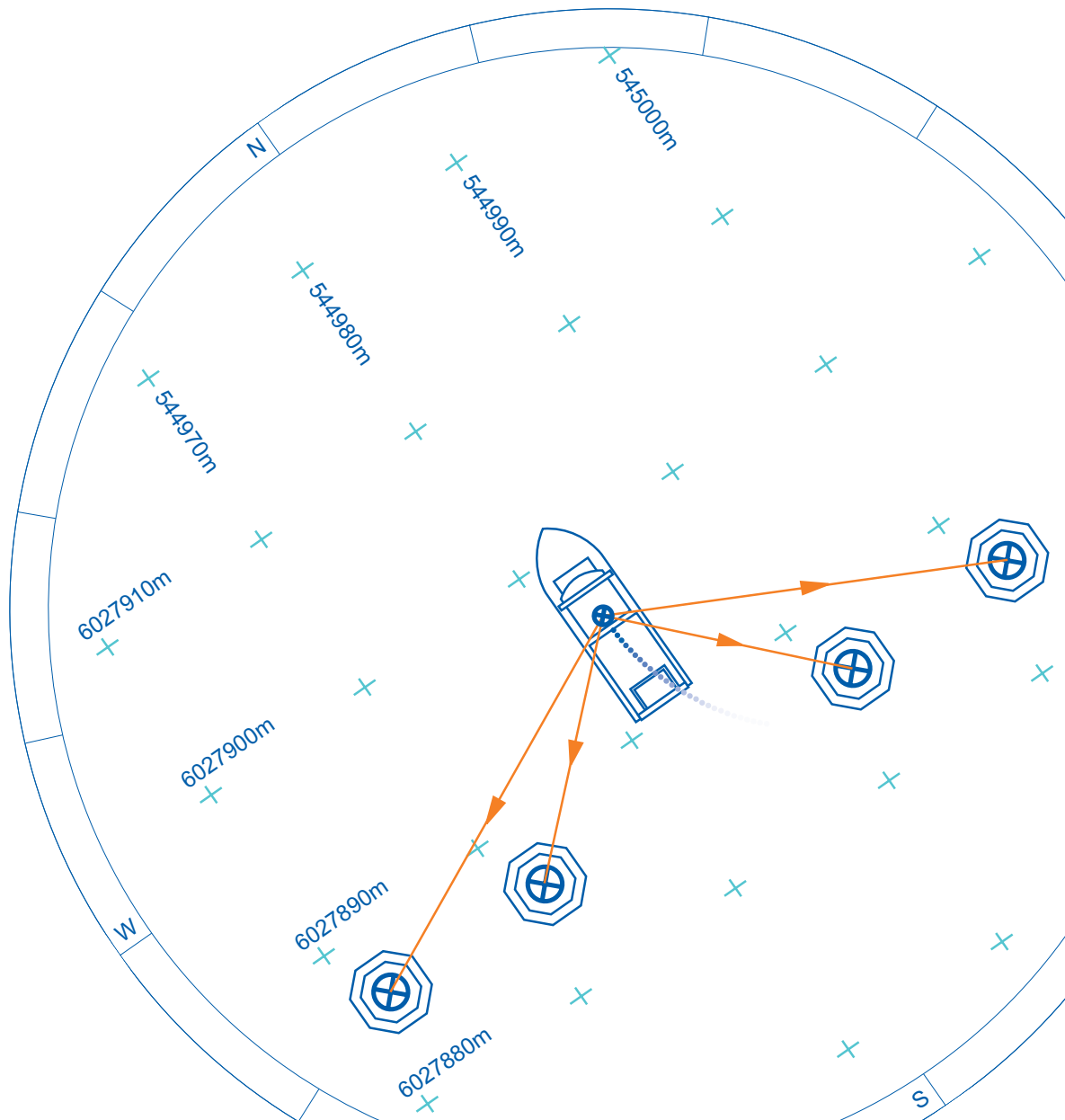




Ranger USBL

Acoustic Positioning System for DP Reference and Survey



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Ranger USBL DP and Target Tracking

Dynamic Positioning

(Below and Middle) Ranger USBL provides stable and repeatable acoustic position referencing for DP applications

and can be interfaced to all industry standard DP systems including Converteam, Kongsberg and MT

ROV and AUV Tracking

High accuracy tracking of ROVs and AUVs is just one application for Ranger USBL



Introduction

Ranger USBL system is a high performance, high accuracy Ultra-Short BaseLine acoustic positioning system designed for Dynamic Positioning (DP) reference and survey operations.

The system provides an operating range of up to 4,000 metres and is ideal for operators with limited experience of USBL systems or who are unlikely to ever undertake complex subsea positioning and tracking tasks. The intuitive user interface means that Ranger is easy to learn, set-up and operate ensuring immediate success.

Two versions of the system are available allowing operators to choose the application that best suits their needs.

Ranger is designed for DP reference and general target tracking of ROVs and towfish. Up to four targets can be tracked simultaneously to ranges of 2,000 metres. The system supports a wide range of industry standard telegrams and is compatible with Sonardyne's Wideband Sub-Mini, DPT, AODC and Compatt 5 range of subsea transponders.

Ranger Pro is designed for more advanced survey applications. Incorporating Sonardyne's unique 'ping stacking' technology, the system offers fast position update rates (one second independent of water depth), tracking of up to 10 targets and full ocean depth operating range (4,000 metres). Ranger Pro also supports many more Sonardyne and non-Sonardyne medium frequency transponders.

A feature available in both Ranger and Ranger Pro is the ability to undertake Inverted USBL (iUSBL) tracking of towfish over super-long laybacks. Rather than mounting the USBL transceiver on the vessel in the traditional manner, with iUSBL the transceiver is installed on the towed body itself.

This method eliminates the need for repeated system calibration, whilst the accuracy and repeatability of the acoustic signals is improved as the transceiver is located in a low noise, dynamically stable environment.

As Ranger systems share the same topside hardware as Sonardyne's most advanced USBL system, Fusion, users can easily and cost effectively upgrade their capabilities as their experience and requirements grow.

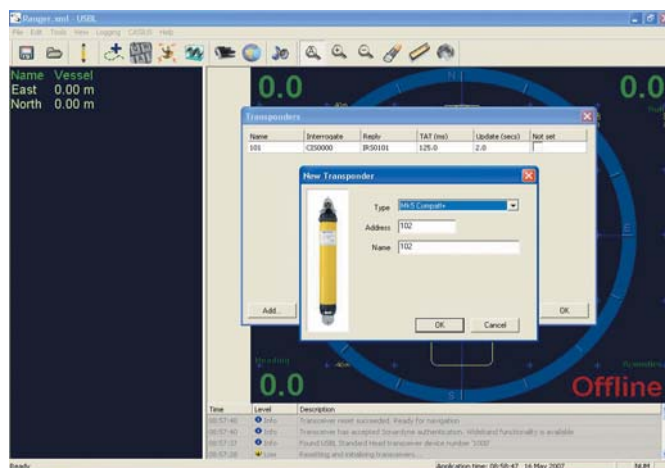
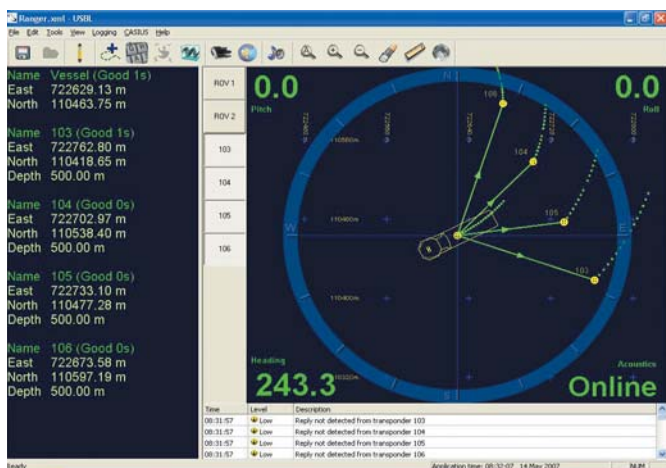
Ranger USBL System Overview

Ranger Software

Ranger software is simple to learn, set-up and operate and rewards the user with immediate success

Transponder Set-up

Adding transponders to a job is simple and once the system is configured, tracking can be turned on or off with a single click



System Overview

Ranger and Ranger Pro systems are comprised of four main components; a rack-mounted or portable Data Fusion Engine, control software, acoustic transceiver and seabed or vehicle mounted transponders.

Data Fusion Engine

The Data Fusion Engine is the heart of the system and is an integrated PC and acoustic processor platform running Ranger software. The unit is designed to meet the complete on-board hardware requirements of any acoustic operation thereby eliminating the need to install and set-up separate systems to meet different acoustic positioning scenarios. As the user's requirements grow, this one-box solution can be upgraded from a Ranger system through to a deep water Fusion USBL system and ultimately a Fusion LBL system able to undertake complex subsea construction survey tasks.

The Navigation Controller Unit (NCU) is the interface between the acoustic instruments, sensors and

the Navigation Computer. In addition to accurately time stamping incoming data from external devices such as GPS, VRU and gyro, the NCU also provides power and communications for ship-borne acoustic transceivers.

The Navigation Computer is a powerful, marine-proven PC that is used in conjunction with the Navigation Controller Unit. Features include front-mounted USB ports for when access to the rear of the unit is restricted by rack mounting and dedicated monitor power supply.

Software

Both versions of Ranger are based upon a common software application that is easy and intuitive to use requiring only basic operator training to become familiar with it.

During set-up, the system automatically identifies the type of transceiver connected to the system and configures it accordingly. Multiple attitude, heading and

position instruments can be added in a simple I/O ports page which provides feedback on the operation of all inputs and outputs. Instruments are shown in green if working and red if not.

Adding transponders to a job is simple and once the system is configured, tracking can be turned on and off with a single click. In the event of a power failure, the only action the user needs to take to get the system tracking again is to restore power. The application will start the Navigation Computer and automatically restart tracking the transponder it was tracking before power was lost.

A key design principle of the UI is that an operator can assess the operation of the system at a glance from across the bridge. For example, positions are displayed in either: green for a good position with update rate, yellow for a good range but bad USBL signal therefore no position computed, red for no reply to the interrogation and finally grey to indicate no information has

Data Fusion Engine

The heart of a Ranger USBL system; an integrated PC and Navigation controller running Ranger software

Ranger USBL Transceivers

Ranger systems are supplied with a Type 8021 transceiver although existing Scout USBL users can opt to use the system with a Type 8024 transceiver



been received for more than twice the update rate.

For advanced tracking of up to 10 targets with the maximum position update rate, Ranger Pro incorporate Sonardyne's unique 'ping stacking' technology, originally developed for ultra deep water drilling operations. This technique allows the system to transmit acoustic interrogations from the transceiver to the transponders before the last reply was received. This enables the system to maintain position update rates of better than one second in any water depth.

All Ranger software includes an extensive array of tools to allow the user to optimise the performance of the system. These include utilities to measure acoustic noise, a signal analyser to filter out a specific transponder's signal and a comms viewer to monitor any NCU or serial port. To correctly calibrate gyro and VRU offsets and therefore improve positioning accuracy, Sonardyne's CASIUS calibration tool is also included.

Ranger USBL Transceivers

The most popular transceiver for use with Ranger and Ranger Pro is the Type 8021, an all purpose MF frequency unit proven for general survey and DP operations where tracking could be at shallow angles or straight up and down.

For high noise environments, the Type 8023 transceiver is optimised to receive signals arriving within a $\pm 50^\circ$ cone. Any noise generated outside of this area, for example by thrusters, is attenuated therefore improving the signal to noise ratio and so the positioning accuracy. In practise, this has been proven to allow the accurate positioning of the noisiest vessels.

To optimise tracking of targets at shallow angles, such as long range towfish tracking, a tilt adaptor can be used with both Type 8021 and Type 8023 transceivers. The advantage of this is that the target being positioned remains within the optimal operating envelope of the transceiver thereby maintaining positioning performance.

Ranger Pro is also compatible with Type 8024 USBL transceivers, an HF frequency transceiver originally designed for use with Sonardyne's shallow water USBL system, Scout. Now the same transceiver can be used with Ranger Pro topside equipment, therefore providing existing Scout users with a cost effective upgrade path to a deep water USBL system.

Transceiver Deployment Machines

The performance of any USBL system is greatly affected by the mounting of the transceiver. Sonardyne has extensive experience in both through-hull and over-the-side deployment and can assist clients with the selection of the right solution for their vessel. Full details are contained within our dedicated USBL Transceiver Deployment Machine brochure.

Ranger USBL Transponder Options

Wideband Sub-Mini (WSM)

(Below and Right) The WSM is Sonardyne's new sub-mini transponder and incorporates the latest Wideband acoustic signalling technology

Dynamic Positioning Transponder (DPT)

(Below) The DPT is a full size transponder designed for DP reference and large target tracking

Back Deck Testing

(Below and Left) Both the Pocket Test Terminal and Deck Test Unit (DTU) are available for testing DPT and Compatt 5 transponders



Wideband Sub-Mini

The Wideband Sub-Mini (WSM) is a new compact, rugged transponder/responder designed primarily to position ROVs, towfish and other small mobile targets. Available as a 1,000 metre rated omni-directional unit or 3,000 metre rated directional unit, WSMs have the option of a depth sensor for improved positioning accuracy.

In addition, WSMs support intelligent charging of its long-life NiMH battery, Windows-based set-up software, Sonardyne Wideband™ signals, tone frequencies and all HPR 300/HiPAP® channels. For applications requiring an acoustic release function, for example releasing a clump weight on a seabed instrument package, WSMs can be connected to an external mechanical release mechanism or conventional burn-wire release via their endcap connector.

Dynamic Positioning Transponder

The Dynamic Positioning Transponder (DPT) is a full sized

transponder designed specifically for seabed deployment or large target tracking. Available in 3,000 metre rated omni-directional or directional transducers, DPTs are equipped with a simple On/Off switch, rugged spring assisted release mechanism, depth sensors and advanced power and gain controls if required.

DPTs support Sonardyne Wideband™ signals, tone frequencies and all HPR 300/HiPAP® channels.

Compatt 5

Compatt 5 is Sonardyne's most advanced Wideband transponder designed to support complex LBL and USBL construction survey projects. Options include depth ratings to 7,000 metres, dual axis inclinometers, DigiQuartz depth sensors and the capability to interface to external equipment for data telemetry to the surface. See separate datasheet for full specifications.

Back Deck Test Units

WSMs and DPTs are supplied with PC utility software that allows users to set-up and program the transponders prior to deployment. For DPTs, a dedicated Deck Test Unit (DTU) or Pocket Test Terminal device is also available.

Supplied in a rugged portable case, the DTU is used initially to program the channel of the transponder, acoustically test the transponder in air and then load the acoustic release mechanism.

Pocket Test Terminal is a new truly portable test tool. Running on a dedicated iPAQ PDA platform, the Pocket Test Terminal software offers all the main features of the PC-based DPT Test Terminal software but from a small, portable, splash proof device. It is therefore ideal for taking on to the back deck to set-up and test DPTs prior to deployment.

Both the DTU and Pocket Test Terminal can be also used with Sonardyne Compatt 5 transponders.

Ranger USBL System Specifications

System Performance

General

Operating Range	2,000 metres (Ranger) 4,000 metres (Ranger Pro)
Acoustic Coverage	$\pm 90^\circ$ or $\pm 50^\circ$ (Depending on transceiver type)
Accuracy	0.27% 1 Drms Slant Range (63% of fixes within 2.7 metre radius in 1,000 metres water depth) or 0.20% 1 Sigma Slant Range (39.4% of fixes within 2 metre radius in 1,000 metres water depth) (Note: The absolute accuracy of the system is dependent upon the quality of attitude and heading sensors, beacon source level, vessel noise, water depth, the mechanical rigidity of the transceiver deployment machine and proper calibration of the total system using CASIUS)
Tracking	Supports tracking of 1 surface vessel and 4 subsea targets (Ranger) Supports tracking of 1 surface vessel and 10 subsea targets (Ranger Pro)
Maximum Update Rate	1 second, independent of water depth (Ranger Pro only)

Transceiver

Type Numbers	8021	8024
Operating Frequency	MF (18-36kHz)	HF (35-55kHz)
Ranging Accuracy	Better than 0.2 metres (0.03 metres Wideband)	Better than 0.2 metres
Positioning Repeatability	Better than 0.1% of slant range 1 Drms	Better than 0.1% of slant range 1 Drms
Deployment Method	Through-hull or Over-the-Side	Through-hull or Over-the-Side
Dimensions (LxDia)	410mm (16.14") x 225mm (8.86")	489mm (19.25") x 160mm (6.3")
Weight in Air	28kg	18.9kg
Weight in Water	13.5kg	8.9kg

Ranger USBL Transponders

Type	Wideband Sub-Mini (WSM)	Dynamic Positioning Transponder (DPT)
Description	A small transponder with some limited downlink capability and optional release outputs	A full size transponder designed for seabed deployment and large target tracking
Depth Rating	1,000 metres (Omni-Directional transducer) 3,000 metres (Directional transducer)	3,000 metres (Omni or Directional transducer)
Positioning	USBL compatible <ul style="list-style-type: none"> • Sonardyne Wideband™ and Tone • HRP400 	USBL compatible <ul style="list-style-type: none"> • Sonardyne Wideband™ and Tone • HRP400
Telemetry	Configurable command downlink <ul style="list-style-type: none"> • Enable/Disable • Release 1,2 etc Equipment status uplink via serial port	High-speed up and downlink (1,500bit/s)
Serial Interface	Test and set-up	Test and set-up
Sensors	Depth (Optional)	Tilt Depth Temperature
Release Options	Separate Sonardyne release mechanism output via connector Burn-wire release output	Integrated mechanical release mechanism Separate release output via connector Burn-wire release output
External On/Off Switch	Yes	Yes
Battery Life (Listening)	60 days NiMH rechargeable	833 days Alkaline 1390 days Lithium
Dimension (LxDia)	Omni = 399mm x 69mm Directional = 407mm x 89mm	1035mm x 135mm

Navigation Controller Unit (NCU)

See separate datasheet for full specifications

Navigation Computer

See separate datasheet for full specifications



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