

UM-8262

User Manual for the Type 8262 Nano Transponder

Issue A Rev 2

Issue Date: 20 April 2017

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Open source software used with this product is listed in *Appendix C*.

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Note



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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	20/01/2017	First Issue	All	All
A	2	20/04/2017	Caution added "Potential heat source" General update	7 All	12 All

Section 1 – Introduction

1.1 Scope of this Manual

This User Manual describes the safe installation, operation and maintenance of the Type 8262 6G[®] Nano wideband transponder. The information and procedures within this manual are based on Sonardyne's experience and knowledge.

1.1 Purpose of this Manual

This user manual contains information for anyone involved with installing, operating and maintaining the Type 8262 6G[®] Nano wideband transponder.

To ensure the safety of the installer and operator is maintained it is important that all warnings and cautions in *Section 2 – Safety* of this manual and in any related manuals are read and fully understood.

1.2 Related Publications

To ensure the equipment is operated safely, a *Sonardyne Safety Manual* is supplied with this user manual. It is important that the *Sonardyne Safety Manual* is read and fully understood before proceeding with any activity on the equipment.

Table 1-1 Related Publications

Publication	Title
<i>Sonardyne Safety Manual</i>	<i>Operational and Safety Precautions</i>
QSG-OG-8262	<i>Quick Start Guide Nano Transponder</i>
UM-8300-099	<i>User Manual for 6G Terminal Lite</i> (included on the 6G Utilities CD)
UM-8315	<i>User Manual for the Type 8315 iWAND</i> (included with the iWAND)

1.3 Conventions

Table 1-2 Conventions used in this Manual

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

Section 2 – Safety

2.1 Introduction

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 that 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 the subsea equipment being operated.

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.

2.2 Safety Procedures

2.2.1 Warnings

 **Personal protection.** 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 pressure risk.** Due to the high internal pressure risk, dismantling the sub-sea equipment must only be carried out by trained personnel.

 **Risk of toxic gases.** Make sure the work environment is well ventilated. Toxic gases may be released when operating the pressure relief vent valve.

 **When transporting and storing the Nano, the battery must be disconnected.**

 **Risk of burns.** Do not carry out maintenance on the transponder if the housing is hot. Lower the transponder into cold water and wait for the housing to cool. Wear Personal Protective Equipment such as gloves.

 **Risk of Explosion.** For Lithium and Lithium Ion battery packs, Class D fire extinguishers should be used. Do not use any other type of extinguisher.

2.2.2 Cautions



Risk of equipment damage. All instruments must be maintained according to their individual operating manuals. Failure to follow recommended procedures could result in instrument failure, and loss of system integrity



Battery Power Failure. Do not charge the battery packs in any way not outlined in this manual. Failure to follow instructions may result in a loss of battery pack life or damage to the battery packs.



Potential heat source. Ensure there are no metal or other foreign objects located inside the docking station cradle while charging.



Loss of Current Protection. Do not allow the transponder to be cooled or heated during the charging process as the over current protection component characteristics may change adversely.



Transponder performance. Ensure the Nano has a clear line of sight to the transceiver and is not obstructed by apparatus or expelled gas from underwater breathing equipment.



Multiple beacon address conflict. Do not operate multiple beacons on the same address in the water at the same time. The address must be unique to any one beacon operating in the same acoustic area.



Protective coating failure. Do not use any abrasive brushes or sharp tools to remove marine growth when cleaning the instrument.

Section 3 – Technical Description

3.1 Introduction

The Type 8262-000-01 Nano Transponder (Nano) operates in the Medium Frequency (MF) band and is designed for short duration acoustic positioning of divers or small underwater vehicles. The Type 8262-000-03 incorporates an integrated pressure sensor. All versions of the Nano include a MEMs inclinometer sensor.

The Nano is constructed of lightweight polymer depth rated to 500 m and has an acoustic source level and beam-shape that is designed to operate over a 750 m slant range under normal conditions.

The Wideband 2 technology uses a correlation reception technique with phase encoded signals over a wide range of carrier frequencies. Signal coding allows for hundreds of channels enabling multiple users to work in the same area without interference.

The Nano connector-less design is charged and configured using the Nano Docking Station.

The Nano can be configured using Sonardyne 6G Terminal Lite software or an iWAND hand-held test unit.

The Nano is sealed and contains no user-serviceable parts.

3.2 Nano Transponder Types

The Nano is available in standard form (Type 8262-000-01) and with an integrated pressure sensor (Type 8262-000-03).

Figure 3-1 Type 8262-000-01 Nano Transponder



3.3 Housing Labelling

Waterproof labels on the housing uniquely identify the transponder as follows:

- Type No. 8262-000-01/03
- Serial No. 123456-007
- Address 2203
- Unit ID 54D4
- Depth 500 m

3.4 Battery

The Nano's lithium-ion battery has a life of >10 days quiescent and >15 hours with a 5 second ping rate.

When the Nano is in disabled mode the battery is disconnected.

Refer to *Sections 7.6 "Battery Status" and 7.7 "Connecting/Disconnecting the Battery"* for instructions on how to disconnect the battery and/or display the battery status.

3.5 Docking Station

The Docking Station can be connected via USB to the 115/230 V ac charger for fast charging or to a PC running Sonardyne 6G Terminal Lite software for configuration and slow charging.

The battery takes approximately 12 hours to fully charge from depleted using the ac charger, and has built in protection to prevent overcharging; see *Section 7.5 "Charging the Battery"*.

When the Nano is placed onto the Docking Station the Enable/Disable LED will light red if the Nano is detected and is disabled or green if the Nano is detected and enabled.

The Nano can be disabled or enabled by pressing the push-button once and recycled by pressing and holding the push-button for five seconds.

Notes

 The battery takes approximately 18 hours to fully charge when the Docking Station is connected to a PC.

 In the disabled mode the battery will continue to be charged.

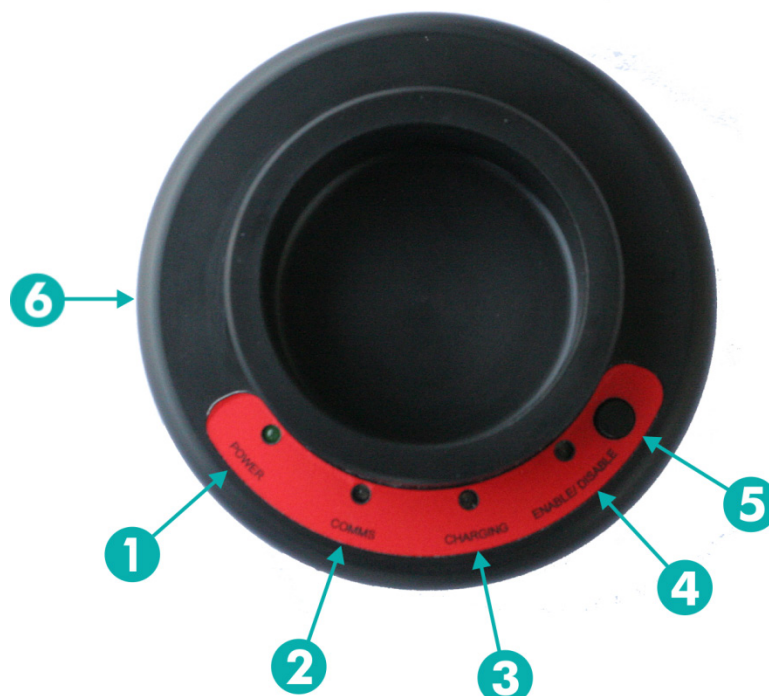
 If the battery completely drains, the LED status will still show as enabled (green) when the Nano is placed in the Docking Station. The Nano must be reset by performing a power-cycle.

Figure 3-2 Nano and Docking Station



The Docking Station status LEDs, push-button and micro USB socket are described below.

Figure 3-3 Docking Station Functions



Docking Station	Status		Description
1 Power LED		Green	Docking station is powered
2 Communications LED		Flashing Green	Searching for Nano
3 Charging LED		Flashing Red	Nano charging
		Green	Nano fully charged
4 Enable/Disable LED		Red	Nano detected and disabled
		Green	Nano detected and enabled
5 Push-Button		Press to enable Nano	
		Press to disable Nano (disconnects the battery)	
		Press and hold for five seconds to power-cycle Nano	
6 Micro USB Socket		Provides power from charger to Docking Station	
		Provides communications between PC and Nano	

3.6 Pressure Relief Vent Valve

A pressure relief vent valve **1** is fitted to automatically release any build-up of pressure inside the Nano during deployment. This could be caused by water ingress during deployment and/or the degassing of the battery.



If there is any reason to suspect there may still be pressure inside the transponder, the pressure relief vent valve must be operated; see *Section 7.8 “Pressure Relief Vent Valve”*.

Section 4 – Installation and Deployment

4.1 Introduction

Before installing and deploying the equipment, ensure *Section 2 – Safety* is read and fully understood.

4.2 First Use

Before the Nano is used for the first time, the battery must be charged for a minimum of 12 hours using the supplied ac charger.

4.3 Pre-use Checks

Before installation and deployment, checks should be carried out to make sure the Nano is serviceable and ready for use. These checks include:

- Inspect the Nano for any signs of mishandling, external damage or leakages.
- Check the pressure relief vent valve; see *Section 7.8 “Pressure Relief Vent Valve”*.
- Check the battery contains enough charge for the current deployment operation; see *Section 7.6 “Battery Status”*.

4.4 Configuration

Carry out the following procedures to configure the Nano if necessary, ready for deployment.

Note

 **There are two methods of accessing the Nano configuration; using 6G Terminal Lite software or using an iWAND hand held test device.**

1. Connect to the Nano using 6G Terminal Lite; see *Section 8.2.1 “6G Terminal Lite or an iWAND hand held test unit; see Section 8.2.2 “iWAND Hand Held Test Device”*.
2. For instructions on functional testing and configuring the Nano, see *Section 8 – Functional Test*.
3. Make sure the Unique Identity (UID) and address are correct.

Note

 **The UID should match the UID printed on the Nano housing label.**

4. Check all the displayed settings are correct.

4.4.1 6G Test Report

A pdf test report can be generated by the software to show the following data:

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

To generate a test report using 6G Terminal Lite, see *Section 8.3.3 “Creating a Test Report”*.

4.5 Deployment

The Nano can be deployed for short duration acoustic positioning of divers or small underwater vehicles.

CAUTION



Ensure the Nano has a clear line of sight to the transceiver and is not obstructed by apparatus or expelled gas from underwater breathing equipment.

An example of a Nano mounted onto the rear of a diver's air cylinder is shown in *Figure 4-1*.

Figure 4-1 Nano Mounted to Diver's Air Cylinder



Section 5 – Operation

5.1 Introduction

Before operating the equipment, ensure *Section 2 – Safety* is read and fully understood.

5.2 Operational Modes

Nano transponders are tracked by a Sonardyne 6G surface control system such as Mini-Ranger 2. For operating instructions refer to the system's user manual.

5.3 After Use

After retrieval from the water, see *Section 6 – Retrieval, Transportation and Storage*.

Section 6 – Retrieval, Transportation and Storage

6.1 Introduction

Before retrieving the Nano, make sure *Section 2 – Safety* is read and fully understood.

6.2 Retrieval

When retrieving from the water, the Nano must be cleaned and inspected before being stored.

1. Clean the Nano; see *Section 7.3 “Cleaning”*.
2. Inspect the Nano; see *Section 7.4 “Inspection”*.

6.3 Transportation and Storage

The Nano can be transported and placed in storage as described below. See *Table 6-1* for the recommended storage conditions.

WARNING



When transporting and storing the Nano the battery must be disconnected.

1. Disconnect the battery; see *Section 7.7 “Connecting/Disconnecting the Battery”* and then confirm the battery has been successfully disconnected by using 6GTerminal Lite (6G Setup tab will not populate; see *Section 8.3.1 “Checking the Wideband Acoustics”*) or by using an iWand/6G transceiver (no acoustic ranging or telemetry is possible).
2. Store the Nano in its transit case.
3. Equipment must be kept in a dry, non-condensing atmosphere (20% to 80% humidity), free from corrosive agents and isolated from sources of vibration.
4. When storing for long periods of time it is recommended to visually inspect the equipment at least annually.
5. When equipment is taken from low temperature storage for immediate use its temperature should be raised to normal operating temperature before use.

Table 6-1 Storage Conditions

Item	Specification
Storage Temperature	-20 to 55°C (<i>see Notes below</i>)
Relative Humidity	20 to 80% (non-condensing)

Notes



To prolong the life of the battery, it is recommended not to exceed the storage temperature range of 0 to 30°C.

Section 7 – Maintenance

7.1 Introduction

Before any maintenance activity is carried out on the equipment, ensure *Section 2 – Safety* is read and fully understood.

7.2 Retrieving from the Water

See *Section 6 – Retrieval, Transportation and Storage*.

7.3 Cleaning

1. Thoroughly wash the Nano in warm clean fresh water, paying particular attention to the pressure relief vent valve.
2. Dry the Nano using a clean lint free cloth.

7.4 Inspection

Regularly inspect the Nano for the following:

1. Inspect the pressure relief vent valve; see *Section 7.8 “Pressure Relief Vent Valve”*.
2. Inspect the transducer and housing for any signs of mishandling, external damage or leakages.

7.5 Charging the Battery

Connect the supplied charger to a 115/230 V ac supply and place the Nano in the Docking Station to initiate charging. When fully charged, the **Charging** LED changes from flashing red  to green  (see *Figure 3-3* for a description of the Docking Station LEDs).

The battery takes approximately 12 hours to fully charge from depleted with built in protection preventing overcharging.

CAUTION

 **Potential heat source. Ensure there are no metal or other foreign objects located inside the docking station cradle while charging.**

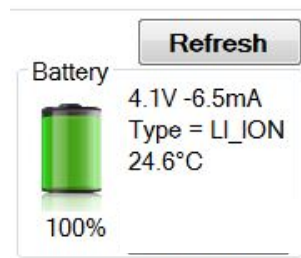


7.6 Battery Status

7.6.1 Checking the Battery Status using 6G Terminal Lite

Connect the Nano to 6G Terminal Lite as described in *Section 8.3 “Test Procedures”*.

The battery status is displayed on the **6G Setup** tab.



7.6.2 Checking the Battery Status using an iWAND

See UM-8315 “User Manual for the Type 8315 iWAND”, *Section “Quick Check > Battery Status”*.

7.7 Connecting/Disconnecting the Battery

The battery can be disconnected/connected by pressing the Docking Station push-button.

7.8 Pressure Relief Vent Valve

A pressure relief vent valve is fitted to automatically release any build-up of pressure inside the Nano during deployment. This could be caused by water ingress during deployment and/or the degassing of a battery.

The pressure relief vent valve should be flush with the endcap face. If there is any reason to suspect there may be pressure inside the transponder, the pressure relief vent valve must be operated as described below.

7.8.1 Operating the Pressure Relief Vent Valve

Note



Refer to Warnings in Section 2 – Safety “High Internal Pressure, Risk of toxic gases and corrosive liquids, Faulty Battery Pack”.

1. Using your fingers or a suitable tool, carefully withdraw the pressure relief vent valve as far as it will extract and wait for any internal pressure to be released.

Note



If using a tool to extract the valve be careful not to damage the valve's surface.



Note



If using a tool to extract the valve be careful not to damage the valve's surface.

2. After any pressure has been released, push the valve fully back into its recess.

Section 8 – Functional Testing

8.1 Introduction

Before performing any functional testing on the equipment, ensure *Section 2 – Safety* is read and fully understood.

Make sure the Nano has been cleaned; refer *Section 7.3 “Cleaning”*.

To make sure the Nano functions correctly, testing can be carried out including:

- Wideband transmit and receive circuitry
- Hardware self-check
- Checking the sensors
- Changing the Nano’s address
- Creating a report

8.2 Equipment

The equipment shown in *Table 8-1* can be used to carry out functional testing of the Nano:

Table 8-1 Test Equipment

Description	Sonardyne Part Number
PC with a USB port	N/A
USB cable (Micro)	820-0503
6G Terminal Lite on 6G Utilities CD-ROM (see <i>Section 8.2.1</i>)	920-2000
iWAND hand held test device (see <i>Section 8.2.2</i>)	8315-0002

8.2.1 6G Terminal Lite

6G Terminal Lite software is supplied on the 6G Utilities CD. See *UM-8300-099 “User Manual for 6G Terminal Lite”* (referred to as *6G Terminal Lite* in this manual).

8.2.2 iWAND Hand Held Test Device

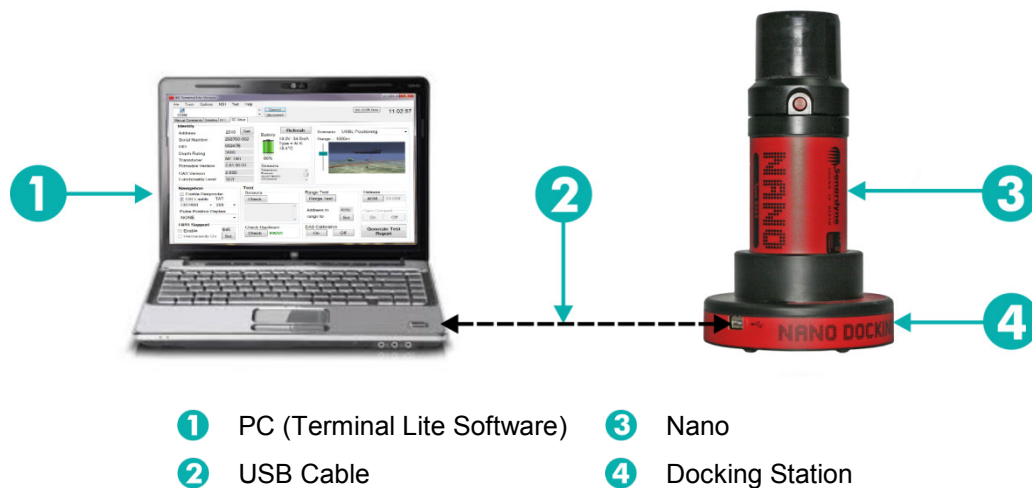
The Type 8315 iWAND is a hand held acoustic transponder test and configuration device for use with Sonardyne’s 6G product range.

8.3 Test Procedures

The following test procedures are described using 6G Terminal Lite. Many of the procedures can also be performed using the iWAND hand held test unit; for more information, see *UM-8315 “User Manual for the Type 8315 iWAND”*.

To carry out operational testing of the Nano, connect the USB cable from the Nano Docking Station to a PC running 6G Terminal Lite software; see *Figure 8-1*.

Figure 8-1 Nano/Docking Station Connected to a PC



8.3.1 Checking the Wideband Acoustics

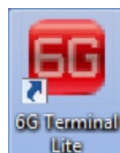
The following procedure describes the acoustics check using 6G Terminal Lite.

Note

 The same checks can also be performed using the iWAND hand held test unit; see *UM-8315 “User Manual for the Type 8315 iWAND”, Section “Ping Check”*.

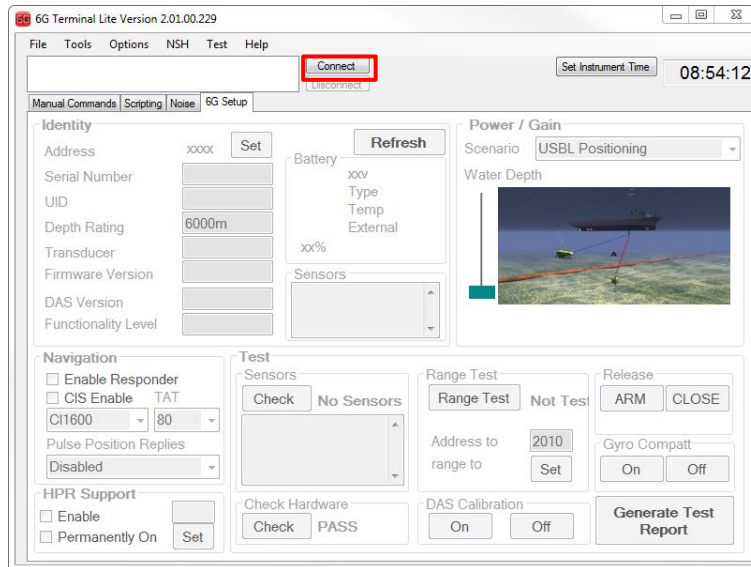
To carry out a check of the Wideband Acoustics of the transponder, it will also be necessary to enter the address of an acoustic target to range to. This can be any 6G Transponder or an iWAND set to Transponder Mode.

1. Connect the Docking Station to the PC and place the Nano in the Docking Station (ensure it is enabled; see *Figure 3-3*).
2. Double-click the **6G Terminal Lite** desktop icon to start the software.

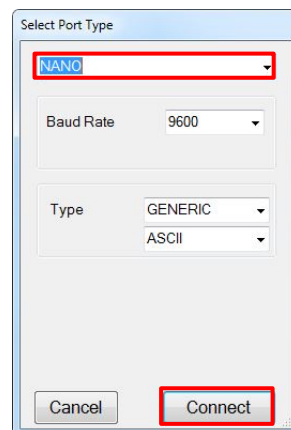


3. The 6G Terminal Lite dialog box will open on the **6G Setup** tab.

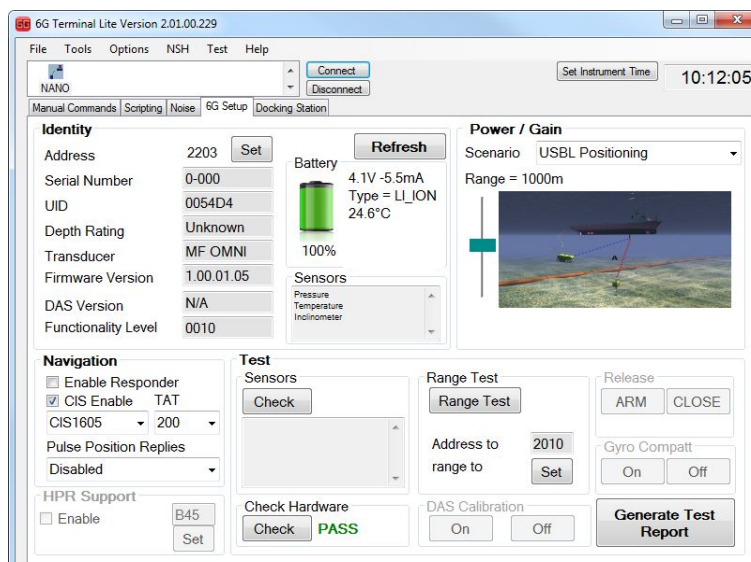
4. Click **Connect**.



5. On the **Select port type** drop-down list, select **Nano** and then click **Connect** (all other options can be left as default).



6. The **6G Setup** tab displays information on the connected transponder including address, serial number, depth rating and battery status.



Note



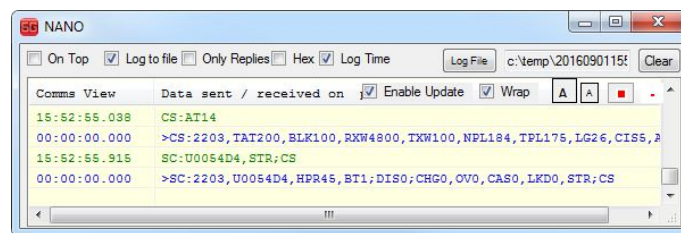
The Battery Connect/Disconnect button is not displayed for the Nano.

7. A COMMS log window will also open (green text indicates the commands sent from the software to the transponder and blue text is the transponder's response).

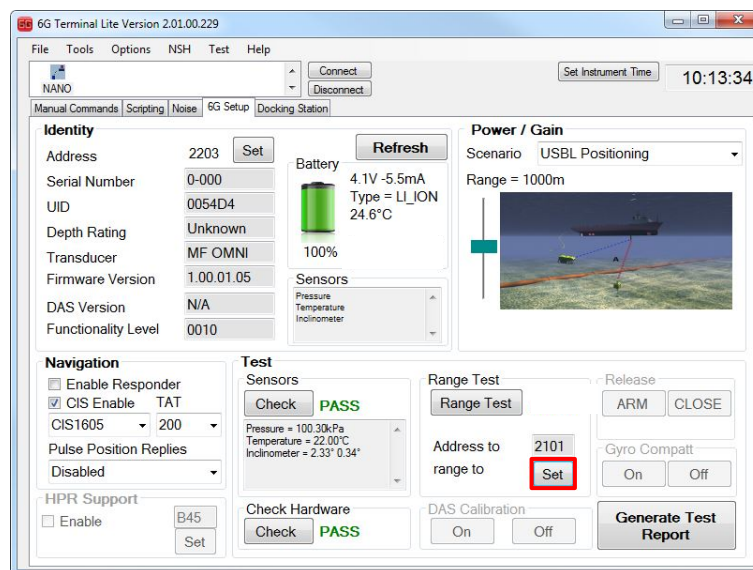
Note



This window automatically logs all communications when open and should be left open to ensure communications are logged for diagnostic purposes.



8. To enter the address of the acoustic target, click **Set** on the **Range Test** section.



9. An **Address Selector** window will open listing all available addresses for Wideband 2. Select the address for the attached device and then click **OK**.

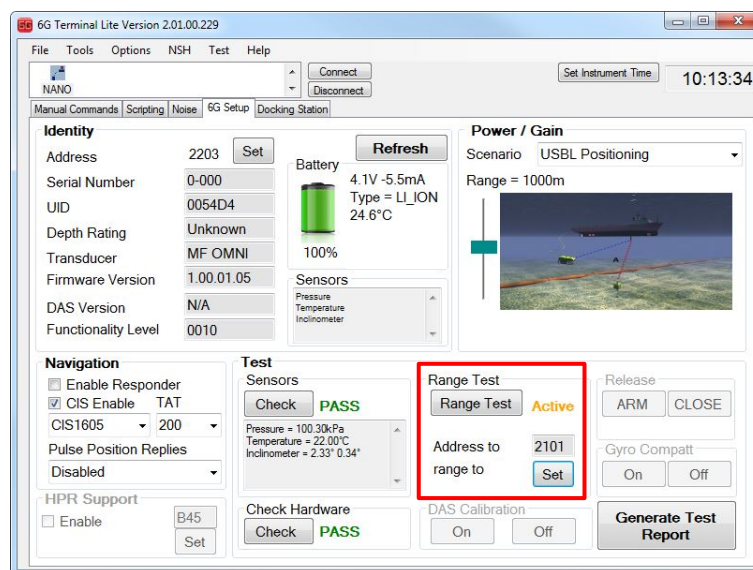
Note



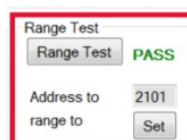
The Mini-Ranger 2 system does not support Wideband 1 for the Nano.



10. The 6G Setup tab will open with the selected address next to **Address to Range to**.
11. Click **Range Test** to begin the acoustic check.
12. During the test **Active** will appear next to the **Range Test** button to indicate the test is in progress.



13. If the Acoustic check is successful **Pass** will appear next to the **Range Test** button (If **Fail** appears, move the transponder to a new location and repeat the range test. If the Range Test continues to fail contact Sonardyne Support).



14. The acoustic checks are now complete.

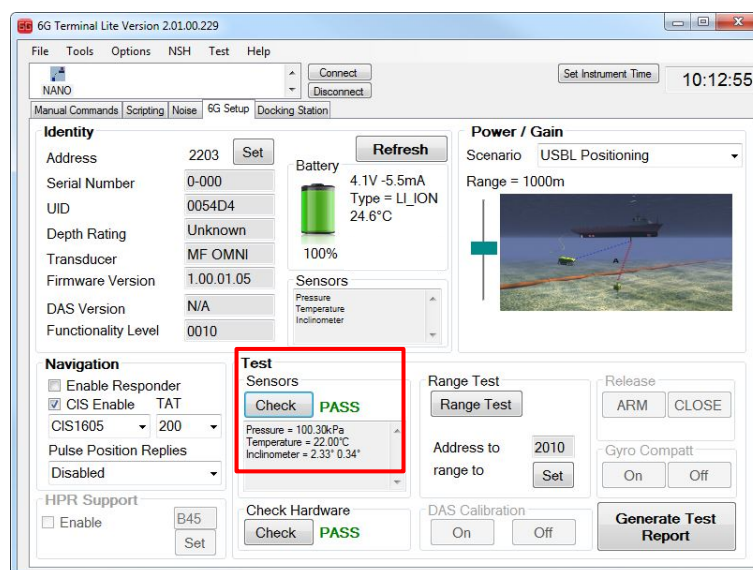
8.3.2 Checking the Sensor Measurements

The following procedure describes the sensor measurements check using 6G Terminal Lite.

Note

 The same checks can also be performed using the iWAND acoustic transponder; see *UM-8315 “User Manual for the Type 8315 iWAND”, Section “View Sensors”*.

1. Click **Test Sensors Check** to perform a test of all sensors installed in the transponder.
2. **Acquiring** appears next to the **Test Sensors Check** button to indicate the test is in operation.
3. **PASS** appears next to the **Test Sensors Check** button to indicate the test is successful (if the test is unsuccessful the word **FAIL** appears).



Note

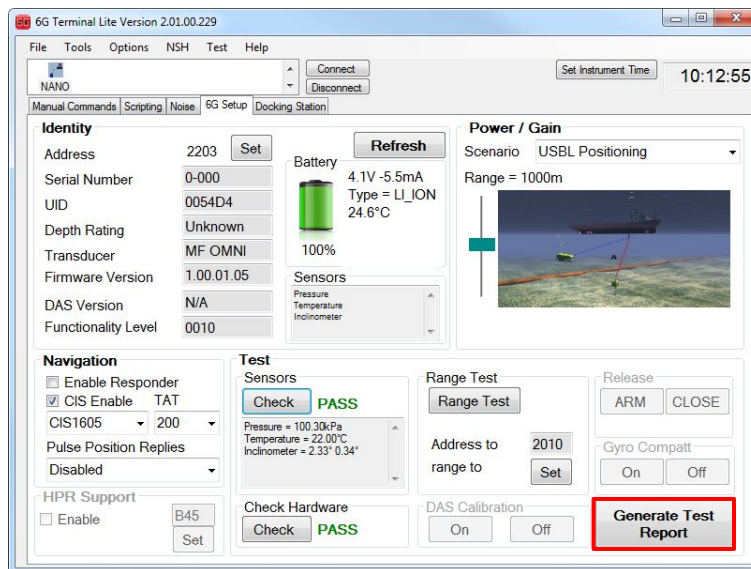


The Inclination values refer to the roll then pitch in degrees.

8.3.3 Creating a Test Report

On completion of a functional testing of the transponder a test report can be created. The report lists detailed information on the transponder, settings, battery and sensors and will indicate if the transponder has passed the tests.

1. Click **Generate Test Report**.



2. Select the folder to save the Test Report.pdf to and then click **OK**.

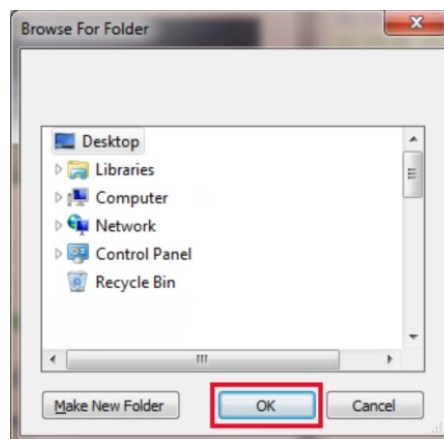


Figure 8-2 Nano Transponder Test Report pdf



6G Test Report 0054D4



Local Date 12 August 2016 12:21:05
UTC Date 12 August 2016 11:21:05
Scenario USBL Positioning : 1000m Range

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

Unit Status			
Acoustic Address	2503	Serial Number	0-000
Transducer	MF OMNI	Depth Rating	Unknown
Firmware Version	1.00.01.04	DAS Version	N/A
Functionality Level	0010	Endcap SN	N/A

Settings			
Turn Around Time	80ms	Navigation Power Level	175dB
Linear Gain	14dB	Telemetry Power Level	175dB
Blocking	100ms	Start Power Level	175dB
Common Interrogate Channel	CIS0 Enabled	Responder Enabled	No
Pulse Position Replies	Disabled	HPR Channel	N/A
Activity Time	permanently on	Wakeup Channel	N/A

Battery Status			
Battery Type	LI_ION	Battery Voltage	4.0volts
Battery Current	-5.5mA	Battery Capacity	3.4Ah
Battery Capacity Left	98.0%	Battery Temperature	25.0 °C

Sensors		
Sensor Type	Details	Last Measurement
Inclinometer	-90.00 to +90.00° Accuracy = 1.00°	

Hardware Identification	
DSP MOD PCB,0308164-002,8050-039-01,A1,09/08/2016	
MOTHERBOARD PCB,0307829-003,8262-035-01,A3,09/08/2016	

Coms Logs	
>CS:2503,TAT80,BLK100,RXW4800,TXW100,NPL175,TPL175,LG14,CIS0,AT14,EC1,MEO,RSP0,PPR0	
>FS:2503,U0054D4_FL0010,FV1.00.01.04,FV1.13,TDR,MF,OMNI;184;175;169,INC-90.00;+90.00;AC1.00	
>VS:2503,HPR45,BT1;LI_ION;VLT4.0;IDC-5.5;CAP3.4/98;T25.0	
>SC:2503,U0054D4,HPR45,BT1;DIS0;CHG0;OVD;CAS0;LKD0	
>FV1;H06T;V1.00.01.04,PICLOCK;V1.00.00.03	
>US:2503,SND-000,TYPE8262	
CKHW:PASS[RX;370815;DBV-4]	
>SENS:2503,INC+3.38+0.06;AG0	
>BV;DSP Bootloader V2.02.00.03, MiniCerb, May 27 2016	
>DCMD?	
>PORT:2503,P0,BR9600;CP0;RS232	
>OPT:2503,U0054D4,S/V1500	

Section 9 – Fault Diagnosis

9.1 Introduction

The following section assists in diagnosis when the transponder fails to operate correctly. Each section identifies a fault, the possible cause and the recommended action to rectify the fault.

9.2 Fault Types

Fault	Possible Cause	Action
Transponder does not reply to interrogation or commands.	Incorrect transponder address set in the surface transceiver.	Check address and repeat with the correct address.
	Operating at long range.	Increase power to the surface transceiver.
	Ray-bending effects stopping the transponder from receiving.	Use software application RAY_TRACE available from Sonardyne Int Ltd.
	Surface thermocline refracting reply signals.	Lower transducer below thermocline.
	Noise level at surface transducer too high.	Lower the dunking transducer/transceiver and reduce the surface transceiver gain settings.
	Noise level at surface transducer too high.	Do a noise check using the applicable transceiver noise check command.
	Transponder has low battery power.	Check log for battery output before deployment.
		Check battery levels since deployment.
	Transponder is set to low power.	Check log for Navigation Power Level (NPL) in the Configuration Status (CS) Command before deployment.
	Transponder is set to low gain.	Check log for Linear Gain (LG) in the Configuration Status (CS) Command before deployment.
Other acoustic systems maybe operating in the same frequency band.		

Section 10 – Spares

10.1 Introduction

When ordering spare parts, you must provide:

- a) The parts number
- b) The drawing number (if known)
- c) The description

Enquiries about, or orders for spare parts should be directed to your local Sonardyne office or agent. Local agents contact details can be found on the back cover of this manual and at www.sonardyne.com

10.2 Recommended Spares

The following is a list of all available spares.

10.2.1 Miscellaneous Parts

Part Number	Drawing Number	Description	Quantity
641-0529	8262-006-01	Nano Docking Station	1
271-9830	N/A	115/230 V AC Power Supply USB Mains Adapter	1

10.2.2 Cables

Part Number	Drawing Number	Description	Quantity
820-0503	8262-055	USB Cable (Micro)	1

Section 11 – Technical Specifications

11.1 Acoustic

Parameter	Specification
Frequency Band	MF (19–34 kHz)
Transducer Beam Shape	Omni-Directional $\pm 130^\circ$
Transmit Source Level (re 1 μ Pa @ 1 m)	184 dB
Communication Interface	USB connection to the Nano Docking Station
Number of Transmissions	~850,000 (Wideband 2)
Pulse length	8 ms Wideband 1&2, 16 ms Wideband 2+
CIS Turnaround Time (Default)	200 ms
Receive Sensitivity	100-130 dB
Number of Unique Addresses	>300

11.2 Mechanical

Parameter	Specification
Depth Rating	500 m
Sensors	Integrated Pressure Sensor (8262-000-03)
Mechanical Construction	Polymer
Diameter (tube main body)	55 mm (2.2")
Overall Length	150.1 mm (6.0") 155.5 mm (6.1") with Integrate Pressure Sensor
Weight in air/Water	458/140 g 536/218 g (with integrated pressure sensor)

11.2.1 Communications

Parameter	Specification
Configuration Battery Status Power Down/Wake-up Test Signal Transmission	Wireless NFC Connection iWand

11.2.2 Battery and Charger

Parameter	Specification
Battery Type	Lithium-ion Battery
Battery Life	Quiescent Listening 5 Second Ping Rate >10 Days >15 Hours

Parameter	Specification
Charger (115/230 V AC)	5 V DC (USB connection to the Nano Docking Station)
Charging Time	12 hours using the 115/230 V AC charger (18 hours when docking station is connected to a PC ¹)

11.2.3 Environmental

Parameter	Specification
Operating Temperature	-5 to 40°C (23 to 104°F)
Storage Temperature	-20 to 55°C (-4 to 131°F)

¹ The USB standard limits the maximum current to 500 mA

11.2.4 Outline Drawings

Figure 11-1 8262-000-01 Nano Transponder

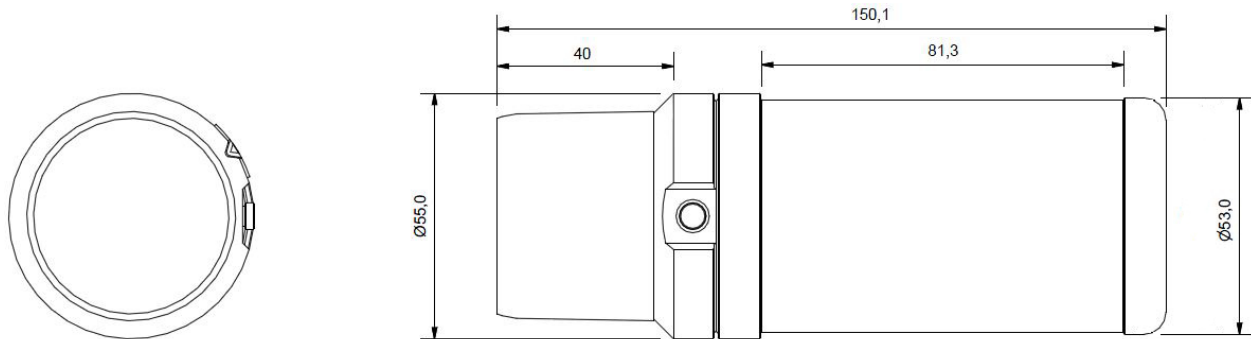
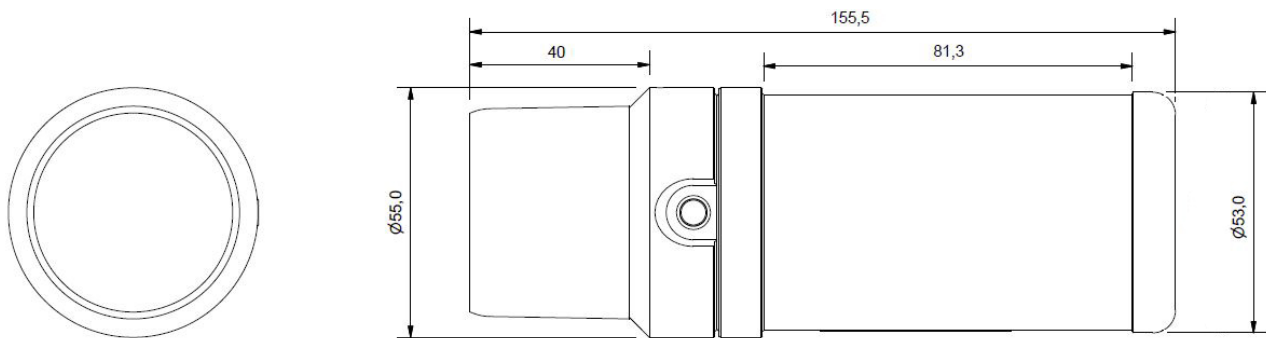
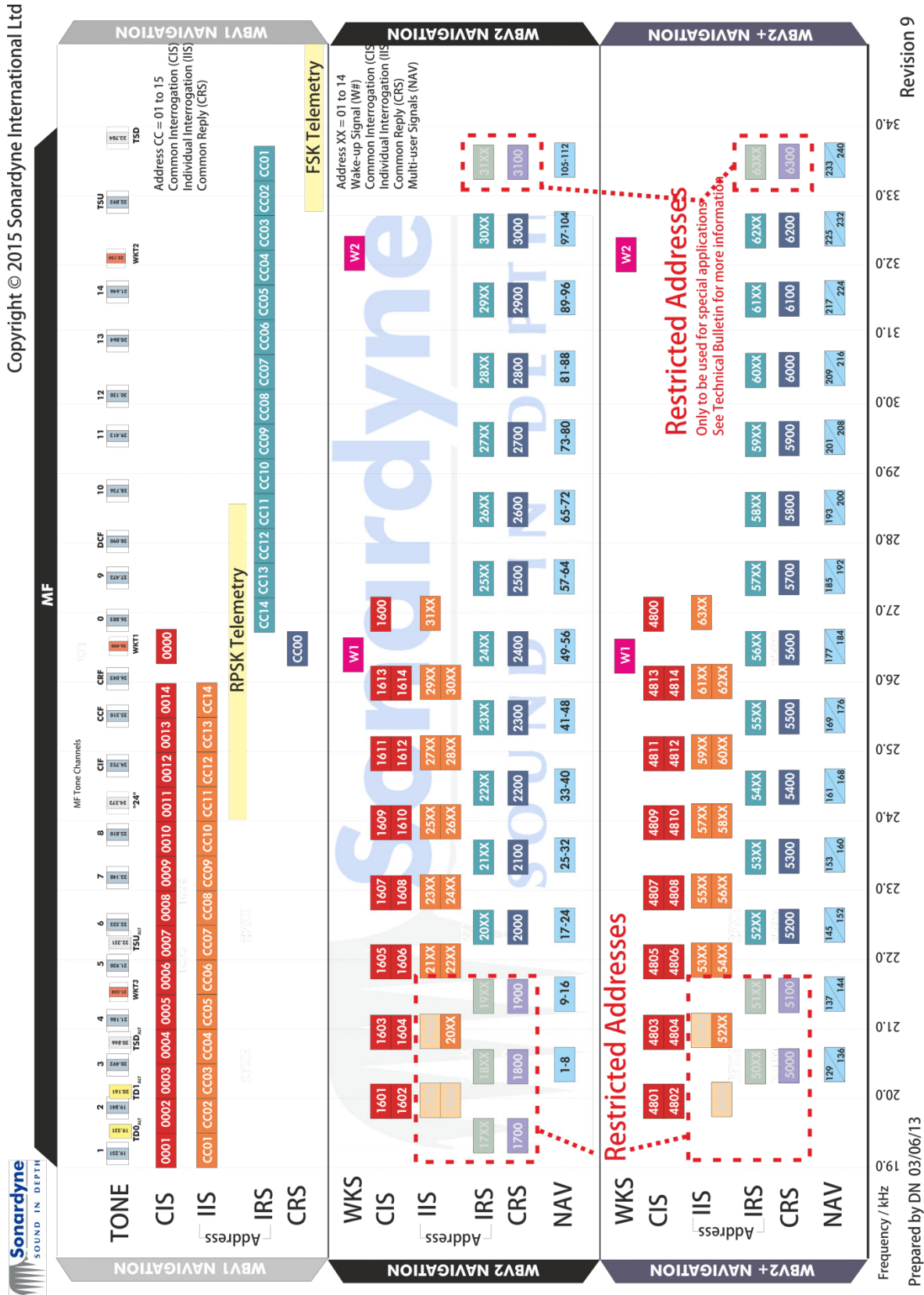


Figure 11-2 8262-000-03 Nano Transponder with Integrated Pressure Sensor



Appendix A – Sonardyne Frequency Chart

The Sonardyne Frequency Chart can be used for guidance on optimising USBL accuracy vs. range and avoidance of other acoustic systems operating in the vicinity.



Appendix B – Basic Principles of Transponder Interrogation and Reply

B.1 Interrogation and Reply

The interrogation signal transmitted to a 6G Wideband 2 transponder is a phase-encoded acoustic signal around 8 milliseconds in length. The acoustic transducer converts the acoustic signal into a low level alternating voltage. All ambient noise is converted into an electrical noise voltage covering a wide frequency range. The pre-amplifier in the transponder amplifies the combined signal and noise voltages and filters to weaken frequencies outside of the band used by the transponder channels. The receiver uses Digital Signal Processing (DSP) to detect the interrogation signal, even in the presence of other noise and signals.

After a specific time-interval known as the 'turnaround time' logic circuits in the transponder and transmitter generate a powerful acoustic reply. The reply is on a different channel to the interrogation signal, but the same length.

The equipment that sent out the interrogation signal will detect the reply signal from the transponder. The delay in receiving the reply will allow the equipment to calculate the range (distance) to the transponder.

The equipment calculates the range as follows:

- *Measures the total time delay = A*
- *Subtracts the turnaround delay = B*
- *This gives the true time delay = C*
- *Multiplies by the speed of sound in water = D*
- *This equals the two way range = E.*

$$A - B = C$$

$$C \times D = E$$

Sound is reflected by the sea surface, seabed and other reflecting surfaces. This causes a received signal to appear much longer in duration than the original transmission. This extended signal has random phases and random decreasing amplitude. This sound reflection is known as reverberation. The transponder has a built in 'blocking period' this allows the reverberation to fade away before a transmission starts. The 'blocking period' prevents multiple replies from being transmitted in response to the reverberation.

The 6G Wideband 2 instruments are set to always receive the Individual Interrogation Signal (IIS), which is set by its acoustic address. The IIS can be followed by an acoustic command. If no command is present the transponder or transceiver will reply on a Common Reply Signal (CRS) depending on the address family. This interrogation mode is used for baseline measurements between transponders, where only one transponder at a time will be replying. The turnaround time is fixed to 320 milliseconds.

The transponders or transceivers can also reply to a Common Interrogation Signal (CIS); its reply can be enabled or disabled via serial or acoustic command. If enabled, it will reply to the interrogation signal using its Individual Reply Signal (IRS), which is set by the acoustic address after the programmable turnaround time. There are different CIS signals (CIS0 to CIS14) these allow independent operation of several Long Base Line (LBL) navigation systems in the same area. The CIS used and the value of the turnaround time can be set by serial port or acoustic command.

To make sure of maximum battery life, the transponder goes into a sleep mode. To wake the transponder from this mode a wake up signal is sent before interrogation. The transceiver which generates the interrogation can be instructed to transmit a wake-up signal immediately before sending the interrogation signal. When the transponder has replied to the interrogation signal it will return to sleep mode after a controllable period of inactivity. The transponder can be programmed with an inactivity time, the length of the inactivity time required depends on the task the transponder is being used. The activity time is restarted after each valid interrogation. If the transponder has not gone into its sleep mode a wake up signal is not required.

B.2 Interrogators

Wideband transponders are being used for general acoustic navigation and special projects where the efficient command structure is required to save time during position and sensor measurement cycles.

Interrogators which are compatible with the new command structure are as follows:

- *TYPE 8310 ROVNav6 is a navigation transceiver used for LBL array calibration, ROV navigation and data telemetry.*
- *TYPE 8142 HPT USBL transceiver with a multi-element array provide both range and bearing information. The transceiver is capable of receiver Sonardyne's high data rate (HDR) telemetry, 3kbps and 6kbps.*
- *TYPE 8220 AvTrak6, Versatile AUV transceiver with Omni-directional transducers and used for self navigation, tracking and acoustic telemetry.*
- *TYPE 8309 MF Dunker transceiver for deployment over the side of a surface vessel and used for command and control and data acquisition from subsea instruments.*

For testing and maintenance, the Type 8063 deck test unit can perform basic WBv1 interrogations acoustic check, but cannot command or configure the transponder. The transponder should be configured using the Sonardyne 6G Terminal Lite software and if required another 6G instrument can be used for a basic acoustic check.

Appendix C – Open Source Software Licence Notices and Terms

C.1 CMSIS (Cortex[®] Microcontroller Software Interface Standard)

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Definitions

Term	Definition
6G [®]	Sonardyne's sixth generation technology hardware platform.
Acoustic Signal	Information carried by sound pressure waves through water. The Sonardyne acoustic signal has a finite length.
Acoustic Responder	An instrument that emits an acoustic signal in response to an electrical signal carried to it by cable.
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.
CIS	Common Interrogate Signal
CRS	Common Reply Signal
COMPATT	COMPUTing and Telemetry Transponder (see Acoustic Intelligent Transponder)
DGPS	Differential Global Positioning System
DSP	Digital Signal Processing
Firmware	The firmware installed on the transponder. Firmware updates can be installed via 6G Terminal Lite. The Tx firmware refers to the transmission signal synthesiser.
HPR	Hydroacoustic Position Reference
IIS	Individual Interrogate Signal
LED	Light Emitting Diode
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
PC	Personal Computer
ROV	Remotely Operated Vehicle
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.
UID	Unique Identity Description

Term	Definition
USB	Universal Serial Bus
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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