

Coastal Acoustics Product Guide

Underwater Positioning, Navigation and Control Systems



Contents

Introduction	01
Scout USBL – A Complete Solution	02
Scout USBL – System Overview	03
Scout USBL – System Specifications	04
Prospector – Wide Area, Absolute Positioning	05
Prospector – System Overview	06
Prospector – System Specifications	07
Homer-Pro – Diver Based Target Relocation	08
ROV-Homer – Low Cost ROV Guidance	09
Coastal Transponders – OBC, LRT and LAT	10
Coastal Transponders – Specifications	12

Sound Solutions In Depth Experience

ROV Positioning

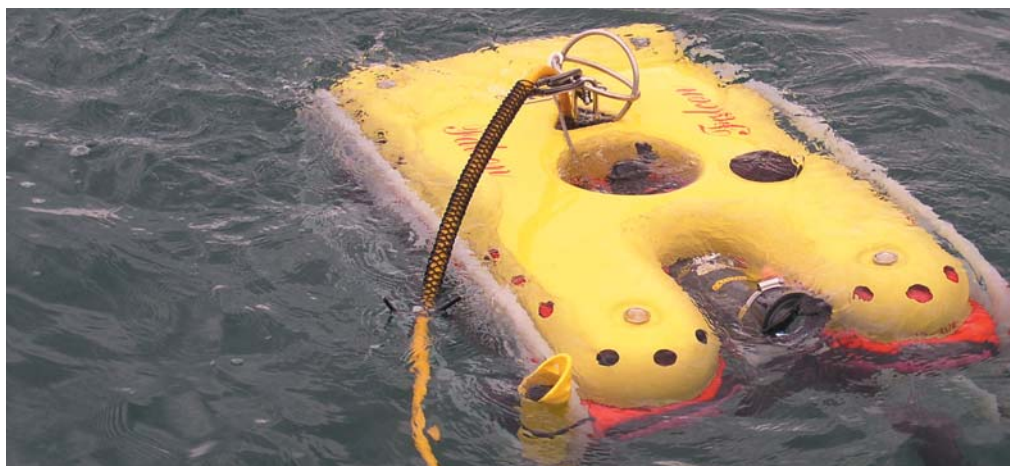
Coastal Acoustics products are widely used to position ROVs, divers and AUVs. The systems provide high accuracy and can be installed on both small and large vehicles

Towfish Tracking

Accurate and reliable towfish tracking, just one of the applications for Scout USBL (Page 02)

Diver Navigation

Save time and cost with precise navigation and guidance for divers



Introduction

Coastal Acoustics from Sonardyne is a range of compatible acoustic positioning, navigation and control systems designed for coastal water applications in water depths to 500 metres.

Sonardyne are world leaders in subsea acoustic positioning, navigation and communication and since the introduction of our first diver-based product in 1974, we have been committed to developing reliable, easy to use and high performance systems for Remotely Operated Vehicles (ROVs) and divers.

Applications for the Coastal Acoustics product range are found within the oceanography, search and salvage, survey and marine archaeology industries where requirements vary from tracking towfish and navigating divers through to conducting ROV inspections and relocating targets of special interest. Sonardyne acoustic release transponders, for example, are an important component in the inventory of many scientific organisations. The units are relied upon for the recovery of valuable data monitoring equipment that in many cases has been deployed for several years.

As all of the products within the Coastal Acoustics product range share the same acoustic frequency band, users can benefit from mixing-and-matching components to suit their particular applications. For example, a Lightweight Release Transponder (LRT) can be used as a simple release transponder or as part of a positioning system depending on what topside equipment is being used.

Certified to ISO 9001:2000, Sonardyne's manufacturing facility is in the UK with regional companies strategically located around the world providing sales, product support and equipment servicing. This is backed by a world-wide, 24hr helpline that provides emergency telephone assistance for all our products.

SCOUT USBL

A Complete Solution

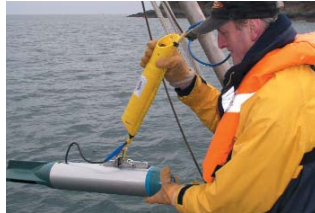
ROV Installation

Installation of a low cost OBC transponder on an ROV



Towfish Installation

OBC transponders are compact and rugged and can be used to track targets such as small towfish by simply attaching them to the umbilical

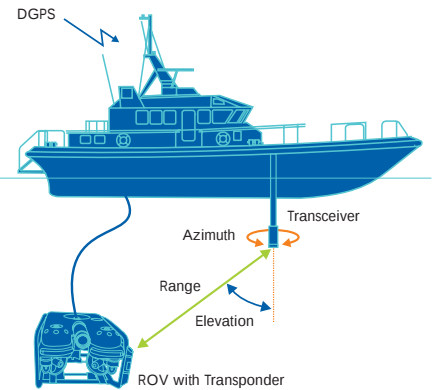


Lightweight Release Transponder

The LRT is a versatile acoustic release transponder with a Safe Working Load (SWL) of 125Kg

Ultra-Short BaseLine

Scout calculates the position of a target by measuring the range and bearing of a transponder from the vessel



Introduction

Scout USBL is a complete vessel based underwater tracking solution for commercial divers, ROVs and towfish. Compact, portable and easy to install on any vessel, Scout is designed to appeal to users with little or no prior experience of acoustic positioning and those who want to arrive on location, switch on and begin tracking a target immediately.

Key Features

- A complete solution
- Easy to install and use
- High performance
- Low cost, rugged transponders
- Upgrade path for deep water

Scout calculates the position of a subsea target by measuring the range and bearing from a vessel-mounted transceiver to a small acoustic transponder fitted to the target; a technique known as Ultra-Short BaseLine (USBL) positioning.

USBL positioning is widely used by the offshore and oceanographic industries as it offers high accuracy performance combined with ease of operation. One of its main advantages is that no other in-water acoustic equipment has to be deployed before underwater operations can commence. Only the targets being tracked need to be equipped with a transponder.

With Scout, a support boat can arrive on location, deploy a diver, ROV or towfish and begin tracking it straightaway. This has particular benefits for search and salvage applications when search times are critical.

Two versions of Scout are available; standard and portable.

The portable version is controlled using a rugged, splashproof, battery powered command unit that allows users to operate the system from the back deck. The standard system is aimed at those who require less portability.

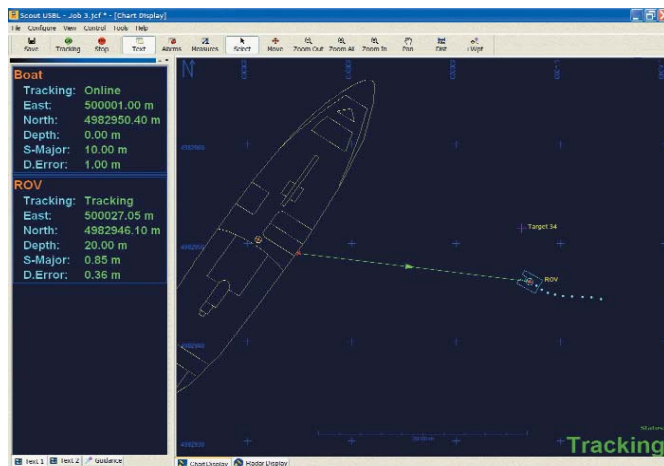
Whichever version you choose, both can provide the same high levels of accuracy as Sonardyne's deep water USBL product range.

SCOUT USBL

System Overview

Scout Software Display

Scout USBL software is easy and intuitive to use and requires minimal user training



System Overview

A Scout USBL system is comprised of four main components; control software, a rack-mounted or portable command and interface unit, acoustic transceiver and a low cost transponder, that is attached to each target being tracked.

Software

The PC software has been designed to be very easy and intuitive to operate with only basic user training required. Features include Wizards and Tools that guide an operator through the process of planning a job and configuring transponders in preparation for tracking. The User Interface shares a common look and feel with Sonardyne's latest generation of Fusion software products thereby ensuring operator familiarity when switching between products.

PC and Surface Interface Unit

A Scout SIU can be rack mounted or simply secured on a bench

Surface Command Unit

The SCU is a self contained PC, display and interface unit for operating Scout from any type of vessel

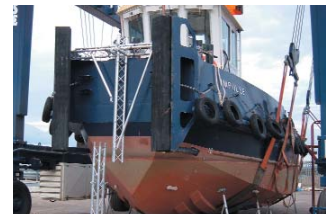


Scout Transceiver

Scout's small, lightweight transceiver

Transceiver Deployment Pole

A dedicated transceiver deployment pole is available from Sonardyne



SIU and SCU

The Surface Interface Unit (SIU) supplied with standard Scout is a rack-mountable unit that supplies power and communications to the system's transceiver. It's connected to the user's own PC or laptop via a serial or USB link and requires a 110-240V AC power supply.

With portable Scout systems, the features of an SIU are incorporated into a portable, fully self contained Surface Command Unit (SCU) with integrated PC, large touch screen display, sensor interface and battery pack. This enables Scout to be operated independently from almost any type of boat.

Transceiver

The Scout transceiver provides a hemispherical pattern of acoustic coverage enabling tracking of targets from far below through to near surface. For this reason, it is suitable for a wide variety of tasks such as towfish tracking.

The compact and lightweight design of the transceiver allows it to be deployed on a rigid, over-the-side pole or through a standard 150mm (6") gate valve if one is available. Sonardyne can supply a lightweight pole, complete with fittings and advice on installation, if required.

To simplify set-up, an integrated motion sensor automatically compensates for the dynamic motion of the vessel. For higher accuracy work external reference sensors can be used.

Transponders

Scout USBL is compatible with the Coastal Acoustics family of low cost HF frequency transponders. The transponders have been designed for applications where size and weight are important operational factors, such as installation on the back of a diver or small ROV. For more information on transponders, turn to Pages 10 and 11.

SCOUT USBL

System Specifications

System Performance

General	
Operating Range	500 Metres
Acoustic Coverage	±90° below transceiver
Accuracy	±2.75% of Slant Range (With internal Heading and Attitude sensor) ±0.5% of Slant Range (With external VRU and Gyro)
Tracking	Supports tracking of one surface vessel and multiple subsea targets

Transceiver

Type Number	8024
Operating Frequency	Sonardyne HF (35-55kHz)
Sensors	Heading and Attitude
Deployment Method	Through-hull or Over-the-Side
Dimensions (LxDia)	500mm (19.7") x 145mm (5.7")
Weight in Air	10Kg
Weight in Water	2.2Kg

Surface Command Unit (SCU)

Type Number	8039
Processor	Pentium M
Operating System	Windows XP Professional
RAM	512Mb
Hard Disk	40Gb
Ports (Front Panel)	4 x Serial Ports, 1 x USB 2.0
External Inputs	Transceiver, Responder Trigger, GPS Antenna (Optional)
Battery	Internal Li-Ion (UN Transport Approved)
Typical Battery Life	1-2 hours
Power Supply	12-16V DC
Display Panel	12.1" TFT touch screen, 1024 x 768
IP Rating	IP65
Dimensions (LxWxH)	444.5mm (17.5") x 305mm (12") x 178mm (7")
Weight	10Kg

Surface Interface Unit (SIU)

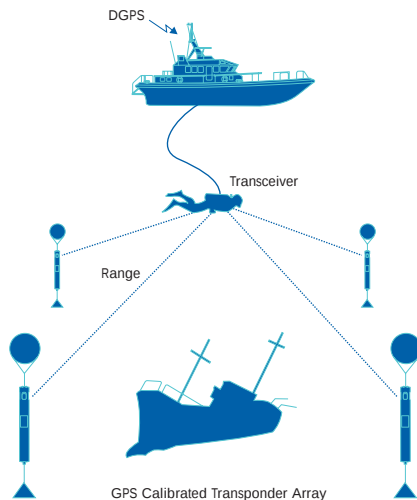
Type Number	8038
Ports	4 x Serial Ports, 1 x USB 2.0
External Inputs	Transceiver, Power, Responder Trigger
Power Supply	110/230V AC
Dimensions (LxWxH)	432mm (17") x 305mm (12") x 51mm (2")
Weight	3Kg

Prospector

Wide Area, Absolute Positioning

Wide Area Positioning

Prospector uses a GPS calibrated transponder array to provide high accuracy absolute positioning over a wide area



Prospector Transponders

A Prospector system uses either 4 OBC transponders or 4 LRT transponders to provide wide area seabed positioning
ROV Installation
ROV equipped with a Prospector transceiver and remote transducer

Diver Navigation

A diver takes a position fix using his Prospector remote transducer



Introduction

Prospector uses a GPS calibrated network of low cost transponders to provide high accuracy absolute positioning over a wide area. Prospector can track one surface and one underwater mobile object, such as an ROV, diver, towfish or Autonomous Underwater Vehicle (AUV). This is combined with the minimum of vessel mounted hardware and easy to use software.

Key Features

- Low cost system
- Quick to deploy
- Easy to calibrate
- Highly accurate

Some of the many tasks that Prospector can be used for include; underwater inspection, debris searches, mapping, inshore construction work, ordnance clearance, marine salvage assessment, marine biology surveys and marine archaeology.

This simplified acoustic system is extremely easy to use and yet brings the inshore diver and ROV operator the same advanced Sonardyne technology used to save time and money in most of the world's offshore oilfield developments.

Four acoustic transponders are deployed on the seabed with surface or sub-surface floats to form an underwater navigation network with each transponder being deployed at one corner of a square. The positions of these four transponders are then calibrated by sailing the vessel briefly around the square (typically in under 20 minutes).

Once calibrated, the transponder array may be used to position a diver or ROV. Since both the boat's position and the diver's or ROV's position are known, referenced to DGPS data, Prospector can track both objects simultaneously to a high degree of accuracy, in water depths from less than 5 metres to 500 metres.

During tracking operations the positions of both the boat and the diver or ROV are shown on a chart display. The chart also shows the position of the four transponders, any waypoints, position fixes or survey lines and can also show a background chart. All of the tracking information such as measurements and positions are recorded for replay.

Prospector System Overview

Remote Transducer

The remote transducer transmits and receives acoustic signals. It is typically held by a diver or floats free above him

Prospector Transceiver

Transceiver electronics module. This is fitted to the diver's backpack or ROV. Cables connect it to the surface and remote transducer



System Overview

The components of a Prospector system are an acoustic transceiver, Surface Interface Unit (or SCU), four transponders and Windows-based software. A computer and Global Positioning System (GPS) receiver are also required. All the equipment is supplied in a rugged case for ease of transport and storage.

Transceiver

The transceiver is the electronics module that is fitted to the diver or ROV. A connector on one end of the unit provides power and communication to the SIU while the other connector is used to attach the acoustic transducer. The transducer is the part that actually transmits and receives the acoustic signals. The transceiver's transducer sends an acoustic interrogation signal to a transponder through the water and receives an acoustic reply signal back from the transponder. By measuring the time between sending the interrogation and receiving the reply the transponder's distance can be determined.

Surface Interface Unit (SIU)

The SIU provides power and a communications link between the transceiver and the computer running the Prospector software. The SIU connects to the transceiver over a long cable fitted with a waterproof connector and to the computer using a USB link. Four additional serial ports are included that can be used to connect to external instruments.

Transponders

Prospector is compatible with either OBC or LRT transponders (see Pages 10 and 11). These can be deployed in a maximum water depth of 500 metres and either mounted in fixed seabed stands or supplied with release hooks for easy recovery on the surface.

Computer and Software

The computer running the Prospector software connects to the SIU using a serial communications cable. The software on the computer talks to the transceiver via the SIU sending it commands to make it measure

acoustic ranges to transponders. The software also takes the range measurements made by the transceiver and calculates the position of the transceiver from them. The boat, the transponders and a chart of the working area can be displayed on the computer's monitor.

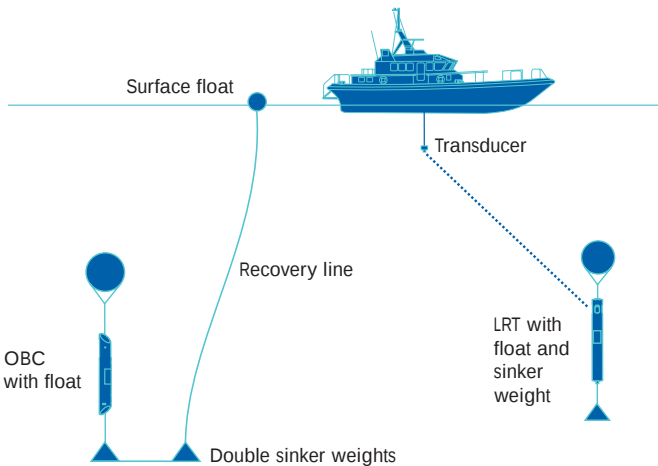
Global Positioning System (GPS) Receiver

Positions from a Global Positioning System (GPS) receiver are used when determining or 'calibrating' the positions of the transponders just after they have been deployed. The GPS receiver is fitted to the boat and provides position measurements in real-world co-ordinates. The GPS receiver connects to the SIU via a serial port.

Prospector

System Specifications

Transponder Deployment
Typical seabed deployment methods for OBC and LRT transponders



Transponder Frame
Preparing to deploy an LRT in a seabed transponder frame



Prospector Installation
A diver prepares to enter the water equipped with a Prospector transceiver



System Performance

General	
Transponder Array Size	500 Metres x 500 Metres (Maximum)
Accuracy	300mm Absolute, 100mm Relative (The accuracy of positions obtained by the system is dependant on the accuracy of the initial array calibration, itself dependant on the quality of the surface positioning instruments)
Tracking	Supports tracking of one surface vessel and one umbilical connected subsea target

Transceiver

Type Number	7832-000-05
Depth Rating	500 Metres
Operating Frequency	Sonardyne HF (35-55kHz)
Transducer Type	Remote Omni-Directional (Cable connected to Transceiver)
Transmit Source Level	190dB re 1µPa at 1 metre
Power	24-48V DC (From SIU or SCU)
Communications	RS485
Mechanical Construction	Anodised Aluminium Alloy and Plastics
Dimensions (LxDia)	500mm (19.7") x 145mm (5.7")
Weight in Air	Transceiver 2.1Kg, Remote Transducer 0.5Kg
Weight in Water	Transceiver 1.3Kg, Remote Transducer Floats

Surface Command Unit (SCU)

Refer to Page 04 for specification

Surface Interface Unit (SIU)

Refer to Page 04 for specification

Homer-Pro

Diver Based Target Relocation

Homer-Pro Display

The Homer-Pro display provides range and direction information so that a diver can swim directly towards the target



Target Selection

Selecting the address of a transponder to home into

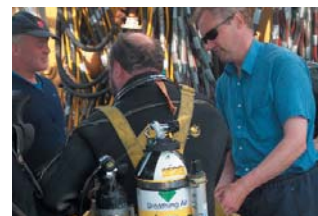


Target Relocation

A diver pointing a Homer-Pro towards the target he wants to relocate

Diver with Transponder

Homer-Pro can be used to relocate any target equipped with a transponder, even other divers



Introduction

Homer-Pro enables divers to quickly and easily relocate targets in low and zero visibility from over 750 metres distance. By using small acoustic transponders to mark points of special interest, for example, tools, wrecks, pipelines etc., a diver can swim directly to a location, thereby reducing wasted dive time.

Key Features

- Small and lightweight
- Easy to use
- Fast, simple target relocation of points of interest; pipes, tools...
- Saves time and money on diving operations
- Compatible with Association of Offshore Diving Contractors (AODC) transponders

Homer-Pro comprises of a diver held relocation device and low cost marker transponders which are deployed at the target locations. Each transponder has its own unique 'address' code, enabling a number of targets in a small area to be marked and relocated unambiguously.

When the diver wishes to relocate an object fitted with a transponder, he switches on his handheld unit and selects the address of the transponder he wishes to relocate. The diver's unit then sends out an interrogation signal to the transponder selected. If the transponder is in acoustic range of the diver's unit then it will automatically reply. From the reply the diver's unit calculates the distance in metres and direction to the transponder. The range and direction information is displayed to the diver enabling him to be guided directly towards the object.

A diver changes the address of the transponder he wishes to home to by using a single push button switch. To save time in switching between targets, the diver's unit can be pre-programmed with only the addresses of the transponders that are likely to be encountered during the dive. The diver's unit contains a Ni-Cad battery which must be charged before diving.

Designed for commercial and amateur divers, Homer-Pro can also be used as a cost-effective survey tool for accurately measuring distances of up to 750 metres.

ROV-Homer

Low Cost ROV Guidance

ROV Range and Direction Unit

The ROV-Homer range and direction unit allows ROV pilots to fly directly towards targets equipped with a transponder



ROV Installation

The ROV unit is accurately aligned with the ROV's heading sensor
Depth ratings to 12,000 metres
For ultra deep applications a 12,000 metre rated system is available. Shown here is a titanium transponder



Introduction

ROV-Homer is a miniature range and direction guidance system for small or large ROVs. Based on proven acoustic principles, it is specifically designed for fast, efficient relocation of underwater targets such as lost diving bells, divers, seabed equipment or small objects.

It enables points of interest to be marked with an acoustic transponder so that an ROV pilot can be guided straight back to the target even in zero visibility. The system helps reduce search time and therefore operating costs.

Key Features

- Low cost ROV guidance system
- Saves time and operating costs
- Allows operation in zero visibility
- Depth ratings to 12,000 metres
- Critical point marking; tools, valve heads, pipelines...
- Emergency relocation; divers, diving bells, ROVs...

The system consists of an ROV mounted range and direction unit, PC control software and transponders which are attached to the targets that need to be relocated. Once the pilot has selected the target he wishes to home into, the ROV unit begins interrogating the designated transponder to determine its range and direction. This information is communicated back to the surface, via the ROV's umbilical, and is displayed on the user's PC. The software indicates the range to the target and in which direction to turn in order to fly the ROV directly towards the selected transponder.

The ROV mounted unit is accurately aligned with the ROV's heading sensor and is connected to spare cores either on the ROV's umbilical or to the ROV's communications multiplexer. The electronics inside the unit incorporate power regulation, an RS232 interface and a microprocessor, all of which are galvanically isolated from the ROV's electrical system.

A 12 to 24V DC power supply is connected via the same connector. On smaller ROVs which do not have communications multiplexers, and therefore cannot support RS232, an RS485 interface can be provided.

The standard depth rating of the ROV unit is 4,000 metres. This allows the system to be used with either the 500 metre range of transponders or the deeper rated Type 7835 transponder which is also depth rated to 4,000 metres. For ultra deep water applications a 12,000 metre titanium version of the system is available.

Coastal Transponders

OBC, LRT and LAT

OBC Transponder

The OBC transponder is a low cost transponder suitable for use with any of the Coastal Acoustics systems



Ocean Bottom Cable Transponder (OBC)

The OBC transponder has been designed for very low cost applications where size and weight are important operational factors. It's the ideal choice for attaching to towfish, underwater structures, diving bells and instrumentation packages so that they can be tracked or relocated using any of the Coastal Acoustics tracking and relocation systems.

Key Features

- Versatile, low cost transponder
- Depth rated to 500 metres
- Compact and rugged design
- Alkaline battery packs give up to 18 months listening life
- Compatible with AODC emergency channels

Lightweight Release Transponder (LRT)

The LRT is a combined positioning and acoustic release transponder depth rated to 500 metres



Lightweight Release Transponder (LRT)

The LRT is similar to an OBC transponder but incorporates an acoustic release mechanism for added flexibility. This allows the transponder to be deployed on the seabed with a sinker weight to hold it down and a buoy to keep it upright.

By sending a special command from surface, the transponder releases the sinker weight and floats to the surface for recovery.

Key Features

- 125Kg Safe Working Load
- Depth rated to 500 metres
- Up to 4 years listening life with lithium battery pack
- Thousands of secure identities
- Reliable, screw off release
- Optional 75 metre rope canister

LRT with optional Rope Canister

The LRT Rope Canister is packed with 75m of high strength rope to allow seabed items to be pulled up



Screw-off Release

The LRT features a highly reliable 'screw-off' release mechanism

LRT System

LRT Deck Unit, dunking transducer, LRT with rope canister and float



The unique design of the 'screw-off' mechanism ensures a positive release action that overcomes any biological growth.

Unlike similar low cost release transponders, the LRT has both receive and transmit functions, enabling accurate slant ranges to be measured, release actuation to be confirmed and position to be determined.

All external parts are made of high strength plastics that provide excellent corrosion resistance whilst field replaceable alkaline or lithium battery packs give a listening life of 18 or 52 months.

As with the OBC transponder, LRTs can be used with any of the Coastal positioning and tracking systems.

Remote Actuation

Activating the inflation of a buoyancy bag is just one use for a Lightweight Actuation Transponder

Lightweight Actuation Transponder (LAT)

LATs provide wireless control of subsea devices. Its signal output can be configured to suit customer electronics

LAT Connector

The LAT features a rugged underwater connector that ensures reliable actuation of devices

Deck Unit

Testing an LRT on the back deck prior to deployment



LRT Rope Canister

An optional attachment for the LRT is a rope canister that allows items left on the seabed, for example, tools, cables and salvage, to be quickly and easily hauled up.

It works by mooring one end of the rope to the item on the seabed and the other end to the LRT via the attached canister of rope. As the transponder ascends to the surface, high strength rope is deployed from the canister. This line can then be used to pull up the item directly or retrieve heavier tag lines.

OBC/LRT Deck Unit

OBCs and LRTs are commanded using a small deck unit and dunking transducer. The unit is used initially to program the acoustic identity of the transponder, test it and load the release prior to deployment. Once deployed, it can be used to measure ranges to the transponder to relocate it and in the case of an LRT, send release commands. The deck unit can also be controlled via RS232 enabling raw range data to be logged to PC.

Lightweight Actuation Transponder (LAT)

The Lightweight Actuation Transponder (LAT) provides a simple yet reliable way of controlling subsea electrical equipment wirelessly. Applications for the LAT include activating the inflation of buoyancy bags and opening or closing valves. The LAT can also be interrogated from the surface to determine its position on the seabed and provide confirmation of electrical activation.

Key Features

- Commands and controls subsea devices
- Configurable signal output
- Robust underwater connector
- Depth rated to 500 metres
- Long battery life

The output from an LAT can be configured to provide multi-width and multi-pulse electrical outputs to suit a wide range of requirements.

A rugged underwater connector ensures reliable activation whilst all external parts are made from high strength plastics that provide excellent corrosion resistance.

An LAT is remotely controlled from the surface using the same deck unit as OBCs and LRTs. This allows the user to program the acoustic identity of the LAT from several thousand available and then test the unit prior to deployment.

Once in the water, the deck unit can measure ranges to the transponder and after sending a secure actuation command, relocate the transponder.

Coastal Transponders

Specifications

Ocean Bottom Cable Transponder (OBC)

Type Number	7815
Depth Rating	500 Metres
Operating Frequency	Sonardyne HF (35-55kHz)
Transmit Source Level	184-187dB
Receive Sensitivity	105-115dB re 1μPa at 1 metre
Number of Unique Addresses	3609 (Field programmable)
Switch On	Continuously operating (No On/Off switch)
Battery Life	Alkaline: 18 months
Mechanical Construction	Plastic and Anodised Aluminium Alloy
Dimensions (LxDia)	442mm (17.4") x 63mm (2.48")
Weight in Air	1.1Kg
Weight in Water	0.75Kg
Deck Unit	Type 7967-000-02 (Includes transducer and 10 metres of cable)

Lightweight Release Transponder (LRT)

Type Number	7986
Depth Rating	500 Metres
Operating Frequency	Sonardyne HF (35-55kHz)
Transmit Source Level	185dB re 1μPa @ 1 metre
Receive Sensitivity	<110dB re 1μPa
Number of Unique Addresses	3609 (Field programmable)
Switch On	Continuously operating (No On/Off switch)
Battery Life	Alkaline: 18 months Lithium: 34 months Long Life Lithium: 52 months
Safe Working Load (at 4:1 ratio)	125Kg
Release Load	125Kg
Breaking Load	500Kg
Proof Load	250Kg (Note: A Proof Test Certificate can be provided upon request)
Mechanical Construction	Plastic, Stainless Steel and Anodised Aluminium Alloy
Dimensions (LxDia)	490mm (19.3") x 63mm (2.48")
Weight in Air	1.75Kg
Weight in Water	0.4Kg
Options	75 Metre or 100 Metre Rope Canister (Longer lengths available upon request)
Deck Unit	Type 7967-000-02 (Includes transducer and 10 metres of cable)

Lightweight Actuation Transponder (LAT)

Type Number	8044
Depth Rating	500 Metres
Operating Frequency	Sonardyne HF (35-50kHz)
Transmit Source Level	185dB re 1μPa @ 1 metre
Receive Sensitivity	<110dB re 1μPa
Number of Unique Addresses	3609 (Field programmable)
Switch On	Continuously operating (No On/Off switch)
Battery Life	Alkaline: 18 months Lithium: 34 months Long Life Lithium: 52 months
Max Actuation Current	120mA increasing with shorter pulse widths (Higher currents available)
Actuation Pulse Voltage	10-15V DC
Actuation Pulse Width	2 seconds typical (Other options available upon request)
Actuation Pulses per Command	1 typical (Other options available upon request)
Total Number of Actuations	100,000 (2 seconds @ 1mA)
Connector Type	8 way Sub con MCBH8FAL/2-0 Bulkhead Female
Mechanical Construction	Plastic, Stainless Steel and Anodised Aluminium Alloy
Dimensions (LxDia)	490mm (19.3") x 63mm (2.48")
Weight in Air	1.75Kg
Weight in Water	0.4Kg
Deck Unit	Type 7967-000-02 (Includes transducer and 10 metres of cable)

Head Office

Sonardyne International Limited
Blackbushe Business Park
Yateley, Hampshire
GU46 6GD United Kingdom

T. +44 (0) 1252 872288
F. +44 (0) 1252 876100
E. sales@coastal-acoustics.com
www.coastal-acoustics.com

Agent ID: