

QUICK START GUIDE



Sonardyne
SOUND IN DEPTH






Mini-Ranger 2

Version

Options

- DP-INS
- LUSBL
- ✓ Multi-AHRS
- Riser Profiling
- Backdrops

- Dual Redundant
- MRAMS
- Multi-User
- ✓ USBL



Loading Job

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MINI-RANGER 2 USBL SYSTEM



SAFETY & SUPPORT

Before any activity is carried out on the equipment, it is recommended that the included Sonardyne Safety Manual and all warnings and cautions in this and the equipment manual(s) are read and fully understood. It is recommended the operator complies with the Health and Safety Regulations applicable to the vessel and the region before operating this equipment.

Operators and service personnel must be familiar with the normal operating and safety procedures for subsea equipment.

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

If any additional equipment is used, any warnings and cautions in the equipment user manual must be read and fully understood and the equipment must only be used as specified by the manufacturer.

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

WARNINGS

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

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

Make sure the equipment is clean and dry before removing the connection cover and connecting any cables.

PRODUCT SUPPORT

Email: support@sonardyne.com **Telephone:** +44 (0) 1252 872288

24 Hour Emergency Helpline: +44 (0) 1252 877600

The Sonardyne 24 hour helpline is answered during normal UK office hours: 08:00–17:00. Outside these hours, your call is automatically transferred to an operator who will log the details of your emergency and alert the appropriate Sonardyne personnel. Our aim is to ensure that emergency requests are dealt with immediately during office hours and are responded to within 30 minutes at all other times. Alternatively, please contact your nearest Sonardyne Office.

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To view third party and open source software licence notices for Mini-Ranger 2, see UM-8245 "Mini-Ranger 2 USBL User Manual".

ABOUT THIS QUICK START GUIDE

Mini-Ranger 2 is an Ethernet-only connected system using the Ethernet Serial Hub (ESH) with an HPT 3000 transceiver and WSM 6+ transponder. This QSG covers the basic installation, configuration and troubleshooting of the system described in the following steps:

- Technical Description
- Hardware Description
- System Installation
- Mini-Ranger 2 Configuration
- Calibration
- Beacons
- Noise Plot
- Troubleshooting
- Definitions

RELATED PUBLICATIONS

For more information on the Mini-Ranger 2 system, refer to the following user manuals:

- UM-8245 "User Manual for Mini-Ranger 2" (included with Mini-Ranger 2)
- UM-8211 "User Manual for the ESH" (included with the ESH)
- UM-8142 "User Manual for Type 8212 HPT" (included with the HPT 3000)
- UM-8370 "User Manual for Type 8370 WSM 6+" (included with the WSM 6+)
- UM-8300-099 "User Manual for 6G Terminal Lite" (included on the 6G Utilities Disc)
- CASIUS User Manual (included in Mini-Ranger 2 Help)

INTRODUCTION TO MINI-RANGER 2

Mini-Ranger 2 is a portable survey-grade Ultra-Short BaseLine (USBL) system designed for inter-coastal operations up to 2000 m range and can be operated from any vessel type.

An extensive set of tools allows the system performance to be optimised, including real-time audio and visual signal and noise analysis graphs. Sonardyne's CASIUS calibration tool allows correct calibration of transceiver offset and orientation, improving positioning accuracy. The system shares the same transponders and software allowing a simple and cost effective upgrade path as requirements grow.

The ESH is the network interface between the in-water acoustic instrument, GNSS and the PC that runs the positioning software and provides power and communications for acoustic transceivers. The ESH supports responder trigger and 1PPS synchronisation across systems.

The HPT 3000 has an array ideally suited for high elevation tracking survey operations. The integrated Xsens Magnetic MTi-30 compass and dedicated Ethernet interface delivers a rapid install and track solution.

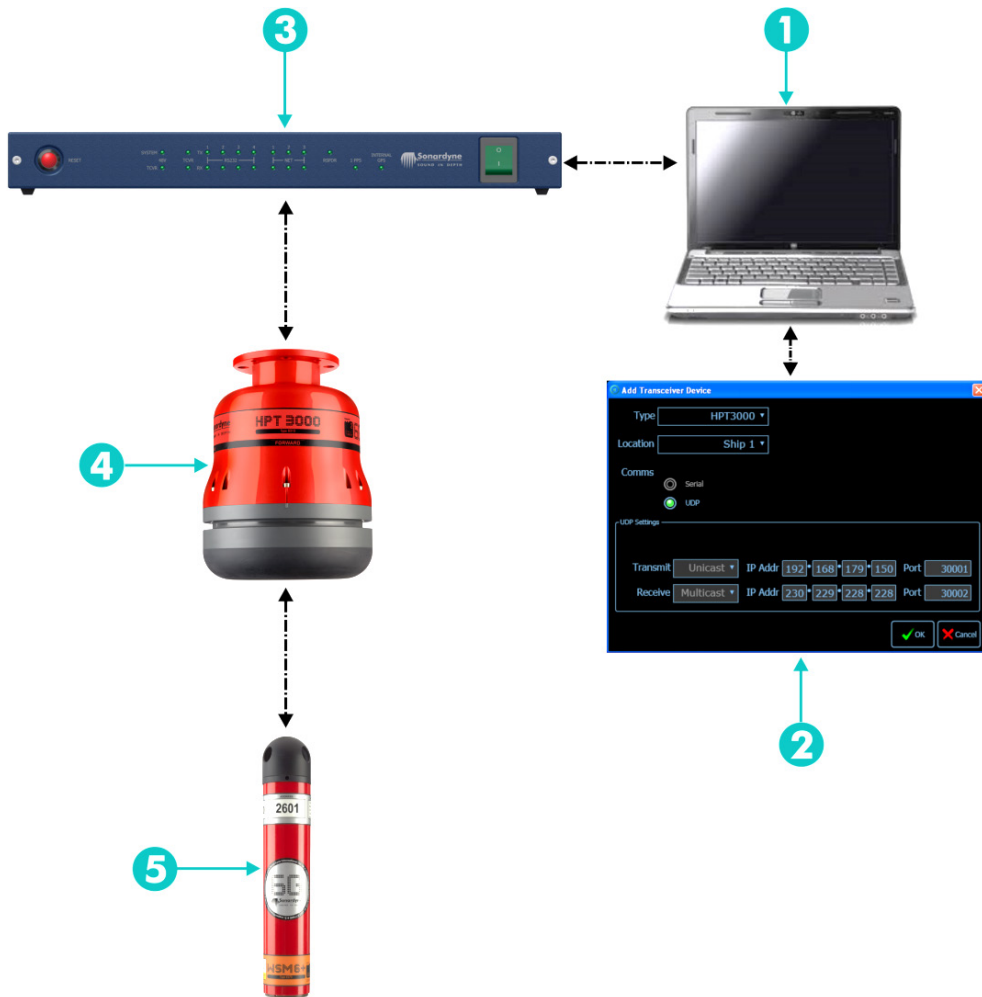
Mini-Ranger 2 operates using Sonardyne 6G[®] WSM6+ mini transponders using two-way Wideband[®] 2 signals and can track up to ten targets simultaneously, from hundreds of unique Wideband channels.

STEP 3

TECHNICAL DESCRIPTION

MINI-RANGER 2 SYSTEM EQUIPMENT

The system comprises of the following components.



- 1** PC (not supplied)
- 2** Ranger2 Software (supplied on DVD)
- 3** ESH and Cables
- 4** HPT 3000 USBL Transceiver
- 5** WSM 6+ (or appropriate beacon)
Software Security Key (not shown)

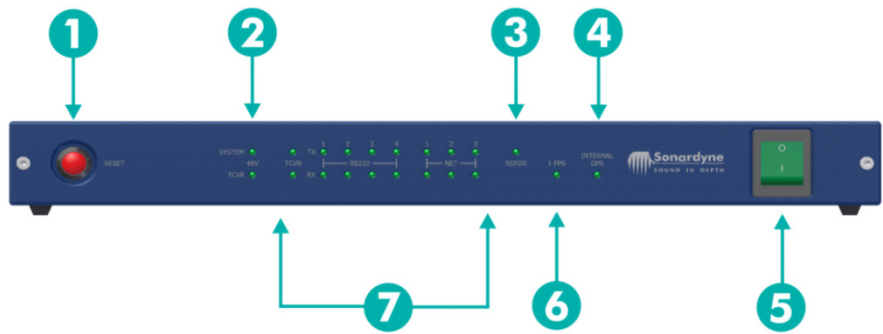
STEP 4

HARDWARE DESCRIPTION

ETHERNET SERIAL HUB

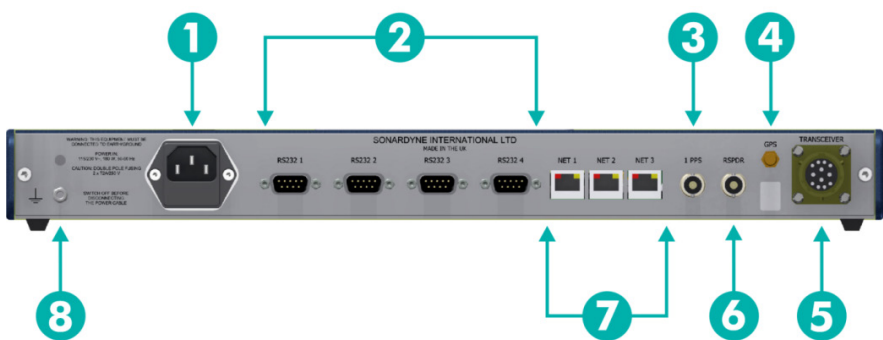
Refer to UM-8211 “User Manual for ESH” for more details.

FRONT



- 1 Reset Button
- 2 Transceiver Supply Status
- 3 Responder Activity LED
- 4 Internal GPS (GNSS) Activity LED
- 5 Power Button
- 6 1 PPS Activity LED
- 7 I/O Activity LEDs

REAR



- 1 IEC Socket 115/230 V AC
- 2 RS232 Serial Ports
- 3 1 PPS Input
- 4 External GPS (GNSS) Antenna Connection
- 5 48 V Transceiver
- 6 Trigger Responder
- 7 RJ45 Ethernet
- 8 Chassis Earth

HPT 3000 CONNECTION

Refer to UM-8142 “User Manual for Type 8212 HPT” for more details.



1 Cable Assembly CPN 820-6793 (30 m)
(Amphenol 62GB-57T14-12P to AGP-2108-M)

2 ESH

CABLE ASSEMBLY WIRING DETAILS

Amphenol Pin Number	Cable Core Colour	AGP Connector Pin Number	Function
F	Screen and Drains	1	Screen
Earth Ring			
J	Red	2	Power +
K	White	3	Ethernet Tx Data +
L	Blue	4	Ethernet Tx Data -
G	Green	5	Trigger
M	Black	6	Ground and Power Return
A	Orange	7	Ethernet Rx Data +
B	Yellow	8	Ethernet Rx Data -
H	Brown	N/C	

INSTALLING MINI-RANGER 2 SOFTWARE

Mini-Ranger 2 software has been tested on the Windows® 7 operating system. The recommended minimum PC specification to run this software is an Intel® Core i7 2.6 GHz processor, 4 GB RAM, 10 GB of free disk space and a graphics card with Direct-X V10 or later. The prerequisite Windows updates and .Net Framework are included on the installation DVD and are installed automatically.

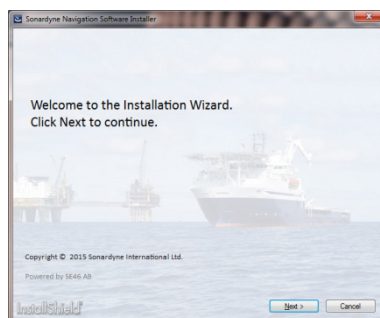
Refer to UM-8251 “Ranger 2 User Manual” for more information on installing and operating the software.

Notes



Previous versions of the software must be removed using ‘Add and Remove Programs’. The dongle security key must be installed on the PC when installing and operating the system.

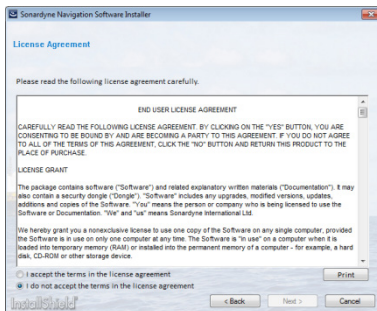
1. Insert the installation DVD and then navigate to and double-click **Setup.exe**
2. After the Windows Security window opens click **Install** to install the security key drivers.
3. After the security key drivers have finished installing, insert the security key into a USB port on the PC.
4. Click **Next** on the Installation Wizard window to start the installation.



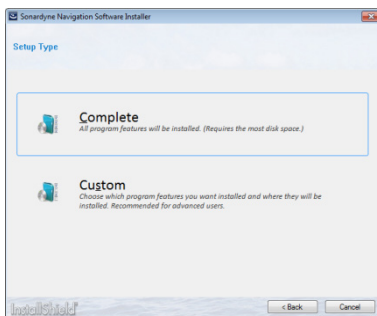
STEP 7

SYSTEM INSTALLATION

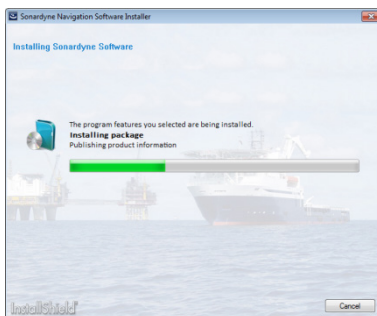
- Click **Yes** to accept the licence agreement



- Select either **Complete** (recommended) for a complete installation or **Custom** to install individual components.



- Click Next to start the installation. A progress bar indicates the installation progress.



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

STEP 8

SYSTEM INSTALLATION

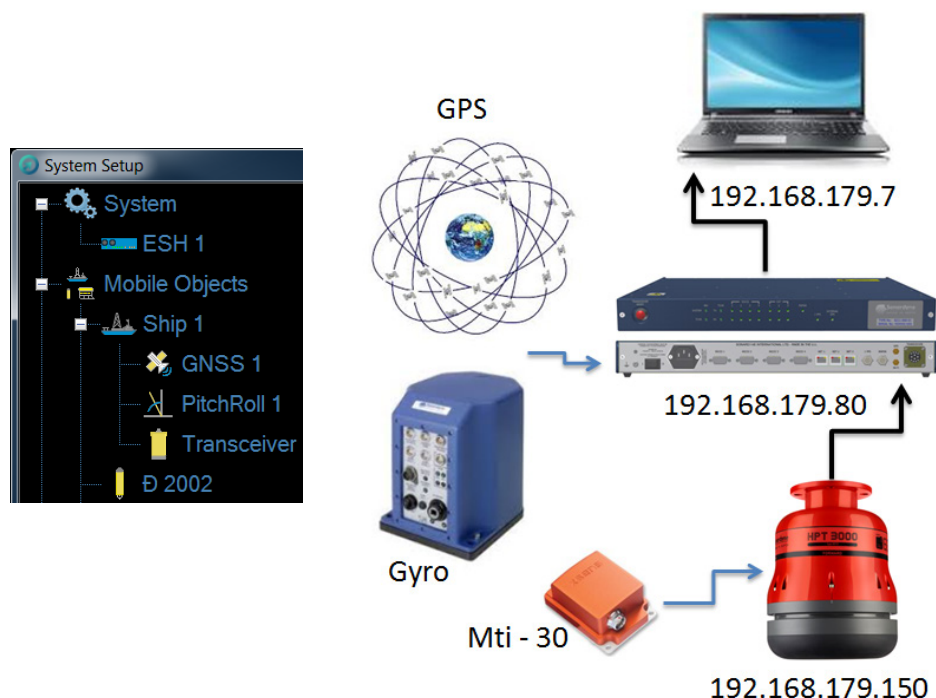
INSTALLING 6G TERMINAL LITE SOFTWARE

6G Terminal Lite software is included on the software utilities DVD. 6G Terminal Lite is a diagnostic tool for 6G instruments. It displays key information about the 6G instrument being interrogated serially and also allows for setup, diagnostics and testing prior to deployment.

Refer to the UM-8300-099 “User Manual for 6G Terminal Lite” for installing and operating 6G Terminal Lite.

TYPICAL SYSTEM SETUP

A typical system setup is shown below. The Mini-Ranger 2 System Setup window is shown on the left with objects configured in the job tree.



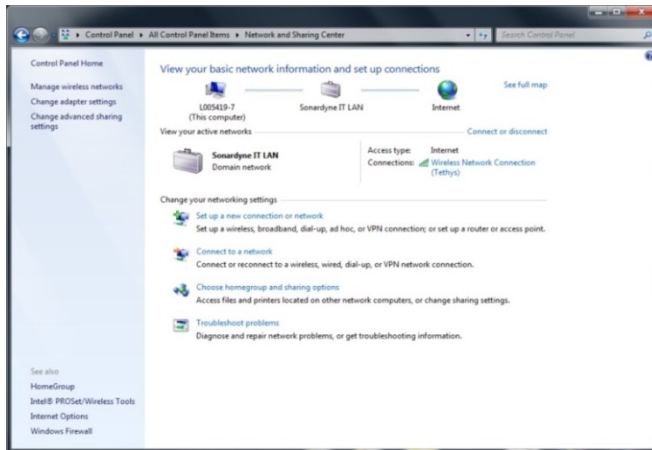
CONFIGURING THE NETWORK (PC AND ESH IP ADDRESS)

When the ESH is started for the first time, or if the non-volatile memory is restored to the factory settings for any reason, the ESH defaults to a static IP address of 192.168.179.80.

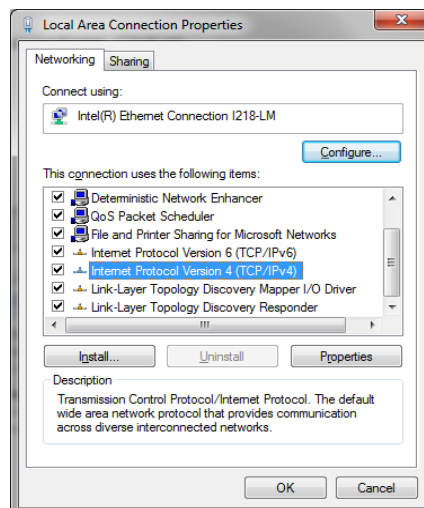
Before starting Mini-Ranger 2 software the PC connecting to the ESH must be configured with the correct IP address.

Windows® 7

1. Connect the ESH to the PC using an Ethernet cable.
2. On the PC, open the **Control Panel** and click **Network and Sharing Center**.



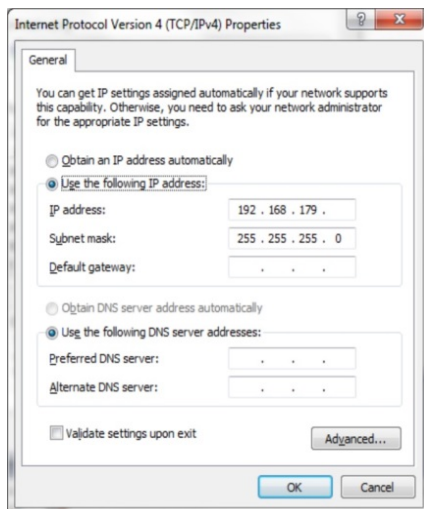
3. On the left pane, click **Change adaptor settings**, right-click the **Local Area Connection (LAN)** and then select **Properties**.
4. On the **Networking** tab, click **Internet Protocol Version 4 (TCP/IPv4)** and then click **Properties**.



STEP 10

SYSTEM INSTALLATION

5. Change the IP address to a static address: **192.168.179.X** (where X is any number between 1–255 except 50, 51, 80, 150 & 200 as these are used by other Sonardyne instruments).
6. Click **OK**.



7. The unidentified Local Area Connection will be displayed in the Network Connections.

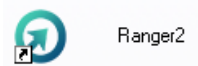
PERIPHERAL INSTRUMENT SETTINGS

The baud rates and string formats for the peripheral instruments such as GNSS and attitude sensor must be correctly configured.

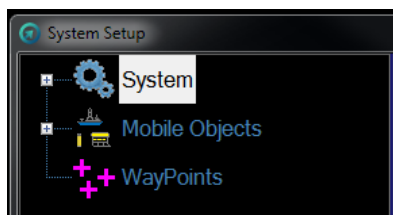
STEP 11 MINI-RANGER 2 CONFIGURATION

STARTING MINI-RANGER 2

Double-click the **Ranger 2** desktop icon to start the software.



For a new installation Mini-Ranger 2 displays the System Setup dialog box, which allows objects to be added to the empty setup in the job tree.



ADDING AN OBJECT

A mobile object can be added in one of two ways:

1. Click the **System > Setup** or the **System** button to open the **System Setup** window or,
2. Click the **Q-Track**, **Beacons** and **Ports** buttons to open the **Quick Track tool**, **Beacons Table**, **Communications Port Table** windows.



Mobile Objects

To add a Mobile Object to the job, right-click the Mobile Objects on the job tree and select from the context menu.

To add an instrument or an object to a vessel, right-click the vessel and select from the context menu.

Edit the objects and instruments as required for the operation. Interfacing an external Motion Reference Unit (MRU) like a Lodestar will greatly improve precision.

Beacons

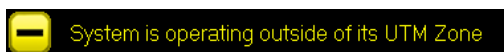
Beacons can be added using the Quick Track tool (for simple jobs with a small number of beacons) or the Beacons table (for multiple beacons/complex acoustic scheduling); see Section "ADDING A BEACON".

STEP 12 MINI-RANGER 2 CONFIGURATION

CONFIGURING A GNSS

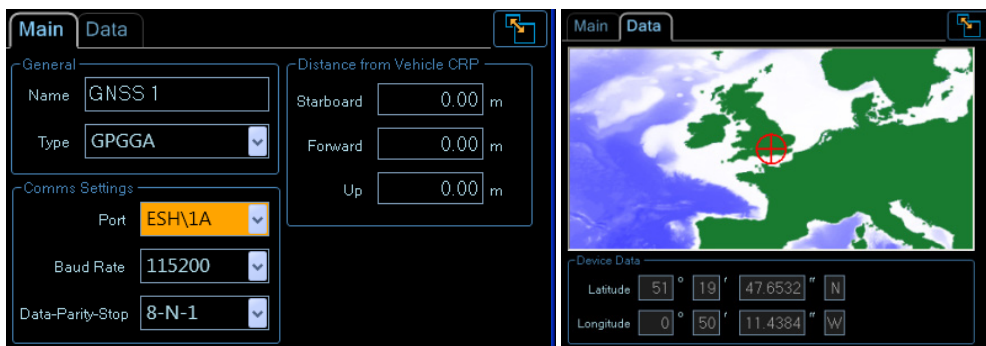
Connect a serial connector with a NMEA string into the rear ESH serial port from a GNSS such as \$GPGGA and confirm the position is being displayed. Port ESH/5A is hard-wired to a simple internal GNSS (that requires an antenna), which can be used for time synchronisation and basic positioning, see UM-8212 "User Manual for the ESH" for more information.

If you have moved UTM zones the warning shown below will appear and it is recommended you reinitialise the software at the new location so the UTM zone is established based on position or perform a reset: **Tools > Geodesy > Reset**.



On the job tree select the **GNSS**.

Ensure the position offsets from the antenna are entered relative to the Common Reference Point (CRP) at water level.



CONFIGURING THE TRANSCEIVER

On the job tree click the **Transceiver** and then click the **Main** tab.

The system communicates with the transceiver using the UDP addresses:

Transmit IP Address: 192.168.179.150 Port 30001

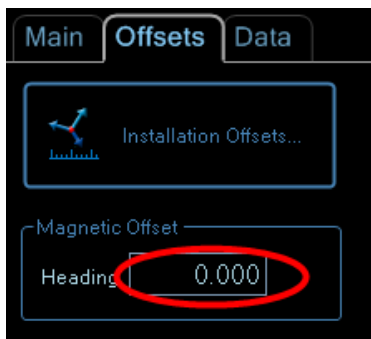
Receive IP Address: 230.229.228.228 Port 30002

The system can also be interfaced using 6G Terminal software – TCP address **192.168.179.150 Port 4000**.

STEP 13 MINI-RANGER 2 CONFIGURATION

Click the **Offsets** tab.

As the compass is mounted inside the head it is important to note that this is a magnetic compass and therefore requires a **Magnetic Offset** deviation value to be entered between true north and magnetic north.



On the **Offsets** tab click the **Installation Offsets** button.

The head can also be aligned to an external gyro. It is recommended that a CASIUS calibration is performed to align the transceiver to the gyro (see STEP 18). It is also important to input the offset between the transceiver and the CRP at water level for the vessel.



STEP 14 MINI-RANGER 2 CONFIGURATION

Click the **Data** Tab.

The internal magnetic sensor also displays Pitch, Roll and Heading data.

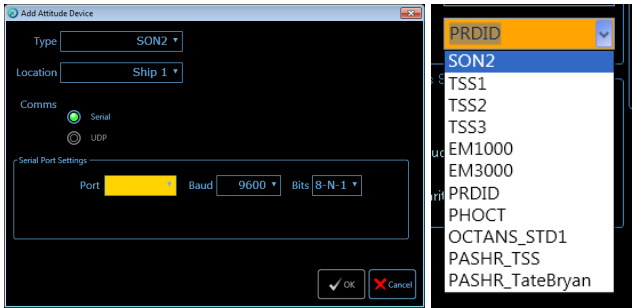


ADDING AN EXTERNAL INSTRUMENT

External instruments can be added to improve precision. ESH ports are preferred over PC serial ports as the timing is more precise and latency is not governed by CPU loading of the computer. Ensure that the vessel sensors are correctly selected otherwise the default is to use the internal magnetic compass.

To add and External instrument:

1. On the job tree, right-click **Ship** and select **Add Attitude**.
2. Select the **Type** and then configure **Serial Port Settings**.



3. On the job tree, click on **Ship**.

STEP 15 MINI-RANGER 2 CONFIGURATION

4. Select the choice of **Attitude** device from the drop-down list:
 - **Compass**: Internal Mti-30 magnetic compass with MEMS inclinometer (pitch roll and heading device).
 - **Internal**: Auxiliary lower grade MEMS inclinometer (pitch and roll only), references the internal lower grade MEMS inclinometer sensor and will degrade grade USBL precision.
 - **Lodestar**: User named external instrument (appears as added by user).

If an external motion sensor is unavailable or the unit is being used by suspended cable then the internal Mti-30 **Compass** is preferable as it is decoupled from the vessel gyro. If this is the case the GNSS antenna should be located above the USBL.

The screenshot shows a configuration window with a dark background. At the top, there is a 'General' section with a 'Name' field containing 'Ship 1'. Below this is a section titled 'Attitude / Heading / Depth Devices used for Tracking'. It contains three rows: 'Pitch / Roll' with a dropdown menu showing 'Compass' (highlighted in orange), 'Heading' with a dropdown menu showing 'Compass' (highlighted in blue), and 'Depth' with a dropdown menu showing 'Internal'. To the right of these dropdowns are two 'Manual' checkboxes, both of which are checked, with the label '(true)' to the right of the second one. Below the 'Manual' checkboxes are two input fields, one for 'Manual Heading' and one for 'Manual Depth' (labeled 'm').

ENVIRONMENTAL SETTINGS

The ranging accuracy will be improved by using a relevant sound speed profile.

To import the appropriate sound velocity information:

1. Click the **Environment** button to open the **Sound Speed** dialog box.
2. Click **Load** and select the profile from those displayed, or
3. Click **Import** and navigate to the sound speed profile import file.

Note



The sound speed profile import file format is a *.PRO file, tab delimited with 5 blank header lines and 2 columns for depth and sound velocity.

STEP 16 MINI-RANGER 2 CONFIGURATION

Sound Speed

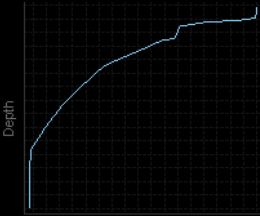
Select one of the following methods to determine sound speed.

☐ Fixed Values

Mean Ranging Sound Speed m/s

Transceiver Sound Speed m/s

☒ Sound Speed Profile



2.24	1540.66
2.79	1541.19
3.35	1541.47
3.91	1541.69
4.47	1541.84

☐ Sound Speed Sensor

If the sound velocity isn't known, a CASIUS calibration can be performed using default values and this will compute the velocity through the water (see STEP 18).

CALIBRATION TYPES

It is advisable to perform a calibration for a new vessel to substantiate system performance and correct for any installation misalignments of the transceiver. The CASIUS calibration will check the offset measurements, instrument misalignments and sound velocity estimates.

If using the internal magnetic compass, a calibration is required to correct for local and regional distortions in the Earth's field and the effects of the vessel and installation pole. If using an external north seeking gyro for heading then a magnetic calibration is not required.

The offsets and misalignment of the head to the vessel can be entered as shown below.

On the job tree click the **Transceiver**, click the **Offsets** tab and then click **Installation Offsets**.

Transceiver 1 Magnetic Compass Offsets

XYZ Offsets

Ship CRP to Tcvr (Measured)

Starboard	1.925	m
Forward	-3.150	m
Down	2.500	m

Orientation Offsets

	Compass to Tcvr (Calculated)	Ship to Compass (Attitude Calibration)	Tcvr to Ship (CASIUS)
Pitch	-1.319	0.000	1.330 °
Roll	-2.746	0.000	2.740 °
Heading	-0.240	0.000	0.240 °

Click on the lock icon to lock or unlock fields.

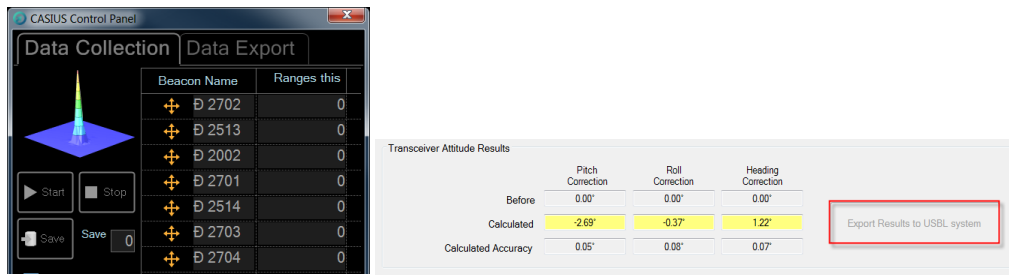
Undo All OK Cancel

Because it is possible to use the internal and external gyro sensors, the corrections are interlinked so that the correct rotation matrix is applied. The values from CASIUS are displayed on the right pane and are automatically populated on completion of a calibration. If using an external ship gyro it is important to ensure it is already aligned to the vessel.

CASIUS CALIBRATION

Click **Tools > CASIUS**.

The **CASIUS Control Panel** collects acoustic data from one or more beacons and then processes that data for calibration of the USBL transceiver.



After calibration, the values determined can be exported to the Transceiver Magnetic Offsets window (see STEP 17). It is advisable to check the offsets and sound velocity computed are not too dissimilar from the user measured values.

A post CASIUS calibration of 1 DRMS 0.5% slant range is the expected performance for a quality system using GNSS, attitude and heading sensors.

If using an internal magnetic compass sensor, the precision will be reduced and dependant on the local magnetic interference.

Refer to the “CASIUS User Manual” for detailed information on calibration.

MAGNETIC COMPASS CALIBRATION

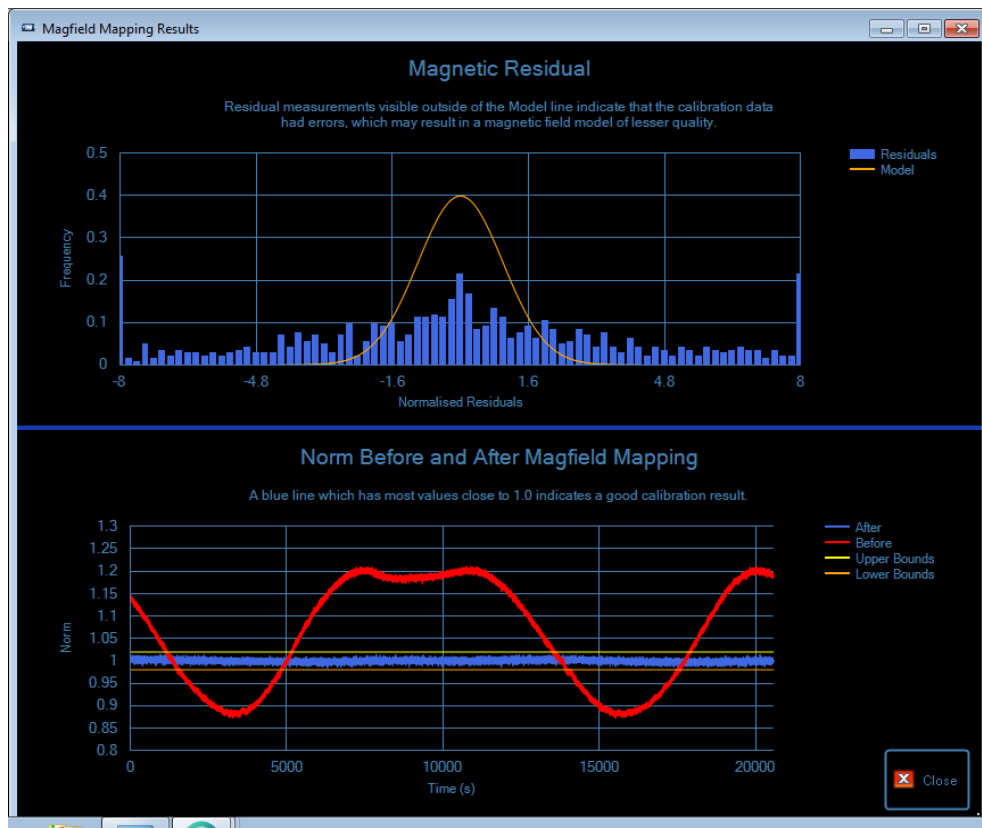
Click **Tools > Advanced > Magnetic Compass Calibration**

During calibration of the magnetic compass, the attitude sensor is switched into a TCP address and will no longer output heading data so the vessel heading will not update. The attitude sensor is set to output special measurements that are logged to a file for post processing the Earth’s field and distortion patterns.

During calibration, the vessel must navigate in a slow complete circle over a period of at least two minutes to ensure enough data is collected.

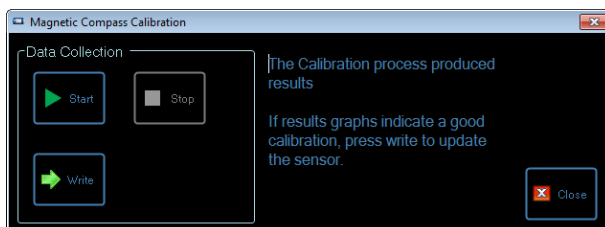
After data collection the results can be reviewed. The magnetic residual data points should look similar to the following example. Data outside the standard distribution curve suggests more noisy data.

After Magfield mapping, the calibration should sit close between the upper and lower bounds in the region of "1" shown on the bottom graph.



After a satisfactory result the corrections can be written to the non-volatile memory of the magnetic compass inside the HPT 3000 transceiver.

After stopping the calibration process, click **Write** to save the corrections to the magnetic compass.



ADDING A BEACON

The Mini-Ranger 2 system is designed to be used with the WSM 6+ transponder but it will also track any 2-way Wideband 6G beacon. After adding beacons to the job they can be configured on the Beacons Table.

For jobs with many beacons/complex acoustic scheduling, it is recommended to add beacons to the job using the Beacons Table (described below).

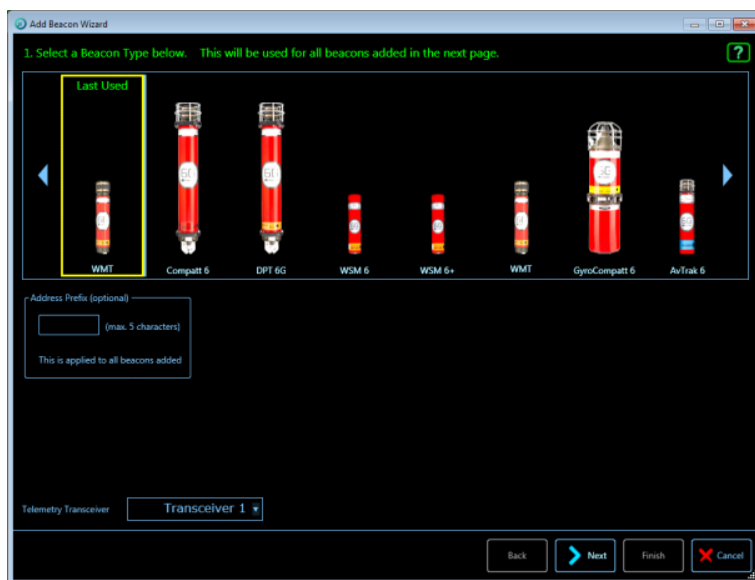
1. To open the Beacons Table click the **Beacons** button.



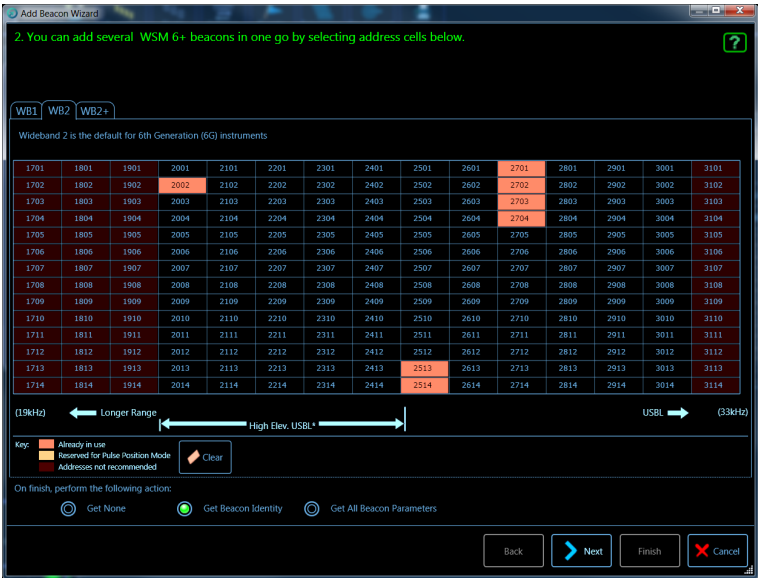
2. Click **Add** on the **Beacons Table** (alternatively beacons can be imported from an iWAND or Auto Discovered).



3. Select the beacon type on the beacon wizard window.
4. Enter the beacon **Address Prefix** (optional) and then click **Next**.



5. Select the beacon **Address(es)** from beacon address table and then click **Finish**.



6. Following successful telemetry communication with the beacons, the yellow warning triangles in the **beacons table** will change to green circles.
7. If the yellow warning triangles remain, the acoustic settings on the **Advanced** tab may need adjusting or the beacon addresses may need verifying

TRACKING A BEACON

After adding beacons they can be configured on the **Beacons Table > Tracking** tab to select a common or individual interrogate signal.

Discovered									
Select	Status			Name		Channels		TAT ms	
	Lock	Enable	Key	Prefix	Address	Interrogate	Reply		
☐				Ð	2002	CIS 1614	IRS 2002	80.0	
☐				Ð	2513	CIS	IRS 2513	80.0	
☐				Ð	2514	IIS	IRS 2514	160.0	
☐				Ð	2701	Responder	IRS 2701	120.0	
☐				Ð	2702	CIS 1614	IRS 2702	200.0	
☐				Ð	2703	CIS 1614	IRS 2703	200.0	
☐				Ð	2704	CIS 1613	IRS 2704	80.0	

The target selection buttons show the beacons being actively tracked with green borders. The buttons can be clicked to toggle the tracking status.



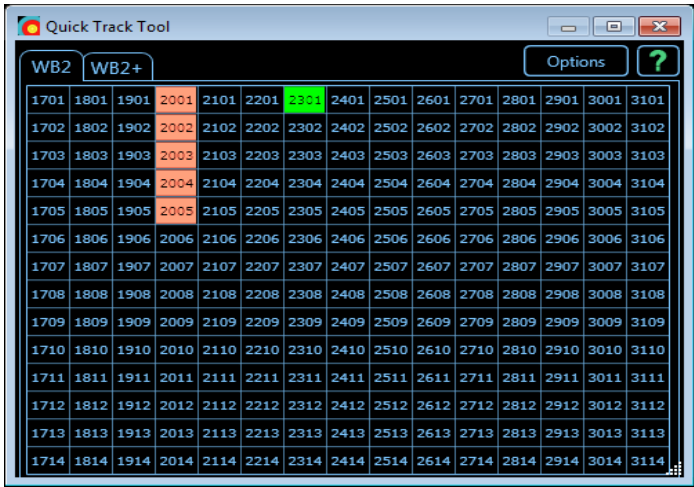
ADDING AND TRACKING A BEACON USING QUICK TRACK

For simple jobs requiring a small number of 6G beacons, it will be easier and faster to add beacons to the job using the Quick Track tool (described below).

- 1. Click **Tools > Quick Track** or click the **Q-Track** shortcut button.

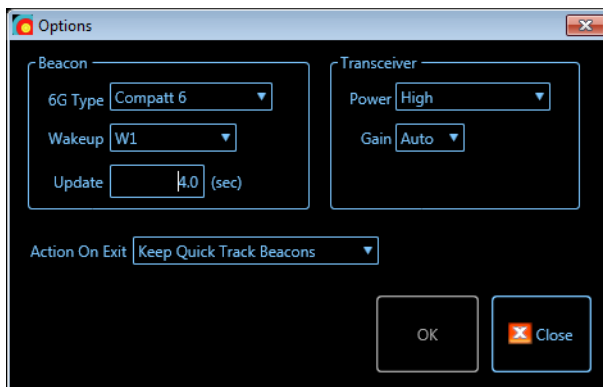


- 2. Click the required address(es) on the Quick Track tool (clicking the same address again stops that beacon tracking and removes it from the job).

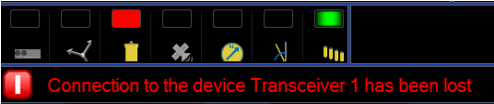
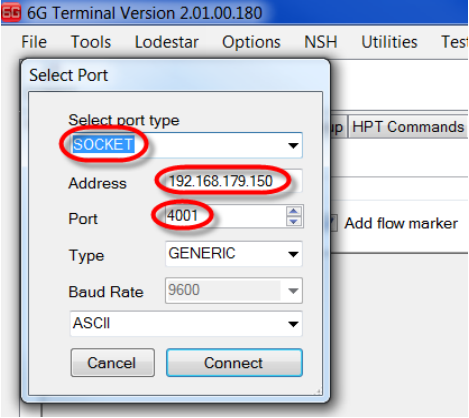


- 3. A 6G beacon with that address is added to the job (see Options below for beacon type).
- 4. An active Quick Track beacon is shown in green (beacon addresses already allocated are shown in pink).
- 5. A beacon output telegram is enabled (if there is a telegram setup).

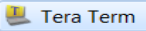
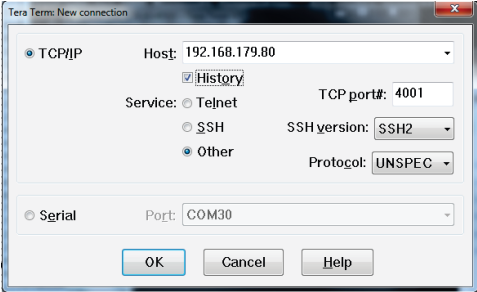
Use **Options** on the Quick Track tool to configure the default **Beacon** type, **Wakeup** tone and **Update** rate.



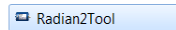
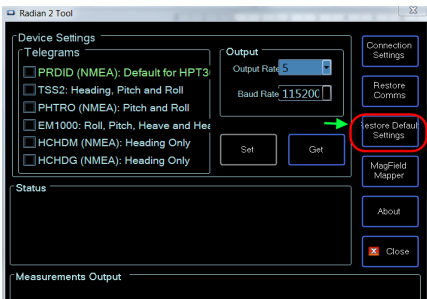
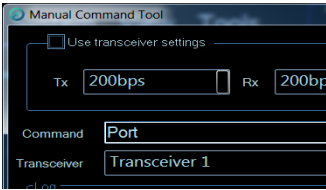
HPT 3000 TROUBLESHOOTING

Fault	Action
Connection to the Transceiver has been lost. 	Press and release the Reset button momentarily to reset the transceiver. 
If resetting the transceiver does not restore the connection.	Check the computer IP address. Start 6G Terminal Lite and connect to a socket to establish a connection as shown below. 
If the IP address is correct.	Check the cable and all connections (the connection to the transceiver is direct and does not require the ESH to have booted or be functioning correctly, only supplying the power). Check the firewall settings or anti-virus software are not blocking the connection.

ESH TROUBLESHOOTING

Fault	Action
Connection to the ESH has been lost. 	Press and hold the Reset button for five second to reboot the ESH (the ESH can take up to two minutes to reboot).  You may need to restart Mini-Ranger 2 to establish a connection.
Confirm communications	Start Tera Term software to confirm communications: Start > Tera Term  Enter the Host: IP address and TCP port and then click OK.  Type port in the Tera Term command window and and press return to confirm communications. If the connection problem still exists, check the firewall settings or anti-virus software are not blocking the connection.

INTERNAL MAGNETIC COMPASS TROUBLESHOOTING

Fault	Action
Connection to the Compass has been lost. 	Close Mini-Ranger 2. Start Radian2Tool software to restore the default settings: Start > Sonardyne > Ranger2 > Radian2Tool  Click Restore Default Settings 
If restoring the default settings does not restore the connection.	Using the manual command tool in Mini-Ranger 2, confirm that the HPT 3000 is set to 115200 on the P1 port. >PORT:1701,P0;BR38400;CF0,P1;BR115200;CF0 

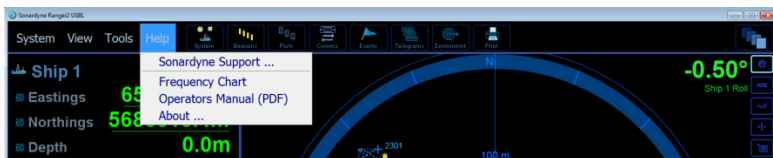
CABLE TROUBLESHOOTING

Transceiver cable Part No. 820-6793 pin details.

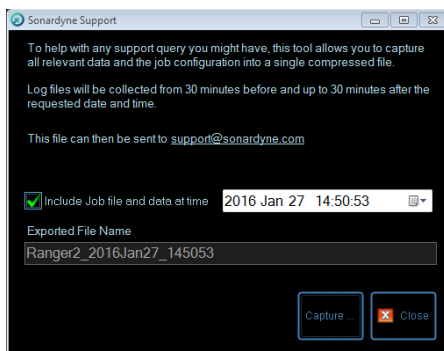
Pin	Description	Pin	Description
1	Screen	5	Trigger
2	Power +	6	Ground and Power return
3	Ethernet Tx Data+	7	Ethernet Rx Data+
4	Ethernet Tx Data-	8	Ethernet Rx Data-

SONARDYNE SUPPORT

If any difficulties or problems are encountered when attempting to operate the Mini-Ranger 2 system, click **Help > Sonardyne Support**.



1. Select the date and time the event occurred and then click **Capture**.
2. Browse to the desired folder for the output file and then click **OK**.
3. A support log file will be created containing logged data from 30 minutes before to 30 minutes after the target time. The support log file can be sent to Sonardyne Support for analysis.



Term	Definition
6G®	Sonardyne's sixth generation technology hardware platform
Beacon (Acoustic)	An instrument that emits acoustic signals. Common beacon types are: Transponder, Responder and Pinger.
CASIUS	Calibration of Attitude Sensors in a USBL System. CASIUS is the Sonardyne recommended USBL calibration tool for the determination of accurate transceiver offsets (X, Y and Z) in relation to the GNSS (GPS) antenna and the transceiver Pitch, Roll and Heading errors. It also determines accurate 'through water' sound velocity calculation
CPU	Central Processing Unit
CRP	Common Reference Point
ESH	Ethernet Serial Hub
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HPT	High Performance Transceiver
LAN	Local Area Network
LED	Light Emitting Diode
MEMS	Micro Electro Mechanical
MRU	Motion Reference Unit
PC	Personal Computer
Sonardyne	Sonardyne International Limited and its affiliates
Sonardyne Wideband®2	6G® transponders and transceivers use Sonardyne Wideband®2 ultra-wide bandwidth signals giving a faster and robust transmission of data, more precise ranging and mitigation from multipath in shallow water and amongst steel structures in deep-water
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
USBL	Ultra Short Base Line Positioning System
UTM	Universal Transverse Mercator
WSM 6+	Wideband Sub-Mini Transponder 6+

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