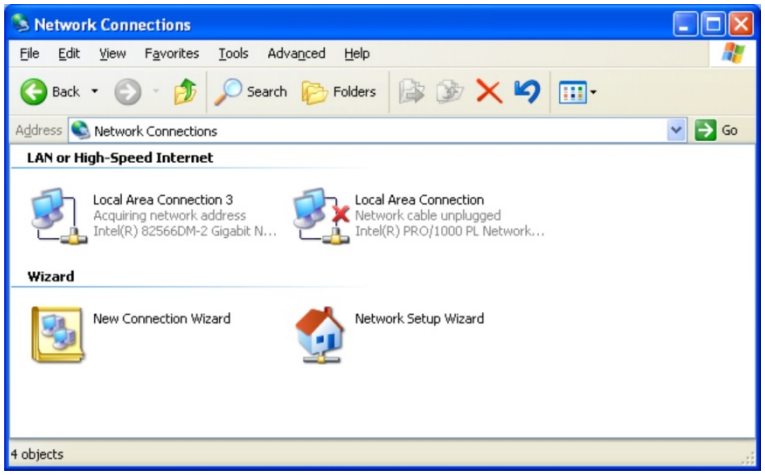
8. Change **Obtain an IP address automatically** to **Use the following IP address**.
9. Click **OK** to close the **Local Area Connection Properties**.

10. The **Local Area Network Connection** will now display **Unidentified Network**.



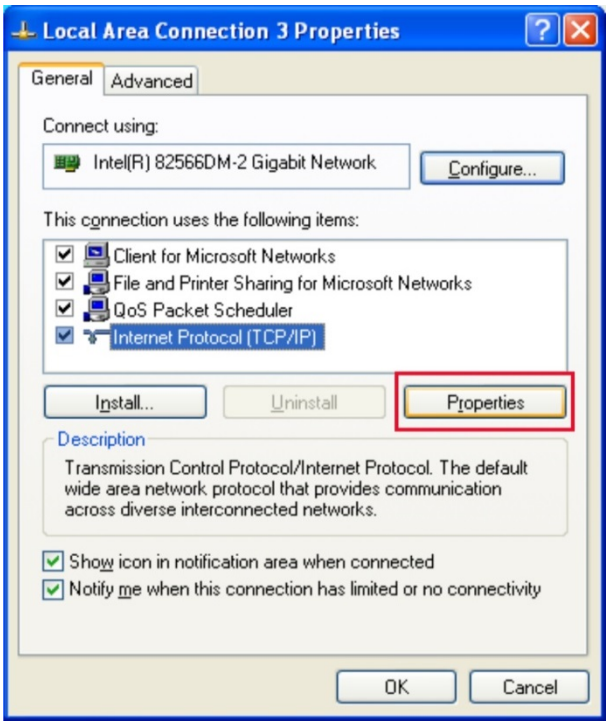
G.1.2 Windows XP

1. Click **Start > Control Panel**.
2. Click **Network Connections**.

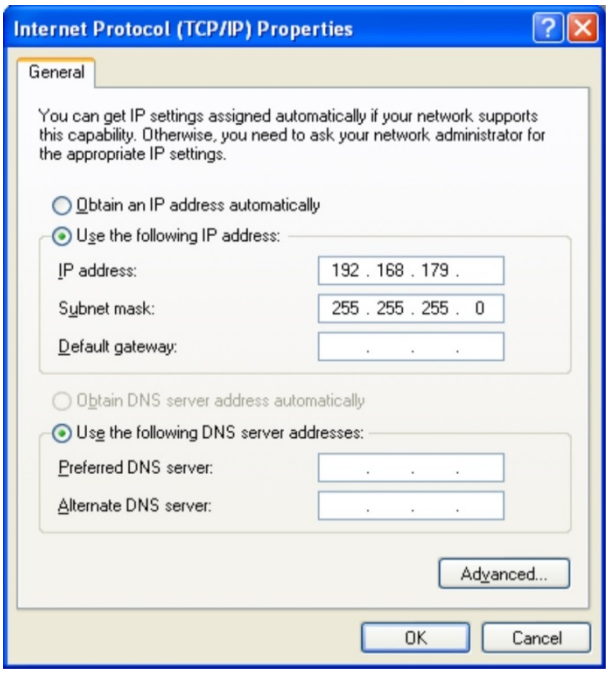


3. Connect the NSH to the computer using an Ethernet Cable.
4. The **Local Area Connection** will change to **Acquiring Network Address**.

5. Right click on the **Local Area Connection** and click **Properties**.
6. On the **General** tab select **Internet Protocol (TCP/IP)** and then click **Properties**.



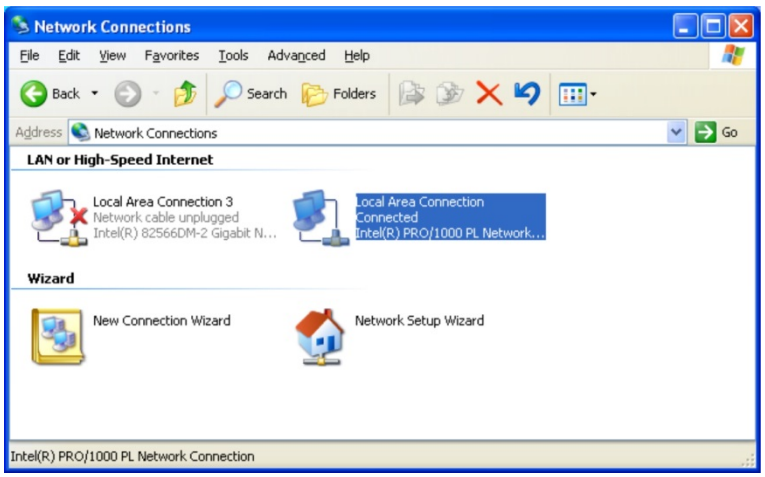
7. Change the **Internet Protocol (TCP/IP)** settings from **Obtain an IP address automatically** to **Use the following IP Address**.
8. Enter the IP address **192.168.179.X**, where **X** is a value between **2** and **255**.



Note

Do not use values 1 or 50 as these addresses will clash with other equipment.

9. Click on the **Subnet mask** box – this will automatically update to the correct setting.
10. Click **OK** on both open windows to confirm the setting changes.
11. The **Local Area Network** connection should indicate it is **connected.**



Appendix H – Test Report using 6G Terminal Lite

H.1 Test Report

A test report can be generated using Sonardyne 6G Terminal Lite Software. Each transponder will report the sensors fitted in the fixed status response.

To create a test report, refer to *6G Terminal Lite, Section "Report Generation".*

The test report is in PDF format and contains the following data:

- Test Report Title
- Date/Scenario
- Hardware/Range/Sensor/Release Tests, confirmation of which tests were performed and the end results; PASS/FAIL
- Unit Status
- Settings
- Battery Status
- Sensors
- Hardware Identification
- Comms

An example of a generated test report with PASS status is shown in *Figure H-1.*

Figure H-1 6G Example Test Report

Sonardyne
SOUND IN DEPTH

6G Test Report 003BE8

Local Date 06 February 2015 16:28:37
UTC Date 06 February 2015 16:28:37
Scenario USBL Positioning : 1000m Range

Hardware Test PASS
Range Test Not Tested
Sensor Test PASS
Release Test N/A

Unit Status			
Acoustic Address	2813	Serial Number	288749-001
Transducer	MF OMNI	Depth Rating	3000m
Firmware Version	3.03.13.02	DAS Version	2.06L
Functionality Level	105E	Endcap SN	289925-001

Settings			
Turn Around Time	80ms	Navigation Power Level	187dB
Linear Gain	26dB	Telemetry Power Level	187dB
Blocking	100ms	Start Power Level	187dB
Common Interrogate Channel	CIS13 Enabled	Responder Enabled	No
Pulse Position Replies	Disabled	HPR Channel	B45 Disabled
Activity Time	16 hours	Wakeup Channel	1

Battery Status			
Battery Type	LI_ION	Battery Voltage	16.0volts
Battery Current	-1023.0mA	Battery Capacity	25.0Ah
Battery Capacity Left	86.0%	Battery Temperature	18.2 ºC

Sensors		
Sensor Type	**Details**	**Last Measurement**
Temperature	-5 to 35ºC Accuracy = 0.10ºC	18.07ºC Age = 2s
Pressure	41368kPa Accuracy = 0.010kPa	100.40kPa Age = 2s
Sound Velocity	1400 to 1600m/s Accuracy = 0.030m/s	9996.00m/s Age = 2s
Lodestar		273.11º 0.03º 0.13º Age = 1s

Hardware Identification
DSP MOD PCB,0000072295E2,8050-036-03,B3,13/09/2012,CRC_OK
I/F PCB,00000705D806,8300-038-01,B3,01/07/2013,CRC_OK
DAS PCB,000007060E85,8300-055-01,B3,07/02/2013,CRC_OK
C6 TX PCB,000006F020A3,8300-036-10,D5,20/09/2012,MF,OMNI,PL196,PL193,PL190,PL187,PL166,CRC_OK
LCG6 PWR PCB,0000005FB37C,8144-042-01,B3,21/12/2012,CRC_OK

Coms Logs
>CS:3001,TAT80,BLK100,RXW800,TXW180,NPL187,TPL187,LG26,CIS13,AT8,EC1,EU0,ME0,RSP0,TRP0,PPR0
>FS:3001,U003BE8,FL105E,FV3.03.13.02,PV1.09,TDR;MF;OMNI;196;193;190;187;166,T-5;35;AC0.10,PR41368;DQZ;AC0.010,SV1400;1600;AC0.030,HRP;INT
>VS:3001,WKT1,HPR45,BT1;LI_ION;VLT16.0;IDC-1023.0;CAP25.0/86;T18.2
>SC:2813,U003BE8,WKT1,HPR45,OV0,CAS0,LKD0
>FVI:HOST;V3.03.13.02,U2S;V04,U3;V1.03.00.00,PV1.09,DV2.06L
>US:3001,SN288749-001,DR3000,AL6082,REMOTE,TDR4
>CKHW:PASS
>SENS:3001,T18.07;AG2,PR100.4;AG2,SV9996.000;AG2,HRP+273.11+0.03+0.13;AG1
>BV:CPU5510-8MHz-BL, V4.01c, May 27 2009, 11:54:53
>DCMD:SN289925-001
>PORT:3001,P0;BR9600;CF0;RS232,P1;BR9600;CF1;RS232

For more information on 6G Terminal Lite software, refer to the *6G Terminal User Manual – UM-8300-099*.

Definitions

Term	Definition
6G®	Sonardyne's sixth generation technology hardware platform.
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: It decodes 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.
AMT	Autonomous Monitoring Transponder
Attitude and Heading Reference System (AHRS)	An inertial sensor that provides outputs of heading, pitch and roll.
CIS	Common Interrogation Signal
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	Data Acquisition System. A micro-controlled data acquisition and logging sub-assembly located within a transponder.

Term	Definition
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.
Depth Status	The transponder can be fitted with an optional depth sensor to send depth information at each interrogation.
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.
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.
Firmware	The firmware installed on the transponder. Firmware upgrades can be installed via GP Bootloader. The Tx firmware refers to the transmission signal synthesiser.
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.
GMT	Greenwich Mean Time
HPR	Hydro-acoustic Position Reference
HPT	High-Performance Transceiver
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
NSH	Navigation Sensor Hub
PC	Personal Computer
PIC	Position-Independent Code
PIES	Pressure Inverted Echo Sounder
PRT	Platinum Resistance Thermometer
PSU	Power Supply Unit

Term	Definition
ROV	Remotely Operated Vehicle
Serial Communications Wait	The maximum time allowed for the Transponder to reply to an RS232 command.
Sonardyne	Sonardyne International Limited and its affiliates.
Sonardyne Wideband®2	6G® transponders and transceivers use Sonardyne Wideband® 2 ultra-wide bandwidth signals giving a faster and robust transmission of data, more precise ranging and mitigation from multipath in shallow water and amongst steel structures in deep-water.
SIU	Surface Interface Unit
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.

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