Sonardyne
SOUND IN DEPTH

UM-8300

User Manual for the Type 8300 Wideband Transponders

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Please note the helpline is for emergency use only.

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NOTE

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AMENDMENT HISTORY

All amendments and additions will be issued with a new copy of this sheet, recording the history of amendments

Issue	Revision	Date	Comments	Section	Page
A	0	30//09/10	First Issue	All	All
A	1	30/11/10	Minor Changes	All	-
A	2	07/12/10	Removed Section 4.2 – changing the inclinometer scaling range as this no longer applies for 6th Generation Transponders. Other minor typographical changes.	4.2	
A	3	17/01/11	Improved drawing resolution and details in Section 15. Section 4.1 inclinometer end-cap drawing and mounting instructions clarified.	4.1, 15	-
A	4	21/01/11	Improved the wording consistency	2	-
B	0	18/02/13	Reformatted the manual. Improved overall construction and consistency. Include new 6G Terminal Lite Software	All	All
B	1	19/08/13	ECN12238 Raised: Stock code for PCBs in recommended spares listing changed. Section 6.3 External Connector Pin-Out	12 6.3	111 29

SECTION 1 – INTRODUCTION

1. Introduction

This User Manual describes the safe installation, operation and maintenance of the Type 8300 Wideband Transponder. The information and procedures within this manual are based on Sonardyne's experience and knowledge.

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

1.1 Related Publications

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

The related publications are:

Table 1-1 – Related Publications

Publication	Title
Safety Manual	Safety Manual

SECTION 2 – SAFETY

2. Introduction

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

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

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

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

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

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

2.1 Procedures

Before carrying out any procedure on the equipment, make sure all the following Warnings and Cautions are read and understood.

WARNINGS

⚠ **Heavy Equipment. The Type 8300 Series of transponders, when out of water, weigh between 35 kilograms and 22.8 kilograms (depending on type). Manual Handling Equipment (MHE) must be used to move the transponders. If MHE is not available, then a manual handling assessment must be carried out prior to carrying out manual lifting / handling. Personal Protective Equipment such as protective footwear and gloves must be worn before lifting the equipment.**

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

⚠ **Electric shock. Electric shock hazard risk is present when dismantling or assembling the equipment. High voltages are present inside the transponder. Dismantling or assembling the equipment must only be carried out by trained personnel.**

⚠ **High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.**

⚠ **Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.**

WARNINGS

Risk of toxic gases and corrosive liquids. Do not stand in direct line with the end of the transponder when operating the Pressure Relief Vent Valve. Sudden release of high pressure gases could cause injury to personnel. Wear Personal Protective Equipment such as goggles when operating the Pressure Relief Vent Valve.

Irritant chemicals. Molykote 44 is a mild irritant. When lubricating the connector faces, personal protective equipment such as gloves and goggles must be worn.

Risk of burns. If the battery pack has been exposed to flooding, corrosive liquids may be present. Personal protective equipment, such as gloves and goggles, must be worn to handle the battery pack.

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 impact injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

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.

Crush Risk. Do not place hands near the Release Mechanism when in operation. The mechanism is opened with a high pressure spring which could trap fingers.

CAUTIONS

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.

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.

Damage to Sealing. Make sure the O-ring seals do not become damaged during removal of the end-caps.

Damage to Connectors. Failure to clean sand or silt correctly could result in damage to the connectors and O-ring seals.

CAUTIONS

Loss of Connector Integrity. Do not over apply grease to the female connector. Grease build up will affect connector integrity.

Equipment Damage. Only use the authorised battery packs in the transponder. Failure to use the correct batteries could cause damage to the equipment

Protective coating failure. Do not use any abrasive brushes or sharp tools to clean the transponder and remove any marine growth, this will damage the protective coating and increase the risk of corrosion.

2.2 Handling Procedures for CMOS Devices and Circuit Boards

Complementary Metal Oxide Semi-Conductor (CMOS) devices have diode input protection against adverse electrical environments such as electrostatic discharge.

Severe electrical transient voltages can be generated during handling.

Static voltages generated by a person walking across a common waxed floor have been measured in the 4 to 15 kilovolt range. These static voltages are potentially dangerous when discharged into a CMOS input, as the energy stored in the capacity (~300 pF) of the human body at these voltage levels.

Present CMOS gate protection structures can generally protect against over-voltages. This is usually sufficient except in the severe cases.

All CMOS devices should be stored and transported in materials that are anti-static. CMOS devices must not be inserted into conventional plastic “snow”, Styrofoam or plastic trays, but should be left in their original container until ready for use.

Operators must comply with safety precautions.

Completed assemblies should be placed in anti-static containers before being moved to stations.

All low impedance equipment (pulse generators, etc.) should be connected to CMOS inputs only after the CMOS is powered up. This type of equipment should be disconnected before power is turned off.

A circuit board containing CMOS devices is an extension of the device and the same handling precautions apply. Unprotected handling of any board containing edge connectors wired directly to CMOS device inputs can cause damage.

Do not insert or remove CMOS devices from their original or test sockets with power applied. Check all power supplies to be used for testing CMOS devices to make sure there are no voltage transients present.

All CMOS devices should be placed on a grounded bench surface and operators should ground themselves prior to handling devices, since a person can be statically charged with respect to the bench surface. Wrist straps in contact with skin are strongly recommended.

Nylon or other static generating materials should not come in contact with CMOS circuits.

When lead straightening or hand soldering is necessary, provide ground straps for the apparatus used and make sure the soldering irons are grounded.

SECTION 3 – TECHNICAL DESCRIPTION

3. Introduction

The 8300 series Wideband®2 Transponders are designed for positioning, data telemetry, data logging functions and remote monitoring of subsea instrumentation.

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.

This manual covers the following Wideband®2 Transponders:

- Type 8300 – Compatt 6 Transponder
- Type 8301 – Dynamic Positioning Transponder 6 (DPT 6)
- Type 8305 – Autonomous Monitoring Transponder 6 (AMT 6)

3.1 Description

3.1.1 Compatt 6 (Type 8300) Series

The Compatt 6 (Type 8300) transponder is designed specifically for full Long Baseline (LBL) subsea deployments. The transducer beamshape is available as omni-directional and directional, and with a depth rating of 3000 metres to 7000 metres. The transponders comprise a dark green, hard anodised pressure housing, protected by a red sleeve. One end has a braced sheet steel guard protecting a black acoustic transducer. The other end may have a stainless steel mechanism for releasing an anchor weight. The flanges at either end of the pressure housing are retained by four bolts which hold the clamp rings together. It is packed in a shipping case with a pair of opening tools and a CD containing software utilities.

Figure 3-1 – Compatt 6 (Type 8300) Transponder – Omni- Directional

Figure 3-2 – Compatt 6 (8300) Transponder – Directional

3.1.2 Dynamic Positioning Transponder 6 (Type 8301) (DPT 6)

The DPT 6 (Type 8301) is designed specifically for seabed deployment or large target tracking. The transducer beamshape is available as omni-directional and directional, with a depth rating of 3000 to 5000 metres. The transponders comprise a dark green, hard anodised pressure housing, protected by a red sleeve. One end has a braced sheet steel guard protecting a black acoustic transducer. The other end may have a stainless steel mechanism for releasing an anchor weight. The flanges at either end of the pressure housing are retained by four bolts which hold the clamp rings together. It is packed in a shipping case with a pair of opening tools and a CD containing software utilities. The DPT is clearly identified by an orange band with the name and type number. It also contains information regarding the battery pack installed.

Figure 3-3 – DPT 6 (Type 8301) Transponder

3.1.3 Autonomous Monitoring Transponder, (Type 8305) (AMT)

The AMT (Type 8305) has the same capabilities as the Compatt 6 with additional capabilities to periodically log sensor and make acoustic baseline measurements. The transducer beamshape is available as omni-directional and directional, and is depth rated to 3000 metres. It comprises a dark green, hard anodised pressure housing, protected by a red sleeve. One end has a braced sheet steel guard protecting a black acoustic transducer. The other end may have a stainless steel mechanism for releasing an anchor weight. The flanges at either end of the pressure housing are retained by four bolts which hold the clamp rings together. It is packed in a shipping case with a pair of opening tools and a CD containing software utilities. The AMT can be acoustically configured using a 6G® Transceiver interface to Sonardyne's MTL software. The AMT is clearly identified by a yellow band with the name and type number.

Figure 3-4 – AMT (Type 8305) Transponder

3.2 Type 8300 Series Variants

These provide increased product operation capabilities, variations of the Type 8300 series of transponders are available: standard, midi unit, mini unit and max unit.

3.2.1 Standard Unit – Type 8300 Series

The standard length unit is approximately 1035 millimetres overall length and comprises a dark green, hard anodised pressure housing approximately 135 millimetres diameter, protected by a red sleeve. The other end may have a stainless steel mechanism for releasing an anchor weight. The flanges at either end of the pressure housing are retained by two bolts which hold the clamp rings together. The standard unit can be fitted with either a lithium battery or an alkaline battery.

Figure 3-5 – Standard Length Unit

3.2.2 Midi Unit – Type 8300 Series

The Midi unit is a one piece instrument, packed in a case with a pair of opening tools and CD containing software utilities. It is approximately 784 millimetres overall length and comprises a dark green, hard anodised pressure housing approximately 135 millimetres diameter, protected by a red sleeve. One end has a braced sheet steel guard protecting a black acoustic transducer. It has a Lithium battery that has approximately 30% of the capacity of the standard Lithium unit, but has the same functionality.

Figure 3-6 – Midi Length Unit

3.2.3 Max Unit – Type 8300 Series

The Max unit is a one-piece instrument, packed in a shipping case with a pair of opening tools and a CD containing software utilities. It is approximately 1575 millimetres overall length and comprises a dark green hard-anodised pressure housing approximately 135 millimetres diameter, protected by a red sleeve. One end has a steel rod guard protecting a black acoustic transducer. It has twice the capacity of the standard lithium unit but has the same functionality.

Figure 3-7 – Maxi Length Unit

3.3 6G® Range

The 8300 series Wideband®2 transponders can be fully integrated with other products from the 6G® range.

3.3.1 AUV Tracking, AvTrak 6 (Type 8220)

The AvTrak 6 is a Wideband®2 capable acoustic navigation and communications instrument designed to form part of an integrated Autonomous Underwater Vehicle (AUV) navigation system. It combines the functions of transponder, transceiver and telemetry link in one low power unit that has been designed for a wide variety of AUV missions and vehicle types.

Figure 3-8 – AvTrak 6 (Type 8220)

3.3.2 High Performance Transceiver (HPT USBL) (Type 8142)

The HPT Ultra-Short Baseline (USBL) and telemetry transceiver is a high performance instrument which fully supports all Sonardyne Wideband®2 instruments.

Figure 3-9 – HPT USBL (Type 8142)

3.3.3 Wideband®2 Mini Transponders (WMT) (Type 8190)

The WMT is a mini-sized transponder that provides full two-way Wideband®2 (interrogation and reply) without interference from other users.

Figure 3-10 – WMT (Type 8190)

3.3.4 Remotely Operated Vehicle Navigation 6 (ROVNav 6) (Type 8310)

The ROVNav 6 is a Wideband®2 capable ranging and telemetry Long Baseline (LBL) transceiver for installation on ROVs or deployment from vessels. Its high power enables long range performance on noisy vehicles.

Figure 3-11 – ROVNav 6 (Type 8310)

3.4 Housing Labelling

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

- Serial No. 213245-006
- Type No. 83XX-XXXX
- Housing Limit 3000 m max
- Unit ID 0047D
- Address 2010 (factory default)

3.4.1 Serial Number

Identifies the transponder and should be quoted in all communications with Sonardyne International Ltd or their agents.

3.4.2 Type Number

The Type Number is a four digit number beginning with an ‘8’ e.g. 8300 – Compatt 6 and 8305 – AMT. The following four digits indicate the depth rating, material housing size and transducer type as indicated in the table below: e.g. 8300-3111 – Standard MF Omni Compatt 6

- 8300 Compatt 6
- 3 = Depth rating 3000 m
- 1 = Material Aluminium 6082
- 1 = Housing Standard
- 1 = Transducer Type MF Omni

Table 3-1 – Type Number Identification

	Depth Rating	Material	Housing	Transducer Type
1	1000 m	Aluminium 6082	Standard	MF Omni
2	2000 m	Aluminium 7075	Max	MF Dir – Type 1
3	3000 m	S/Duplex	Mini	MF Dir – Type 2
4	4000 m	Aluminium Bronze	Midi	MF Super Dir
5	5000 m	Titanium	Dunker	LMF Omni
6	6000 m	Stainless Steel	Remote	LMF Dir
7	7000 m	Composite	Sphere	LF Omni
8		Glass		EHF Omni
9	Special	Special		
0	No Code	No Code		

3.4.3 Housing Limit

This is the nominal pressure rating of the transponder housing. The sensor end-cap may be rated less than the housing limit. Check the end-cap label and use the lower figure.

3.4.4 Unit ID

The Unit ID box shows the unique identification number for the transponder. The Unit ID number is required to upgrade the software to aid the functionality of the transponder. The Unit ID cannot be changed and is stored on the CPU/Motherboard.

3.4.5 Address Box

The Address Box contains the acoustic command identity of the transponder. The acoustic command is used by the transceiver to communicate with the transponder. The first two digits of the address define the code or family group, the last two digits of the address define the channel number. It is important the information on the address label is kept up to date.

Table 3-2 – Address Range

Address Range	Signal Type	Purpose
0101 – 1514	Wideband®1	Backward compatibility with 5G Wideband Transponders and GDT USBL
2001 – 3014	Wideband®2 standard	Standard Navigation 6G
5101 – 6214	Wideband®2 advanced	Advanced navigation and telemetry for harsh environments, noisy and reverberant.

3.4.6 Sensor End-Cap

The sensor end-cap is an inter-changeable Data Acquisition Sub-Assembly (DAS), and has its own label, serial number and configuration number.

Figure 3-12 – Example of a Sensor End-Cap

The configuration (Config) lists the sensors and features fitted to the end-cap, selected from the following list:

- R = Release Mechanism
- T = Temperature Sensor
- P = Strain Gauge Pressure Sensor
- HP = Hi-Precision Strain Gauge Pressure Sensor
- Q = Quartz Pressure Sensor
- S = Sound Speed Sensor
- I = High Accuracy Dual-Axis Inclinometer

Two examples of end-cap labels:

Serial No. XXXXXX-XXX Config: T Q I Depth Sensor cal: 2050 m Max depth: 2450 m	Temperature (PRT), 2000 m Quartz, Pressure, Inclinometer
Serial No. XXXXXX-XXX Config: R T P S Depth Sensor cal: 3000 m	Temperature (PRT), 3000 m Strain Gauge, Sound Speed

The depth is a full scale rating of the pressure sensor fitted.

CAUTION

Equipment Damage. Quartz sensors can be damaged if over pressurised by a range of 20%.

The high accuracy inclinometers fitted have a range of ±90°.

All transponder sensor end-caps have a low accuracy inclinometer fitted as standard.

End-caps supporting external sensors, which require non-standard modifications to the DAS, PCB, wiring or firmware, will be marked with an additional label.

3.5 Basic Principles of Transponder Interrogation and Reply

The interrogation signal transmitted to a 6G® Wideband®2 Transponder is a phase-encoded acoustic signal. This signal is 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 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 ‘turn-around 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 is the same length.

The equipment sending 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 follow:

- Measures the total time delay = A
- Subtracts the turn-around delay = B
- This gives the true ‘through water’ time delay = C
- Multiplies by the speed of sound in water = D
- This equals the two way range = E

A – B = C

C x 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 other 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’ which allows the reverberation to face away before a transmission starts. The ‘blocking period’ prevents multiple replies from being transmitted in response to the reverberation of the initial interrogation signal.

The 6G® Wideband®2 transponder is set to always receive its 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 will reply on the Common Reply Signal (CRS). This interrogation mode is used for baseline measurements between transponders, where only one transponder at a time will be replying. The turn-around time in this fixed mode is 320 milliseconds.

The transponders can also reply to a Common Interrogation Signal (CIS), this reply can be enabled or disabled by 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 turn-around time. There are different CIS signals (CIS0 to CIS14) these allow independent operation of several Long Baseline (LBL) navigation systems in the same area. The CIS used and the value of the turn-around time can be set by serial port commands or acoustic telemetry commands.

To maximise 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 controlled period of inactivity. The transponder can be programmed with an activity time, the length of the inactivity time depends on how 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.

3.5.1 Transceivers

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.

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

- Type 8309 Dunker 6 is an ‘over-the-side’ navigation transceiver used for LBL array calibration, ROV navigation and data telemetry.
- Type 8310 ROVNav 6 is a vehicle mounted navigation transceiver used for LBL array calibration, ROV navigation and data telemetry.
- Type 8142 HPT USBL transceiver with a multi-element array provides both range and bearing information. The transceiver is capable of receiving Sonardyne’s high data rate (HDR) telemetry, supported rates including 3 kbps and 6 kbps
- Type 8220 AvTrak 6 is versatile AUV transceiver with omni-directional or directional transducers used for self-navigation, tracking and acoustic telemetry.

For testing and maintenance, the Type 8063 Deck Test Unit can perform basic WBv1 interrogation acoustic checks, but cannot command or configure the transponder. The transponder should be configured using the 6G Terminal Lite and if required another 6G instrument can be used for a basic acoustic check.

3.6 Command and Telemetry Functions

‘Command’ is the remote control of operating modes of transponder by coded acoustic signals, transmitted from a surface vessel..

The Wideband transponders use Wideband digital telemetry to send commands and transmit data replies. This allows multiple parameters to be set in one command, giving a faster set-up than previous command systems. Wideband digital telemetry has error detection and correction to improve reliability and security.

When the command function has been executed by the transponder, a telemetry signal is transmitted to acknowledge the operation is complete.

Example commands include the ability to change power levels, gain and navigation turnaround time for the beacon; to collect sensor readings and / or baseline measurements or (when fitted) actuate a release drive. All acoustic commands are initiated from an acoustic transceiver which is in turn driven by bespoke Sonardyne software.

3.7 Communicating via RS232

The transponder can be configured and tested via the RS232 link from a PC running the Sonardyne software. All compatible Sonardyne Wideband transceivers ship with a copy of the relevant acoustic and serial protocol document. This describes the acoustic and serial commands supported by each transponder.

3.8 Acoustic Navigation System Principles

3.8.1 Long Baseline Principles

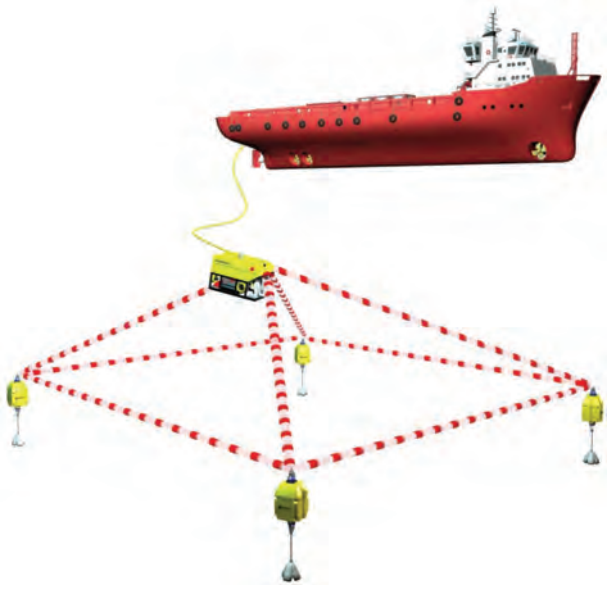
A Long-Baseline (LBL) system has two parts or segments.

The first segment comprises a number of acoustic transponders moored in fixed locations on the seabed. The positions of the transponders are described in a co-ordinate frame fixed to the seabed. The distances between them form the “baselines” used by the system.

The second segment comprises an acoustic transducer on a transceiver which is temporarily installed on the vessel, or on a Towfish. The distance from a transducer to a transponder can be measured by causing the transducer to transmit a short acoustic signal which the transponder detects and causes it to transmit an acoustic signal in response.

The process is repeated for the remaining transponders and the position of the vessel relative to the array of transponders is then calculated or estimated.

Figure 3-13 – LBL System



Navigation can be achieved using just two seabed transponders but in doing this there is a possible doubt as to which side of the baseline (a line drawn between the transponders) the vessel may be on, also the depth or height of the transducer has to be assumed.

Three transponders is the minimum required for certain navigation in three dimensions. Four is the minimum number required for some degree of redundancy – which is useful for checks on the quality of navigation.

LBL baselines are much larger, so an LBL system is very accurate compared with the Short Baseline (SBL) and Ultra Short Baseline (USBL) versions and also has the advantage of positioning the vessel (or any other object) directly in a “fixed” or an inertial frame. This removes most of the problems associated with vessel motion.

The array of seabed transponders needs to be calibrated and there are several techniques to do this. The applicable technique depends on the requirements of the task or job and the available hardware.

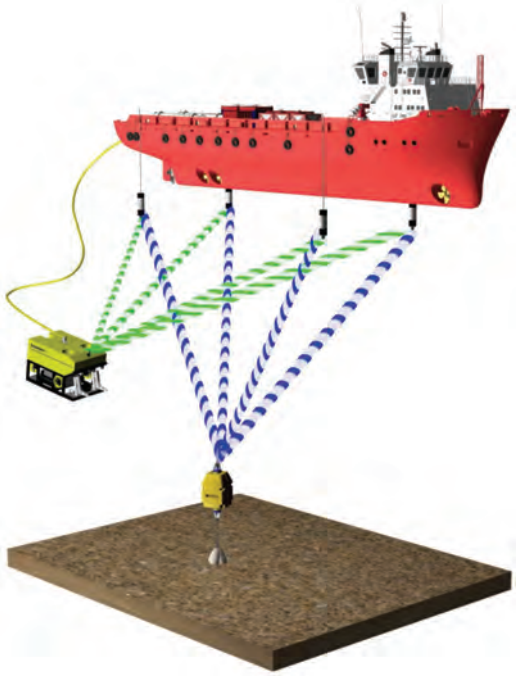
With the continuing integration of LBL, SBL and USBL systems, intelligent transponders (that measure baselines directly) and satellite navigation systems, the calibration of seabed arrays is becoming a quick and simple operation. The operator will be free to choose the techniques applicable to the task requirements.

3.8.2 Short Baseline Principles

A SBL system can be fitted to a vessel such as a barge, semi-submersible or a large drilling vessel. A number at least three or four acoustic transducers are fitted in a triangle or a square on the lower part of the vessel. The distance between the transducers is the base line and is made as large as is practical.

The position of each transducer within a co-ordinate frame fixed to the vessel is determined by conventional survey techniques or from the “as built” survey of the vessel.

Figure 3-14 – SBL System



If the distance from the transducers to the transponders is measured as described for LBL, then the position of the transponders, within the vessel co-ordinate frame, can be computed. If redundant measurements are made, a best estimate can be determined which is, statistically, more likely to be more accurate than the basic position calculation.

It is impractical to transmit a signal from each SBL transducer in turn. So the systems that use transponders transmit from one transducer but receiver simultaneously on all transducers. The result is one distance (or range) measurement and a number of range (or time) differences.

With an SBL system, the co-ordinate frame is fixed to the vessel. The vessel is subject to roll, pitch and yaw motion. This movement can be overcome by using additional equipment such as a Vertical Reference Unit (VRU) to measure roll and pitch and a Gyro-Compass to measure yaw. The co-ordinates of the transponders can be calculated mathematically to remove the effect of the movement.

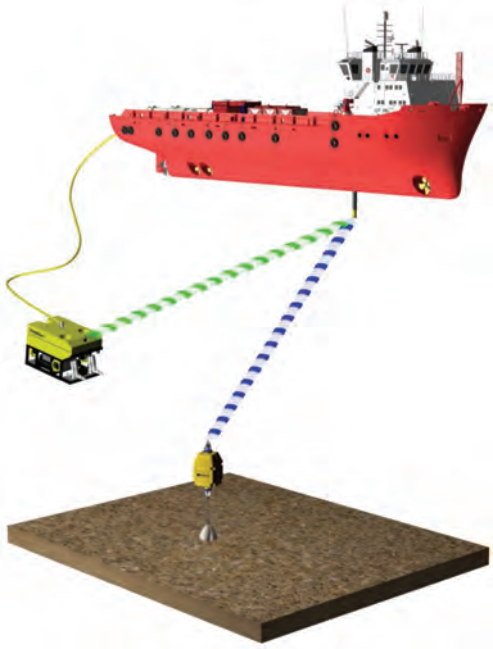
To estimate the position of the vessel in a “fixed” or “inertial” frame such as one fixed to the seabed. Then at least one transponder should be in a fixed position on the seabed and used as a reference point. This principle is used for Dynamic Positioning (DP) of vessels. If a transponder is fixed to the seabed and a responder located on a Remotely Operated Vehicle (ROV), the system will calculate the position of the vessel and the ROV in a seabed-fixed frame.

3.8.3 Ultra Short Baseline Principles

USBL transducers are built into a single transceiver assembly – or the array of transducers is replaced by an array of transducer elements in a single transceiver assembly.

The distances or ranges are measured the same as the SBL system, but the time differences are now much less. Systems using sinusoidal signals measure the “time-phase” of the signal in each element with respect to a reference in the receiver. The “time-phase differences” between transducer elements are computed by subtraction and then the system is equivalent to an SBL system.

Figure 3-15 – USBL System



Similar rules apply in systems using three elements (or groups of elements) and have the same restrictions as SBL systems with three transducers. USBL systems using four elements have the same restrictions as SBL systems using four transducers.

If an unambiguous position within a hemisphere is require and there are only three elements or element groups in use, then the element spacing must be less than one-half wavelength of the signal. Alternatively, a prior set of measurements must have been made with an element spacing of less than one-half wavelength.

The transducer elements are in a transceiver assembly that is placed somewhere in the vessel frame. The attitude of the assembly in the vessel frame must be measured during installation. A USBL system positions a transponder in a frame fixed to the transceiver assembly, not directly in a vessel-fixed frame as in the SBL.

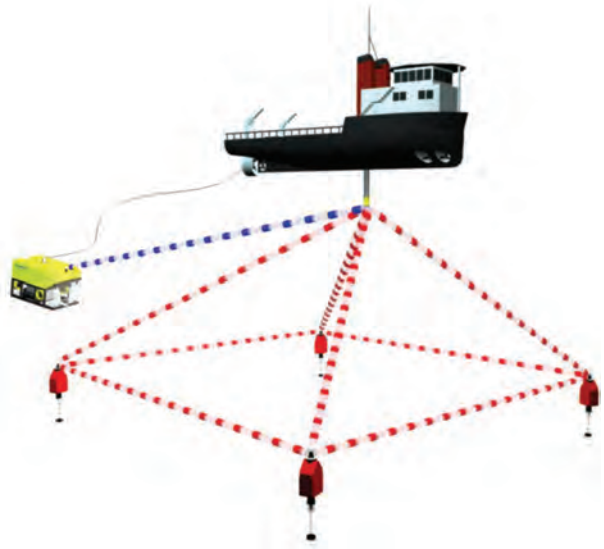
3.8.4 Long Ultra Short Baseline Principles

The Long Ultra Short Baseline (LUSBL) system is a variation of a USBL system. It uses USBL hardware in a configuration similar to the LBL system.

The range and bearing in the LUSBL system is measured as for a basic USBL system. A larger number of transponders are deployed on the seabed to achieve greater accuracy.

In a LUSBL system, the seabed array must be calibrated separately and the base line data entered manually into the LUSBL navigation processor. If a radio navigation input is available to the LUSBL system, it is possible to locate each seabed transponder directly in an earth-referenced frame to an accuracy determined by the accuracy of the radio navigation system. Using this method removes the need for the separate calibration of the seabed transponder array.

Figure 3-16 – LUSBL System



If transponders of the Compatt type are used on the seabed, it is possible for the seabed array, under command from the LUSBL system to be self-calibrating. Using Compatt transponders has the advantage of giving the system more flexibility they can be commanded to respond to a variety of frequencies and with any delay time. As an operator the Compatt version of the system is simpler and faster to set up and use.

Two complete sets of LUSBL equipment (navigation processor, monitor, keypad and transceiver) may operate in tandem to form a dual-redundant version of the system. The two sub-systems are cross-linked in the event of a failure of any major element. The system operation will continue without operator intervention. As an operator the dual-redundant version is almost the same as a standard version.

In operation, one of the sub-systems operates as the master system and performs all normal system functions. The second sub-system monitors the function of the master system and will take over system operation if it detects the master system is not functioning.

SECTION 4 – INSTALLATION

4. Pre-Use Checks

Before deploying the transponder make sure all Warnings and Cautions in **Section 2– Safety** of this manual, and the Safety Manual are read and fully understood.

The best positioning accuracies are achieved when the array transponders are held in a rigid support structure. Care should be taken to avoid metal to metal contact with the structure, as accelerated corrosion of the transponder may result. The integral tilt switch can be used to indicate whether a frame has fallen over.

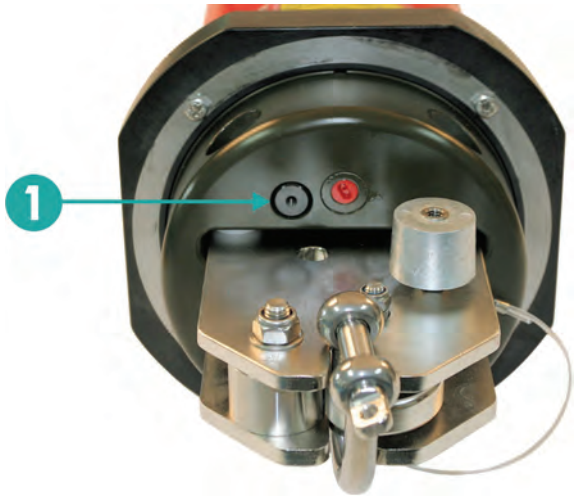
Before installing the equipment it is advised to visually inspect the equipment for any signs of damage, e.g. corrosion, dents, bent protective guard or damage to the release mechanism (if fitted).

It is recommended a full functional test of the equipment is carried out to make sure the transponder is fully serviceable and to check the battery has sufficient charge to carry out its full term of operations. For instructions on functionally testing the transponder refer to **Section 8 – Functional Test**.

4.1 Check the Pressure Relief Vent Valve

Before using the transponder it is recommended the Pressure Relief Vent Valve is inspected to make sure it is flush with the end-cap.

Figure 4-1 – Inspect the Pressure Relief Vent Valve



1 Pressure Relief Vent Valve

If the Pressure Relief Vent Valve is found not to be flush it indicates a build-up of internal pressure. Refer to section **7.4.1 – Operation of the Pressure Relief Vent Valve** to release the internal pressure.

4.2 Floatation

No floatation accessories are provided with the transponder, and as it has a net weight in water of several kilograms, buoyancy must be added for weights in water and air for the different versions.

Glass spheres or syntactic foam with a suitable depth rating can be used and must be able to give a net up-thrust of 3 kilograms or more, allowing for the weight of the shackle and strop. Syntactic foam floats are usually in the form of “collars” which clamp around the pressure housing. Glass spheres or other floats should be attached to the top guard by a rope long enough to minimise “shadowing” of the transducer. Sonardyne supply a range of suitable floatation collars of different depth ratings.

Max Unit only: fit the floatation collar mid-way along the tube. This will allow the transducer to remain in the water when the unit is at the surface.

Make sure the label with the acoustic command address and the Unit ID number are clearly visible with the floatation fitted.

4.3 Anchor Weights

To take the transponder to the seabed and hold it there an anchor weight is required for each deployment. A minimum of four times the net transponder/float buoyancy is recommended. As the anchor weight will be left on site after recovery of the transponder, Sonardyne International Ltd recommend a “bio-degradable” anchor weights which take the form of gravel inside a double or triple skin of hessian sacks.

4.4 Strops

The suspension rope or strop between the anchor weight and the shackle in the release mechanism should be long enough to allow ‘line of sight’ between the transponders in the array, and any topographical features in between. The minimum strop length should be 1.5 metres to make sure the momentum of the falling transponder does not carry it down onto the weight when the weight reaches the seabed, and possibly damaging the release. Allowance should also be made for any currents which may deflect the transponder from floating straight above the anchor weight.

If a wire strop is used, particular attention should be paid to the materials used. Electrolytic action between dissimilar metals could result in the strop breaking and the transponder drifting away.

The eye of the wire strop must be electrically insulated from the release mechanism to minimise corrosion.

4.5 Mounting Guidelines

CAUTION

Inaccurate Equipment Operation. Realignment of the inclinometer orientation when re-installing the unit, following removal, is important. Small tilt angle differences can be zeroed out when the system is calibrated during lowering, however incorrect orientation will result in the system giving an incorrect Course to Steer.

a) **Orientation** – It is important to install the unit on a structure with a known orientation. The flat bottom end-cap has a label next to a vertical groove which reads BOW/Forward. This must be facing North.

b) **Levelness** – Although the inclinometers will be calibrated for levelness during structure lowering care should be taken to ensure it is mounted as near to vertical as practical. The sensors only have a ±10° range.

c) **Isolation** – To minimise corrosion of the aluminium pressure housing, contact with structure metalwork should be avoided at all costs. Clamps around the tube should only be in contact with the housing sleeve. The flat bottom face should be insulated with an insulating material such as neoprene or nylatron.

d) **Acoustic masking** – The position on the structure should be such that the transducer is well away from reflecting surfaces above it, especially flat areas.

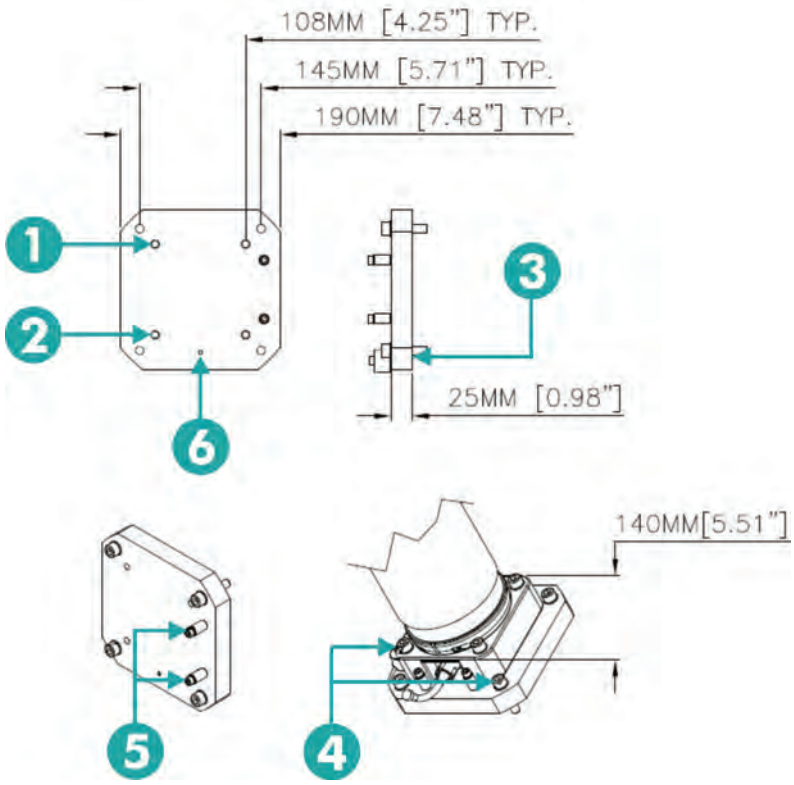
e) **Installation Kit** – An installation kit is available from Sonardyne – order code 650-2559. To mount the bottom end-cap onto an adaptor plate, four mounting holes to take M8 bolts are needed and 2 bosses to give a datum line to which the end-cap can be abutted. An electrical isolation layer between the mounting plate and the end-cap should offer corrosion protection.

NOTE

The locking sleeve on the end-cap connector protrudes from the Port side face of the end-cap.

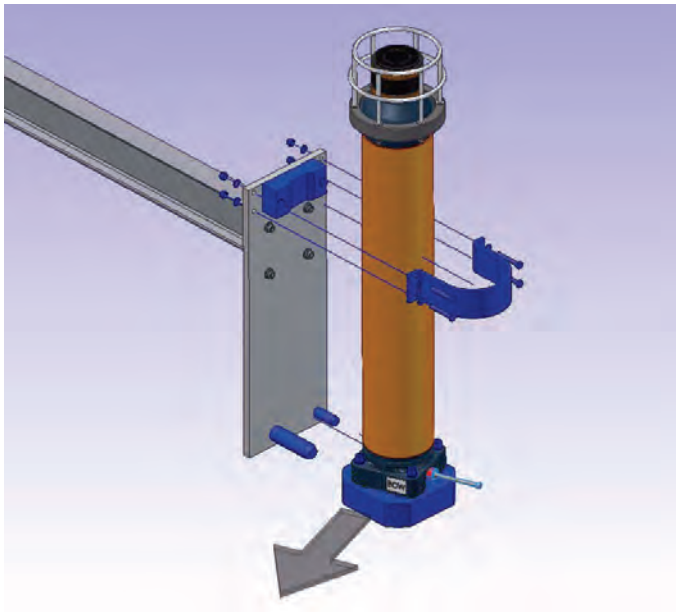
f) **Riser Monitoring** – Typically, the transponder is held by one or two clamp rings around the tube which are stood off the Riser approximately 1 metre. The stand-off arms must be detachable to allow the Riser through the drill floor. A bucket could equally be used to hold the transponder on the end of the arm(s).

Figure 4-2 – Inclinometer End-Cap Mounting Plate



1. 4 holes drill 10.2 mm
2. 4 holes tap M10
3. Hard anodised aluminium
4. Use M10 bolts
5. Location bosses
6. Ident align with end-cap notch

Figure 4-3 – Example of Inclinometer Mounting



SECTION 5 – DEPLOYMENT

5. Introduction

Deployment of a transponder can take many forms. The following sections detail all possible deployment methods.

Before deploying a transponder, make sure all Warnings and Cautions in this section and **Section 2– Safety** are read and fully understood.

5.1 Lifting

WARNINGS

⚠ **Heavy Equipment. The Type 8300 Series of transponders, when out of water, weigh between 35 kilograms and 22.8 kilograms (depending on type). Manual Handling Equipment (MHE) must be used to move the transponders. If MHE is not available, then a manual handling assessment must be carried out prior to carrying out manual lifting / handling. Personal Protective Equipment such as protective footwear and gloves must be worn before lifting the equipment.**

⚠ **Risk of crush injury. Do not stand underneath suspended equipment. Personal Protective Equipment such as safety boots and hard hat must be worn.**

The shackle on the transducer guard can be used to lift the transponder.

Lifting eyes on the floatation collar can be used – if fitted.

5.2 Deployment from Ship

The recommended method of deploying a transponder from a surface vessel is as follows:

1. Thread a loop of rope through an eye in the anchor weight. Make fast one end of the rope. Take the strain on the free end.

2. Lower the transponder and float to the water so they stream behind the ship as it approaches the drop position.

3. Lower the weight to the water line, allowing the rope to slip through the eye.

4. When on location let go of the free end of the rope. The weight will sink immediately, pulling the transponder with it.

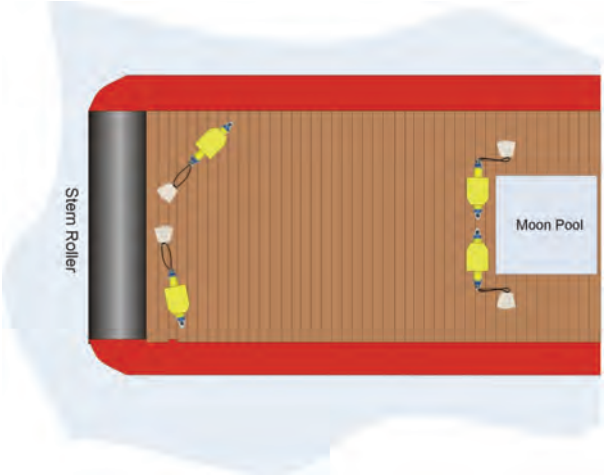
5. Recover the free end of the rope.

5.2.1 Additional Deployment methods

5.2.1.1 Roll the Transponder off the Deck

Roll the transponder off the deck and the weights will follow.

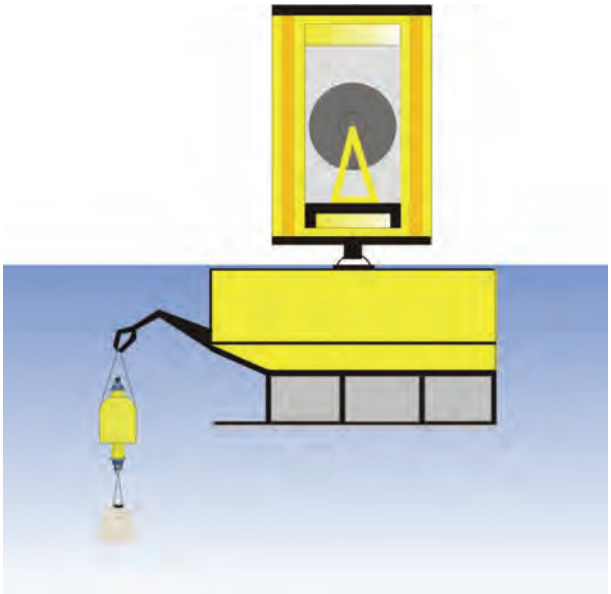
Figure 5-1– Rolling the Transponder off the Deck



5.2.1.2 Lowered by Vessel Crane or A-Frame – Version A

The ROV grabs a 1 metre loop of rope attached to the top guard or the float.

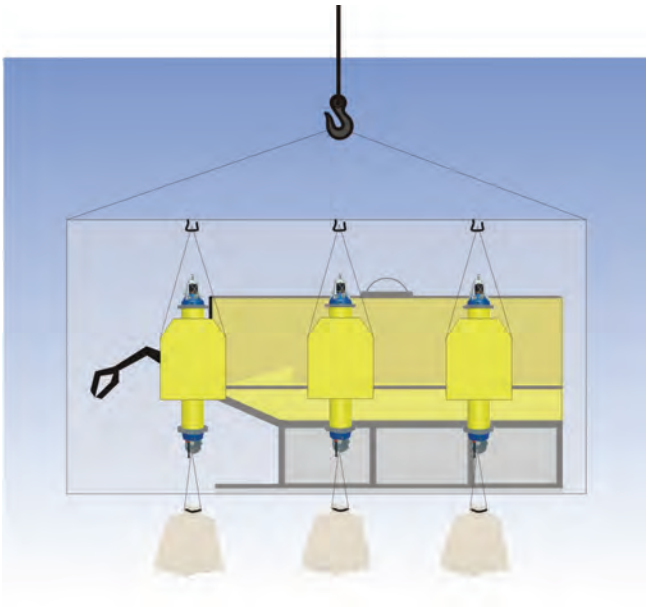
Figure 5-2 – Lowered by Vessel Crane or A-Frame – Version A



5.2.1.3 Lowered by Vessel Crane or A-Frame – Version B

The ROV grabs a 1 metre loop of rope attached to the top guard or the float.

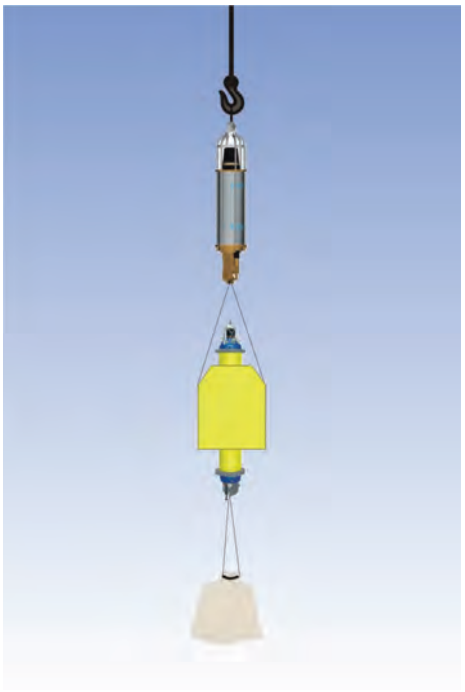
Figure 5-3 – Lowered by Vessel Crane or A-Frame – Version B



5.2.1.4 Acoustic Release used as Crane Hook

An acoustic release is used as a crane hook. Typically the release will need to be 15 – 20 metres under water for a survey boat and 35 – 50 metres for a semi-sub.

Figure 5-4 – Acoustic Release used as a Crane Hook



5.2.1.5 Slip Hook with Integral Swivel

Slip hook with integral swivel and D shackle to transponder to be released.

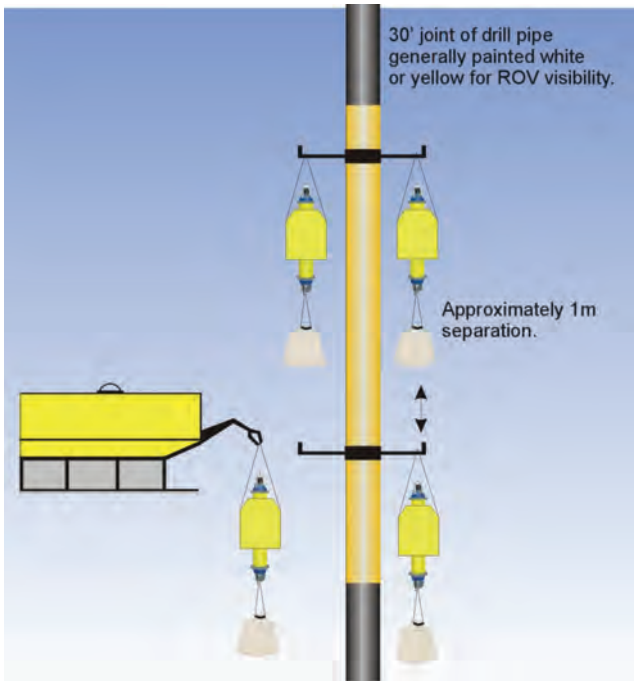
Figure 5-5 – Slip Hook with Integral Swivel

1 Release Control Line

5.2.1.6 ROV grabs 1 metre Loop of Rope

The ROV grabs a 1 metre loop of rope attached to the top guard or float.

Figure 5-6 – ROV grabs 1 metre loop of Rope



5.3 Long Term Deployments

In warm waters, marine growth around the release mechanism can build up and impede the release operation if deployed for months at a time.

Painting the release casting with marine anti-fouling paint may prolong operation under these conditions. Do not paint the zinc anodes.

SECTION 6 – OPERATION

6. Operational Modes

When the transponders have been installed, the system is monitored and controlled by the Marksman Ranger 2 software package or the Fusion software package.

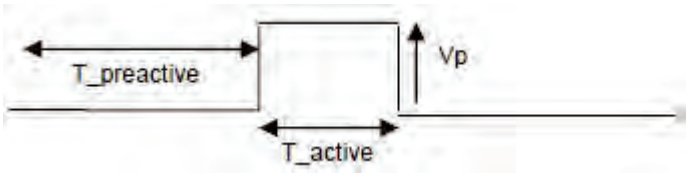
6.1 Operating Notes for Bi-Directional Sync

All transponders have a bi-directional sync line which can be operated as both an input and output. Whether the sync is enabled or disabled for input or output can be controlled serially or acoustically.

6.1.1 Sync Input

As an input, the sync line is used to drive the transponder as a responder which can be particularly useful if the transponder is to be mounted on a very noisy vehicle and operating at depth.

Table 6-1 – Sync Input



Symbol	Description	Min	Max
T_preactive	Time that Sync Input is required to remain high prior to a falling edge to begin sync pulse validation	200 us	Infinite
T_active	Time that Sync Input remains low before a valid sync pulse to be recognised	100 us	Infinite
Vp	Sync Input voltage	4.5 V	15 V

If the minimum value for T_preactive is not met then no amount of low state on the Sync Input line will generate a sync event. Similarly if the minimum value for T_active is not met then no sync event will be generated. Operating as a responder, the transponder will fire a reply acoustic transmission timed from the rising edge of the sync input pulse.

6.1.2 Sync Output

As an output the sync line can be made to generate a positive going pulse output at a prescribed time after the receipt of an acoustic detection. The pulse is a positive going, 5 volts, output that drives for 1 millisecond exactly 80 milliseconds after a Wideband navigation acoustic detection (either an individual or a common interrogation if common interrogation is enabled for the transponder).

6.2 Operating Notes for External Power Out

All transponders can be configured serially or acoustically to allow three external power options; power out disabled, power out enabled at regulated 12 Volts DC or power out enabled at the battery voltage. The maximum rating for the external power out supply is 3 Watts.

6.3 External Connector Pin-Out

The transponders are configured with the following pin-outs:

Table 6-2 – Connector Pin-Out

Pin	Description	
1	RS232 In	HOST
2	GND	Power and Comms ground
3	RS232 Out	HOST
4	Power In	Quiescent Power only 8 V – 18 V (Not Acoustic Transmission) Quiescent and Ping Power 18 V – 24 V (Not Telemetry)
5	Power Out	12 V Reg or V Batt
6	Sync	Refer to **6.1 - Operating Notes for Bi-Directional Sync**
7	RS232 Out	DAS
8	RS232 In	DAS

6.4 Operating Notes for Inclinometer

The standard transponders can be fitted with an end-cap containing dual axis inclinometers as an option. This version of the bottom end-cap will be non-release, and will be labelled with the Config option I2.

The range of the sensors fitted is ±90°, but when the transponder passes 90° in pitch or roll the sensor output will show a reducing angle, as the sensor is a sine law device.

The output of the cross axis sensor may report an inverted angle. There is no indication of either of these occurrences in the output from the transponder. The tilt sensor will not help as it indicates that the transponder is either upright or inverted within a 45° cone.

The inclinometers orientation is marked on the bottom end-cap by a groove running up the edge of the end-cap, indicating the bow or forward face and a BOW/Forward label is fitted adjacent to the groove. The Sonardyne polarity follows a standard Cartesian format:

Bow Up = Pitch +ve

Port Up = Roll +ve

SECTION 7 – MAINTENANCE & MONITORING

7. Maintenance

Before any maintenance activity is carried out make sure all warnings and cautions in **Section 2– Safety** are read, and the Safety Manual is fully read and understood.

Documentation must be consulted whenever the warning symbol is found on the equipment, in order to determine the nature of the potential hazard and any actions which should be taken.

7.1 Safety Precautions

WARNINGS

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

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. Make sure Personal Protective Equipment such as gloves are worn.

Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when the Pressure Relief Vent Valve is operated.

Electric shock. Electric shock hazard risk is present when dismantling and assembling the equipment. High voltages are present inside the transponder. Dismantling and assembling the equipment must only be carried out by trained personnel.

Risk of burns. If the battery pack has been exposed to flooding, corrosive liquids may be present. Personal protective equipment, such as gloves and goggles, must be worn to handle the battery pack.

Risk of toxic gases and corrosive liquids. Do not stand in direct line with the end of the transponder when operating the Pressure Relief Vent Valve. Sudden release of high pressure gases could cause injury to personnel. Wear Personal Protective Equipment such as goggles when operating the Pressure Relief Vent Valve.

Heavy Equipment. The Type 8300 Series of transponders, when out of water, weigh between 35 kilograms and 22.8 kilograms (depending on type). Manual Handling Equipment (MHE) must be used to move the transponders. If MHE is not available, then a manual handling assessment must be carried out prior to carrying out manual lifting / handling. Personal Protective Equipment such as protective footwear and gloves must be worn before lifting the equipment.

WARNINGS

Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.

Irritant chemicals. Molykote 44 is a mild irritant. When lubricating the connector faces, personal protective equipment such as gloves and goggles must be worn.

Risk of injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

CAUTION

Equipment Damage. Only use the authorised battery packs in the transponder. Failure to use the correct batteries could cause damage to the equipment.

7.2 Scheduled Maintenance and Recalibration

To make sure the transponder provides long and effective service, it is important to carry out scheduled maintenance and recalibration processes.

The following table identifies the scheduled maintenance and the frequency of the activity.

Table 7-1 – Scheduled Maintenance and Recalibration Timetable

Maintenance Schedule					
Task	**6 monthly**	**Annually**	**2 years**	**3 years**	**5 years**
Depth (strain gauge)		X			
Depth (Quartz)		X			
Inclinometer (precision)			X		
Inclinometer (MEMS)			X		
Temperature, PRT			X		
Sound Speed		X			

7.3 Lubrication

The following lubricants are recommended for use to assist in the maintenance of the equipment.

WARNING

Risk of irritation. Prolonged use of lubricants can cause slight irritation of the skin. Wear Personal Protective Equipment such as gloves when applying lubrication.

Table 7-2 – Lubricants

Assembly	Lubricants
Subconn and Micro-Subconn connectors	Molykote 44 Medium
'O' ring seals	Petroleum Jelly

7.4 General Maintenance

Before carrying out any general maintenance activity on the equipment, make sure all Warnings and Cautions in section **7.1 - Safety Precautions** are read and fully understood.

On retrieval of the transponder the following general maintenance must be carried out:

CAUTION

Damage to protective coating. Do not use any abrasive brushes or sharp tools to clean the transponder and remove any marine growth, this will damage the protective coating and increase the risk of corrosion.

1. Thoroughly clean the transponder in clean fresh water to remove all accumulations of salt, sand and silt.
2. Remove any accumulated marine growth. Clean the anodes with a nylon brush.
3. Dry the transponder with a lint free cloth.
4. Check the Pressure Relief Vent Valve is flush with the Sensor end-cap. If it is protruding it indicates internal pressure build up in the transponder housing. Refer to section **7.4.1 – Operation of the Pressure Relief Vent Valve**.
5. Inspect the paint finish for any signs of corrosion such as flaking, cracking or delamination.
6. Inspect all cables and connections for signs of abrasion, cracks or splits.
7. Check the guard for distortion.
8. Check there is sufficient zinc remaining on the anodes, replace if necessary.
9. Inspect the rubber boot on the transducer for signs of splitting.

10. Check the brass filling screw is in place.

11. Inspect the connector contacts for signs of corrosion.

12. Inspect the clamp ring bolts for signs of corrosion.

13. Check the plastic clamp ring insulators are in place.

7.4.1 Operation of the Pressure Relief Vent Valve

Before operating the Pressure Relief Vent Valve, make sure all Warnings and Cautions in the Safety Precautions are read and understood. Refer to section **7.1 - Safety Precautions**.

WARNINGS

⚠ **Risk of toxic gases and corrosive liquids. Do not stand in direct line with the end of the transponder when operating the Pressure Relief Vent Valve. Sudden release of high pressure gases could cause injury to personnel. Wear Personal Protective Equipment such as goggles when operating the Pressure Relief Vent Valve.**

⚠ **Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.**

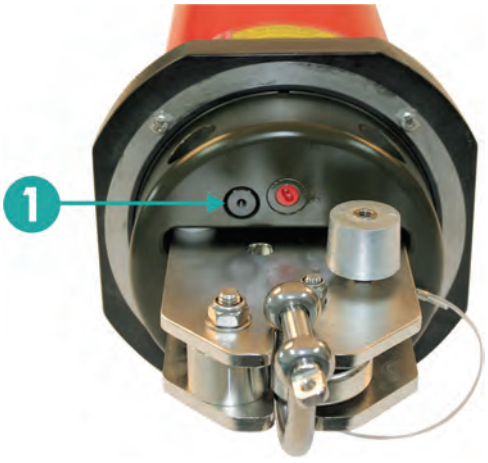
To release any build-up of internal pressure, the Pressure Relief Vent Valve must be operated as follows:

1. Before carrying out operation of the Pressure Relief Vent Valve, carry out general maintenance where necessary. Refer to section **7.4 – General Maintenance**.

2. Make sure any marine growth around the Pressure Relief Vent Valve is removed.

3. Refer to **Figure 7-1**. Check the position of the Pressure Relief Vent Valve ❶. If the valve is not flush, i.e. sticking out, this would indicate internal pressure build up.

Figure 7-1 – Inspect the Pressure Relief Vent Valve

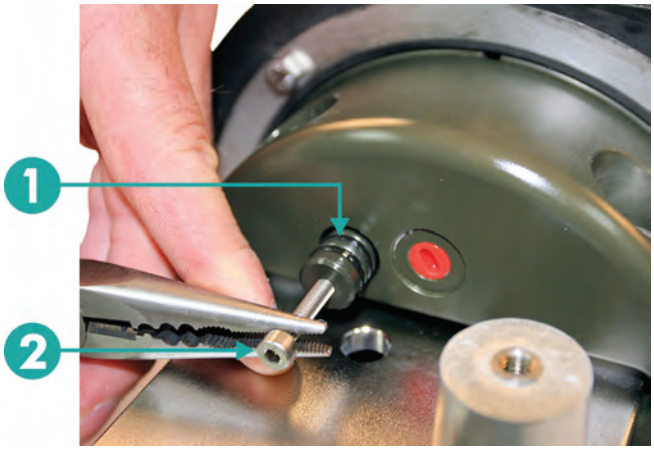


❶ Pressure Relief Vent Valve

4. Inspect the end-caps for any signs of movement or distortion. A gap between the end-cap and the housing would indicate a build-up of internal pressure.

5. Refer to **Figure 7-2**. Insert an M4 screw ❷ (not supplied) into the Pressure Relief Vent Valve ❶.

Figure 7-2 – Pressure Relief Vent Valve Operation



❶ Pressure Relief Vent Valve ❷ M4 screw (not supplied)

NOTES

If the Pressure Relief Vent Valve is difficult to pull out, a pair of long nosed pliers can be used to assist.

The Pressure Relief Vent Valve has an internal retaining screw preventing it from being fully pulled out of the end-cap.

6. Pull the Pressure Relief Vent Valve out until the second O-ring is revealed.

7. Wait for any internal pressure to be completely released.

8. With the Pressure Relief Vent Valve pulled out inspect the O-rings for any signs of damage.

9. Apply a small amount of petroleum jelly to lubricate the O-rings.

10. Release the Pressure Relief Vent Valve and an internal spring will pull it back into the end-cap. Apply a small amount of pressure to assist if it does not reseat fully.

11. Make sure the Pressure Relief Vent Valve is flush with the end-cap.

7.5 Removal and Fitment of a Directional Transducer End-Cap

If the transponder is configured with a directional transducer end-cap the removal and fitment procedures will different to that of the omni-directional transducer.

7.5.1 Directional Transducer End-Cap Removal

Before any maintenance activity is carried out on the transponder, make sure section **7.1 - Safety Precautions** is read and fully understood.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

Risk of injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

CAUTION

Damage to Sealing. Make sure the O-ring seals do not become damaged during removal of the end-caps.

Figure 7-3 – Transducer End-Cap Types

1 Directional Transducer

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

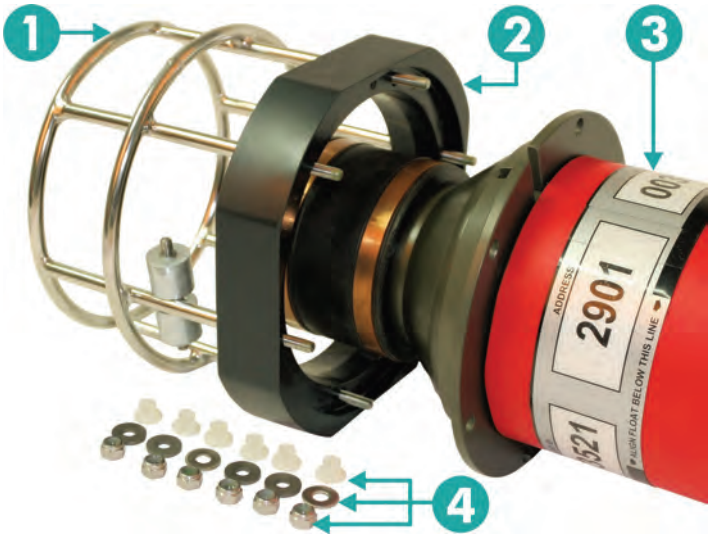
3. Refer to **Figure 7-4**. Undo, remove and retain the six nuts, washers ❺ and white nylon spacers ❹ from the end of the guard ❶ protecting the transducer ❷.

Figure 7-4 – Removing the Protective Guard

❶ Guard
❷ Transducer
❸ Rubber Bump Stop
❹ Nylon Spacer
❺ Washers and Nuts

4. Refer to **Figure 7-5**. Lift the end of the transponder housing a small amount to allow the protective guard ❶ and bump stop ❷ to be removed from the clamp rings ❸.

Figure 7-5 – Remove the Guard and Bump Stop



❶ Guard
❷ Bump Stop
❸ Clamp Rings
❹ Nuts, Washers and Nylon Spacers

5. With the guard and bump stop removed, remove the clamp rings.

6. Remove any dirt, silt or water that may have accumulated around the end-cap.

7. Using the Opening tools, lever the transducer end-cap from the housing until the O-ring seals are exposed.

8. Using a lint free cloth, clean around the O-ring seals.

CAUTION

Damage to cables. Remove the transducer end-cap slowly to prevent the cables becoming detached.

9. Pull the transducer end-cap slowly from the transponder body. Take care not to pull too hard or suddenly resulting in the cables becoming detached from the housing.

10. Disconnect the black battery connector lead by pressing in the connector locking pin and pulling out.

11. Disconnect the white transducer cable connector by pressing in the connector locking pin and pulling out.

7.5.2 Fitment of the Directional Transducer End-Cap

Before fitment of the directional transducer end-cap , make sure section **7.1 - Safety Precautions** is read and fully understood.

Make sure all general maintenance activities are carried out on the transponder, refer to section **7.4 - General Maintenance**.

WARNINGS

Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.

1. Inspect the transducer end-cap for any signs of damage, pay particular attention to the O-ring seals and groove.

2. Inspect the O-rings and replace if necessary.

3. Lubricate the O-rings with petroleum jelly.

4. Position the transducer end-cap next to the transponder housing.

5. Connect the white transducer end-cap cable to the white connection block.

6. Connect the battery connector to the black connection block.

CAUTION

⚠ Damage to cables. Observe the position of the transducer cable, make sure the cable does not become trapped when inserting the transducer.

7. Slowly rotate the transducer to coil the cable inside the bulkhead plate; push the transducer into the housing taking care not to trap the cable.

8. Position the clamp rings in the grooves on the end-cap.

9. Position the guard with the bump stop over the transducer.

10. Refer to **Figure 7-6**. Rotate the clamp rings ❸, if necessary, to align the holes with the screw ends of the guard ❷.

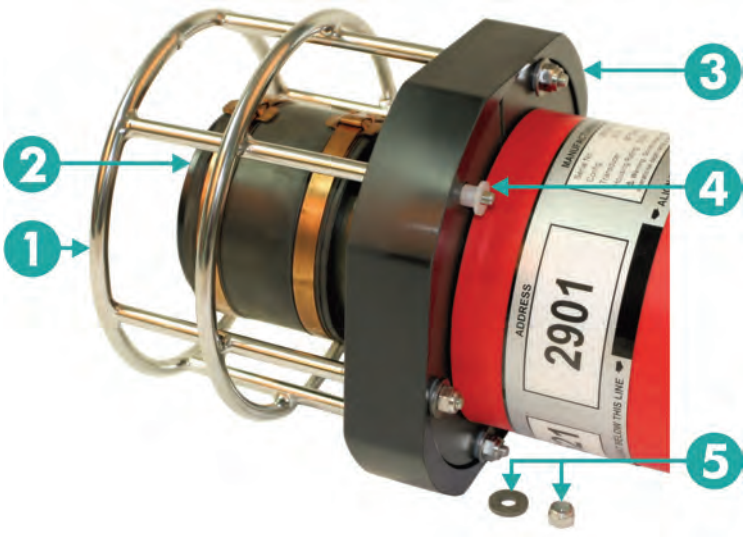
Figure 7-6 – Refitting the Guard and Bump Stop

❶ Guard Securing Screw ❷ Clamp Rings

11. Lift the end of the transponder enough to locate the guard screws through the holes in the clamp rings.

12. Refer to **Figure 7-7**. Secure the Bump Stop and Guard in place with the six nylon spacers, washers and nuts.

Figure 7-7 – Securing the Bump Stop and Guard



1. Guard
2. Transducer
3. Rubber Bump Stop
4. Nylon Spacer
5. Washers and Nuts

13. The transponder is now ready to be tested for operation – refer to **Section 8 – Functional Test**.

7.6 Removal and Fitment of Omni-Directional Transducer End-Cap

7.6.1 Omni-Directional Transducer End-Cap Removal

Before any maintenance activity is carried out on the transponder, make sure section **7.1 - Safety Precautions** is read and fully understood.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

WARNING

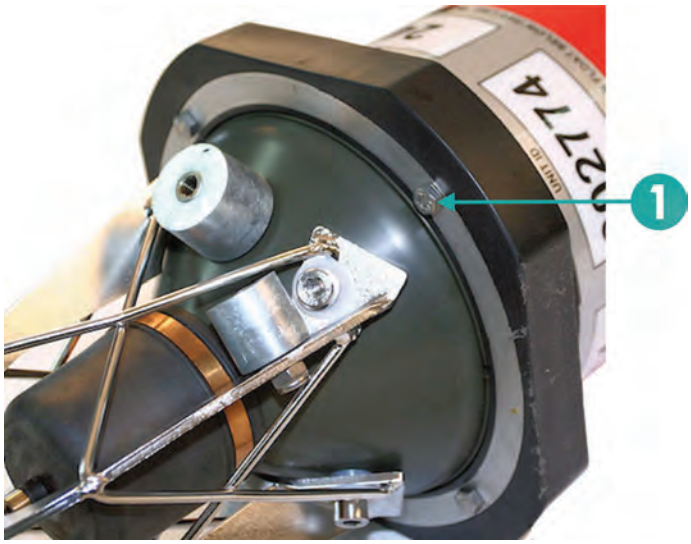
⚠ **Risk of injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.**

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

3. Refer to **Figure 7-8**. Undo and remove the nuts, washers and bolts ❶ securing the clamp rings securing the transducer to the housing.

Figure 7-8 – Removal of the Clamp Rings



❶ Transducer End-cap securing bolt, nut and washer

4. Refer to **Figure 7-9**. Push the rubber bump stop ❷ free from the clamp rings ❶ and housing; use the tapered end of the Opening Tools to assist if necessary.

5. Refer to **Figure 7-9**. With the Rubber Bump Stop ❷ free, remove the clamp rings ❶.

Figure 7-9 – Removal of the Rubber Bump Stop

❶ Clamp Rings ❷ Rubber Bump Stop

6. Remove any dirt, silt or water that may have accumulated around the end-cap.

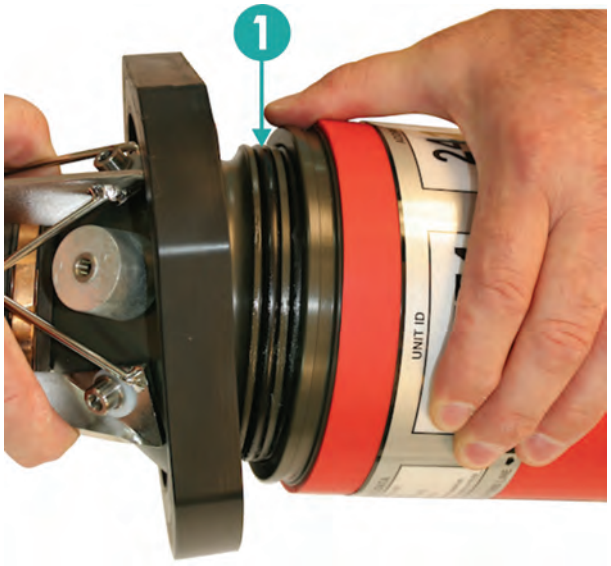
7. Refer to **Figure 7-10**. Using the Opening Tools ❷, lever the transducer end-cap from the housing until the O-ring seals are exposed.

Figure 7-10 – Removing Transducer Housing using the Opening Tools

❶ Transducer End-Cap Assembly ❷ Opening Tools

8. Refer to **Figure 7-11**. Using a lint free cloth, clean around the O-ring seals.

Figure 7-11 – Clean the O-ring Seals



1 O-Ring Seal

7.6.2 Fitment of the Omni-Directional Transducer End-Cap

Before fitment of the directional transducer end-cap , make sure section **7.1 - Safety Precautions** is read and fully understood.

Make sure all general maintenance activities are carried out on the transponder, refer to section **7.4 - General Maintenance**.

WARNINGS

Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.

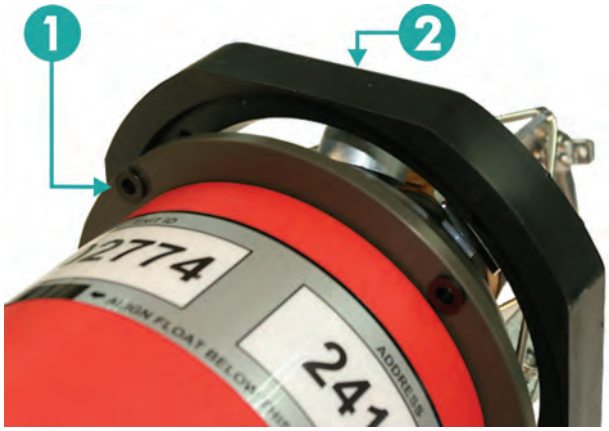
1. Inspect the transducer end-cap for any signs of damage, pay particular attention to the O-ring seals and groove.
2. Inspect the O-rings and replace if necessary.
3. Lubricate the O-rings with petroleum jelly.
4. Position the transducer end-cap next to the transponder housing.
5. Connect the white transducer end-cap cable to the white connection block.
6. Connect the battery connector to the black connection block.

CAUTION

⚠ Damage to cables. Observe the position of the transducer cable, make sure the cable does not become trapped when inserting the transducer.

7. Refer to **Figure 7-12**. Position the clamp rings ❶ in the grooves on the end-cap.

Figure 7-12 – Fitment of Clamp Rings and Bumper Stop



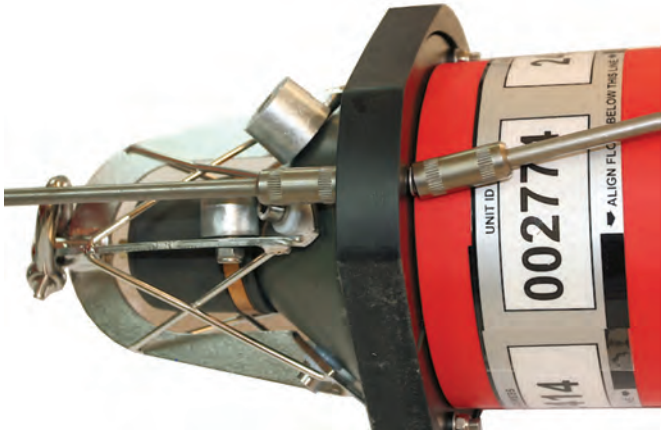
❶ Clamp Rings ❷ Rubber Bump Stop

8. Refer to **Figure 7-12**. Slide the rubber bumper stop ❷ over the end-cap and align with the holes in the clamp rings.

9. Secure the clamp rings to the bumper stop using the bolts, washers and nuts.

10. Refer to **Figure 7-13**. Tighten the nuts and bolts.

Figure 7-13 – Secure Bump Stop to Clamp Rings



7.7 Battery Replacement

7.7.1 Battery Removal

Before any maintenance activity is carried out on the transponder, make sure section **7.1 - Safety Precautions** is read and fully understood.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

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.

Risk of impact injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

3. Remove the transducer end-cap – for a directional transducer end-cap refer to section **7.5.1 – Directional Transducer End-Cap Removal**; for an omni-directional transducer end-cap refer to section **7.6.1 – Omni-Directional Transducer End-Cap Removal**.

CAUTION

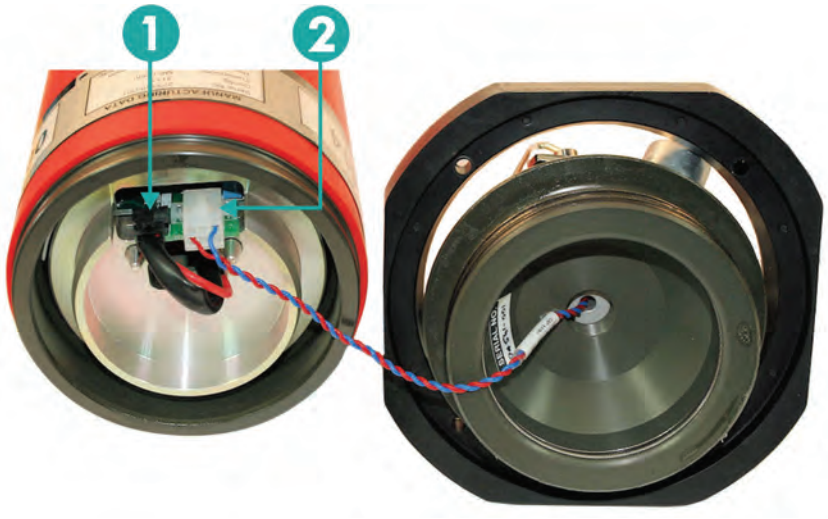
Damage to cables. Remove the transducer end-cap slowly to prevent the cables becoming detached.

4. Refer to **Figure 7-14**. Pull the transducer end-cap slowly from the transponder body. Take care not to pull too hard or suddenly resulting in the cables becoming detached from the housing.

5. Refer to **Figure 7-14**. Disconnect the black battery connector lead ❶ by pressing in the connector locking pin and pulling out.

6. Refer to **Figure 7-14**. Disconnect the white transducer cable connector ❷ by pressing in the connector locking pin and pulling out.

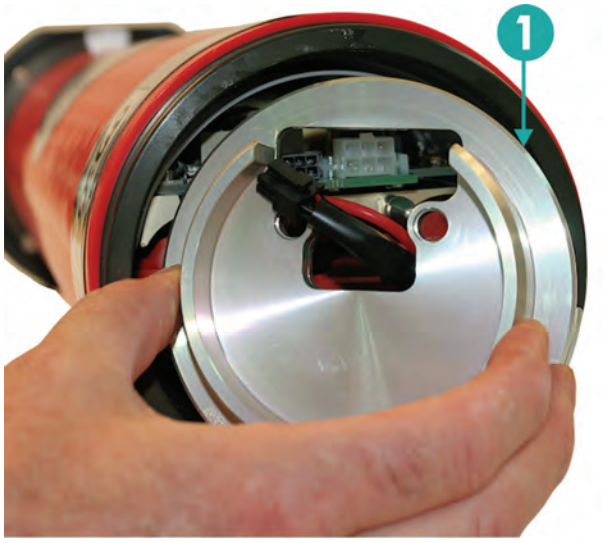
Figure 7-14 – Transducer End-Cap removed from the Transponder



❶ Battery connection point ❷ Transducer connection point

7. Refer to **Figure 7-15**. With the transducer removed, pull out the top bulkhead ❶.

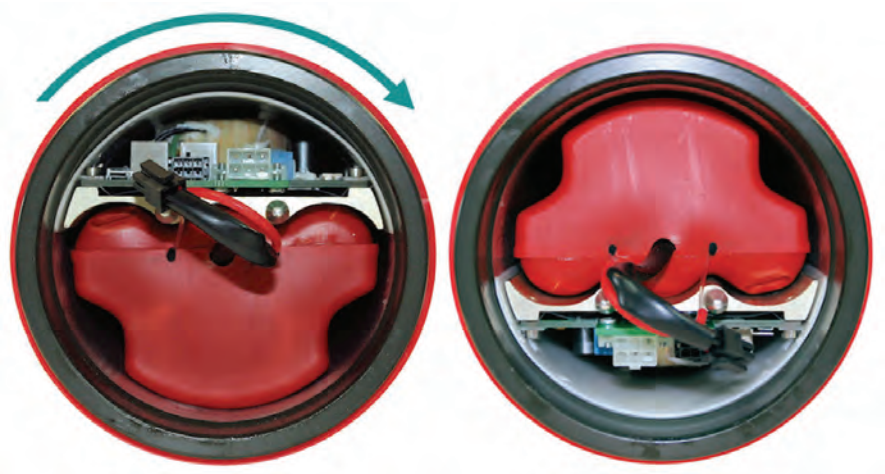
Figure 7-15 – Remove the Bulk Head



❶ Bulkhead

8. Refer to **Figure 7-16**. Rotate the housing so the battery is located upper most in the housing.

Figure 7-16 – Battery Positioning



WARNING

⚠ **Risk of burns. If the battery pack has been exposed to flooding, corrosive liquids may be present. Personal protective equipment, such as gloves and goggles, must be worn to handle the battery pack.**

9. Refer to **Figure 7-17**. Using the drawstring ❶ attached to the battery pack, slowly pull and support the battery pack out of the transponder.

Figure 7-17 – Battery Removal

❶ Battery Drawstring

10. The battery is now fully removed from the transponder.

7.7.2 Battery Fitment

Before fitting a new battery pack make sure there are no obstructions inside the pressure housing.

WARNINGS

Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.

Heavy Equipment. The Type 8300 Series of transponders, when out of water, weigh between 35 kilograms and 22.8 kilograms (depending on type). Manual Handling Equipment (MHE) must be used to move the transponders. If MHE is not available, then a manual handling assessment must be carried out prior to carrying out manual lifting / handling. Personal Protective Equipment such as protective footwear and gloves must be worn before lifting the equipment.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

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.

1. Make sure the correct type of battery is available. Remove any packaging and inspect for any damage.

2. Position the transponder on a clean bench so the battery can be inserted on top of the circuitry.

CAUTION

Internal Obstruction. The battery pack should be able to slide smoothly inside the transponder housing. If any resistance is felt remove the battery and inspect the transponder housing.

3. Refer to **Figure 7-18**. With the battery connector ❷ facing outwards, support the battery pack ❶ and slide into the transponder housing.

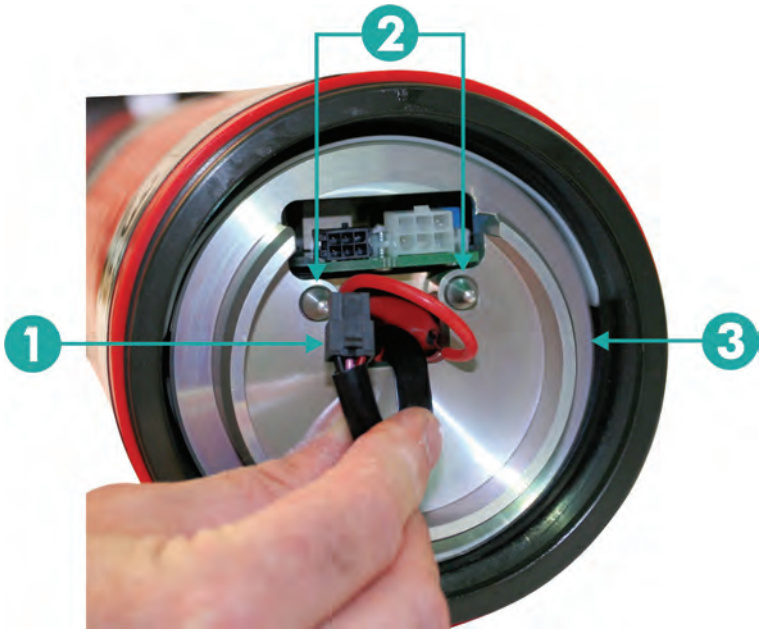
Figure 7-18 – Inserting the Battery Pack

❶ Battery pack ❷ Battery Connection

4. Refer to **Figure 7-19**. Position the bulkhead plate ❸ so the machined rim is outer most. Feed the battery connection lead ❶ through the bulkhead plate.

5. Refer to **Figure 7-19**. Position the bulkhead plate ❸ over the two locating pins ❷ and firmly push into position.

Figure 7-19 – Fitting the Bulkhead Plate



❶ Battery connection ❸ Bulkhead Plate
❷ Locating Pins

6. Refer to **Figure 7-20**. Inspect the transducer end-cap for any signs of damage, pay particular attention to the O-ring seals and groove.

Figure 7-20 – Inspecting the Transducer End-Cap

7. Inspect the O-rings and replace if necessary.

8. Lubricate the O-rings with petroleum jelly.

9. Position the transducer end-cap next to the transponder housing.

10. For fitment instructions of the directional transducer end-cap refer to section **7.5.2 – Fitment of the Directional Transducer End-Cap**; for fitment instructions of the omni-directional transducer end-cap refer to section **7.6.2 – Fitment of the Omni-Directional Transducer End-Cap**.

7.8 Sensor End-Cap Replacement

7.8.1 Sensor End-Cap Removal

Before proceeding with the removal of the Sensor End-Cap Assembly, make sure section **7.1 - Safety Precautions** is read and fully understood.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

WARNINGS

⚠ **Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.**

⚠ **Risk of impact injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.**

⚠ **Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.**

⚠ **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.**

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

3. Remove the transducer end-cap – for a directional transducer end-cap refer to section **7.5.1 – Directional Transducer End-Cap Removal**; for an omni-directional transducer end-cap refer to section **7.6.1 – Omni-Directional Transducer End-Cap Removal**.

CAUTION

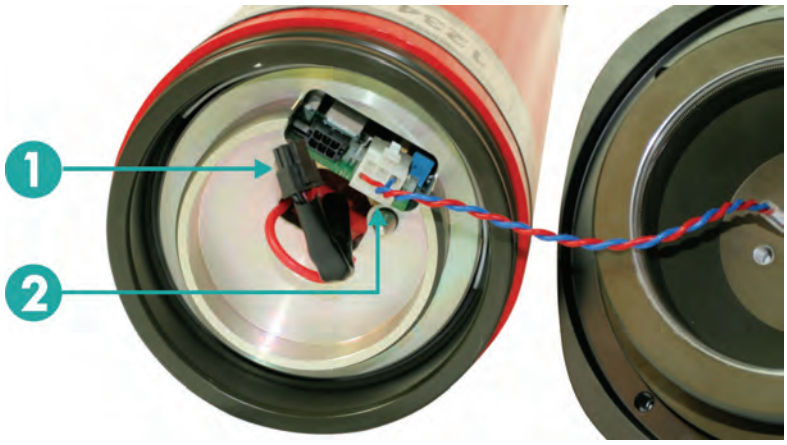
⚠ **Damage to cables. Remove the transducer end-cap slowly to prevent the cables becoming detached.**

4. Pull the transducer end-cap slowly from the transponder body, Take care not to pull too hard or suddenly resulting in the cables becoming detached from the housing.

5. Refer to **Figure 7-21**. Disconnect the black battery connector lead ❶.

6. Refer to **Figure 7-21**. Disconnect the white transducer cable connector ❷.

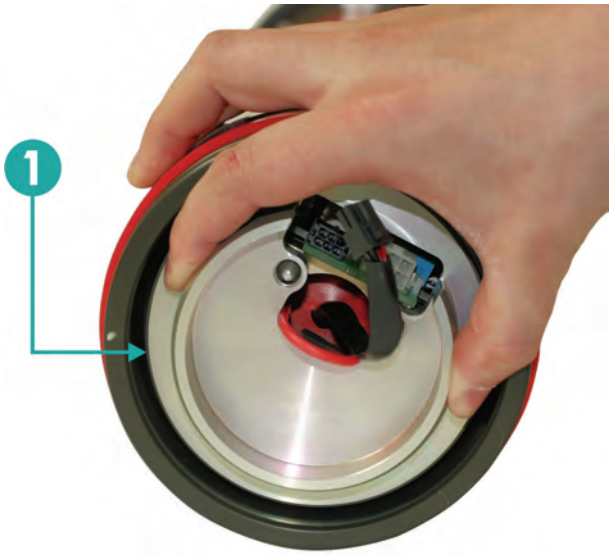
Figure 7-21 – Transducer End-Cap removed from the Transponder Housing



❶ Battery connection point ❷ Transducer connection point

7. Refer to **Figure 7-22**. With the transducer removed, pull out the bulkhead plate.

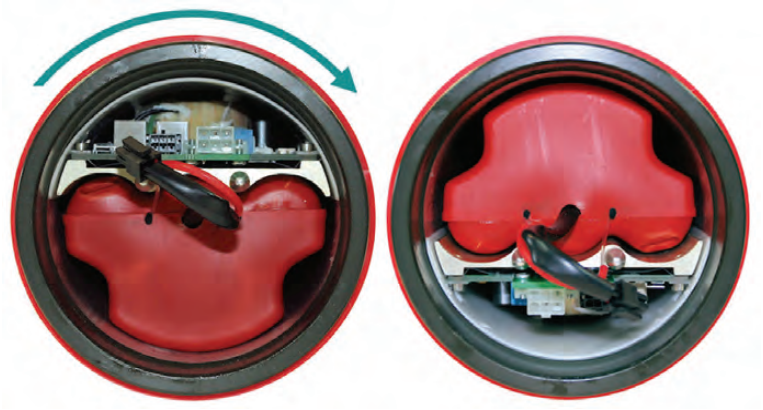
Figure 7-22 – Remove the Bulkhead Plate



❶ Bulkhead Plate

8. Refer to **Figure 7-23**. Rotate the housing so the battery is located on top of the circuitry.

Figure 7-23 – Rotate housing for Battery Positioning



WARNING

⚠ **Risk of burns. If the battery pack has been exposed to flooding, personal protective equipment, such as gloves, must be worn to handle the battery pack.**

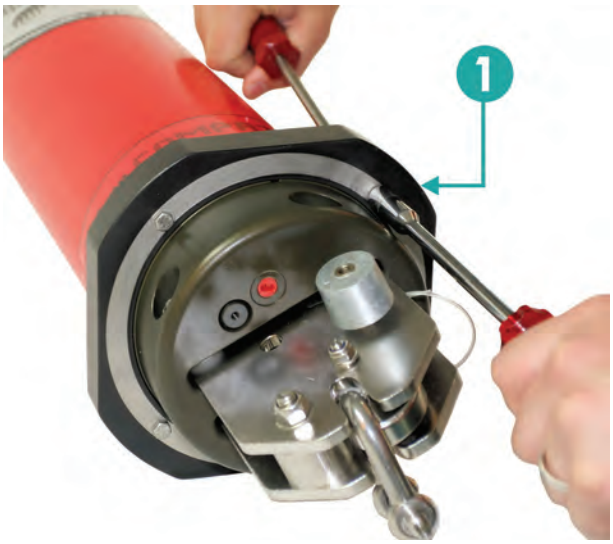
9. Refer to **Figure 7-24**. Using the drawstring ❶ attached to the battery pack, slowly pull and support the battery pack out of the transponder.

Figure 7-24 – Remove the Battery Pack

❶ Battery Drawstring

10. Refer to **Figure 7-25**. Undo and remove the nuts, washers and bolts securing the clamp rings and Bump Stop ❶ from the Sensor End-cap.

Figure 7-25 – Remove the Sensor End-Cap Bumper Stop and Clamp Rings



❶ Sensor End-cap Bump Stop

11. Push the rubber bump stop free from the clamp rings and housing. Use the tapered end of the Opening Tools to assist if necessary.

12. With the Rubber Bump Stop free, remove the clamp rings.

13. Remove any dirt, silt or water that may have accumulated around the Sensor End-cap.

14. Refer to **Figure 7-26**. Using the Opening Tools ❷ to assist to lever the Sensor End-cap ❶ from the housing until the O-rings are exposed.

Figure 7-26 – Remove the Sensor End-Cap

❶ Sensor End-Cap ❷ Opening Tool

15. Using the lint free cloth, clean around the O-ring seals.

16. Refer to **Figure 7-27**. Slowly pull the Sensor End-cap ① from the transponder housing.

17. Refer to **Figure 7-27**. Inspect the condition of the 'O'-ring ② seals; replace if necessary.

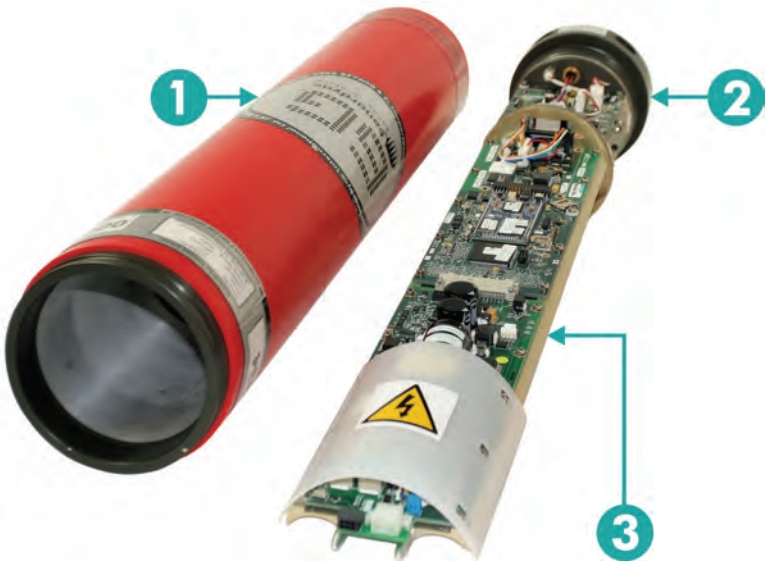
Figure 7-27 – Removing the Sensor End-cap

① Sensor End-Cap ② 'O'-rings

18. While pulling out the Sensor End-Cap, support the chassis without touching the printed circuit boards.

19. Refer to **Figure 7-28**. Place the chassis on a clean dry surface.

Figure 7-28 – Sensor End-Cap and Chassis

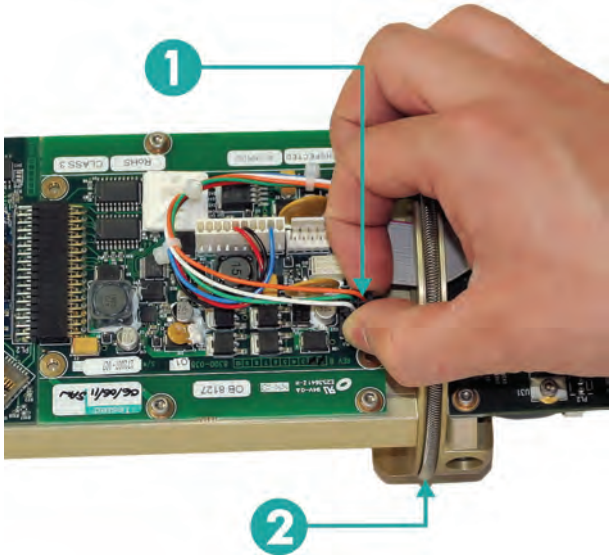


① Transponder Housing ③ Chassis
② Sensor End-Cap

20. Refer to **Figure 7-29**. Inspect the spring gaskets ❷ for signs of damage. Replace if necessary.

21. Refer to **Figure 7-29**. Disconnect the PL1 connection ❶ from the Interface PCB Assembly.

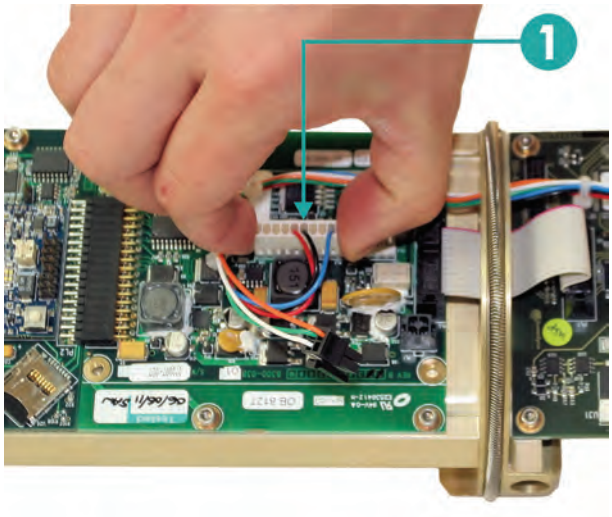
Figure 7-29 – Disconnecting PL1 Connection from the Interface PCB Assembly



❶ PL1 Connection ❷ Spring Gasket

22. Refer to **Figure 7-30**. Disconnect the PL2 connection ❶ from the Interface PCB Assembly.

Figure 7-30 – Disconnecting PL2 Connection from the Interface PCB Assembly



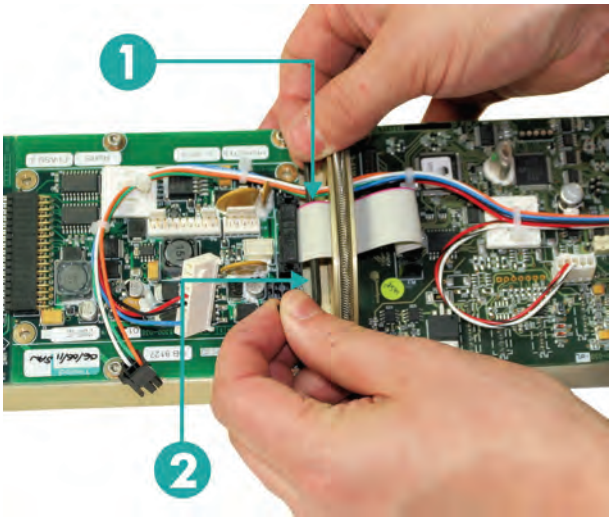
❶ PL2 Connection

23. Refer to **Figure 7-31**. Disconnect the Ribbon Cable ❶ from the connection point on the Interface PCB Assembly.

NOTE

An Allen key can be used to assist in lifting the ribbon cable connection from its location point.

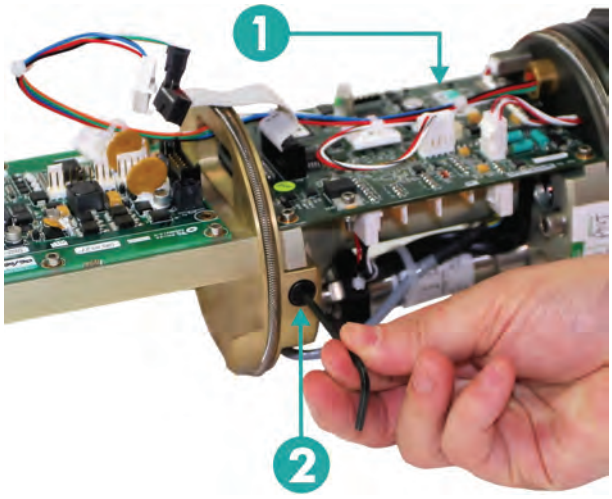
Figure 7-31 – Disconnecting the Ribbon Cable from the Interface PCB Assembly



❶ Ribbon Cable ❷ Allen Key

24. Refer to **Figure 7-32**. Use an Allen Key to undo the 2 x retaining screws ❷ the Sensor End-Cap to the main chassis.

Figure 7-32 – Disconnecting the Sensor End-Cap from the Main Chassis

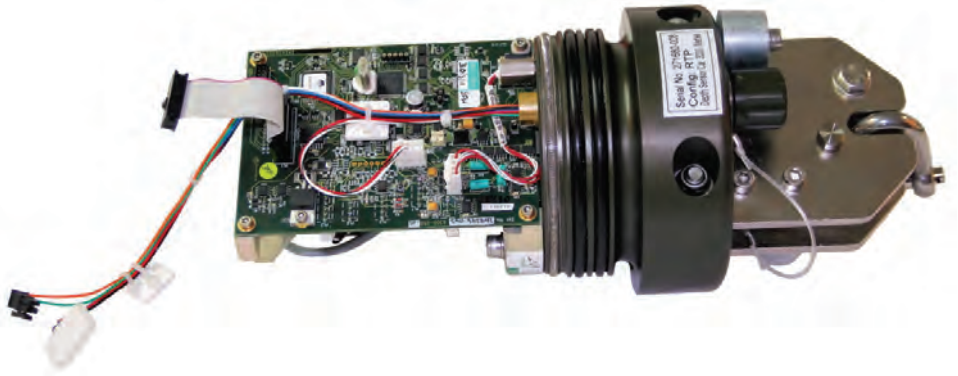


❶ Sensor End-Cap ❷ Retaining Screw

25. Carefully feed all cables through the hole in the end of the chassis.

26. The Sensor End-Cap is now disconnected from the main chassis and can be replaced if necessary.

Figure 7-33 – Disconnected Sensor End-Cap



7.8.2 Sensor End-Cap Fitment

Fitment of the Sensor End-Cap must only be carried out by trained personnel.

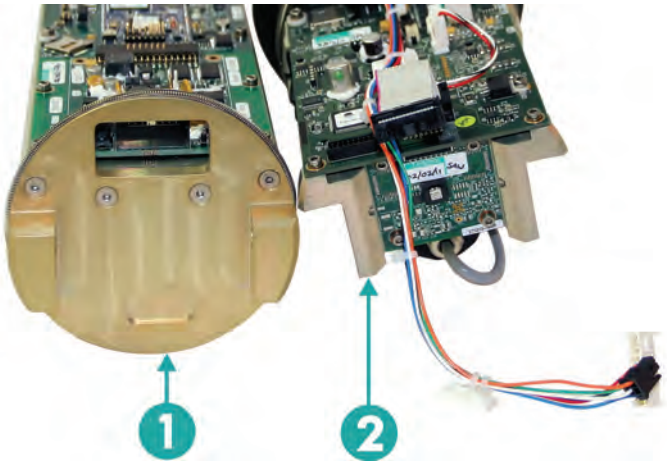
WARNINGS

Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

1. Refer to **Figure 7-34**. Before fitting a new Sensor End-Cap, inspect the main chassis and Sensor End-Cap mating faces for any signs of damage.

Figure 7-34 – Inspecting the Chassis and Sensor End-Cap mating faces

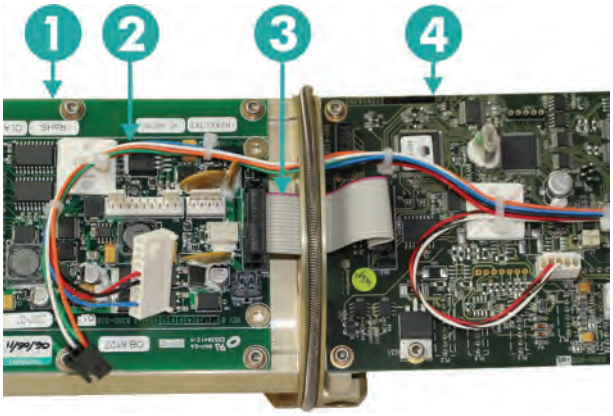


1 Chassis mating face 2 Sensor End-Cap mating face

2. Refer to **Figure 7-35**. Position the Sensor End-Cap so it abuts the main chassis.

3. Refer to **Figure 7-35**. Feed the wiring and ribbon cable through the cut out in the main chassis.

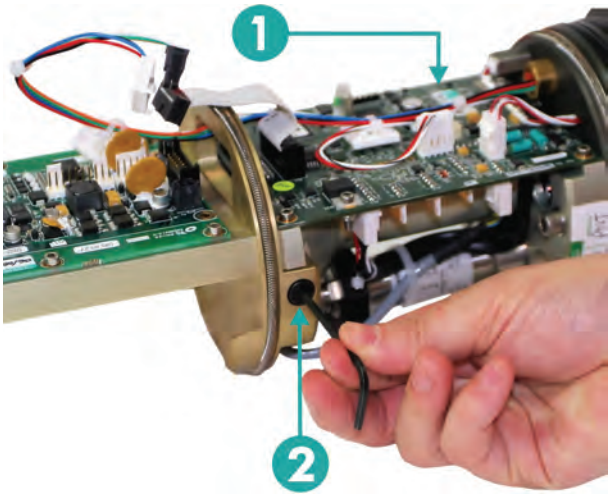
Figure 7-35 – Abutting Chassis and Sensor End-Cap



1 Main Chassis
2 Wiring loom
3 Ribbon Cable
4 Sensor End-Cap

4. Refer to **Figure 7-36**. Using an Allen Key, secure the Sensor End-Cap 1 to the Chassis using the 2 x retaining screws 2.

Figure 7-36 – Securing the Sensor End-Cap to the Chassis



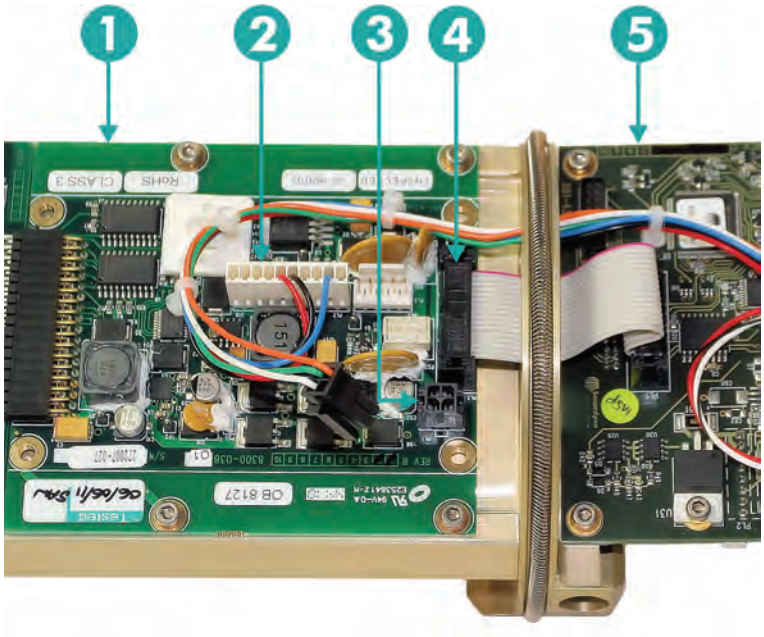
1 Sensor End-Cap
2 Retaining Screw

5. Refer to **Figure 7-37**. Connect the ribbon cable to the black connection block 4 on the Interface PCB Assembly.

6. Refer to **Figure 7-37**. Connect the white block connection to the PL2 connection point 2 on the Interface PCB Assembly.

7. Refer to **Figure 7-37**. Connect the black block connection to the PL1 connection point ❸ on the Interface PCB Assembly.

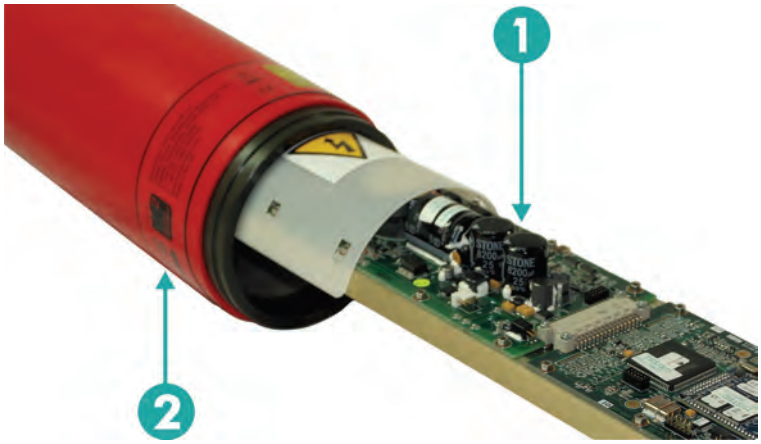
Figure 7-37 –Interface PCB Connections



❶ Interface PCB Assembly
❷ PL2 Connection point
❸ PL1 Connection point
❹ Ribbon Cable connection point
❺ Sensor End-Cap

8. Refer to **Figure 7-38**. Support the chassis ❶ and insert into the housing; check the direction of housing labels ❷ to make sure the chassis is inserted to the bottom of the housing.

Figure 7-38 – Inserting the Chassis into the Housing



❶ Chassis
❷ Housing Label

9. Refer to **Figure 7-39**. Lubricate the 2 x O-rings ❷ on the Sensor End-cap with petroleum jelly.

Figure 7-39 – Lubricate Sensor End-Cap O-Ring Seals

❶ Sensor End-Cap ❷ O-ring Seals

10. Push the Sensor End-cap fully into the housing.

CAUTION

⚠ **Internal Obstruction. It should be possible to push the Sensor End-Cap fully into the housing. If any resistance is felt, pull out the Sensor End-Cap and Chassis fully and inspect the housing for any obstructions.**

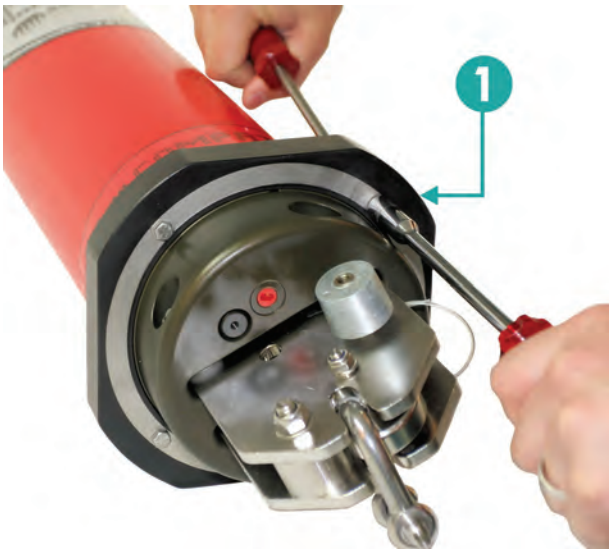
11. Position the clamp rings in the grooves on the Sensor End-cap.

12. Slide the rubber bumper stop over the Sensor End-cap and align the holes in the clamp rings.

13. Secure the clamp rings to the bumper stop using the bolts, washers and nuts.

14. Refer to **Figure 7-40**. Tighten the nuts and bolts.

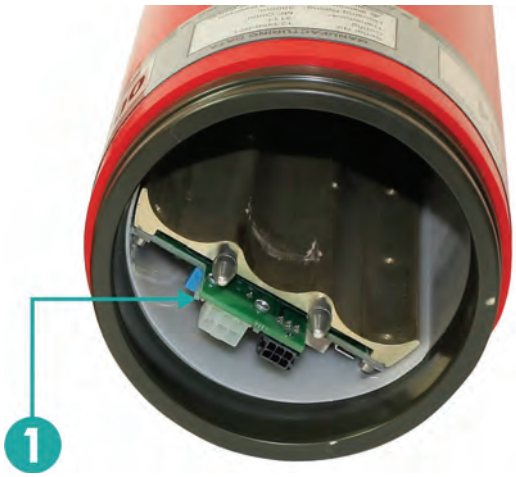
Figure 7-40 – Securing the Sensor End-Cap Bumper Stop and Clamp Rings



1 Sensor End-cap Bump Stop

15. Refer to **Figure 7-41**. Viewing the housing from the other end, rotate the transponder housing so the circuitry is at the bottom of the housing.

Figure 7-41 – View of circuitry in the Housing



1 Circuitry

16. Check inside the housing for any signs of obstruction.

CAUTION

Internal Obstruction. The battery pack should be able to slide smoothly inside the transponder housing. If any resistance is felt remove the battery and inspect the transponder housing.

17. Refer to **Figure 7-42**. Support the battery pack and slide into the transponder housing.

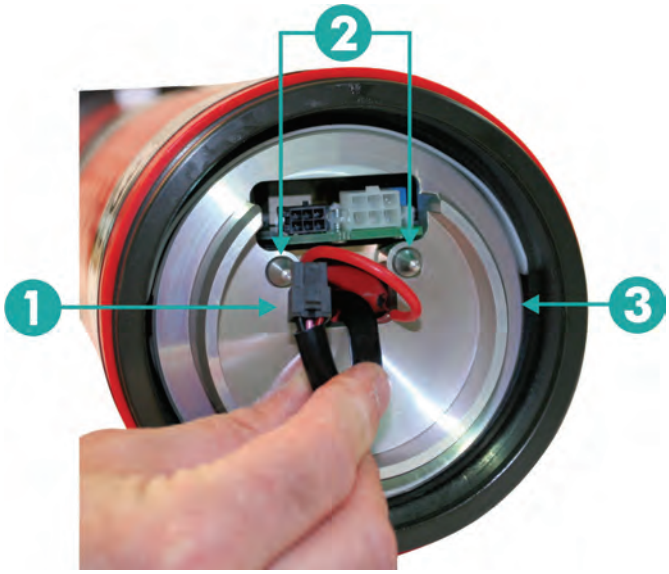
Figure 7-42 – Inserting the Battery Pack into the Housing

1 Battery pack
2 Battery Connection

18. Refer to **Figure 7-43**. Position the bulkhead plate so the machined rim is outer most. Feed the battery connection lead through the bulkhead plate.

19. Position the bulkhead plate over the two locating pins and firmly push into position.

Figure 7-43 – Fitting the Bulkhead Plate over the Pins



1 Battery Connection
2 Wiring loom
3 Ribbon Cable

20. Refer to **Figure 7-44**. Inspect the transducer end-cap for any signs of damage, pay particular attention to the O-ring seals and grooves.

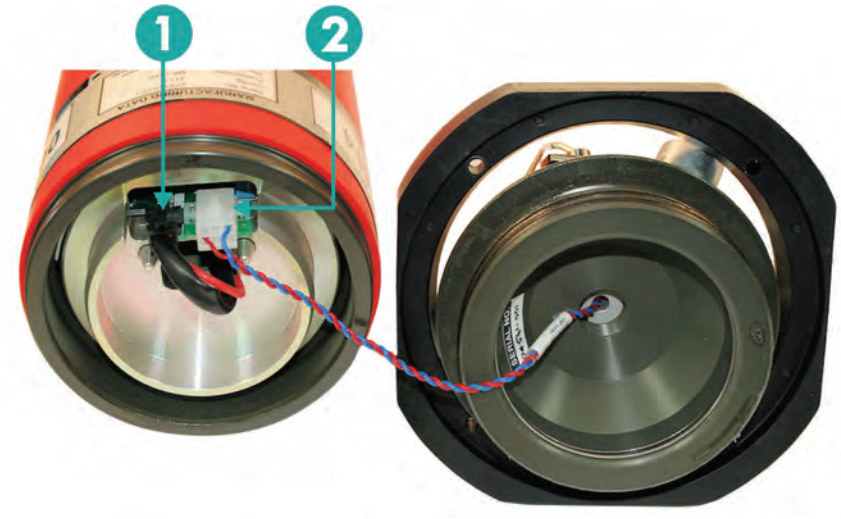
Figure 7-44 – Inspect the Transducer End-Cap

21. Inspect the O-rings and replace if necessary.

22. Lubricate the O-rings with petroleum jelly.

23. Refer to **Figure 7-45**. Position the transducer end-cap next to the transducer housing.

Figure 7-45 – Connecting the Transducer End-Cap



1 Battery Connection 2 Transducer Connection

24. For fitment instructions of the directional transducer end-cap refer to section **7.5.2 – Fitment of the Directional Transducer End-Cap**; for fitment instructions of the omni-directional transducer end-cap refer to section **7.6.2 – Fitment of the Omni-Directional Transducer End-Cap**.

7.9 Interface Circuit Board Replacement

7.9.1 Interface Circuit Board Removal

Before attempting to remove the Interface Circuit Board Assembly, make sure section **7.1 - Safety Precautions** is read and fully understood.

Before removal of an end-cap, general maintenance must be carried out on the transponder, refer to section **7.4 - General Maintenance**.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

Risk of toxic gases and corrosive liquids. Do not stand in direct line with the end of the transponder when operating the Pressure Relief Vent Valve. Sudden release of high pressure gases could cause injury to personnel. Wear Personal Protective Equipment such as goggles when operating the Pressure Relief Vent Valve.

Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

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.

Risk of impact injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

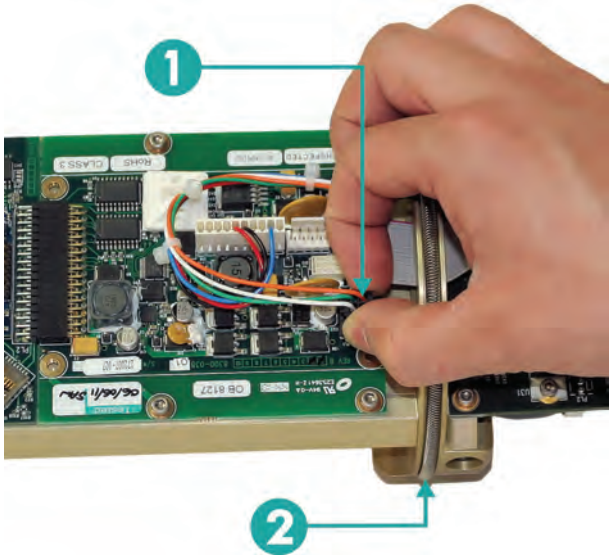
3. Remove the transducer end-cap – for a directional transducer end-cap refer to section **7.5.1 – Directional Transducer End-Cap Removal**; for an omni-directional transducer end-cap refer to section **7.6.1 – Omni-Directional Transducer End-Cap Removal**.

4. Remove the Sensor End-Cap and Chassis in accordance with section **7.8.1 - Sensor End-Cap Removal**.

5. Refer to **Figure 7-46**. Inspect the spring gaskets ② for signs of damage. Replace if necessary.

6. Refer to **Figure 7-46**. Disconnect the PL1 connection ① from the Interface PCB Assembly.

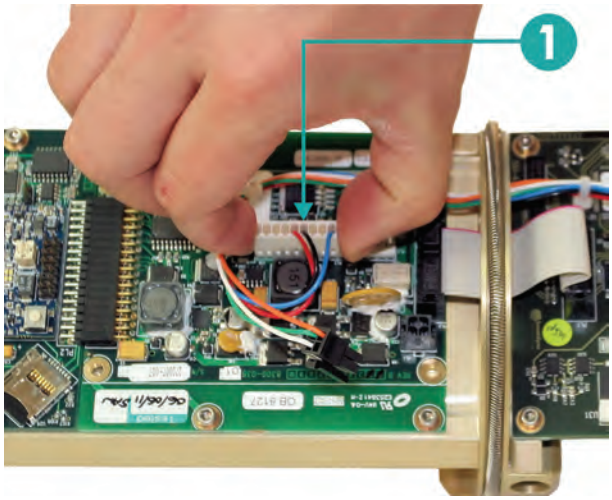
Figure 7-46 – Disconnecting PL1 Connection from the Interface PCB Assembly



① PL1 Connection ② Spring Gasket

7. Refer to **Figure 7-47**. Disconnect the PL2 connection ① from the Interface PCB Assembly.

Figure 7-47 – Disconnecting PL2 Connection from the Interface PCB Assembly



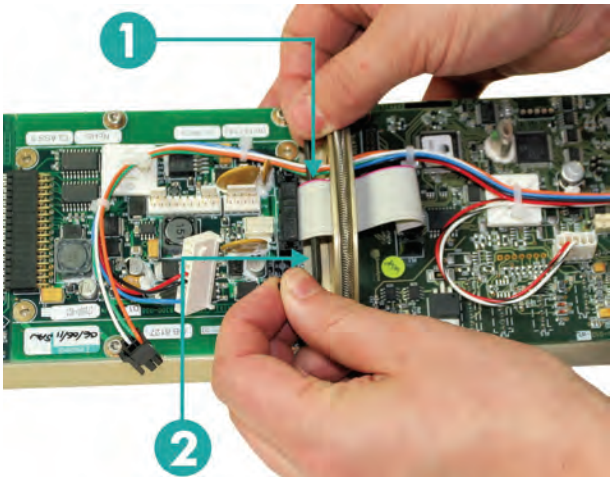
① PL2 Connection

8. Refer to **Figure 7-48**. Disconnect the Ribbon Cable ❶ from the connection point on the Interface PCB Assembly.

NOTE

Use an Allen key to assist in lifting the ribbon cable connection from its location point.

Figure 7-48 – Disconnecting the Ribbon Cable from the Interface PCB Assembly

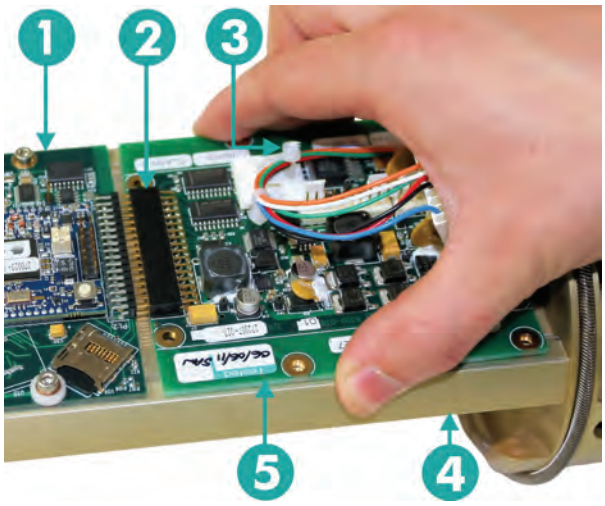


❶ Ribbon Cable ❷ Allen Key

9. Refer to **Figure 7-49**. Remove any cable ties ❸ retaining cables to the Interface PCB Assembly.

10. Using an Allen Key, undo and remove the 4 x screws and washers retaining the Interface PCB Assembly to the chassis.

Figure 7-49 – Removing the Interface PCB Assembly



❶ CPU Motherboard
❷ Samtec Conn 2x17 w
❸ Cable Ties
❹ Chassis
❺ Interface PCB Assembly

11. Refer to **Figure 7-49**. Carefully slide the Interface PCB Assembly ❺ towards the Sensor End-Cap end to disconnect the Samtec Conn 2x17 w ❷ on the Interface PCB Assembly ❺ from the connecting point on the CPU Motherboard ❶.

12. Once all the pins are disconnected, the Interface PCB Assembly is free to be removed from the chassis.

7.9.2 Interface Circuit Board Fitment

Before fitting the new interface circuit board, inspect the chassis for any signs of damage.

WARNINGS

⚠ **Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.**

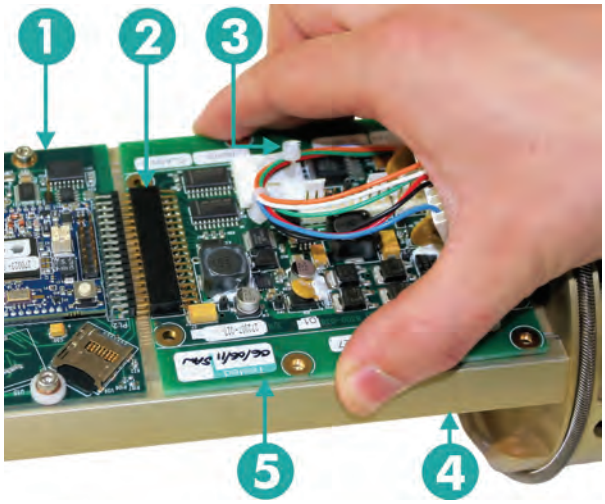
⚠ **Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.**

Before proceeding with fitment of the DAS Circuit Board Assembly, make sure section **7.1 - Safety Precautions** is read and fully understood.

1. Refer to **Figure 7-50**. Position the Interface PCB Assembly ❺ onto the chassis and locate the Samtec Conn 2x17 w ❷ into the pins on the CPU Motherboard ❶.

2. Refer to **Figure 7-50**. Lay the cables onto the white cable retaining square and secure in place with a cable tie ❸.

Figure 7-50 – Fitment of the Interface PCB Assembly



❶ CPU Motherboard
❷ Samtec Conn 2x17 w
❸ Cable Ties
❹ Chassis
❺ Interface PCB Assembly

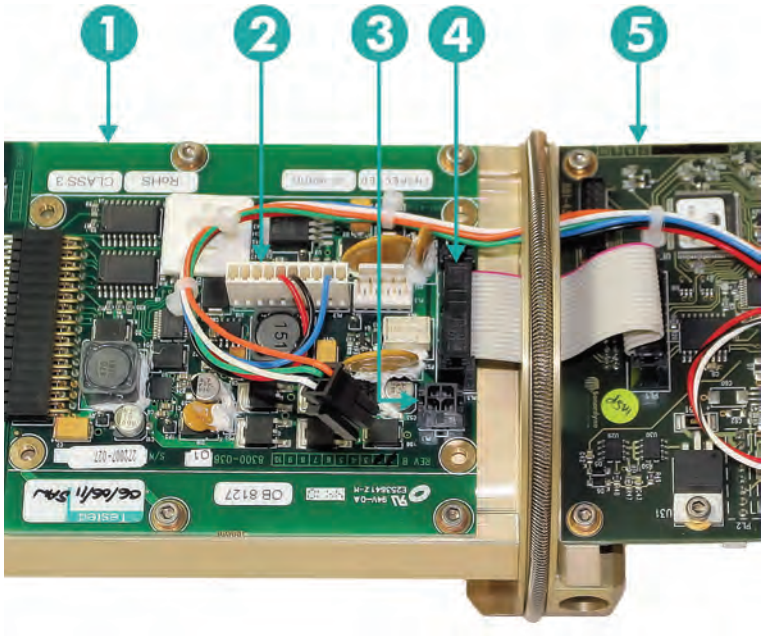
3. Secure the Interface PCB Assembly to the chassis using the screws and washers.

4. Refer to **Figure 7-51**. Connect the ribbon cable to the black connection block ❹ on the Interface PCB Assembly.

5. Refer to **Figure 7-51**. Connect the white block connection to the PL2 connection point ❷ on the Interface PCB Assembly.

6. Refer to **Figure 7-51**. Connect the black block connection to the PL1 connection point ❸ on the Interface PCB Assembly.

Figure 7-51 –Interface PCB Connections



❶ Interface PCB Assembly
❷ PL2 Connection point
❸ PL1 Connection point
❹ Ribbon Cable connection point
❺ Sensor End-Cap

7. The Sensor End-Cap and Chassis can now be refitted in accordance with section **7.8.2 - Sensor End-Cap Fitment**.

7.10 CPU Motherboard PCB Replacement

7.10.1 CPU Circuit Board Removal

Before proceeding with removal of the CPU Circuit Board, make sure section **7.1 - Safety Precautions** is read and fully understood.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

Risk of toxic gases and corrosive liquids. Do not stand in direct line with the end of the transponder when operating the Pressure Relief Vent Valve. Sudden release of high pressure gases could cause injury to personnel. Wear Personal Protective Equipment such as goggles when operating the Pressure Relief Vent Valve.

Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

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.

Risk of impact injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

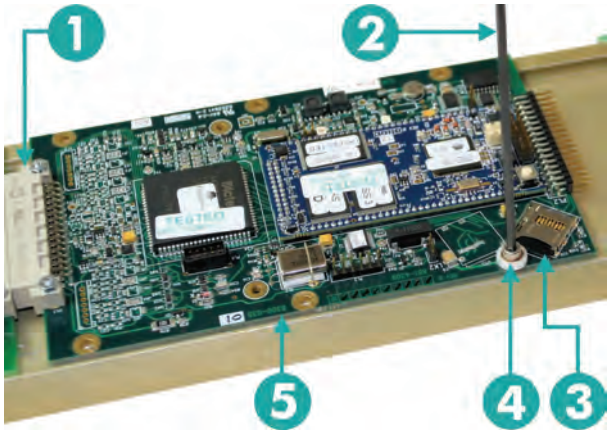
3. Remove the transducer end-cap – for a directional transducer end-cap refer to section **7.5.1 – Directional Transducer End-Cap Removal**; for an omni-directional transducer end-cap refer to section **7.6.1 – Omni-Directional Transducer End-Cap Removal**.

4. Remove the Sensor End-Cap and Chassis in accordance with section **7.8.1 - Sensor End-Cap Removal**.

5. Remove the Interface Circuit Board in accordance with section **7.9.1 - Interface Circuit Board Removal, paragraphs 6 to 12**.

6. Refer to **Figure 7-52**. On the CPU Motherboard PCB, use an Allen Key to undo the screw and nylon washer ❹ retaining the SD Card ❸.

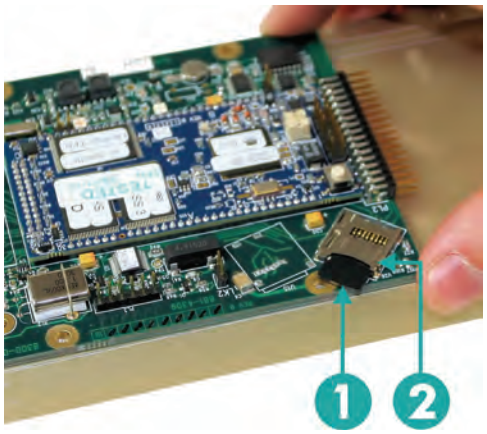
Figure 7-52 – Disconnecting the CPU Motherboard PCB



❶ DIN41612:1
❷ Allen Key
❸ Removable SD Card
❹ Screws and Washers
❺ CPU Motherboard

7. Refer to **Figure 7-53**. To remove the SD card ❶, push the card further into the SD card holder ❷ and then release. The card will now spring out its location.

Figure 7-53 – SD Card removal

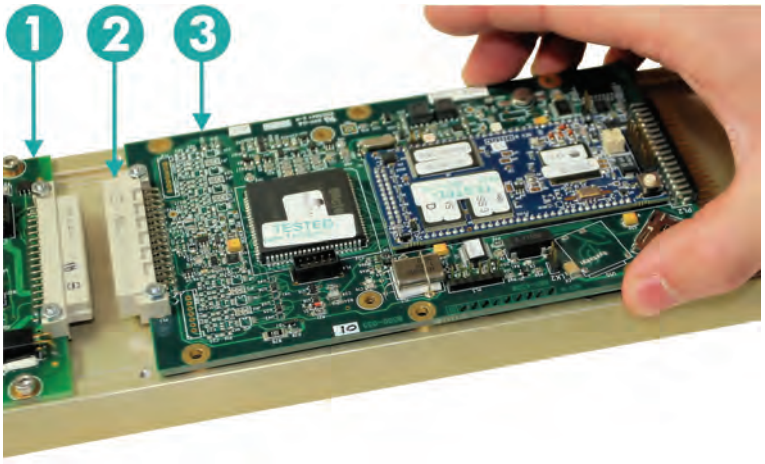


❶ SD Card ❷ SD Card Holder

8. Unscrew and remove all remaining screws and washers retaining the CPU Motherboard PCB to the chassis.

9. Refer to **Figure 7-54**. Slide the CPU Motherboard PCB ❸ towards the Sensor End-Cap to disconnect the DIN41612:1 ❷ connection.

Figure 7-54 – Disconnecting the CPU Motherboard PCB



❶ TX PCB
❷ DIN41612:1
❸ CPU Motherboard

10. The CPU Motherboard is now removed from the chassis.

7.10.2 CPU Motherboard PCB Fitment

Before fitting the new CPU Motherboard PCB, inspect the chassis for any signs of damage.

WARNINGS

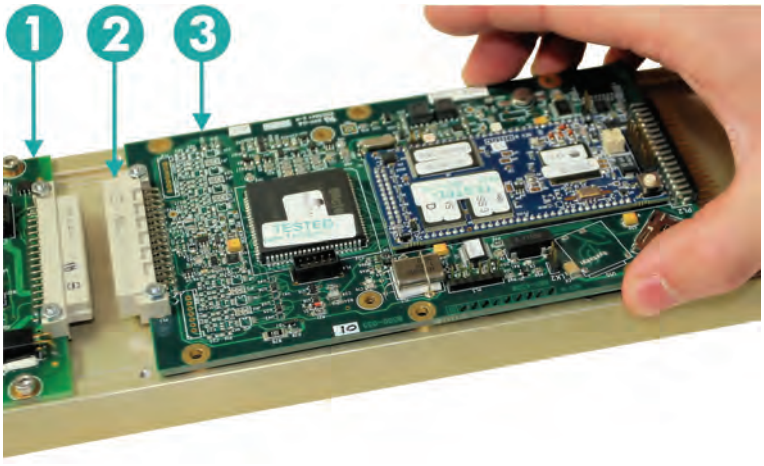
Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

Before proceeding with fitment of the CPU Motherboard PCB, make sure section **7.1 - Safety Precautions** is read and fully understood.

1. Refer to **Figure 7-55**. Position the CPU Motherboard PCB ❸ onto the chassis and locate the DIN41612:1 ❷ connection onto the point on the Tx PCB ❶.

Figure 7-55 – Fitting the CPU Motherboard PCB



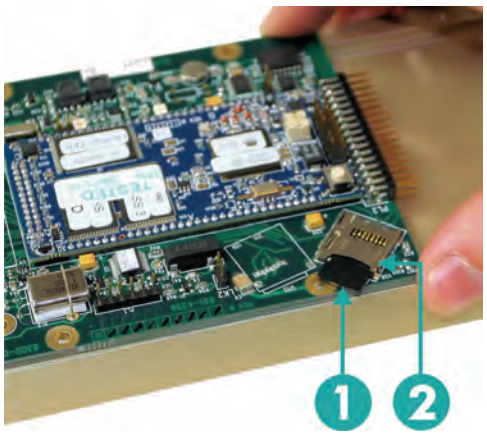
❶ TX PCB
❷ DIN41612:1
❸ CPU Motherboard

2. Secure the CPU Motherboard PCB in place with 2 x screws and washers, make sure the hole in front of the SD Card Holder is not used at this stage.

3. Refer to **Figure 7-56**. If the SD Card has been removed, insert into the SD Card Holder ❷ on the CPU Motherboard PCB.

4. Refer to **Figure 7-56**. Push the SD Card ❶ sufficiently into the holder ❷ until it clicks into place.

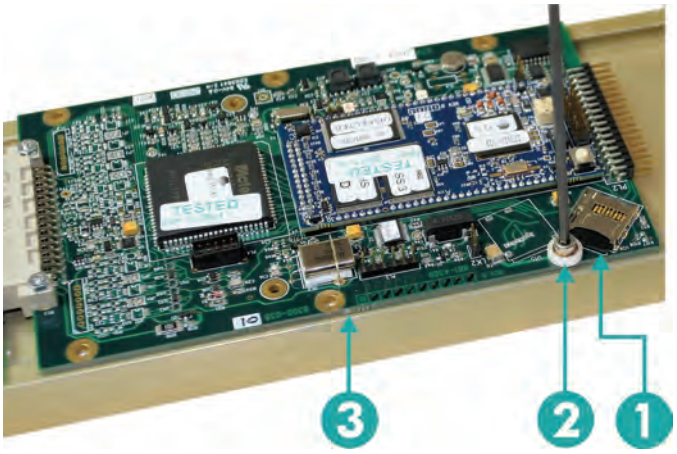
Figure 7-56 – SD Card Fitment



❶ SD Card
❷ SD Card Holder

5. Refer to **Figure 7-57**. Fit the remaining screws and washers to secure the CPU Motherboard PCB ❸ to the chassis. Make sure the nylon washer ❷ is fitted on front of the SD card ❶ to assist in retaining the SD card in place.

Figure 7-57 – Securing the CPU Motherboard PCB in place



❶ SD Card
❷ Nylon washer
❸ CPU Motherboard

6. Refit the Interface Circuit Board in accordance with section **7.9.2 - Interface Circuit Board Fitment, paragraphs 1 to 6**.

7. The Sensor End-Cap and Chassis can now be refitted in accordance with section **7.8.2 - Sensor End-Cap Fitment**.

7.11 TX/Pre-amp Circuit Board Replacement

7.11.1 TX/Pre-amp Circuit Board Removal

Before proceeding with removal of the TX/Pre-amp Circuit Board, make sure section **7.1 - Safety Precautions** is read and fully understood.

WARNINGS

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

Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

WARNINGS

High Internal Pressures Risk. Make sure the Pressure Relief Vent Valve is manually operated to release any internal pressure before attempting to dismantle the equipment.

Risk of toxic gases and corrosive liquids. Do not stand in direct line with the end of the transponder when operating the Pressure Relief Vent Valve. Sudden release of high pressure gases could cause injury to personnel. Wear Personal Protective Equipment such as goggles when operating the Pressure Relief Vent Valve.

Risk of toxic gases. Make sure the work environment is well ventilated. Toxic gases may be released when operating the Pressure Relief Vent Valve.

Risk of Explosion. Do not fit unauthorised battery pack types into the transponder.

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.

Risk of impact injury. Do not stand in line with the end-cap when removing from the transponder. Any internal pressure could rapidly force the end-cap from the transponder like a projectile.

1. Make sure the transponder has been cleaned with clean fresh water and any marine growth removed. Refer to section **7.4 - General Maintenance**.

2. Operate the Pressure Relief Vent Valve in accordance with section **7.4.1. - Operation of the Pressure Relief Vent Valve** to release any internal pressure.

3. Remove the transducer end-cap – for a directional transducer end-cap refer to section **7.5.1 – Directional Transducer End-Cap Removal**; for an omni-directional transducer end-cap refer to section **7.6.1 – Omni-Directional Transducer End-Cap Removal**.

4. Remove the Sensor End-Cap and Chassis in accordance with section **7.8.1 - Sensor End-Cap Removal**.

5. Remove the Interface Circuit Board in accordance with section **7.9.1 - Interface Circuit Board Removal, paragraphs 6 to 12**.

6. Remove the CPU Motherboard Circuit Board in accordance with section **7.10.1 - CPU Circuit Board Removal, paragraphs 6 to 9**.

WARNING

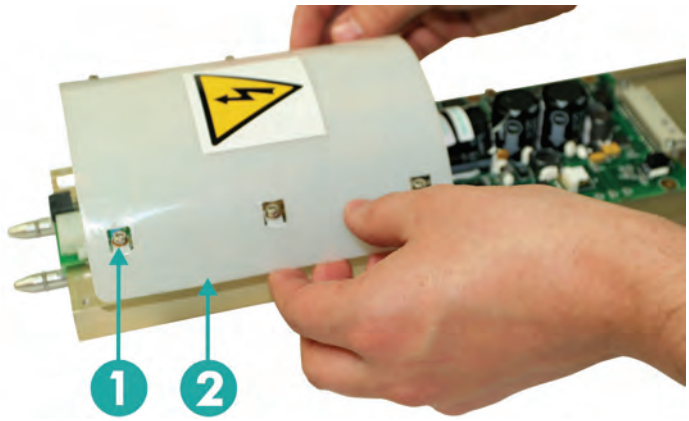
Electric shock. Electric shock hazard risk is present when dismantling the equipment. High voltages are present inside the transponder. Dismantling the equipment must only be carried out by trained personnel.

NOTE

The plastic capacitor protective cover can be removed with the TX/Pre-amp Circuit Board or removed separately.

7. Refer to **Figure 7-58**. To remove the TX/ Pre-amp Circuit Board protective plastic cover, undo the 6 x screws and washers retaining the plastic cover to the circuit board.

Figure 7-58 – Removal of the Protective Cover from the TX/ Pre-amp Circuit Board



1 Screws and Washers 2 Protective Cover

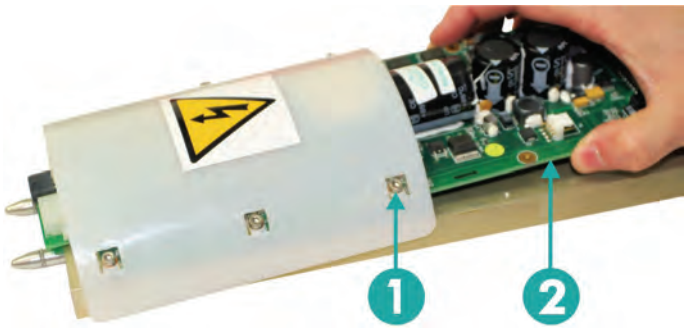
8. Refer to **Figure 7-59**. Undo and remove the remaining screws and washers to release the Tx/ Pre-amp Circuit Board from the main chassis.

Figure 7-59 – Tx/ Pre-Amp Circuit Board with Protective Cover removed

1 Tx/ Pre-amp Circuit Board

9. Refer to **Figure 7-60**. Alternatively undo all the screws and washers retaining the Tx/ Pre-amp Circuit Board to the chassis. The Tx/ Pre-amp Circuit Board is now free to be removed from the chassis.

Figure 7-60 – Removal of the TX/ Pre-Amp Circuit Board with Cover



1 Screws and Washers 2 TX/ Pre-amp Circuit Board

7.11.2 TX/Pre-amp Circuit Board Fitment

Before proceeding with fitment of the TX/Pre-amp Circuit Board, make sure section **7.1 - Safety Precautions** is read and fully understood.

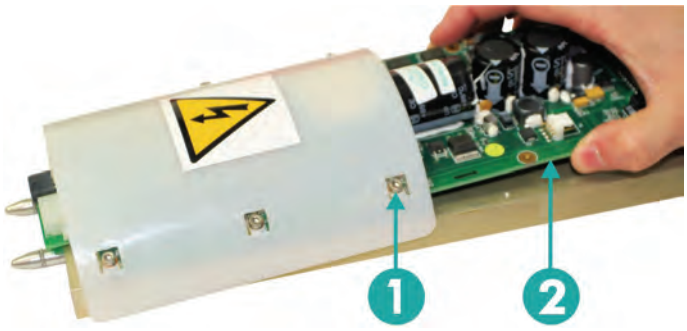
Before fitting the new TX/Pre-amp circuit board, inspect the chassis for any signs of damage. Make sure there are no obstructions inside the pressure housing.

WARNINGS

Electric shock. Electric shock hazard risk is present when assembling the equipment. High voltages are present inside the transponder. Assembling the equipment must only be carried out by trained personnel.

1. Refer to **Figure 7-61**. Position the TX/Pre-amp Circuit Board onto the chassis and align the securing holes.

Figure 7-61 – Fitting the TX/Pre-Amp Circuit Board to the Chassis



1 Screws and Washers 2 TX/ Pre-amp Circuit Board

2. Secure the TX/Pre-amp Circuit Board in place with the 10 x screws and washers.

3. Refit the CPU Motherboard PCB in accordance with section **7.10.2 - CPU Motherboard PCB Fitment, paragraphs 1 to 5**.

4. Refit the Interface Circuit Board in accordance with section **7.9.2 - Interface Circuit Board Fitment, paragraphs 1 to 6**.

5. The Sensor End-Cap and Chassis can now be refitted in accordance with section **7.8.2 - Sensor End-Cap Fitment**.

SECTION 8 – FUNCTIONAL TEST

8. Introduction

To make sure the Compatt 6 functions correctly functional testing can be carried out. Many functions can be tested via the RS232 serial link using the Wideband Test Terminal software.

Functional testing can be carried out on all major sub-systems in the Compatt 6, these include:

- Acoustic Transducer
- Pre-amplifier
- Tone Receiver Circuitry
- Transmitter Synthesizer
- Wideband Receiver Circuitry
- Release Motor and Sensors

8.1 Test Equipment

The following equipment is required to carry out functional testing of the transponders:

Table 8-1 – Test Equipment

Description	Sonardyne Drawing No.	Sonardyne Order Code
PC with spare comm	-	
Power supply (24 VDC) @ 2 amp	-	
6G® Utilities CD-ROM	8300-300	6G® Utilities
Dual Serial Cable	8000-157	820-6713
or Compatt to PC serial Cable	8000-156	820-6570

Figure 8-1 – Dual Serial Cable

8.2 Connecting the Dual Serial Cable

Before carrying out any activity on the transponder make sure all Warnings and Cautions in **Section 2 – Safety** are read and understood.

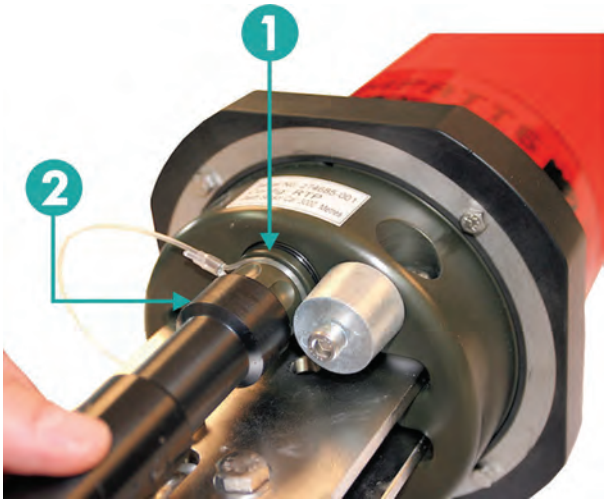
Before connecting the Dual Serial Cable general maintenance must be carried out on the transponder, refer to section **7.4 - General Maintenance**.

Once all the above processes have been carried out connect the Dual Serial Cable as follows:

1. Locate the round Dual Serial Cable connection point on the transponder.

2. Refer to **Figure 8-2**. Using the special tool ❷, remove the protective cover ❶ from the Dual Serial Cable connection point.

Figure 8-2 – Remove Protective Cover



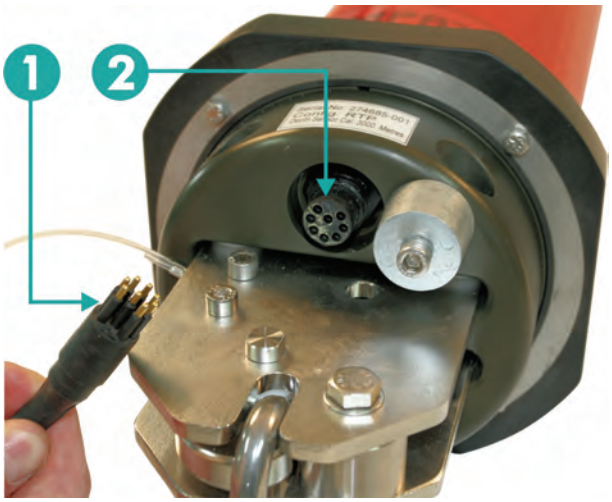
❶ Protective Cover ❷ Special Tool

3. Refer to **Figure 8-3**. Check the connection points are free from dirt and obstruction.

Figure 8-3 – Connection Points

4. Refer to **Figure 8-4**. Position the Dual Serial Cable ❶ in the correct orientation and insert into the connection point ❷.

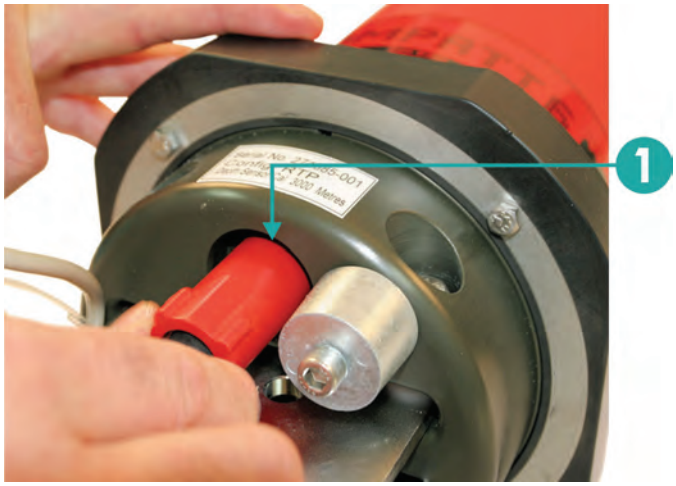
Figure 8-4 – Orientation of the Dual Serial Cable



❶ Dual Serial Cable ❷ Connection Point

5. Refer to **Figure 8-5**. Make sure the Dual Serial Cable ❶ is inserted fully, and secure in place by screwing in the red plastic cover clockwise.

Figure 8-5 – Secure the Dual Serial Cable



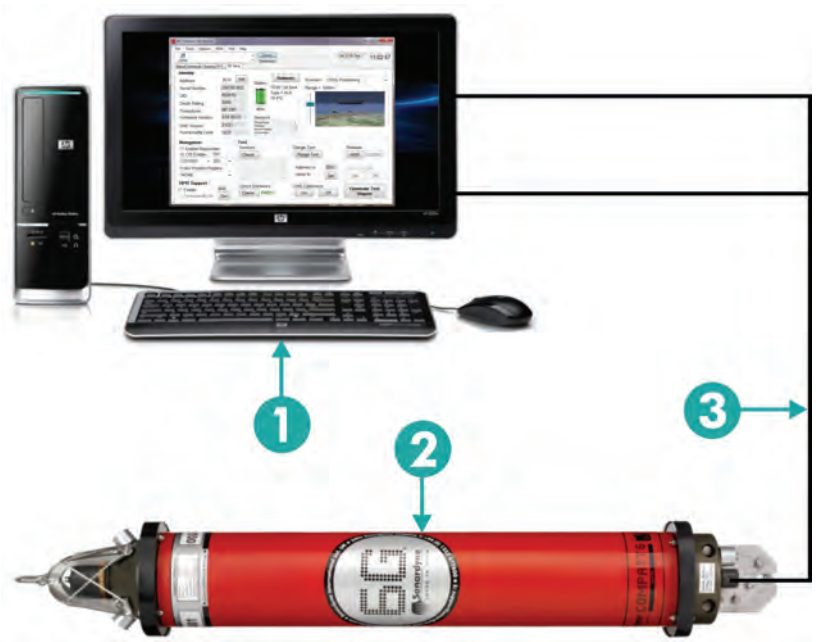
❶ Dual Serial Cable

6. The other end of the Dual Serial Cable has the CPU and DAS connectors for use when requested by the instructions.

8.3 Operational Test

To carry out an operational test of the Compatt 6 transponder connect the Dual Serial Cable in accordance with section **8.2 – Connecting the Dual Serial Cable**.

Figure 8-6 – Compatt 6 Connected to the PC using the Dual Serial Cable



1 Computer
2 Compatt 6
3 Dual Serial Cable

8.3.1 Checking the Wideband Acoustics

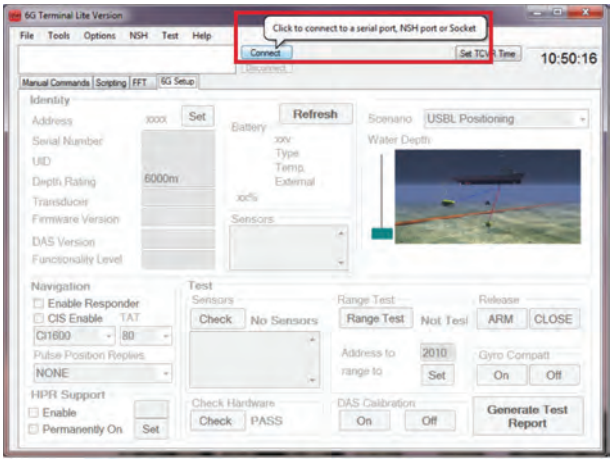
To carry out a check of the Wideband Acoustics of the transponders, it will also be necessary to enter the address of an acoustically paired device, if one is attached.

1. Refer to **Figure 8-7**. Double click on the **6G Terminal Lite** icon to open the software.

Figure 8-7 – 6G Terminal Lite icon

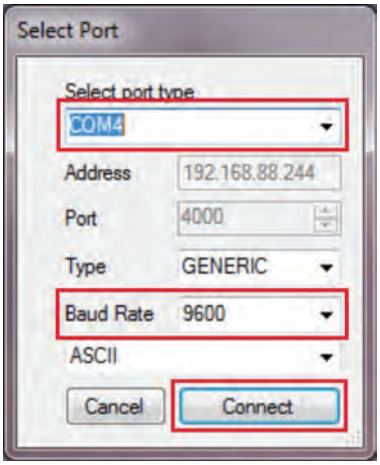
2. Refer to **Figure 8-8**. The 6G Terminal Lite home page will open on a blank 6G Setup tab. Click **Connect**.

Figure 8-8 – Click Connect



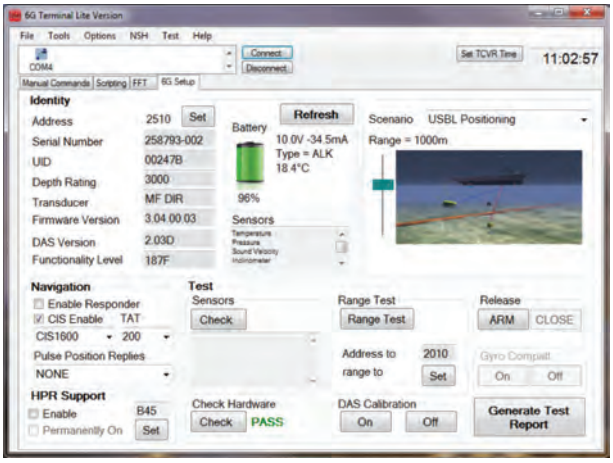
3. Refer to **Figure 8-9**. In the **Select Port** window select the correct port the PC is connected to and the **Baud Rate** from the drop down menus. Click **Connect**.

Figure 8-9 – Select Port



4. Refer to **Figure 8-10**. The 6G Setup page will now show all information regarding the connected transponder including the address, serial number, depth rating and battery status.

Figure 8-10 – 6G Setup Information Page

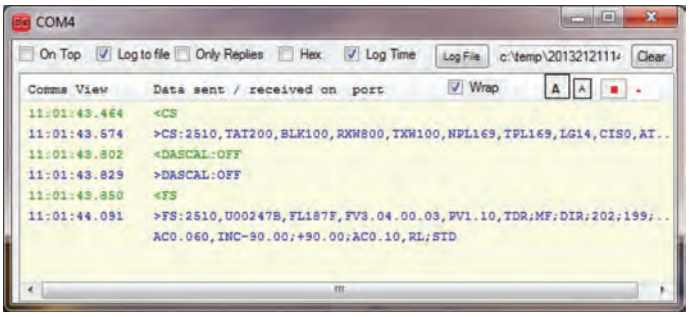


5. A **Comms Log** screen will also appear. The green writing indicates the commands sent from the software to the transponder, the blue writing is the transponders response.

NOTE

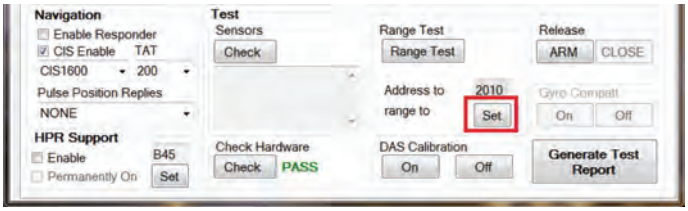
This window can be used for diagnostic purposes.

Figure 8-11 – Comms Log Window



6. Refer to **Figure 8-12**. To enter the address of the acoustically paired device, if one is attached, click **Set** in the **Range Test** section of the 6G Setup tab.

Figure 8-12 – Range Test Set Address



7. Refer to **Figure 8-13**. An **Address Selector** window will appear listing all available addresses for Wideband 2. Select the address for the attached device then click **OK**.

NOTE

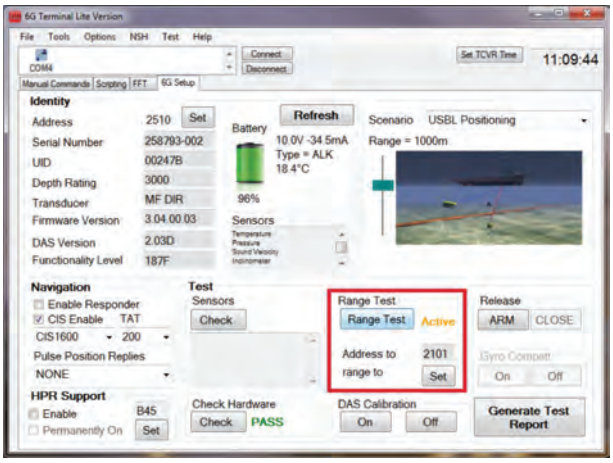
Tabs are also available to show addresses for Wideband 1 systems and Wideband 2+ systems.

Figure 8-13 – Address Selector

8. Refer to **Figure 8-14**. The 6G Setup tab will appear with the selected address in the Range Test 'Address to' window. Click **Range Test** to begin the acoustic check.

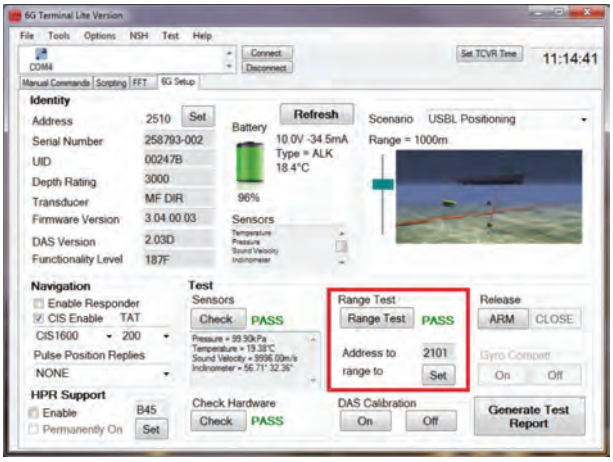
9. Refer to **Figure 8-14**. During the test **Active** will appear next to the **Range Test** button to indicate the test is in progress.

Figure 8-14 – Range Test Active



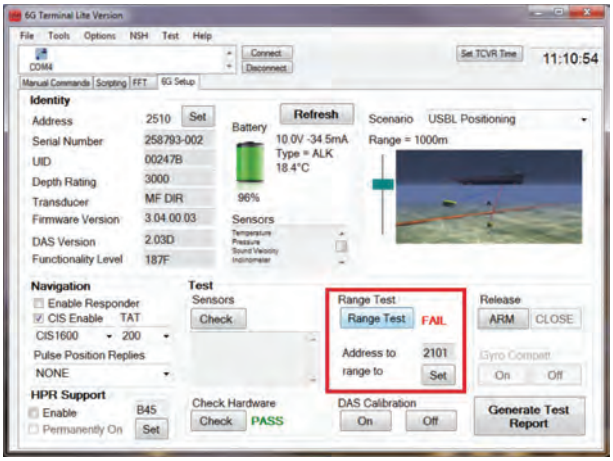
10. Refer to **Figure 8-15**. If the Acoustic check is successful **Pass** will appear next to the **Range Test** button.

Figure 8-15 – Range Test Pass



11. Refer to **Figure 8-16**. If the Range Test is unsuccessful **Fail** will appear next to the **Range Test** button.

Figure 8-16 – Range Test Fail



12. If **Fail** appears next to the range test move the transponder to a new location and repeat the range test. If the Range Test continues to fail go to **Contacting the Sonardyne Support Team**.

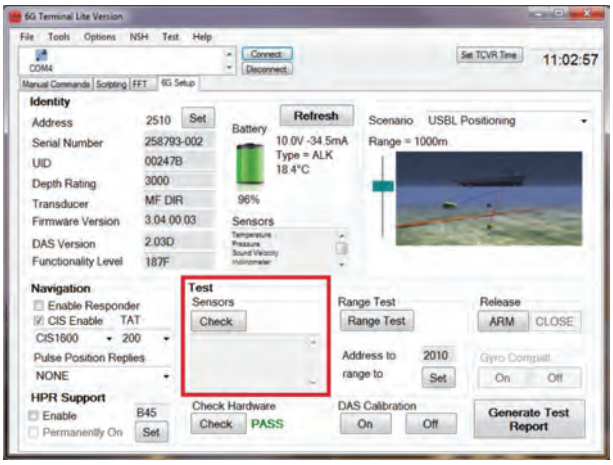
13. The Acoustic Checks are now complete.

8.3.2 Checking the Sensor Measurements

Use the following procedure to carry out a sensor check.

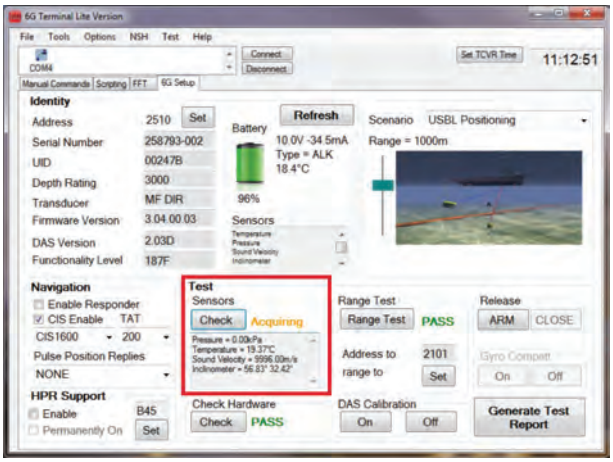
1. Refer to **Figure 8-17**. In the **6G Setup** tab, selecting the **Sensor Check** button will perform a test of all sensors installed in the transponder.

Figure 8-17 – Sensor Check



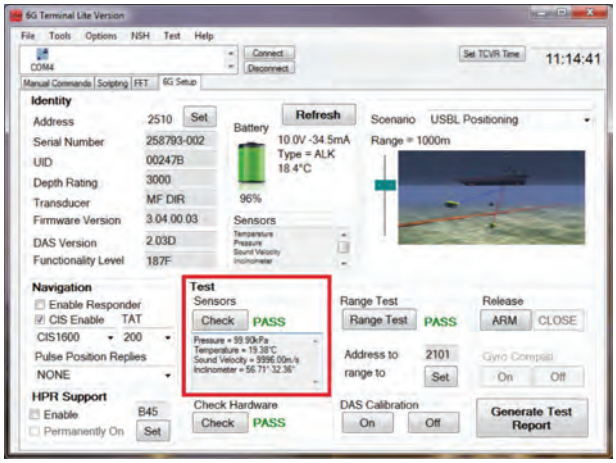
2. Refer to **Figure 8-18**. Click **Check** to carry out a full test of all sensors. **Acquiring** will appear to indicate all sensor information is being gathered.

Figure 8-18 – Sensor Reading - Acquiring



3. Refer to **Figure 8-19**. If all the information has been gathered successfully **Pass** will appear.

Figure 8-19 – Sensor Reading – Pass



NOTE

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

8.3.3 Checking the Release Mechanism

Before carrying out any activity on the transponder make sure all Warnings and Cautions in **Section 2 – Safety** are read and understood.

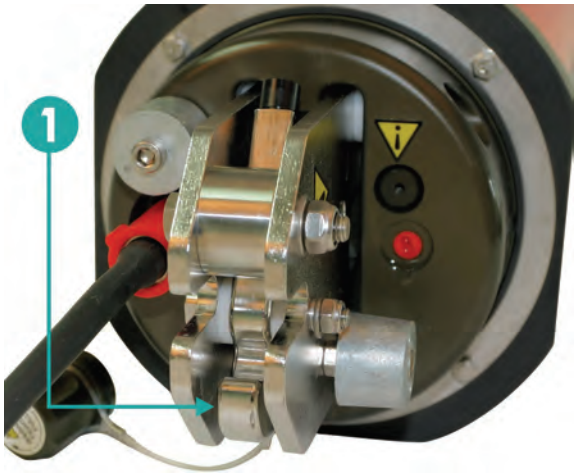
WARNINGS

Risk of crush injury. Do not place hands near the Release Mechanism when in operation. The mechanism is opened with a high pressure spring which could trap fingers.

1. Make sure the Dual Serial Cable is connected to the transponder, refer to section **8.2 - Connecting the Dual Serial Cable**.

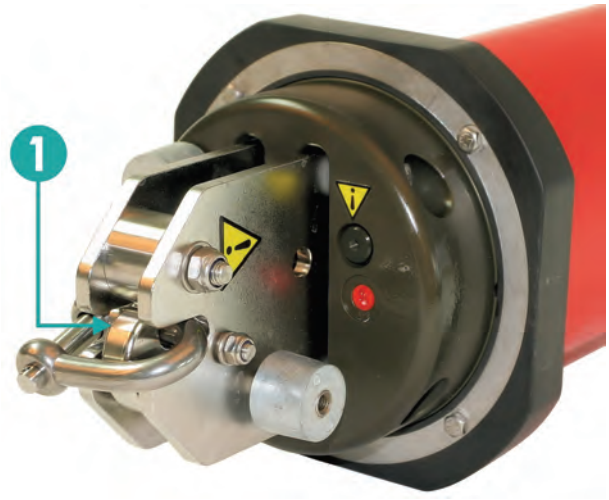
2. Check the position of the release mechanism, to see if it is in the fully open position (refer to **Figure 8-20**) or fully closed position (refer to **Figure 8-21**).

Figure 8-20 – Release Mechanism Fully Open



1 Release Mechanism

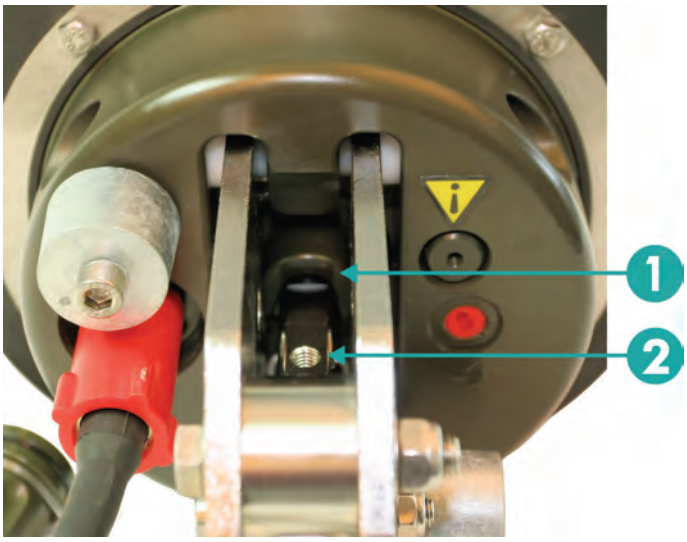
Figure 8-21 – Release Mechanism Fully Closed



1 Release Mechanism

3. Refer to **Figure 8-22**. When closed the Release Mechanism ❷ is held in position by a rotating lock ❶.

Figure 8-22 – Release Mechanism Rotating Lock



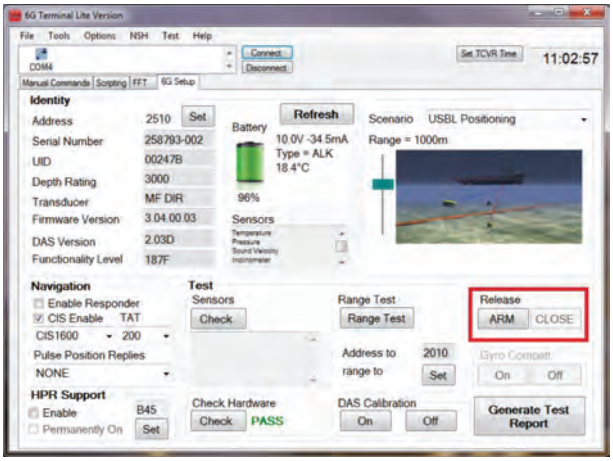
❶ Rotating Lock ❷ Release Mechanism

4. A functional test of the Release Mechanism can be carried out using the **6G Setup** tab on the 6G Terminal Lite software, refer to **Figure 8-23**.

5. In the **6G Setup** tab, the **Release** section is used to carry out the test of the **Release Mechanism**.

6. The window next to the **ARM** button will indicate what position the Release Mechanism is in.

Figure 8-23 – Release Test



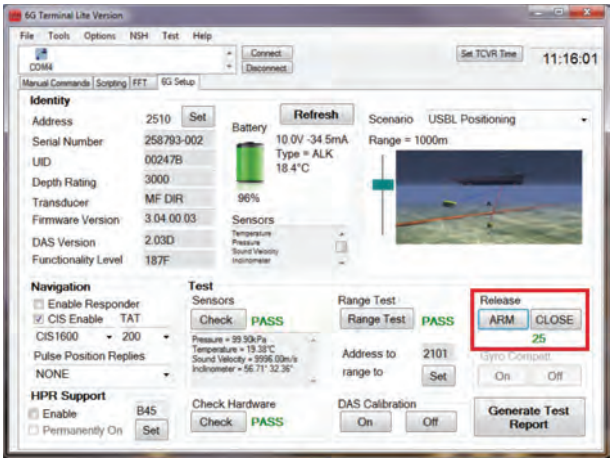
7. To operate the Release Mechanism select **ARM**.

8. Refer to **Figure 8-24**. As soon as **ARM** is pressed the operation button (**OPEN** or **CLOSE**) becomes available to activate the Release Mechanism.

NOTE

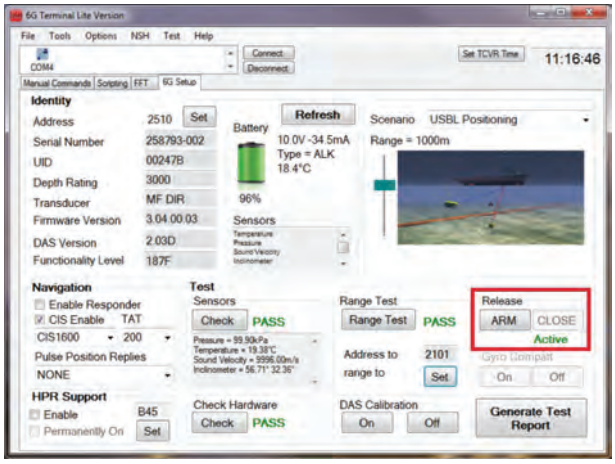
A 30 seconds countdown will begin to show the Release Mechanism is armed and available to operate.

Figure 8-24 – Release Mechanism Countdown



9. Refer to **Figure 8-25**. Press the **OPEN** or **CLOSED** button before the countdown ends.

Figure 8-25 – Release Mechanism – Active



10. Once the operation button has been selected, it will grey out and **Active** will appear to indicate the mechanism is moving.

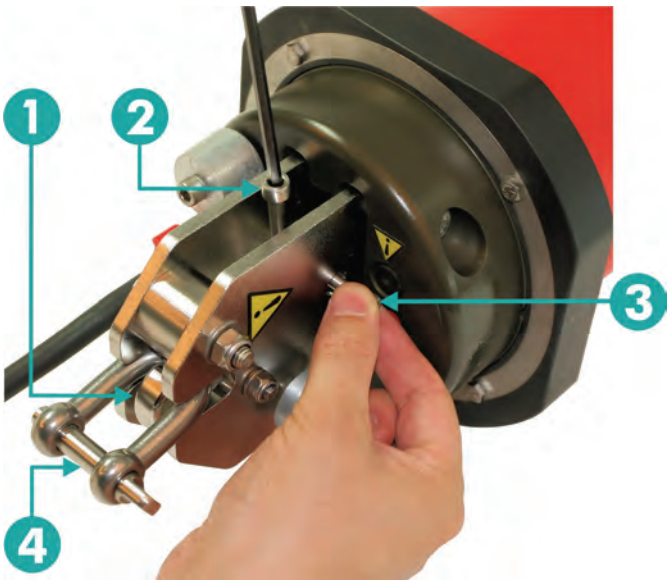
11. As soon as the movement is complete the window will indicate the new position the release mechanism is in.

12. If the release is in the Open position, it will be necessary to manually position the release in the closed position.

13. Refer to **Figure 8-26**. Screw a long screw ❷ (either an M4 or M5 screw – not supplied by Sonardyne) into the Release Mechanism ❶.

14. Refer to **Figure 8-26**. Unscrew the pin ❹ from the 'D' shackle pin. With the aid of a screwdriver, push the Release Mechanism into the closed position and insert the 'D' shackle pin ❹ into the holes in the side of the mechanism ❸ to hold the Release in the closed position.

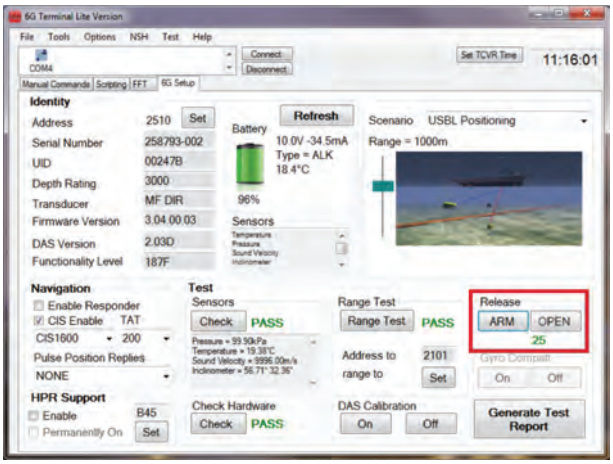
Figure 8-26 – Manually Closing the Release Mechanism



❶ Release Mechanism
❷ Screw
❸ Mechanism Retaining Screw Hole
❹ 'D' Shackle Pin

15. Refer to **Figure 8-27**. Select **ARM** to prepare the Release Mechanism to be operated.

Figure 8-27 – Release Mechanism Countdown to Close



16. As soon as **ARM** is pressed the **CLOSE** button becomes available to activate the Release Mechanism.

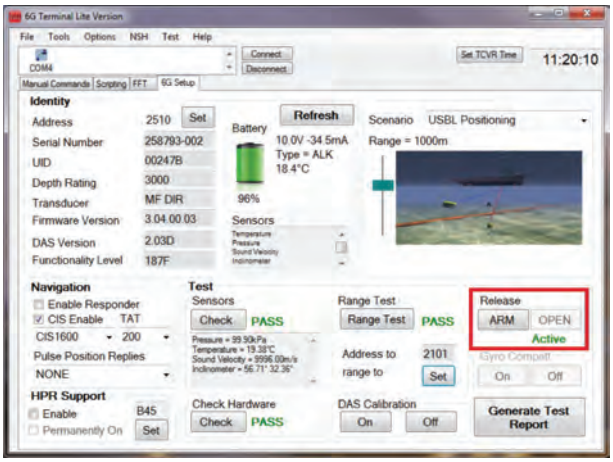
NOTE

A 30 seconds countdown will show the Release Mechanism is armed and ready to close.

17. Refer to **Figure 8-28**. Press the **CLOSE** button before the countdown has finished.

18. Once the **CLOSE** button has been selected, it will grey out and **Active** will appear to indicate the mechanism is moving.

Figure 8-28 – Release Mechanism Position



19. The window next to the **ARM** button will now indicate that the mechanism is closed.

CAUTION

Incorrect Operation of Equipment. Deployment of the transponder with the 'D' shackle pin fitted to retain the Release Mechanism in the closed position will prevent the Release Mechanism from opening. This will result in the transponder being irretrievable from the seabed. Make sure the 'D' shackle pin is removed when the Release Mechanism locked is in the closed position.

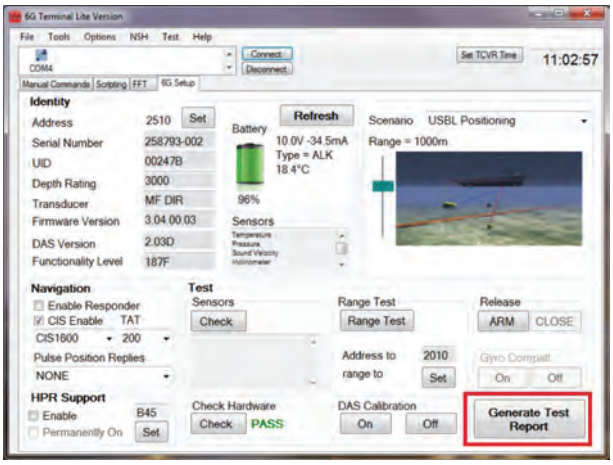
20. Remove the 'D' shackle pin from the retaining hole and refit to the 'D' shackle inserted through the release mechanism.

8.3.4 Creating a Test Report

On completion of a functional testing of the transponder a test report can be created. The report will list all information provided on the 6G Setup tab of the 6G Terminal Lite software.

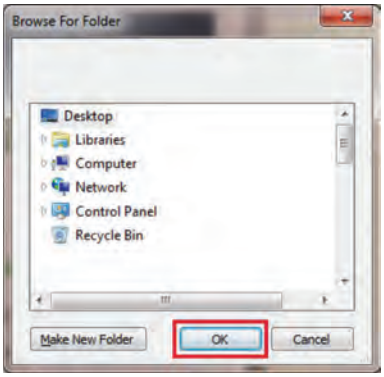
1. Refer to **Figure 8-29**. Click **Generate Test Report** on the 6G Setup tab on 6G Terminal Lite.

Figure 8-29 – Generate Test Report



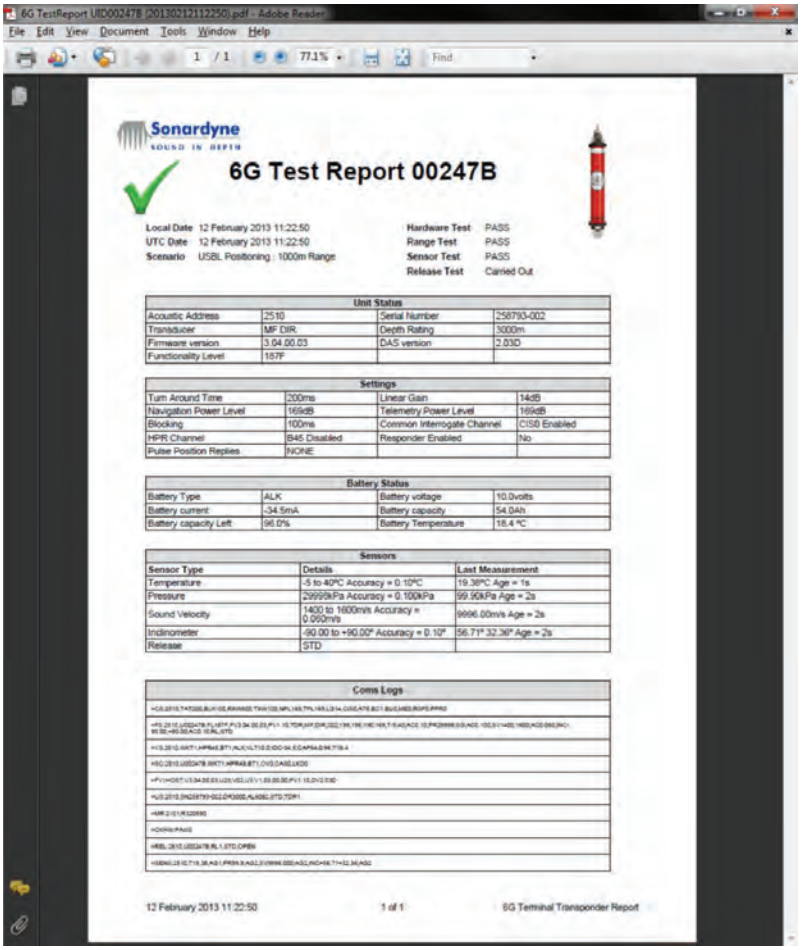
2. Refer to **Figure 8-30**. A file location window will open to save the created Test Report pdf.

Figure 8-30 – Test Report File Location



3. Refer to **Figure 8-31**. A pdf test report will now be created and saved in the designated location. The report will list all information provided on the 6G Setup tab. A tick and pass will appear alongside all the tests to indicate the transponder has passed all the tests.

Figure 8-31 – Transponder Test Report pdf



4. On completion of the review, the 6G Terminal Lite software can be closed.

SECTION 9 – FIRMWARE UPGRADE

9. Firmware Upgrade Procedures

It may be necessary to upgrade the firmware installed in the transponder. New firmware can be supplied by Sonardyne International Ltd either by the issue of a CD ROM or downloading the firmware upgrade from the Sonardyne website.

When the new firmware has been downloaded, make a note of this location to assist in the upgrade process.

To assist in upgrading the firmware it will be necessary to connect the Dual Serial Cable, refer to section **8.2 - Connecting the Dual Serial Cable**.

9.1 HOST Firmware Upgrade

To upgrade the HOST firmware proceed as follows:

1. Make sure the Dual Serial Cable is connected fully to the connection point on the transponder.

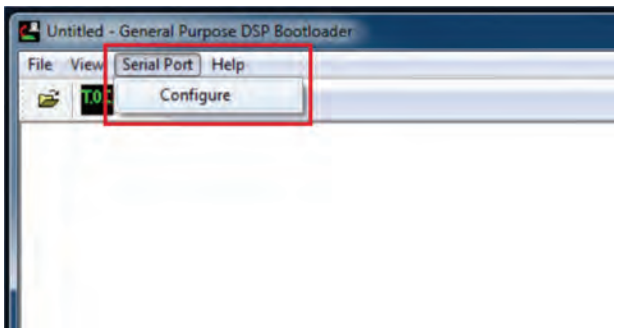
2. Connect the **CPU** connector to a comms port on the PC. Make a note of which comms port is used.

3. Refer to **Figure 9-1**. Double click on the **GP Bootloader.exe** icon to open the program.

Figure 9-1 – GP Bootloader icon

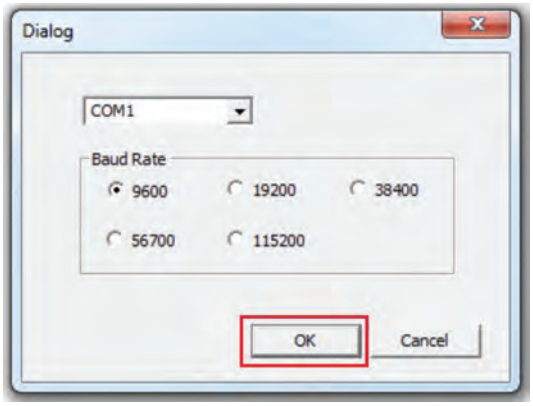
4. Refer to **Figure 9-2**. From the menu toolbar, select **Serial Port**, then **Configure**.

Figure 9-2 – Bootloader Serial Port selection



5. Refer to **Figure 9-3**. In the **Dialog** screen select the correct **COM** port and Baud Rate (38400, 56700 or 115200)

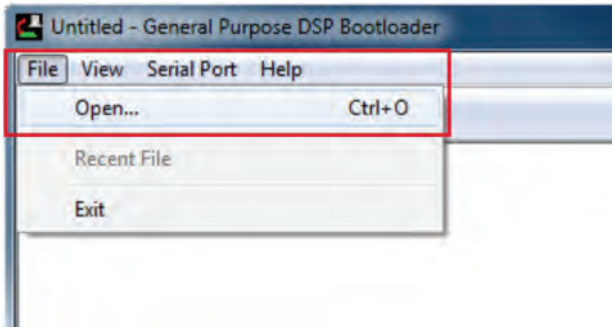
Figure 9-3 – Dialog Options



6. Refer to **Figure 9-3**. Click **OK**.

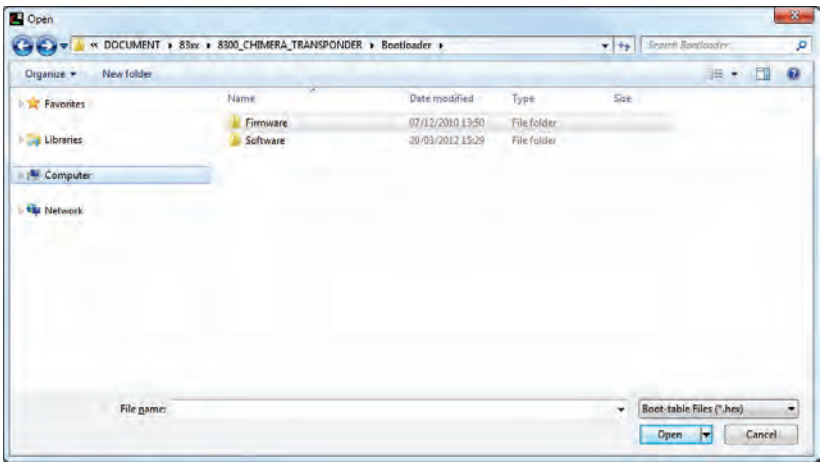
7. Refer to **Figure 9-4**. The Dialog window will close. On the main screen select **File**, then **Open**.

Figure 9-4 – File Open option



8. Refer to **Figure 9-5**. Browse to the location where the new firmware is stored.

Figure 9-5 – New Firmware location

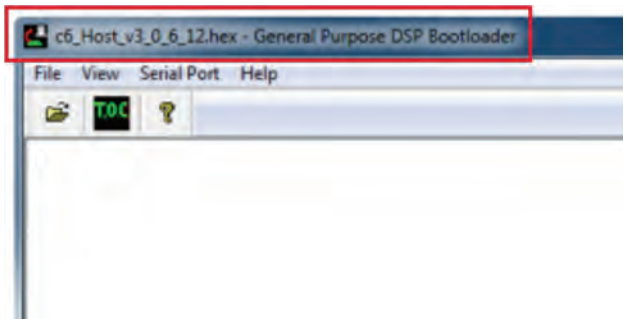


9. Refer to **Figure 9-5**. Select the new firmware. Click **Open**.

NOTE

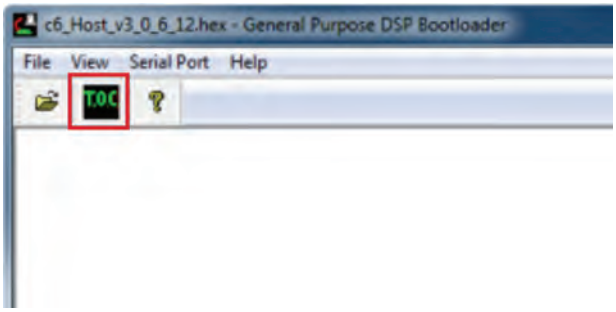
Once the new firmware has been selected it will appear in the Bootloader homepage title bar.

Figure 9-6 – New Firmware version



10. Refer to **Figure 9-7**. On the Bootloader main screen, select **TOC**.

Figure 9-7 – Select TOC on Bootloader home page



11. Refer to **Figure 9-8**. If a connection is not made successfully, an error message will appear in the Bootloader screen.

Figure 9-8 – Bootloader Failure to Connect notification

12. Check all cables are connected correctly to the PC.

13. Go to the **Device Manager** facility on the PC and check the correct Comms Port has been selected for the CPU cable.

14. Click **Refresh Table** after checking the connections.

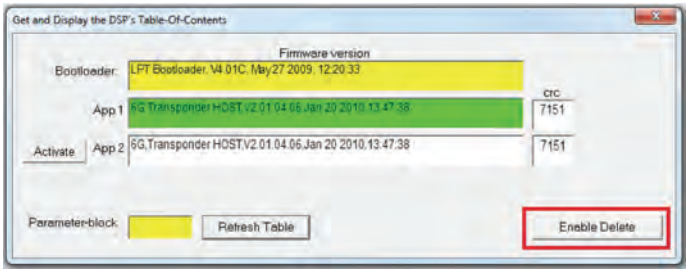
15. If all cable connections have been made successfully, the window will refresh.

NOTE

Two spaces are available on the hardware for firmware. If all spaces are full, then one must be deleted to accommodate the firmware upgrade. The green highlighted App indicates the currently active firmware.

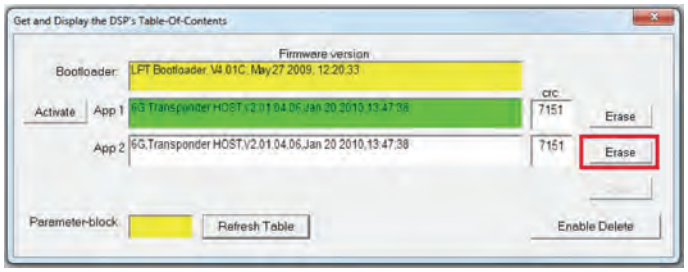
16. Refer to **Figure 9-9**. To erase an application, click **Enable Delete**.

Figure 9-9 – Enable and Delete Firmware



17. Refer to **Figure 9-10**. Pressing **Enable Delete** will allow **Erase** buttons to appear at the end of each installed firmware. Selecting one of the **Erase** buttons will remove that firmware.

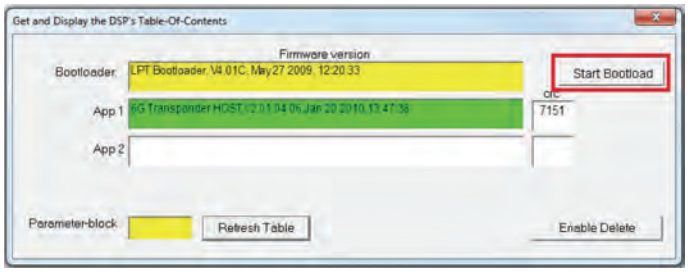
Figure 9-10 – Erase a Firmware App.



18. Refer to **Figure 9-11**. Once an old firmware version has been erased, the **Start Bootload** button will appear.

19. Refer to **Figure 9-11**. Click **Start Bootload** to start uploading the new firmware

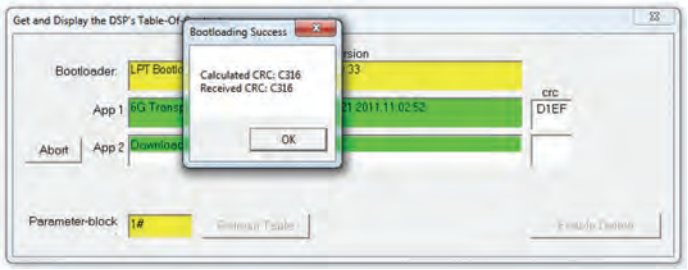
Figure 9-11 – Start Bootload



20. Once **Start Bootload** is selected, a percentage uploading bar will scroll across the App location.

21. Refer to **Figure 9-12**. Once the upload has completed a **Bootloading Success** window will appear.

Figure 9-12 – Bootloader installation Success window



22. Click **OK** to confirm the installation is a success.

23. The new uploaded program will appear in the selected App Window.

24. Close the **Get and Display the DSP's Table of Content** window.

25. To confirm the new firmware is working, on the main Bootloader screen, click on the **TOC** and the new firmware should be displayed highlighted in green.

26. Close all screens.

9.2 DAS Firmware Upgrade

To upgrade the DAS firmware proceed as follows:

1. A CD installed with 6GTerminal Lite and DASCAL software is supplied to assist with the upgrade of the DAS firmware.

2. Connect the Dual Serial Cable in accordance with section **8.2 - Connecting the Dual Serial Cable**.

3. Connect the CPU and the DAS connectors to the comms ports on the PC.

NOTE

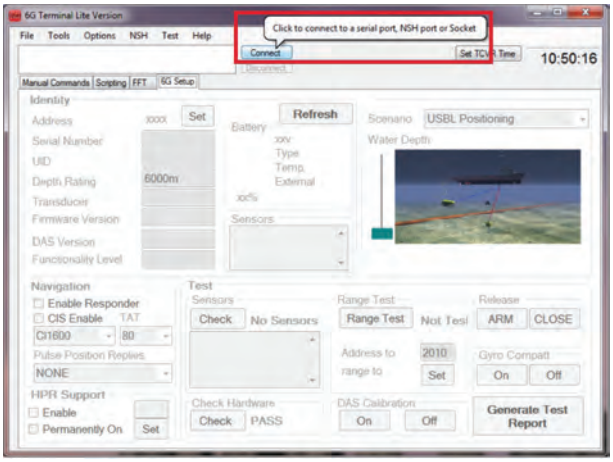
Make a note of which comms port each connector is connected to.

4. Refer to **Figure 9-13**. Double click on the **6G Terminal Lite** icon to open the software.

Figure 9-13 – 6G Terminal Lite Icon

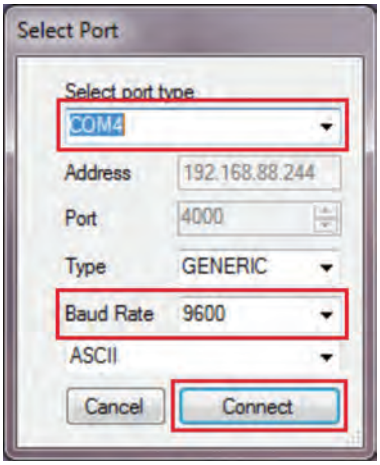
5. Refer to **Figure 9-14**. The 6G Terminal Lite home page will open on a blank 6G Setup tab. Click **Connect**.

Figure 9-14 – Click Connect



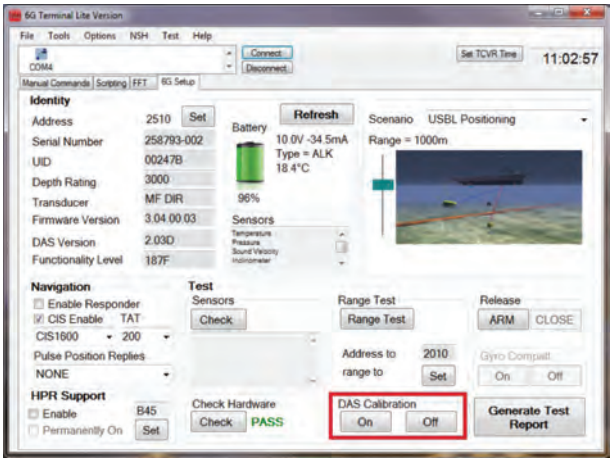
6. Refer to **Figure 9-15**. In the **Select Port** window select the correct port the PC is connected to and the **Baud Rate** from the drop down menus. Click **Connect**.

Figure 9-15 – Select Port



7. Refer to **Figure 9-16**. In the **6G Setup** tab, select the DAS Calibration **On** button to upgrade the DAS firmware.

Figure 9-16 – Enable DASCAL

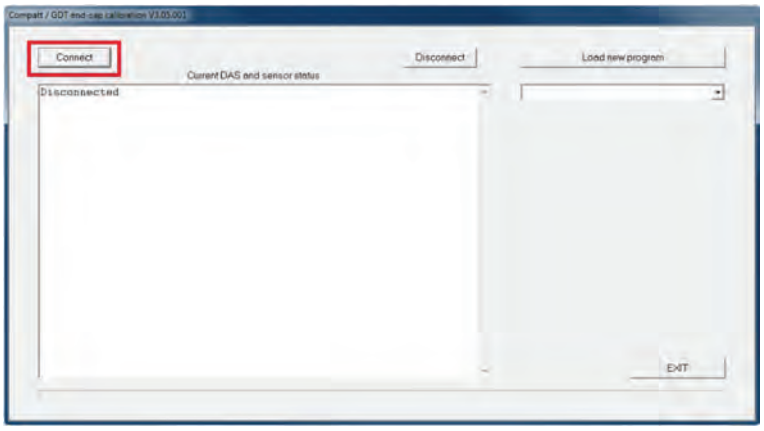


8. Refer to **Figure 9-17**. Open the DAS software by double clicking on the icon.

Figure 9-17 – DASCAL Icon

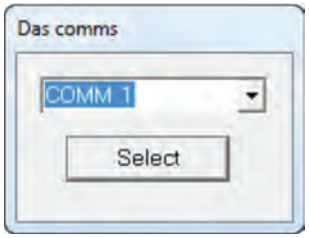
9. Refer to **Figure 9-18**. On the DAS page click **Connect**.

Figure 9-18 – DASCAL Connect



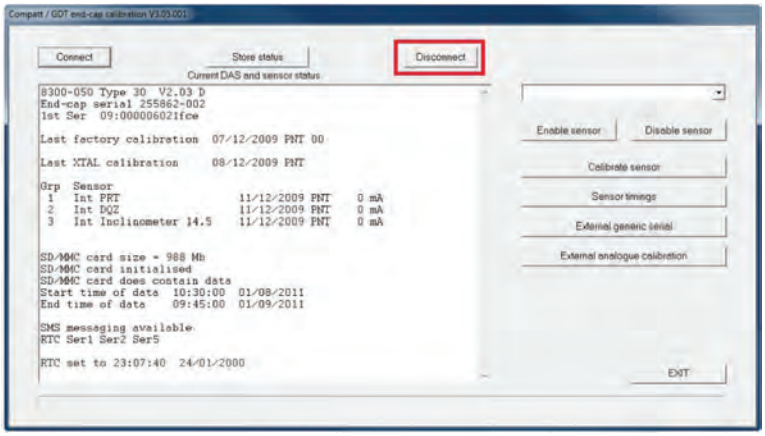
10. Refer to **Figure 9-19**. A **DAS Comms** selection window will open. Choose the correct COMMS port for the DAS connection, from the drop down selection. Click **Select**.

Figure 9-19 – COMMS port selection for DASCAL



11. Refer to **Figure 9-20**. When the DASCAL program opens select **Disconnect**.

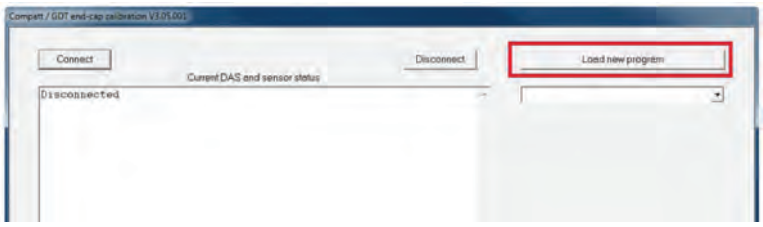
Figure 9-20 – DASCAL program select Disconnect



12. Refer to **Figure 9-21**. Disconnected will appear in the main screen.

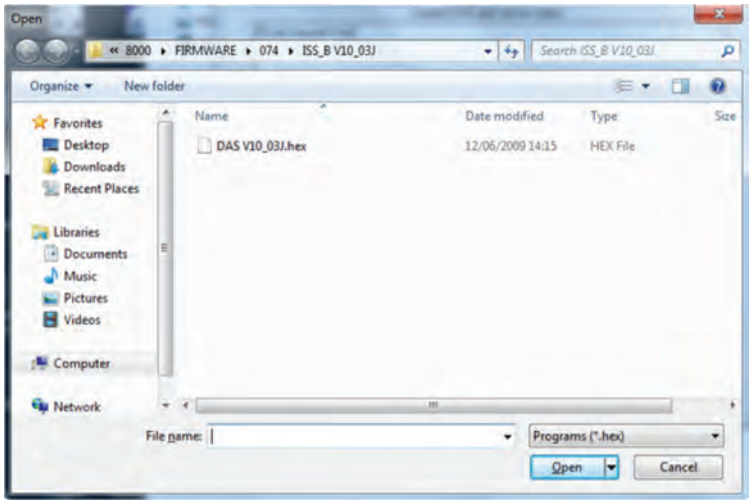
13. Refer to **Figure 9-21**. Select **Load New Program** to load the new firmware.

Figure 9-21 – DASCAL Load New Program



14. Refer to **Figure 9-22**. Navigate to the location of the new program. Click **Open**.

Figure 9-22 – Locate new program

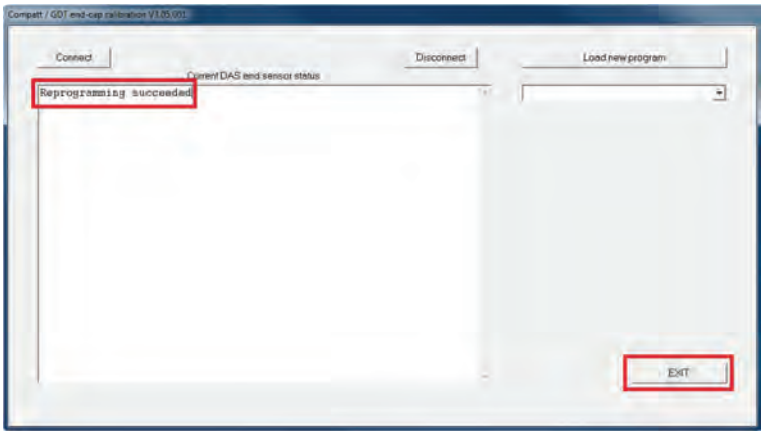


15. The firmware upgrade will now commence. This process will take approximately 4-5 minutes.

16. Refer to **Figure 9-23**. When the new firmware upgrade has completed, a **Reprogramming Succeeded** notification will be displayed in the DAS homepage main screen.

17. Refer to **Figure 9-23**. Click **Exit** to return to the 6G Terminal Lite software.

Figure 9-23 – Reprogramming Succeeded

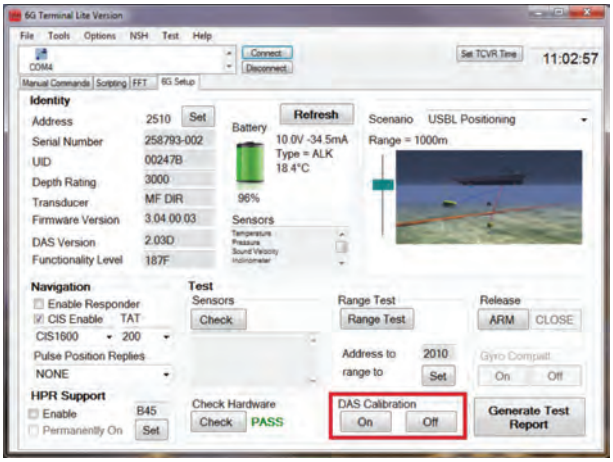


NOTE

If only one Comms Port connection has been used, then close the DAS program by selecting Exit Program, disconnect the DAS connection from the Comms Port and replace it with the CPU connection on the Dual Serial Cable. Open the 6G Terminal Lite program by double clicking the icon.

18. On the 6G Setup tab of the 6G Terminal Lite software click the **DAS Calibration Off**.

Figure 9-24 – DASCAL Calibration Off



19. The 6G Terminal Lite software can now be closed.

SECTION 10 – FAULT DIAGNOSIS

10. 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.

10.1 Transponder does not reply to interrogations or commands

Fault	Possible Cause	Action
Transponder does not reply to interrogation or commands	Transducer or transceiver connections not made or loose	Check all connections on the surface transducer or transceiver.
	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 as surface transducer too high	Lower the dunking transducer/transceiver or towfish and reduce the surface transceiver gain settings.
		Do a noise check using the applicable transceiver noise check command.
		Increase the transponder power level using the Navigation Power Level (NPL) in the Configuration Status (CS) Command.
	Transponder has low battery power	Check log for battery output before deployment.
		Check battery levels since deployment.
	Surface currents maybe streaming the transducer away from transponder location	Add 20 kg of ballast on a 1 m strop from the transducer guard.

Fault	Possible Cause	Action
	Other acoustic systems maybe operating in the same frequency band.	Check the signals for validating by using the noise command on the surface transceiver
	Cathode Ray Tube (CRT) screens or instruments	Check CRT screens are not radiating emissions in the 20 – 30 kHz range.

10.2 Transponder replies to commands, but not to interrogations

Fault	Possible Cause	Action
Transponder replies to commands, but not interrogations	Transponder disabled	Check by reading the transponder CS reply
		EC1 indicates the transponder is enabled for CIS interrogations
		EC0 indicates it is disabled.
	The incorrect CIS signal.	Check the transponder CS reply
	Battery capacity is below 5%.	Check the capacity remaining as reported by the VS reply. Send a Secure Configuration (SC) command to override, release and recover the transponder. Replace the battery.
	Transponder may have been moved from original position.	

10.3 Transponder replies to commands, but telemetry errors are detected

Fault	Possible Cause	Action
Transponder replies to commands, but telemetry errors are detected.	Noise level at surface transducer too high	Lower the dunking transducer / transceiver or towfish and reduce the surface transceiver gain.
		Do a noise check using the applicable transceiver noise check command.
		Set the transponder to high power telemetry transmission using the TPL parameter in the CS command.
	Other acoustic systems maybe operating in the same frequency band.	Check for signals validating by using the noise command on the surface transceiver.

SECTION 11 – RETRIEVAL AND STORAGE

11. Retrieval of the Transponder

11.1 Recovery Planning

It is advised that a full recovery planning procedure is formulated before attempting to recover any equipment.

CAUTION

⚠ **Equipment Damage. Recovery using ROV manipulators or grappling with boat hooks can result in major damage to the transducer.**

A dedicated loop of rope fitted to the transducer guard shackle or floatation will reduce the risk of damage to the equipment during recovery.

For ROV handling, add a metal ring to this rope loop. The rope loop must sufficiently long enough to allow the ring to fall below the acoustic transducer.

CAUTION

⚠ **Equipment Damage. The floatation bump-stop ring must not be used to lift more than the Transponder and Float Collar.**

Two holes in the plastic floatation bump-stop ring may be used to fit a floating rope loop, to assist later recovery.

A transponder floating to the surface can be tracked during its ascent by ranging to it, or by making repeated depth readings.

11.2 Recovery from the Sea

When a transponder reaches the surface, it will float approximately horizontal, depending on the float collar fitted.

WARNINGS

⚠ **Heavy Equipment. The Type 8300 Series of transponders, when out of water, weigh between 35 kilograms and 22.8 kilograms (depending on type). Manual Handling Equipment (MHE) must be used to move the transponders. If MHE is not available, then a manual handling assessment must be carried out prior to carrying out manual lifting / handling. Personal Protective Equipment such as protective footwear and gloves must be worn before lifting the equipment.**

⚠ **Risk of crush injury. Do not stand underneath suspended equipment. Personal Protective Equipment such as safety boots and hard hat must be worn.**

CAUTION

Equipment Damage. The transducer guard must not be used to hook the Transponder, this will result in damage to the transducer.

A boat hook can be used to hook:

- A rope loop attached to the transducer Guard Shackle
- A rope loop attached to the floatation bump stop
- A lifting point fitted to the floatation collar
- The release guard if fitted

The transducer guard must not be used to hook the transponder, this can result in damage to the transducer.

If recovered into a small boat, the transponder should be lifted on board the mother vessel using a crane attached to the lifting shackle or the lifting point on the float.

SECTION 12 – SPARES

12. Introduction

When ordering spare parts, you must provide:

a) The parts number

b) The drawing number

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 viewed at www.sonardyne.com and are as follows:

Sonardyne International Ltd
Blackbushe Business Park
Yateley, Hampshire
GU46 6GD
United Kingdom
T: +44 (0) 1252 872 288
F: +44 (0) 1252 876 100
E-mail: support@sonardyne.com
www.sonardyne.com

Sonardyne International Ltd
Units 12 – 14, The Technology Centre
Claymore Drive, Bridge of Don
Aberdeen AB23 8GD
T: +44 (0) 1224 707875
F: +44 (0) 1224 707876
E-mail: sales@sonardyne.com

Sonardyne Inc
8280 Willow Place Drive North
Suite 130, Houston
Texas 77070
USA
T: +1 281 890 2120
F: +1 281 890 7047
E-mail: usa.sales@sonardyne.com

Sonardyne Asia Pte Ltd
34 Loyang Crescent
Block B
Singapore
508993
T: +65 6542 1911
F: +65 6542 6937
E-mail: asia.sales@sonardyne.com

Sonardyne Brasil Ltda
Rio das Ostras, Brasil
Av. Zen lotes 05 e 06
Quadra D
Zen, Rio das Ostras – RJ
CEP 28.890-000, Brasil
T: +55 22 2123 4950
F: +55 22 2123 4951
brasil.sonardyne.com

12.1 Recommended Spares

The following is a list of all available spares.

12.1.1 Batteries

Part Number	Drawing Number	Description	Quantity
641-0126	8300-002	Alkaline Battery Pack (Standard unit)	1
641-0127	8300-006	Lithium Battery Pack (Standard unit)	1
641-0162	8300-004	Lithium Battery Pack (Midi and Mini unit)	1
641-0127	8300-006	Lithium Battery Pack (Max unit)	2

12.1.2 PCB's

Part Number	Drawing Number	Description	Quantity
631-7753	8300-035-01	CPU PCB	1
631-7938	8300-036-01	Tx / Pre-amp PCB, MF Omni	1
631-7942	8300-036-06	Tx / Pre-amp PCB, MF Directional	1
631-7944	8300-036-08	Tx / Pre-amp PCB, LMF Omni	1
631-7943	8300-036-07	Tx / Pre-amp PCB, LMF Directional	1
631-7859	8300-038-01	Interface PCB, Non isolated	1
631-7915*	8300-050	DAS PCB (* or similar depending on option required)	1

12.1.3 Upgrades

Part Number	Drawing Number	Description	Quantity
650-0060	8300-000-3111	MF Omni C5 to C6 Upgrade Kit	1
650-0061	8300-000-3113	MF Directional C5 to C6 Upgrade Kit	1
650-0062	8300-000-3141	MF Omni C5 Midi to C6 Midi Upgrade Kit	1

12.1.4 Miscellaneous Parts

Part Number	Drawing Number	Description	Quantity
890-0026	8300-118	Compatt 6 connector blanking socket	1
641-3332	8000-905	Compatt 6 Opening Tool	1
650-2334	8000-007	Transducer Spares Kit, MF Omni (incl. 'O' rings)	1
750-1267-SP	8000-247	Transducer Guard Spares Kit	1
650-2531		Anode Kit – MF Omni TDR End-Cap	1
650-2533		Anode Kit – Release End-Cap	1
810-0010-SP	8300-024	Housing Sleeve Red, (for 3000 m tube)	1
200-3455		Main Housing 'O' Rings, 100-345-5570	4
201-5140		Spring Gasket, 106LB-[MW]-4.005-2	2
231-0035		Release Shackle 10 mm D, s/duplex, Breaking load 4800 kg	1
231-0145		Lifting Shackle 8 mm D, s/duplex SWL 500 kg	1
925-0005		Silica Gel Bag – self indicating	4

12.1.5 Cables

Part Number	Drawing Number	Description	Quantity
820-6795	8000-075	SubConn 8 W mating connector kit incl. locking sleeve	1
820-6713	8000-157	PC to Compatt 6 Dual Serial Cable	1
820-0038	8159-070	CPU to DAS Ribbon Cable (16 way x 60 mm)	1

SECTION 13 – TECHNICAL SPECIFICATIONS

13. Technical Specifications for 8300 Series Transponders

13.1 Mechanical (Standard)

Standard Unit	
Parameter	**Specification**
Diameter (main body)	133.5 ±2 mm (5.3 ±0.1 ins)
Overall Length	1035 mm (40.7 ins)
Weight in air (Alkaline battery)	23.4 kg (51.5 lb)
Weight in water (Alkaline battery)	11.4 kg (25.1 lb)
Weight in air (Lithium battery)	21.3 kg (46.9 lb)
Weight in water (Lithium battery)	9.9 kg (21.8 lb)
Max Operating Depth	3000 m Limited by depth sensor (see end-cap label)
Release Mechanism	Safe Working Load (SWL) 250 kg (551 lb)
Transducer Guard Shackle	Safe Working Load (SWL) 250 kg (551 lb)

13.2 Mechanical (Midi Unit)

Midi Unit	
Parameter	**Specification**
Diameter (main body)	133.5 ±2 mm (5.3 ±0.1 ins)
Overall Length	784 mm (30.9 ins)
Weight in air (Alkaline battery)	16.0 kg (35.2 lb)
Weight in water (Alkaline battery)	7.4 kg (16.3 lb)
Max Operating Depth	3000 m Limited by depth sensor (see end-cap label)
Release Mechanism	Safe Working Load (SWL) 250 kg (551 lb)
Transducer Guard Shackle	Safe Working Load (SWL) 250 kg (551 lb)

13.3 Mechanical (Mini Unit)

Standard Unit	
Parameter	**Specification**
Diameter (main body)	133.5 ±2 mm (5.3 ±0.1 ins)
Overall Length	566 mm (22.7 ins)
Weight in air (Alkaline battery)	11.0 kg (24.2 lb)
Weight in water (Alkaline battery)	5.0 kg (11.0 lb)
Max Operating Depth	3000 m Limited by depth sensor (see end-cap label)
Release Mechanism	Safe Working Load (SWL) 250 kg (551 lb)
Transducer Guard Shackle	Safe Working Load (SWL) 250 kg (551 lb)

13.4 Mechanical (Max Unit)

Standard Unit	
Parameter	**Specification**
Diameter (main body)	133.5 ±2 mm (5.3 ±0.1 ins)
Overall Length	1647 mm (64.8 ins)
Weight in air (Lithium battery)	35.8 kg (78.9 lb)
Weight in water (Lithium battery)	15.2 kg (33.5 lb)
Max Operating Depth	3000 m Limited by depth sensor (see end-cap label)
Release Mechanism	Safe Working Load (SWL) 250 kg (551 lb)
Transducer Guard Shackle	Safe Working Load (SWL) 250 kg (551 lb)

13.5 Battery Life

Battery Type	Capacity (Ah)	Start Life Voltage		Battery Limit Voltage	
Alkaline	54	15.5		11.3	
Lithium	100	14.5		13.0	
Transducer Type		Omni-Directional		Semi-Directional	
Battery Type		Alkaline	Lithium	Alkaline	Lithium
Listening only when disabled (days)		750	1388	750	1388

Figure 13-1 – Estimated Battery Life (Alkaline)

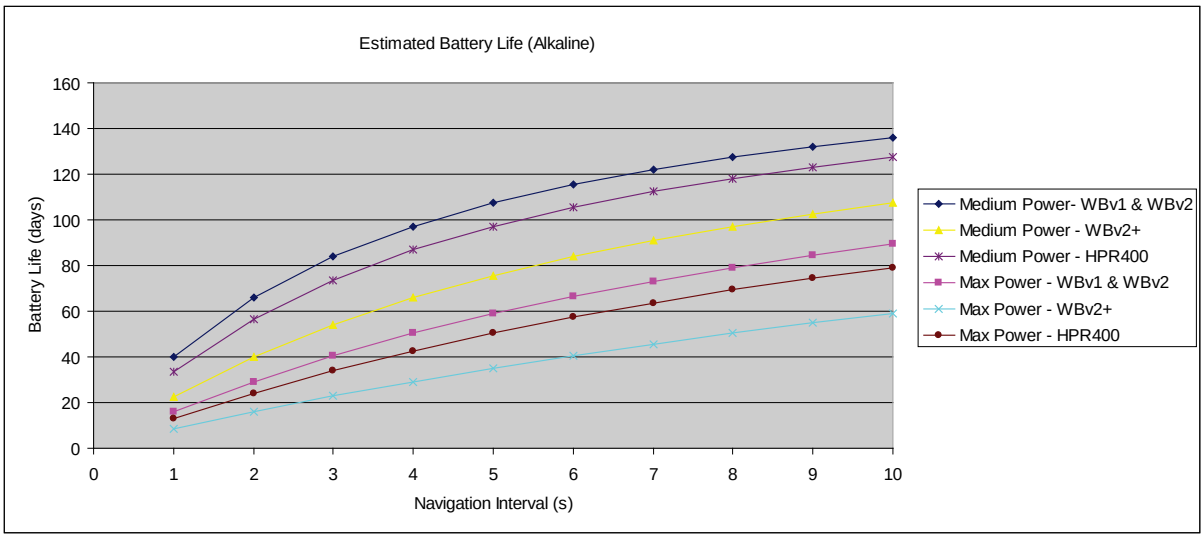
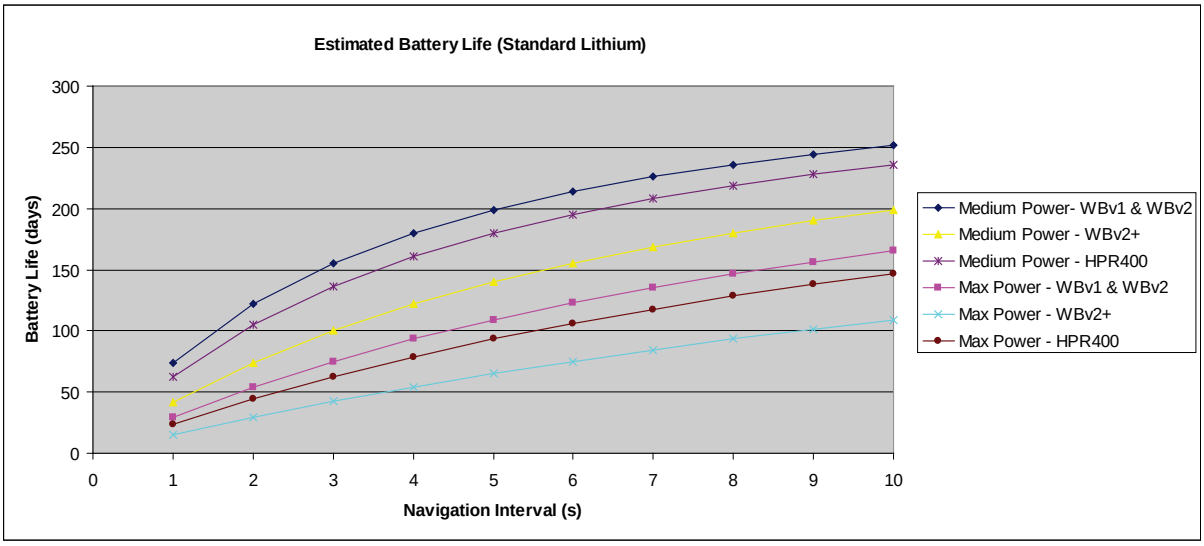


Figure 13-2 – Estimated Battery Life (Standard Lithium)



13.6 6G Battery Life Estimator

To determine there is sufficient battery life for operational scenarios, the 6G Battery Life Estimator is available as a new Android Battery life Estimation App.

Figure 13-3 – 6G Battery Life Estimator App.

The app estimates the battery life of the 6G transponders for a pre-defined operational scenario allowing the operator to specify instrument type with navigation and telemetry settings. Based on the information entered the app will provide an estimate, measured in days, of the remaining battery life.

The app can be downloaded using the following QR code:

Figure 13-4 – 6G Battery Life Estimator App. QR Code

13.7 Communication Port

Type	**RS232**
Baud Rate (default)	Default 9600 baud (8 data bit, no parity, 1 bit stop) Configurable to 2400, 4800, 9600, 19200, 38400, 57600 and 115200 baud

13.8 Acoustic

Transducer Type		Omni-Directional	Semi-Directional
Transducer Beam Shape		Hemispherical (±120°)	Semi-Directional
Frequency Range		MF 19 – 36 kHz	MF 19 – 36 kHz
Acoustic Sensitivity	dB re 1 µPa	<85	<85
Acoustic Transmit source level (4 levels)	dB re 1 µPa @ 1m	196/193/190/187	202/199/196/190
Pulse length, Wideband	ms	8/16	8/16
CIS Turnaround Time (Default)	ms	200	200
Time resolution	µs	1	1

13.9 Environmental

Parameter	Specification
Temperature Operation	-5° to 30°C (23° to 86°F)
Temperature Storage	-20° to 70°C (-4° to 158°F)
Rated for Outdoor use	Relative humidity 100%
	IP68
	Maximum depth

13.10 Sensors

Temperature Measurement	-5° to 40°C (23° to 104°F)
Resolution	0.01°C
Accuracy	±0.1°C (±0.05°C to special order)

Depth Measurement (Strain Gauge)					
Span (depth)	5000 m	3000 m	1000 m	500 m	300 m
Resolution	0.01 kPa	0.01 kPa	0.01 kPa	0.01 kPa	0.01 kPa
Accuracy	±5.0 m	±3.0 m	±1.0 m	±0.5 m	±0.3 m

Depth Measurement (High Precision Strain Gauge)					
Span (depth)	5000 m	3000 m	1000 m	500 m	300 m
Resolution	0.01 kPa	0.01 kPa	0.01 kPa	0.01 kPa	0.01 kPa
Accuracy	±0.5 m	±0.3 m	±0.1 m	±0.05 m	±0.03 m

Depth Measurement (Quartz option)			
Span (pressure psi)	0 – 6000 psi	0 – 3000 psi	0 – 2000 psi
Span (pressure kPa)	0 – 41370 kPa	0 – 20685 kPa	0 – 13790 kPa
Span (depth)	0 - 4100 m	0 - 2050 m	0 - 1360 m
Resolution	0.01 kPa	0.01 kPa	0.01 kPa
Accuracy	±0.42 m	±0.21 m	±0.14 m

Options I2 an I4 dual axis high accuracy. (Inclinometer I4 option is inverted for transponders mounted upside down)		
Range	±90°	
Resolution	0.01° (over the range ±14.5°)	0.05° (over the range ±45°)
Accuracy	±0.05° (over the range ±14.5°)	±0.2° (over the range ±45°)

Tilt Switch
Internal 45° tilt switch indicates vertical position

Sound Speed Sensor		
Model	50 mm	100 mm
Resolution	0.01 m/s	0.01 m/s
Range	1400 – 1600 m/s	1400 – 1600 m/s
Accuracy	±0.06 m/s	±0.03 m/s

13.11 Responder Input Trigger (Sync Input)

Inactive State	Low
Ground Reference	Power Ground
Input Impedance	~47 kΩ
Trigger Pulse	Nominally positive pulse minimum 4 V maximum 24 V. Leading edge triggered. Responder mode is enabled by serial or acoustic command.
Pulse Width	Ref. Section 4, 2.1 Sync Input
Turn Around Delay	TAT reported by CS Command is used for IRS replies. HPR replies have a fixed TAT of 30 ms
Blocking Time	TAT + BLK as reported by CS Command

13.12 Synchronisation Output (Sync Out)

Inactive State	Low
Ground Reference	Power Ground
Output Impedance	1 kΩ when active (500 kΩ inactive)
Trigger Pulse	Nominally 5 V positive pulse 80 ms after receiving individual interrogation signal (IIS). The sync pulse width is 1 ms. Sync output is enabled by serial command.

13.13 Nett Upthrust

Is the difference between the net buoyancy of the float and the total weight of an object, or objects, in water that it is supporting, e.g.

Nett Upthrust =

(Minimum net buoyancy of the Float) – (the weight of the instrument + inserts in water)

e.g. 30 kg – (11.2 + 0.5) kg = 17.3 kg net upthrust

13.14 Standard Dimensions

Figure 13-5 – 8300-3111

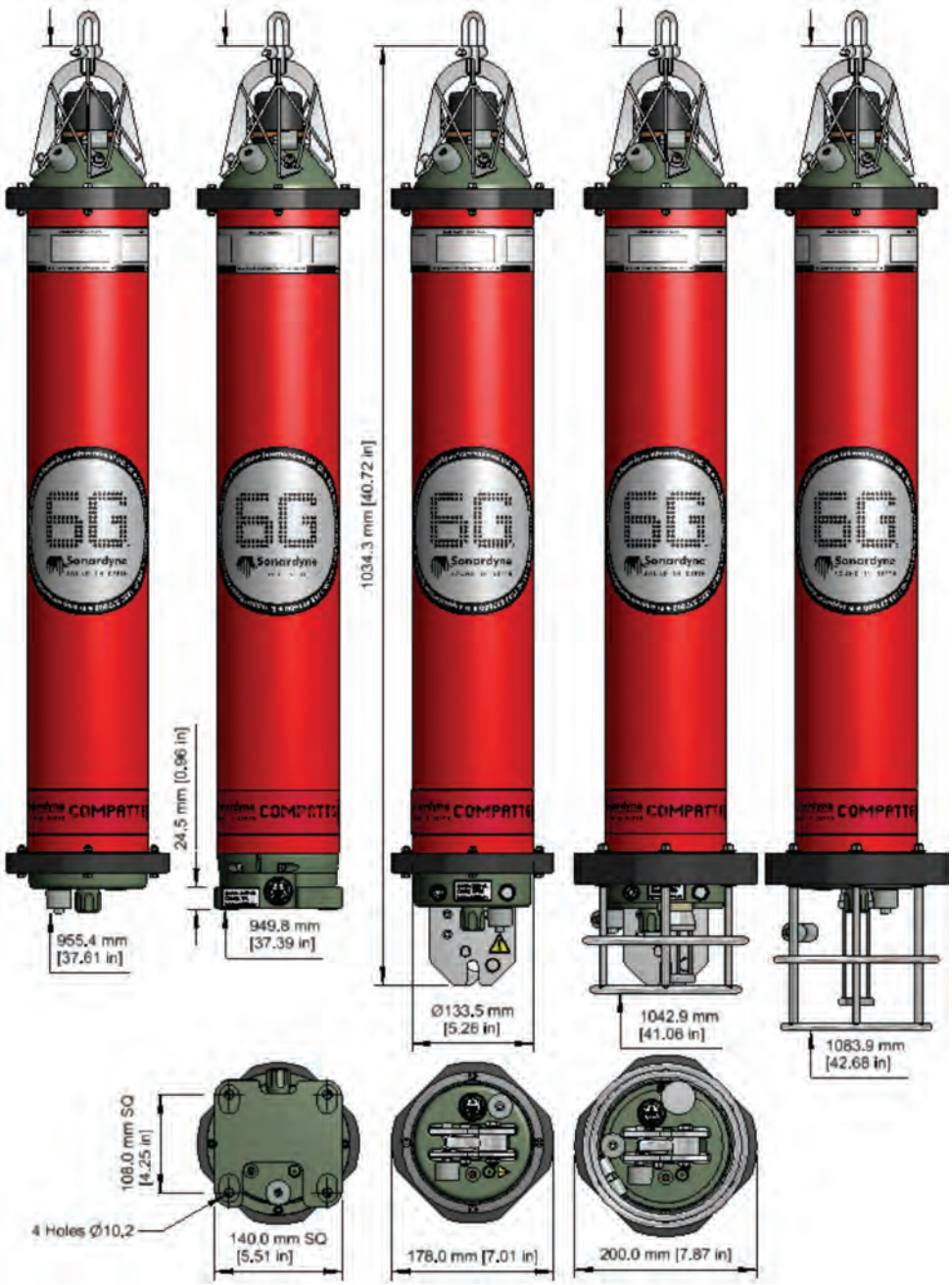
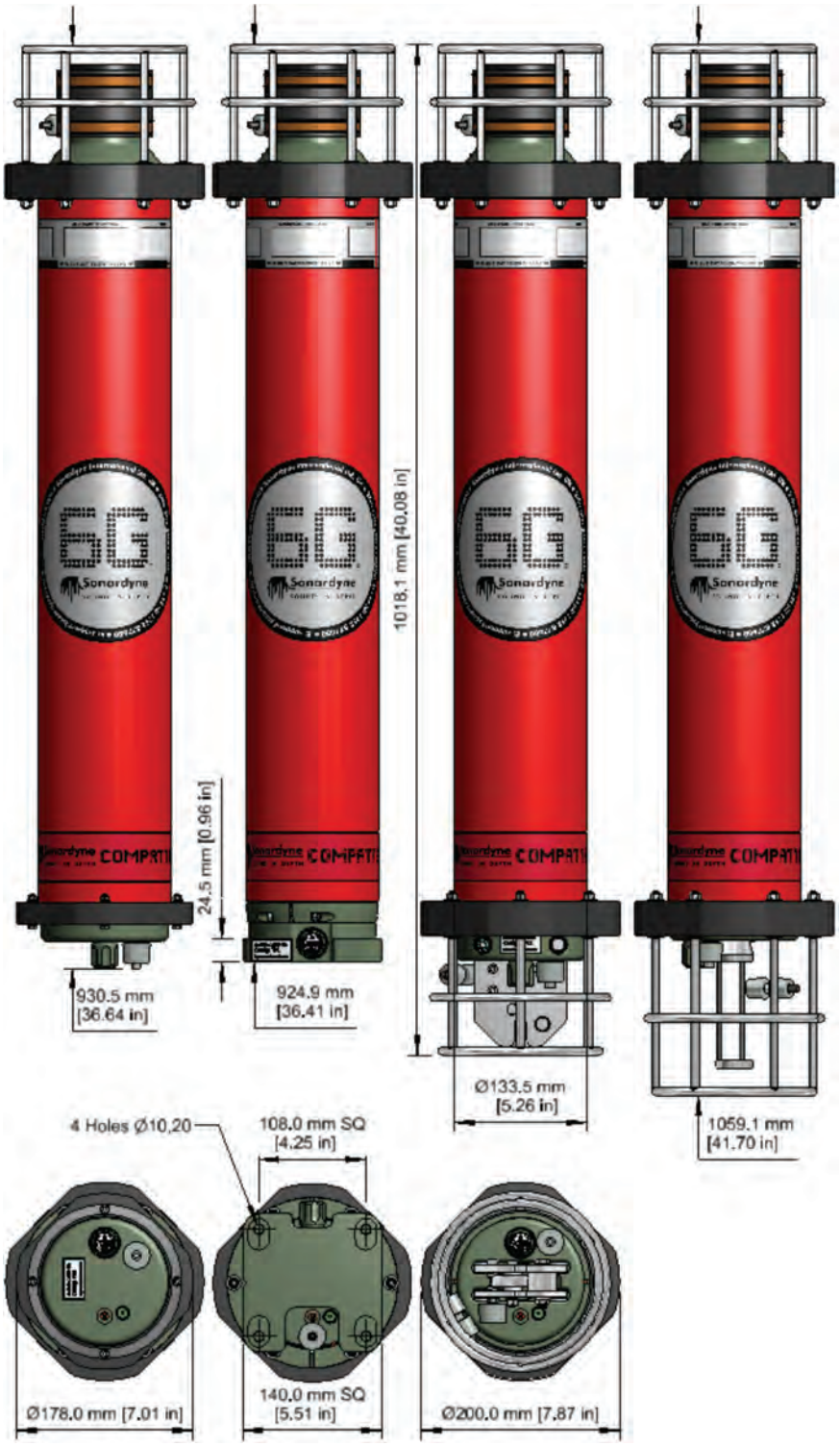


Figure 13-6 – 8300-3113



13.15 Midi Dimensions

Figure 13-7 – 8300-3141

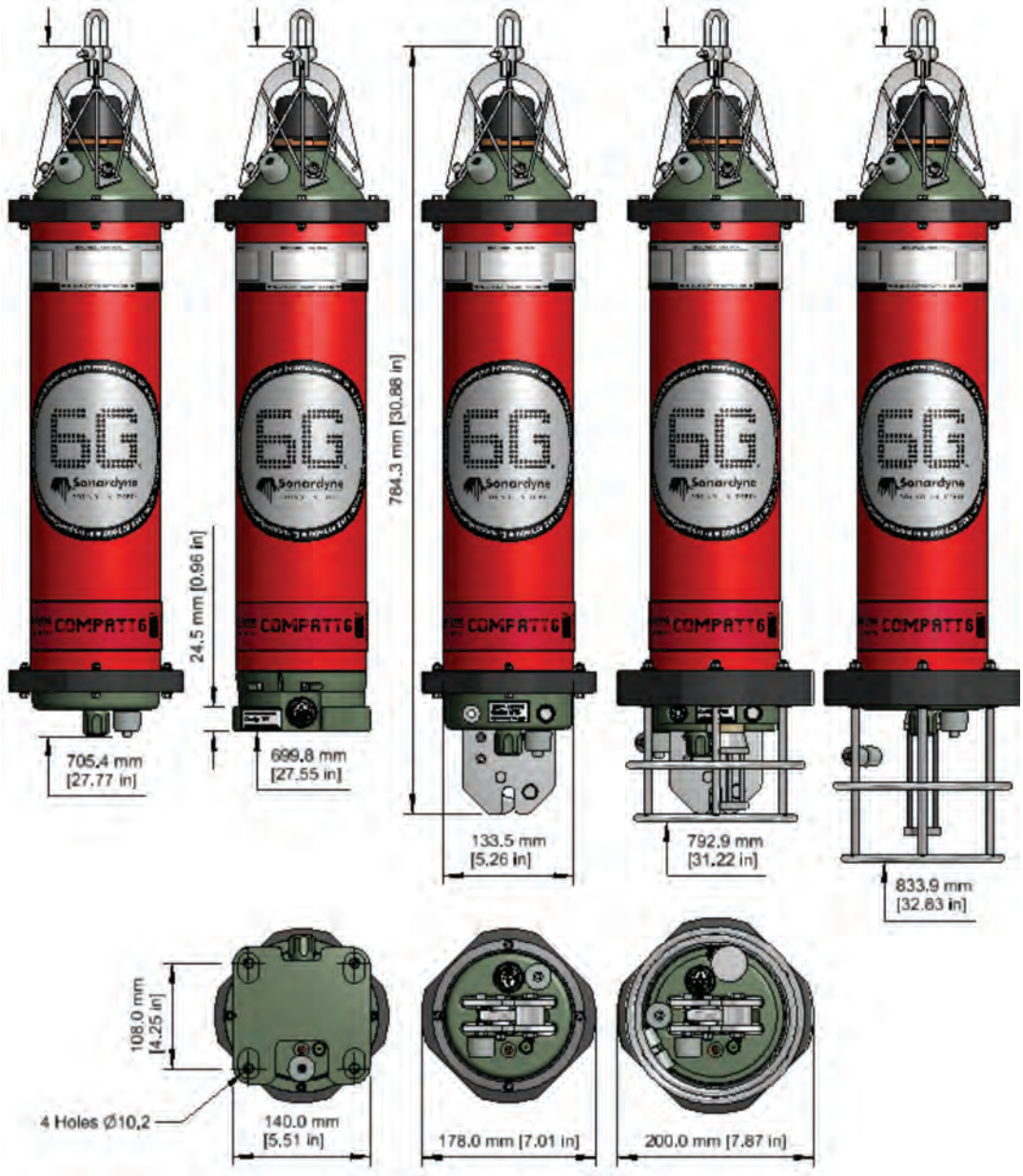
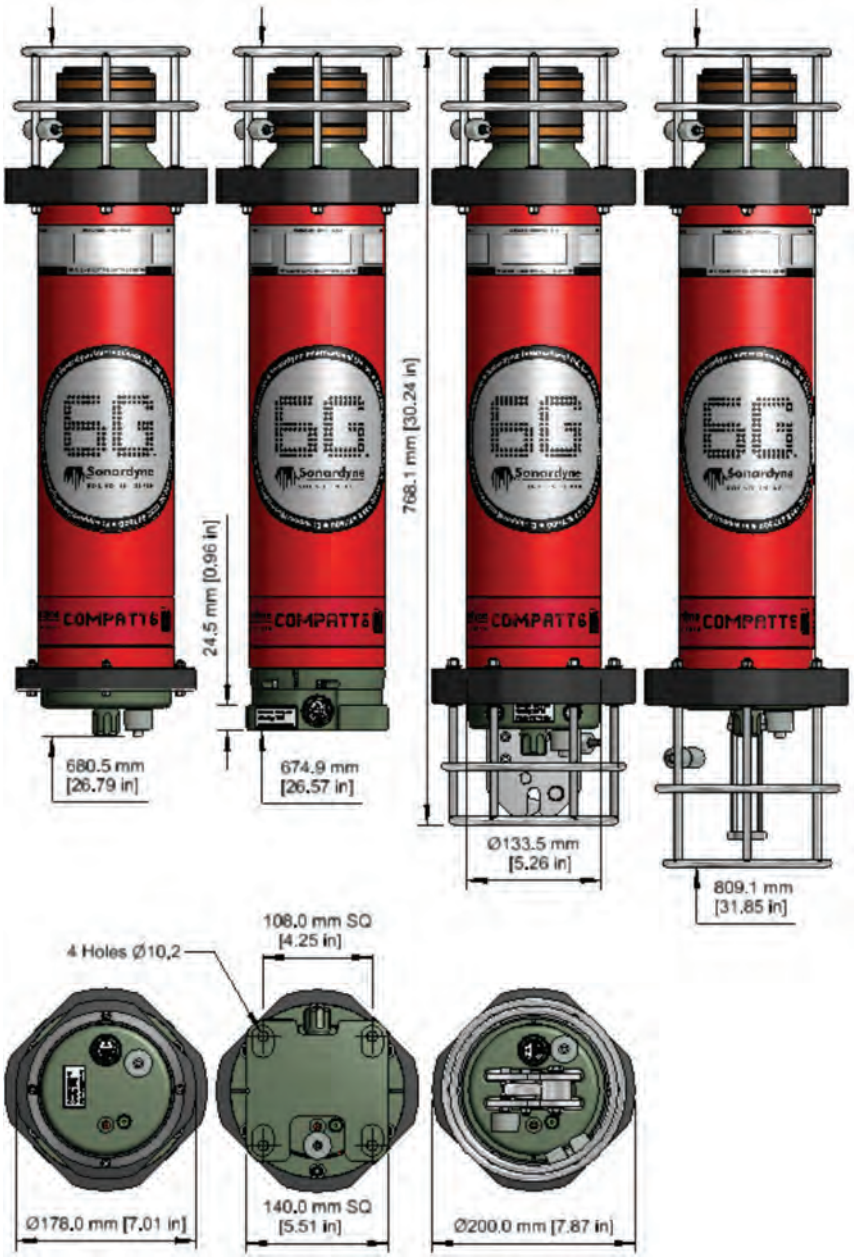


Figure 13-8 – 8300-3143



13.16 5000 m Rated Omni-Directional

Figure 13-9 – 8300-5211

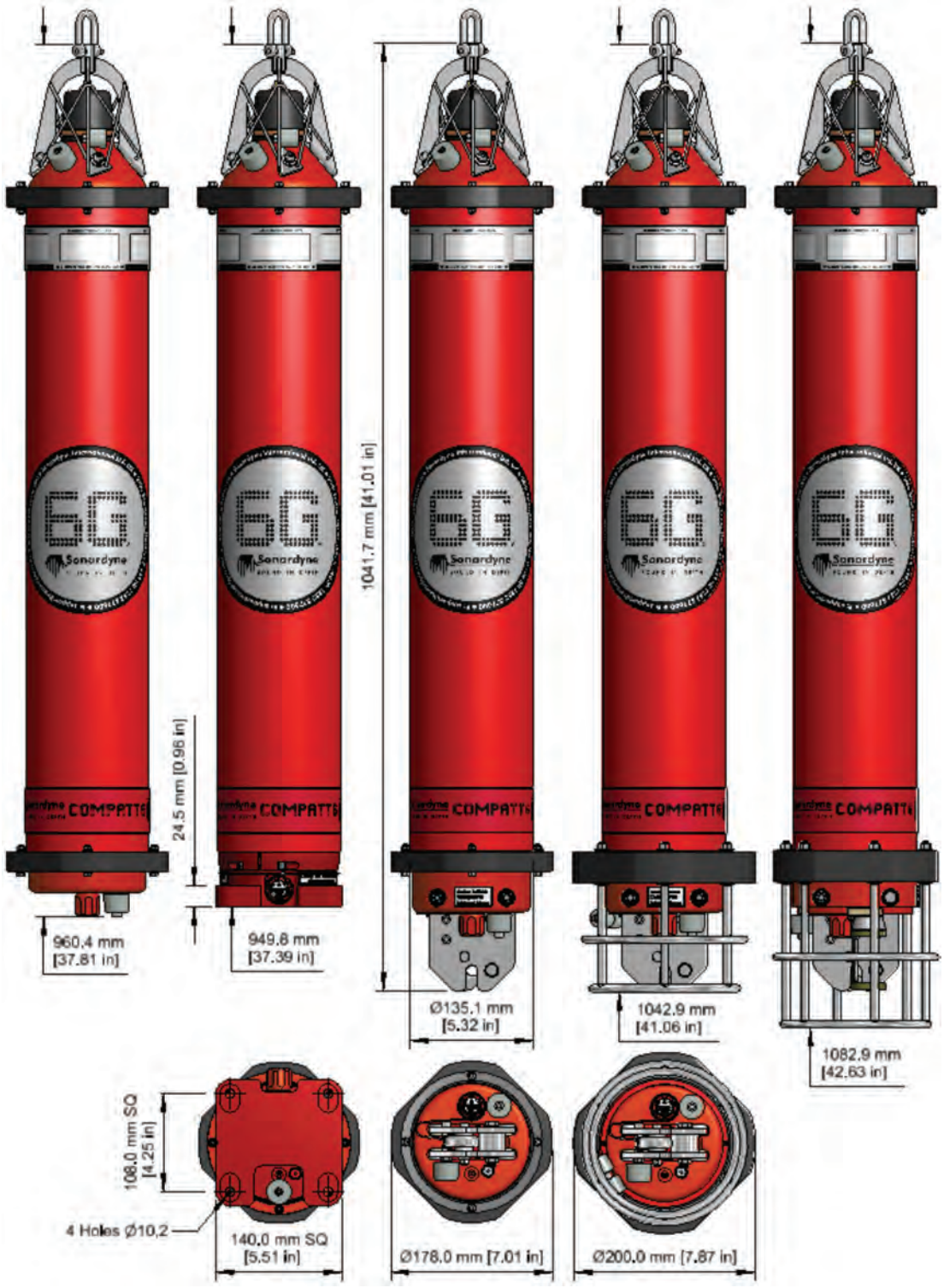
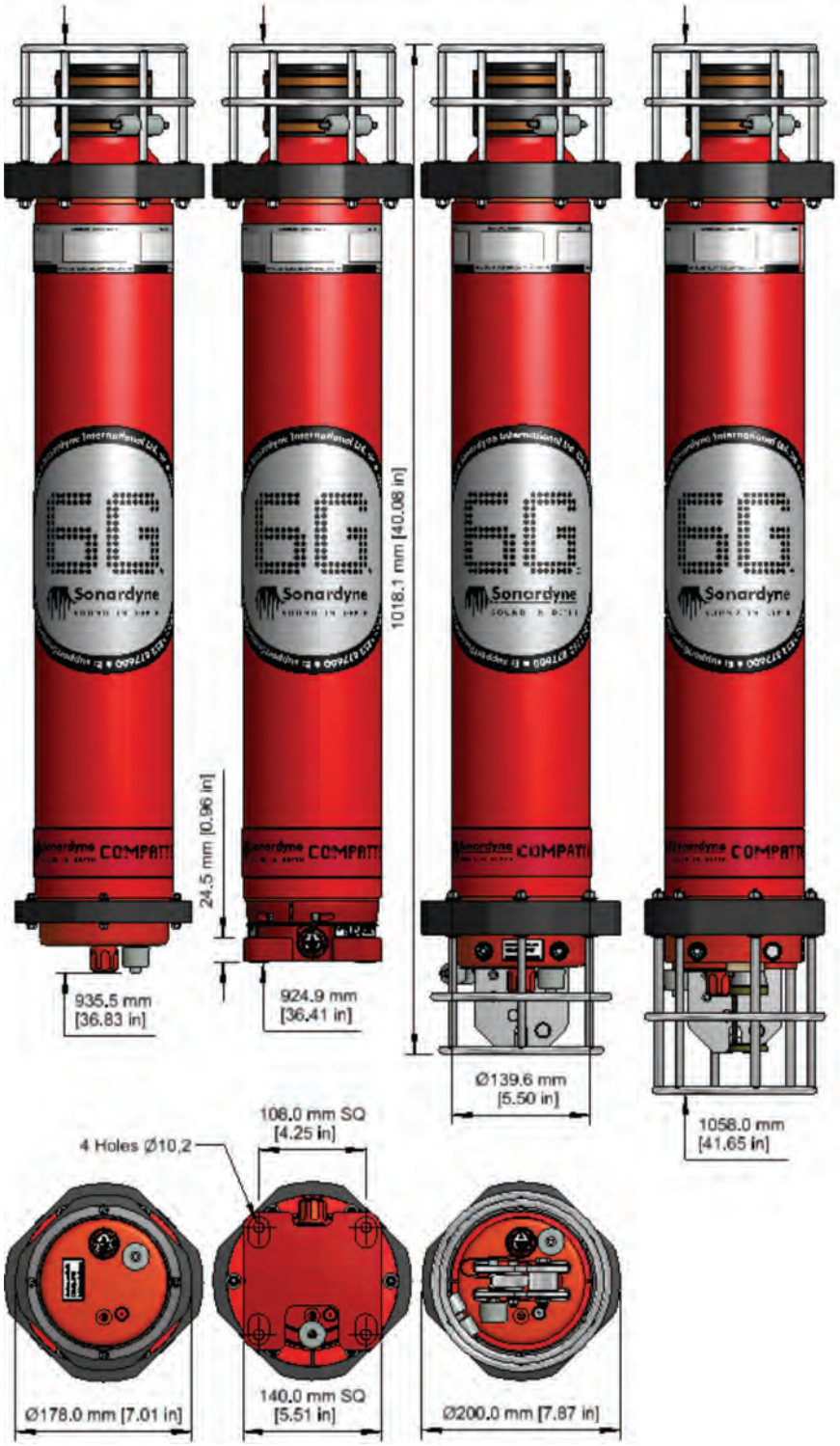


Figure 13-10 – 8300-7213



APPENDIX A – FIRMWARE HISTORY RECORD

This table is a history and record of all firmware installed into the equipment.

Table A-1 – Firmware History Record

Version	Date	Description

APPENDIX B – SOFTWARE COPYRIGHT / LICENSE / WARRANTY

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GLOSSARY OF TERMS

Term	Definition
Acoustic Responder	An instrument that emits an acoustic signal in response to an electrical signal carried to it by cable.
Acoustic 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.
CMOS	Complementary Metal Oxide Silicon. A major integrated circuit technology based on combinations of p-channel and n-channel field effect transistors fabricated on the same silicon substrate. Especially attractive in low-power applications since the basic CMOS logic gate only consumes significant power during switching.
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
DAS	A micro-controlled data acquisition and logging sub-assembly located within a transponder.
Delay between commands	Provides a delay between adjacent commands.
Depth Status	The transponder can be fitted with an optional depth sensor to send depth information at each interrogation.

Term	Definition
Firmware	The firmware installed on the transponder. Firmware upgrades can be installed via 6G Terminal Lite. The Tx firmware refers to the transmission signal synthesiser.
Long Base Line Positioning System (LBL)	A system where two or more transponders are on the seabed. The positions of the transponders are established by a calibration process in a seabed frame. The distances from a transducer to each transponder are measured using a transceiver. The position of the transducer can be computed in the seabed frame. The name comes from the “baselines” joining each transponder.
LUSBL	Long and Ultra Short Base-Line
PSU	Power Supply Unit
QR code	Quick Response Code. A matrix barcode of black modules arranged in a square grid on a white background.
ROV	Remotely Operated Vehicle
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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