

UM-8373

User Manual for the Type 8370 WSM 6+ Transponder (and Variants)

Issue B Rev 1

Issue Date: 02 August 2022

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

T: +44 (0) 1252 872288

F: +44 (0) 1252 876100

E: support@sonardyne.com

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Amendment History

The amendment history records all amendments and additions made to this manual.

Issue	Revision	Date	Comments	Section	Page
A	1	28-05-2015	Initial Issue	All	All
A	2	04-01-2016	ECN 13168: "All Sonardyne Tone Frequencies" deleted from Navigation Schemes. Some sections re-organised within this manual. General update.	11.3 3, 4, 5, 6, 9 All	34 All All
A	3	20-07-2017	OB 12504: Battery Voltage information added. "Replies only" removed from Navigation Schemes.	7.8.3 8.4.6 11.3	18 22 30
A	4	12-12-2019	Type 8377 Modem 6 Sub-Mini variant added. General update.	All	All
B	1	02-08-2022	Note added relating to serial communications being possible after switching off. Formatted with new branding style General update	5.3 All	14 All

Section 1 – Introduction

1.1 Purpose

This manual contains information for personnel involved in WSM 6+ system operations. It includes technical information to configure, operate and maintain these systems, and specific information concerning WSM 6+ products supplied by Sonardyne.

1.2 Scope

This User Manual describes the safe installation and operation of the Wideband Sub-Mini 6+ (WSM 6+) Transponder/Responder and variants. The information and procedures within this manual are based on Sonardyne's knowledge and experience.

1.3 Related Publications

The following publications can be referred to in conjunction with this manual.

Table 1-1 Related Publications

Publication	Title
<i>Sonardyne Safety Manual</i>	<i>Operational and Safety Precautions</i>
<i>UM-8300-099</i>	<i>User Manual for 6G Terminal Lite</i> (supplied on the 6G utilities DVD)
<i>UM-8315</i>	<i>User Manual for the Type 8315 iWand</i> (supplied with the iWand)
<i>IM-Modem 6</i>	<i>Modem 6 Integration Manual</i>

1.4 Conventions

The following conventions are used in this manual.

Table 1-2 Conventions used in this Manual

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

Section 2 – Safety

2.1 Introduction

Before any activity is carried out on the equipment, it is recommended that the included *Sonardyne Safety Manual* and all warnings and cautions in this manual are read and fully understood.

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

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

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

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

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.

2.2 Safety Procedures

2.2.1 Warnings



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



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



Dismanting. This transponder must only be accessed internally and dismantled by qualified Sonardyne personnel.



Faulty battery pack. If a fault is suspected with the battery pack it must be investigated by qualified Sonardyne personnel and should not be deployed.



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.



Hazardous substance. Molykote 44 is a mild irritant. When lubricating connector faces, Personal Protective Equipment such as gloves and goggles must be worn.



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.

2.2.2 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.



Damage to battery packs. The WSM 6+ battery pack must only be charged using the Sonardyne Type 8370-011-01 (/-02) comms/charger unit and matching charger PSU.



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



Equipment damage. Do NOT allow the transponder to be cooled or heated during the battery charge level check or charging process.



Equipment damage. Do NOT continually connect the battery charger to the transponder if the battery is fully charged as it will reduce its life and may cause damage.



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



Equipment damage. A standard Subconn non-shorting blanking plug must be fitted when deployed if the connector on the unit is not being used.



Damage to external connector when submerged. The external connector must be covered while the transponder is submerged, either by the protective dummy plug or by the free plug of an external power cable.



Damage to connectors. The Subconn and Micro-Subconn connectors must not be mated without lubrication as this will lead to delamination of the rubber from the connection pins and cause connector failure.



Damage to connectors. Do not over apply grease to the connector faces as a build-up of grease in the female connector will affect connector integrity.



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



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.

Section 3 – Technical Description

3.1 Introduction

The Wideband Sub-Mini Plus (WSM 6+) transponder/responder is designed for use with Sonardyne Wideband Navigation Systems, SIMRAD "HPR" and Sonardyne LUSBL families of range-bearing acoustic navigation systems. The WSM 6+ can be configured to any interrogation and reply setting, and its command address can also be changed easily using the supplied PC software, 6G Terminal Lite.

The WSM 6+ is a small, rugged beacon targeted at USBL applications such as subsea vehicle tracking or towfish tracking. It has an operating life of at least three days at one pulse/second when powered from the Nickel Metal Hydride rechargeable battery pack (see *Section 11.3 "Specifications"*). Alternatively, the WSM 6+ can be powered by an external dc supply for continuous operation.

An external switch allows disconnection of the power to preserve battery life between deployments.

In addition to these features, all WSM 6+ beacons are fitted with a depth sensor to offer depth-aided navigation by sending dual, time-coded reply pulses to each interrogation, or report depth as a telemetry reply.

The Type 8377 Modem 6 Sub-Mini is designed specifically for modem telemetry.

Note



Dismantling of the WSM 6+ must only be carried out by Sonardyne qualified personnel.

3.2 WSM 6+ Types

The WSM 6+ available types are described below (see *Section 11.3 "Specifications"*):

- Type 8370-1111 – Omni-directional
- Type 8370-4112 – Directional
- Type 8370-1211 – Omni-directional, dual release support (voltage)
- Type 8370-4212 – Directional, dual release support (voltage)
- Type 8370-1411 – Omni-directional, dual release support (contact closure)
- Type 8370-4412 – Directional, dual release support (contact closure)
- Type 8377-1111 – Omni-directional, Modem 6 Sub-Mini
- Type 8377-4112 – Directional, Modem 6 Sub-Mini

Omni-Directional (837x-1x11) variants (see *Figure 3-1*) have a maximum operating depth of 1000 metres, while directional (837x-4x12) variants (see *Figure 3-2*) have a maximum operating depth of 4000 metres.

Types 8370-1211 and 4212 also provide two bi-directional voltage outputs via the endcap connector for applications such as driving a motor release or burnwire. The output can provide up to a maximum of 1 A current, with the ability to configure the output duration (up to 20 minutes) and set a trip or hold current.

Types 8370-1411 and 4412 also provide two contact closure outputs via the endcap connector.

Figure 3-1 Type 8370-1111 Omni-Directional Wideband WSM 6+



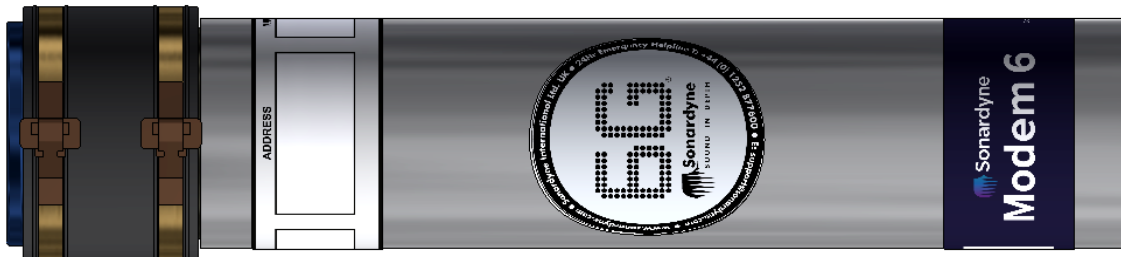
Figure 3-2 Type 8370-4112 Directional Wideband WSM 6+



Figure 3-3 Type 8377-1111 Omni-Directional Modem 6 Sub-Mini



Figure 3-4 Type 8377-4112 Directional Modem 6 Sub-Mini

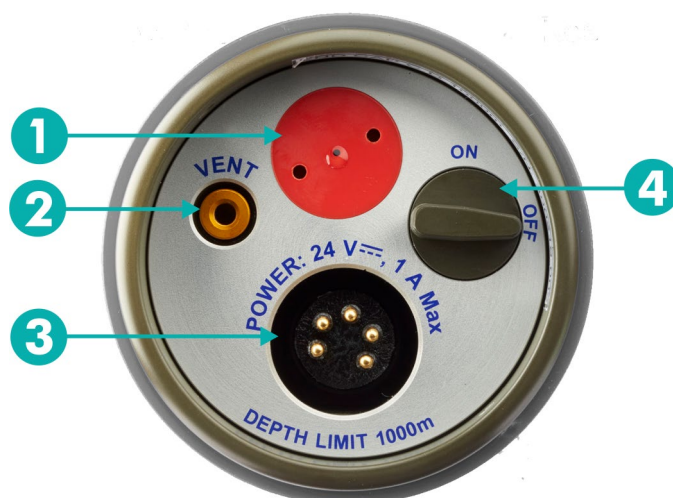


3.3 Endcap

The connector endcap contains the pressure relief vent valve, connector and **ON/OFF** rotary switch. When not in use, the unit should be switched **OFF** to preserve battery charge.

Figure 3-5 shows the endcap for the Type 8370-1111 omni-directional WSM 6+ (Type 8370-4112 is identical apart from a wider diameter and a **DEPTH LIMIT** 4000 m identification).

Figure 3-5 Omni-Directional WSM 6+ Endcap



- | | |
|------------------------------|--|
| 1 Depth Sensor Cover Plug | 3 5-way connector MCBH5M for Comms / charging* |
| 2 Pressure Relief Vent Valve | 4 ON/OFF Rotary Switch |

*See Section 11.2 "Pin-Out Wiring Connections" for connector pin details.

3.3.1 Connectors

The endcap connector allows a responder electrical trigger, RS232 communications to configure the unit, a battery charging input and a separate external dc power input.

Note

 See Cautions in Section 2 – Safety "Damage to external connector when submerged".

3.3.1.1 Standard Connector

The standard 5-way endcap connector (Subconn Micro MCBH5M) mates with a standard in-line connector (Subconn Micro MCIL5F).

3.3.1.2 Remote External Release Variant

The remote external release 8-way endcap connector (Subconn Micro MCBH8F) mates with a standard in-line connector (Subconn Micro MCIL8M).

3.3.2 Pressure Relief Vent Valve

A pressure relief vent valve is provided to release any build-up of pressure inside the housing; this could be caused by water ingress during deployment or the degassing of a battery.

The WSM 6+ includes special circuitry to monitor the battery pack during charging. This safety feature ensures the battery cannot be overcharged in normal use. For this reason, it is not deemed necessary to remove the pressure relief vent valve during charging of a fully operational transponder.

Should there be any reason to suspect that there is pressure inside the unit, or that the charging circuitry may be faulty, it is recommended the pressure relief vent valve is extracted prior to charging (see Section 7.7.1 "Operating the Pressure Relief Vent") .

3.4 Housing Labelling

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

- MANUFACTURING DATA
 - Serial No. 123456-789
 - Config. 1111
 - Transducer MF Omni
 - Housing Rating 1000 m
- UNIT ID
- ADDRESS

Manufacturing Data

The manufacturing data details all essential information about the equipment that will be required if it is necessary to contact Sonardyne International Limited.

Serial No.

The serial no. is the unique WSM 6+ identification number and should be quoted in all communications with Sonardyne International Ltd and their agents.

Config

The Config number is a four-digit number that identifies the depth rating, material, housing size and transducer type.

e.g. Config: 4112

- 4 = Depth rating 4000 m
- 1 = Standard
- 1 = Standard
- 2 = MF Dir – Type 1

Table 3-1 Configuration Identification Table

	Depth Rating	Variant	Housing	Transducer Type
1	1000 m	Standard	Standard	MF Omni
2	2000 m	Voltage Out	Max	MF Dir – Type 1
3	3000 m	Burn Out	Mini	MF Dir – Type 2
4	4000 m	Contact Closure	Midi	MF Super Dir
5	5000 m		Dunker	LMF Omni
6	6000 m		Remote	LMF Dir
7	7000 m		Sphere	LF Omni
8				EHF Omni
9	Special			
0	No Code			

Transducer Type

The transducer identifies the type of transducer beam-shape fitted to the transceiver. The transducer type can be omni or directional.

Housing Rating

The housing limit is the normal pressure rating of the transceiver housing. The sensor endcap may be rated less than the housing limit. Check the endcap label and use the lower figure.

UNIT ID

The UNIT ID box shows the unique identification number for the transceiver or transponder. The UNIT ID number is required to upgrade the functionality of the transceiver or transponder. The UNIT ID cannot be changed and is stored on the device.

ADDRESS

The address contains the acoustic identity of the transceiver or transponder. The acoustic address is used by the transceiver to communicate with another transceiver or transponder. The first two digits of the address define the family group and the last two digits of the address define the channel number.

The acoustic address can be changed using a secure acoustic or serial command, which requires the UID of the transponder.

Note



It is recommended that the current address is always displayed on the transceiver/transponder.

3.5 Operation

The WSM 6+ is designed to be operated in both transponder and responder modes. An electrical trigger input pin is provided on the external connector to enable operation in responder mode.

The acoustic command address and the interrogation channel can be changed by software, via the RS232 link.

All Sonardyne wideband addresses are available as well as all HPR 400 channels. A full table of frequencies for each valid navigation channel is shown in *Appendix A*.

Acoustic commands can be used to reconfigure the transponder and to switch on depth aiding.

3.6 Functionality

3.6.1 Type 8370

Sonardyne's Type 8370 WSM 6+ offers wideband navigation replies which are capable of significant improvements in ranging accuracy and repeatability, especially in responder mode. It also retains compatibility with existing HPR and LUSBL range-bearing acoustic navigation systems. The acoustic signal level transmitted by the Type 8370-4112 is strongest on axis and useful over a 90 degree cone. It is usually mounted with the transducer pointing upwards – typically for marking small ROVs.

In circumstances where orientation in the general direction of the ship cannot be guaranteed, such as for longer ranges in shallow water, the omni-directional response of the Type 8370-1111 omni-directional transponder is recommended. The Type 8370-1111 has the same functionality as the 8370-4112 apart from depth rating and has a lower transmit acoustic source level on axis but a wider omni-directional beam-pattern ($\pm 120^\circ$).

The WSM 6+ offers the following benefits to the user:

- High capacity nickel metal hydride rechargeable battery with at least 3 days operating life at 1 pulse/second and rapid-charge capability by external connector.
- All "HPR 400" channels are supported.

- All Sonardyne wideband reply signals are supported giving better range accuracy and repeatability.
- External connector for "Responder" mode trigger, external power supply, charger and communications interface.
- ON/OFF feature via external switch.
- Acoustic commands to enable and disable the transponder and to enable the Depth Data reply.
- Configured using 6G Terminal Lite software.

3.6.2 Type 8377

The Type 8377 Modem 6 Sub-mini offers modem functionality only, suitable for transmission of data from a wide range of sensors including: current profilers, temperature, depth and custom instrumentation.

A Modem 6 Integration Manual (*IM-Modem 6*) is available for configuring the Modem 6 for operational use.

3.7 Configuration Options

The WSM 6+ configuration options are shown below:

Table 3-2 WSM 6+ Configuration Options

Type Number	Transducer Type	Location	Depth Rating	External Release Option
8370-1111	Omni-Directional	Integral	1,000 m	N/A
8370-1211	Omni-Directional	Integral	1,000 m	Voltage
8370-1411	Omni-Directional	Integral	1,000 m	Contact Closure
8370-4112	Directional	Integral	4,000 m	N/A
8370-4212	Directional	Integral	4,000 m	Voltage
8370-4414	Directional	Integral	4,000 m	Contact Closure
8377-1111	Omni-Directional	Integral	1,000 m	N/A
8377-4112	Directional	Integral	4,000 m	N/A

3.8 Battery and Charger

The WSM 6+ is fitted with a 2000 mAh nickel metal hydride battery pack and must only be charged with the Sonardyne Type 8370-011-01 (/ -02) comms/charger unit and matching charger PSU.

Earlier types of transponders with different battery pack capacity and different versions of charger are not compatible with the WSM 6+.

Note



The Nickel Metal Hydride (NiMH) batteries self-discharge over a number of weeks so the WSM 6+ should always be fully charged before use.

Section 4 – Installation and Deployment

4.1 Pre-Deployment Checks

Before installation and deployment, the following checks must be carried out to make sure the WSM 6+ is serviceable and ready for use:

1. Inspect the WSM 6+ for any signs of mishandling, external damage or leakages.
2. Check the pressure relief vent valve; see *Section 7.7 "Pressure Relief Vent Valve"*.
3. If necessary, charge the battery; see *Section 7.8 "Battery Maintenance"*.
4. Configure the WSM 6+ (if required); see *Section 4.2 "Configuration"*.
5. Ensure either the external power/comms cable is connected to the endcap or that a dummy blanking plug is fitted to the endcap connector.

4.2 Configuration

Configuration of the WSM 6+ can be performed using either 6G Terminal Lite software or an iWand handheld test unit (where specified).

4.2.1 6G Terminal Lite

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

4.2.2 iWand handheld Test Unit

Refer to *UM-8315 User Manual for the Type 8315 iWand*.

4.2.3 Setting the Address

1. Switch the WSM 6+ **ON** by rotating the **ON/OFF** switch on the connector endcap.
2. To change the address using 6G Terminal Lite, refer to *6G Terminal Lite, Section "6G Setup"*.

Note



It is advisable to mark the command address and Interrogation channel on the outside of the unit if either is changed from the factory set values.

4.2.4 Power and Gain Configuration

1. Refer to *6G Terminal Lite, Section "6G Setup"*.
2. Power and gain levels are configured automatically on the **Power / Gain** pane on the **6G Setup** tab based on operational range and scenario.

4.2.5 Navigation Mode Configuration (Type 8370 only)

1. Refer to *6G Terminal Lite, Section "6G Setup"*.
2. The navigation settings (CIS / IIS / HPR) are configured on the **Navigation** pane on the **6G Setup** tab.

4.2.6 Pulse Position Depth Aiding (Type 8370 only)

1. Refer to *6G Terminal Lite, Section "6G Setup"*.
2. The pulse position depth modes are configured on the **Navigation** pane on the **6G Setup** tab.

4.3 Location on ROV

The unit should be positioned in an upright attitude, with the transducer endcap uppermost, pointing towards the sea surface. If clamped to a metal structure, rubber should be used to isolate the transponder from the structure both electrically (to prevent corrosion) and mechanically (to reduce vibration related acoustic noise).

The WSM 6+ has a red plastic sleeve around the transponder to provide both electrical and some mechanical isolation. Units should be mounted with their body axis vertical.

As the Type 8370-4x12 transducer has a Directional beam pattern, it can be located with the face of the transducer flush with the level of the ROV's syntactic foam buoyancy. This will serve to protect the transponder in the event of accidental collisions during ROV operations.

The Type 8370-1x11 transducer has an omni-directional beam pattern, therefore it must be located with the transducer above the level of the ROV's syntactic foam buoyancy to obtain sufficient "line of sight" in high elevation tracking scenarios.

4.4 Electrical Connections

If the unit is operating in "Responder" mode or with external power, a mating cable with the appropriate wiring must be used to connect the WSM 6+ to the vehicle or external power source. The **trigger** pin and **common** must be connected via an umbilical to the **HPR** or **USBL** system on the vessel.

The cable types are described below.

- Standard housing mating cable type 820-5163 (see *Section 11.2.1 "Type 8370 Standard Housing Wiring Connections"*).
- External release option mating cable type 820-6796 (see *Section 11.2.3 "External Remote Release Option Wiring Connections"*).

Note



See **Cautions** in **Section 2 – Safety "Damage to external connector when submerged"**.

4.5 Pre-Deployment Checklist

The following checklist can be used to ensure all the necessary steps have been followed prior to deployment.

Table 4-1 WSM 6+ Pre-Deployment Checklist

Type Number:	8370-000-....	
Address:		
Serial Number:		
Firmware Version:		
Tested By:		
Date:		
Reference	Test	Tick / Comment
Section 7.7	Checking the Pressure Relief Vent Valve	
Section 7.8	Charging the Battery	
Section 4.2.3	Setting the Address	
Section 4.2.4	Power/Gain Configuration	
Section 4.2.5	Navigation Mode Configuration	
Section 4.2.6	Pulse Position Depth Aiding (On/Off)	
Section 4.3	Location on ROV	
Section 4.4	Electrical Connections	
N/A	Test on battery power: Responder Operation	
N/A	Test on external power: Responder Operation	

Section 5 – Operation

5.1 Operational Modes

The WSM 6+ is capable of two modes of operation, and may be powered either internally or externally:

- *Transponder Mode* – triggered (interrogated) by an acoustic signal.
- *Responder Mode* – triggered by an electrical signal via the external connector.

The Responder Mode is recommended for the following operational scenarios:

- On acoustically noisy ROVs.
- Whenever an electrical trigger signal is available via an umbilical from the ship's navigation system.
- When tracking from a USBL at < 20° from the horizon.

The normal operational state is achieved with the appropriate address selected via RS232 and the ON/OFF switch operated on the connector endcap.

5.1.1 Transponder Mode

The Transponder Mode is interrogated by an acoustic input.

Note



If there is no external power connection, the connector must be fitted with the dummy plug.

When set to an HPR series 400 channel, the transponder will respond 60 milliseconds after recognising an incoming acoustic burst of the selected frequency and of sufficient magnitude/duration. If the ambient noise level is too great for the interrogation signals to be heard, the WSM 6+ may not reply to interrogations or may reply erratically.

In Sonardyne Wideband configuration, a single interrogation signal will trigger a wideband reply after the selected 'turn-around time'.

5.1.2 Responder Mode

In Responder Mode, the transponder is triggered to transmit on the configured reply signal by an electrical trigger signal applied to the external connector. Following the reply, the transponder will be inhibited from responding to acoustic interrogations for the blocking period, after which it will respond to either acoustic or electrical triggers.

The trigger pulse waveform is a positive going pulse with a pulse width between 5 and 40 ms and voltage levels between 4 and 24 V.

5.1.3 Modem 6 (8377 only)

Refer to the Modem 6 Integration Manual (IM-Modem 6), together with the appropriate user manual for the system in use.

5.2 After Use

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

Note

 After the WSM 6+ is switched off it is still possible to establish serial communications for up to 60 seconds until the storage capacitors have discharged.

Section 6 – Retrieval and Storage

6.1 Introduction

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

6.2 Cleaning and Maintenance

On retrieval from the water, the following procedures must be carried out before the instrument is stored.

1. Make sure the ON/OFF switch is set to **OFF**.
2. Clean the instrument; see *Section 7.4 "Cleaning"*.
3. Inspect the instrument; see *Section 7.5 "Inspection"*.
4. Lubricate the connectors; see *Section 7.6 "Lubrication"*.
5. Check and recharge the battery if required; see *Section 7.8 "Battery Maintenance"*.

6.3 Storage

On completion of all checks in the previous section the WSM 6+ can be placed in storage as described below. See *Table 6-1* for the recommended storage conditions.

1. Store the WSM 6+ in its transit case.
2. Equipment must be kept in a dry, non-condensing atmosphere (20% to 80% humidity), free from corrosive agents and isolated from sources of vibration.
3. The packaging should be stored on solid, level and damp-proof floors. It must not be stored directly on damp or dirt floors or areas prone to flooding. In this case suitable shelving raised off the floor should be used.
4. It is recommended to visually inspect the equipment at least annually.
5. When equipment is taken from low temperature storage for immediate use its temperature should be raised to normal operating temperature before use.

Table 6-1 Storage Conditions

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

Section 7 – Maintenance

7.1 Introduction

Before using or storing the WSM 6+, the battery must be recharged; see *Section 7.8 "Battery Maintenance"*.

7.2 Dismantling

Dismantling of the WSM 6+ must only be carried out by Sonardyne qualified personnel.

7.3 Cleaning

Note



Do not use any abrasive brushes or sharp tools to remove marine growth when cleaning the instrument as this will damage the protective coating and increase the risk of corrosion.

1. Ensure the ON/OFF switch is set to **OFF**.
2. Thoroughly wash the transponder in warm clean fresh water to remove accumulations of salt, sand or silt and marine growth, paying particular attention to the ON/OFF switch and electrical connectors.
3. Remove any attached cabling or dummy plugs/protective caps and wash the external socket.
4. Dry the instrument and any attached cabling with a clean lint free cloth.
5. Replace any attached dummy plugs/protective caps.

7.4 Inspection

Regularly inspect the WSM 6+ for the following:

1. Inspect the pressure relief vent valve; see *Section 7.7 "Pressure Relief Vent Valve"*.
2. Inspect the housing for any signs of damage or corrosion. When at full working depth, the housing is at risk of failure if damage or corrosion is not repaired. If any corrosion is found, see *Section 7.9 "Corrosion Removal"*.
3. Inspect the connectors and cables for signs of abrasion, damage or corrosion.
4. Check the security of the connector by fitting the locking sleeve from the mating half of the connector, and check for movement. Any movement will require attention and the connector to be secured.
5. Inspect the jointing faces of the endcaps and the main housings. Signs of corrosion indicate leakage of water into the transponder.

7.5 Lubrication

Note



See *Warnings and Cautions* in *Section 2 – Safety "Hazardous Substance" and "Damage to Connectors"*.

7.5.1 Subconn and Micro-Subconn Connectors

The connectors should be cleaned and lubricated using the manufacturer's recommended lubricant "Molykote 44 Medium" before each mating.

1. Make sure the connectors are clean and dry.
2. Clean using a spray-based contact cleaner (isopropyl alcohol).
3. Lubricate the connectors as follows:
 - a. Apply a layer of grease to the female connector corresponding to a minimum 1/10th of socket depth.
 - b. The inner edge of all sockets should be completely covered, and a thin layer of grease left visible on the face of the connector.
 - c. After greasing, fully mate the male and female connector to optimise distribution of the grease on pins and in sockets.
 - d. Confirm that the grease has been sufficiently applied by de-mating and checking that grease is present on every male pin.
 - e. Re-mate the connectors

The following lubricants are recommended for maintenance of the instrument.

Table 7-1 Lubricants

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

7.6 Pressure Relief Vent Valve

The pressure relief vent valve should be flush with the endcap face. If the pressure relief vent valve is not flush it should be operated to check for and release any internal pressure as described below.

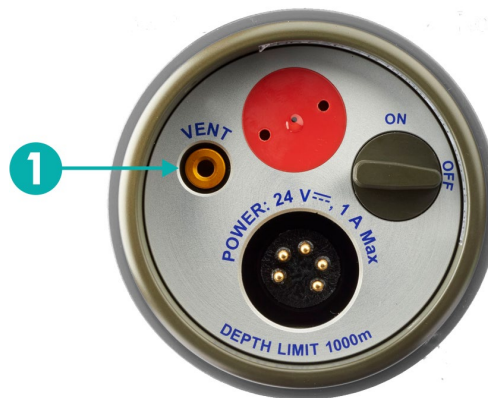
7.6.1 Operating the Pressure Relief Vent

Note



See *Warnings* in *Section 2 – Safety*, "*Risk of toxic gases and corrosive liquids, Faulty Battery Pack*".

Figure 7-1 WSM 6+ Pressure Relief Vent Valve



1 Pressure Relief Vent Valve

To operate the pressure relief vent valve:

1. Screw an M4 bolt into the pressure relief vent valve.
2. Slowly pull the M4 bolt to withdraw the vent valve and wait for any internal pressure to be released.
3. With the pressure relief vent valve pulled out inspect the O-rings for any signs of damage.
4. Apply a small amount of petroleum jelly to lubricate the O-rings.
5. The valve should retract back into place; remove the M4 bolt and check the valve is flush with the endcap face.

7.7 Battery Maintenance

7.7.1 Charging Description

A discharged battery will charge for approximately three hours at the full rate of 1 A, during which the red fast charge LED will illuminate. The charging current is applied to pin 3 of the external connector (zero volts is pin 2).

The charging current is controlled by electronics inside the transponder. When the battery reaches a full charge the charging current is switched off, and the fast charge LED will switch off. However, the charger also supplies external power (28 V, 85 mA on pin 4), which will trickle charge the battery and illuminate the yellow trickle charge LED.

It is safe to leave the trickle charge connected indefinitely.

7.7.1.1 Fast Charging Feature

The fast charge feature is controlled by electronics inside the transponder which monitors the voltage and temperature of the battery pack to decide when to stop charging. The parameters are first monitored some 14 minutes after connection so connecting the fast charger to a fully charged battery will allow the full charging current to flow for that length of time.

Repeatedly connecting the fast charger to a fully charged (or near fully charged) battery will reduce the life of the battery and may cause damage.

The charge control chip within the transponder will cut off fast charge current if:

- The rate of change of voltage with time indicates the pack is approaching full charge.
- The temperature of the pack rises outside limits (10–40°C).
- A time limit is exceeded (in the WSM 6+ case this is three hours).

The current during fast charging is limited by the WSM 6+ PSU, not by the WSM 6+ charger/comms unit.

If, in an emergency, it is necessary to charge the WSM 6+ by means other than the Type 8370-011-01/02 dedicated comms/charger unit, then the charge supply should be 24 V at 1 A constant current for 2 hours maximum.

Note



The charging time must be reduced if the battery pack has been charged recently. The charging current should be applied to pin 3 of the external connector with the return (zero volts) connected to pin 2.

Various components inside the transponder are designed to limit damage due to misconnection of the external signals. However, some damage to the electronic components may result. Under no circumstances should mains ac power be applied to the transponder.

7.7.2 Deeply Discharged Battery

Special care must be taken if the battery has been allowed to become deeply discharged. In this state it is possible for some cells to drop to near-zero voltage or even reverse the voltage on their terminals. The WSM 6+ should always be switched off when not in use to minimise the chance of entering this deep discharge state.

Once a cell has become deeply discharged, its capacity is reduced. This has the effect of unbalancing the pack and therefore reduces the pack capacity. Usually the pack can be recovered by fully re-charging. If not, then recovery can only be achieved by removing the pack and subjecting it to several slow (200 mA) charge/discharge cycles. Even then the full capacity may not be recovered.

Charging a pack which has suffered deep discharge can result in some gas being discharged by the affected cells. If the pressure relief vent valve is found to be proud of its normal position, this may be an indication that one or more cells have gassed and the appropriate action should be taken to replace the battery pack.

Note



The battery pack must only be removed and replaced by qualified Sonardyne personnel.

7.7.3 Charging the Battery

The battery voltage is nominally 18.8 V but can rise to 21 V after a full charge. If the displayed voltage is below 18.0 V the battery must be recharged before deployment. To check the battery voltage, see *Section 8.4.6 "Battery Check"*.

Note



See Cautions in Section 2 – Safety "Damage to Battery Packs", "Loss of current protection" and "Equipment damage".

To charge the battery, follow the instructions below and see *Figure 7-2*.

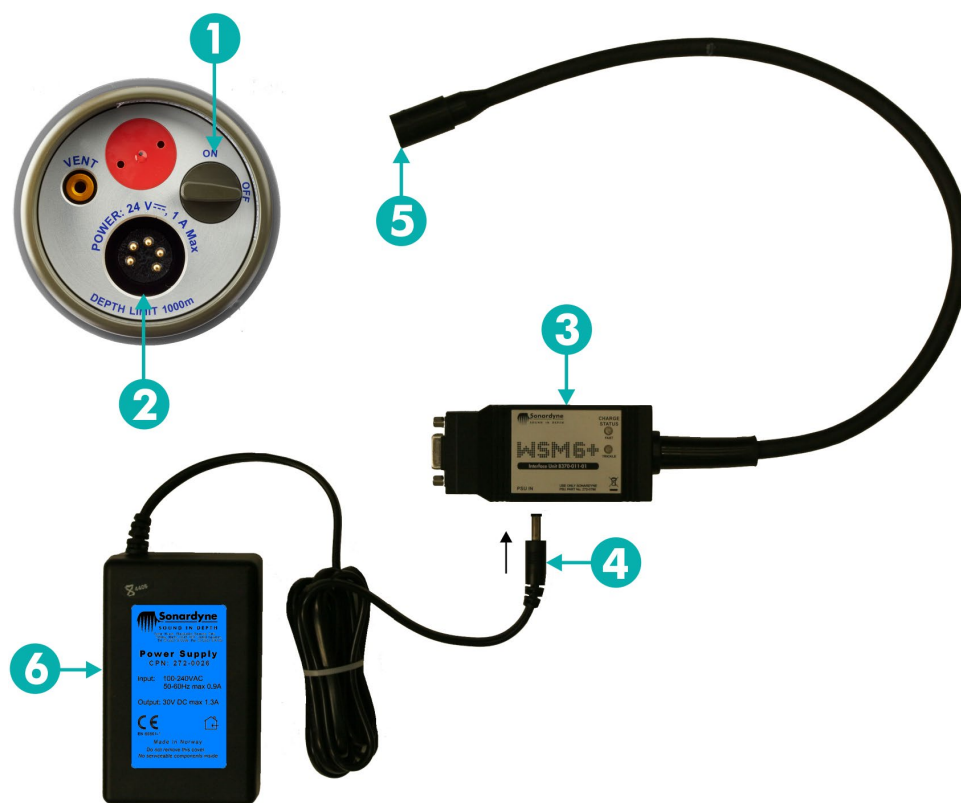
1. Check the ambient temperature is between 10 and 40°C (the battery will not accept fast charge outside these limits).
 2. Ensure the WSM 6+ ON/OFF switch **1** is set to **OFF**.
 3. Unscrew and remove the protective cap from the connector endcap **2**.
 4. Connect the comms/charger cable **5** to the WSM 6+ endcap connector **2**.
-

5. Connect the PSU 2.1 mm power socket **4** to the comms/charger **3**.
6. Connect the PSU **6** to an ac power source using a standard IEC power lead.
7. Observe the initial 15 minutes of the charging operation to determine the state of charge of the battery.
8. If the battery is partially discharged, the red and yellow LEDs will both flash for about 2–3 minutes. The red fast charge LED will then come on for up to 3 hours.
9. When the battery reaches full charge, the red fast charge Led will go out and the yellow trickle charge LED will illuminate. The trickle charge may be left connected.
10. To finish the charge process, remove the ac power from the comms/charger.
11. Check the pressure relief vent valve is flush with the endcap face.
12. Check the battery voltage as reported by the WSM 6+; see *Section 8.4.6 "Battery Check"*.

Note

 **The WSM 6+ should always be switched off when not in use to minimise the battery entering into a deeply discharged state.**

Figure 7-2 WSM 6+ Battery Charging Connections



- | | |
|---------------------------------|---|
| 1 ON/OFF Switch | 4 PSU 2.1mm Power Socket |
| 2 WSM 6+Connector | 5 Comms/Charger Connector |
| 3 8370-011 Comms/Charger | 6 PSU (see <i>Table 10-1</i> for ac power cable option part numbers) |

7.8 Corrosion Removal

Cases of slight corrosion found on the transponder housing can be treated effectively as described below.

1. Make sure the instrument is thoroughly clean and dry.
2. Clean the corroded area with a degreaser.
3. Treat the corroded area with Alocrom for approximately two minutes, or until the aluminium changes colour to golden brown.
4. Wash off with clean fresh water and dry thoroughly.
5. Make sure the corroded area is completely dry then cover the exposed metal with 2-part epoxy.

Section 8 – Functional Testing

8.1 Introduction

To ensure the WSM 6+ functions correctly, the following functional tests can be carried out:

- Transponder test
- Responder test
- Sensor test (Type 8370 only)
- Release test (Type 8370 only)
- Battery test

8.2 Test Equipment

Testing of the WSM 6+ can be performed using either 6G Terminal Lite software or an iWand handheld test unit (where specified).

8.2.1 6G Terminal Lite

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

8.2.2 iWand Handheld Test Unit

Refer to *UM-8315 User Manual for the Type 8315 iWand*.

8.3 Connecting the WSM 6+ to a PC

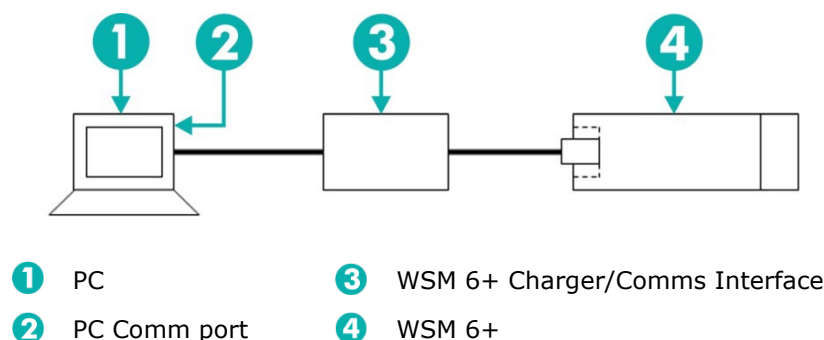
Note



See **Cautions in Section 2 – Safety "Equipment Damage"**.

Connect the WSM 6+ to a PC via the Type 8370-011-01/02 charger/comms.

Figure 8-1 WSM 6+ to PC Connection Configuration



8.4 Functional Tests

8.4.1 Serial Communications Test

Use the following procedure to test the serial communications of the WSM 6+.

1. Using the 8370-011-01/02 charger/comms interface, connect the WSM 6+ to a PC.
2. Start the *6G Terminal Lite* software.
3. Switch the transponder **ON**.
4. Refer to *6G Terminal Lite*, Section "Connecting".

8.4.2 Transponder Test

Use either of the two following procedures to test the transponder:

8.4.2.1 6G Terminal Lite

Refer to *6G Terminal Lite*, Section "Range Test".

8.4.2.2 iWand Handheld Test Unit

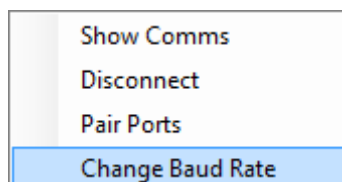
Refer to *UM-8315 "User Manual for the Type 8315 iWand"*, Section "Ping Check".

8.4.3 Responder Test (Type 8370 only)

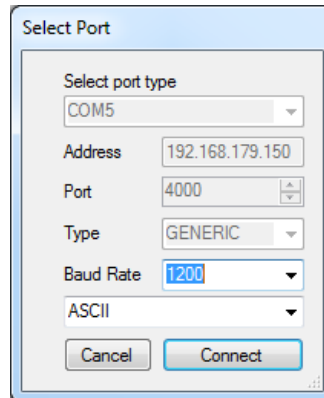
As the WSM 6+ uses the same connection for RS232 **comms in** and **trigger in**, a PC terminal software package can be used to test responder mode.

1. Connect to the WSM 6+ using the *6G Terminal Lite* software.
2. On the **6G Setup** tab, ensure the **Enable Responder** check box is ticked.
3. On the **6G Setup** tab, ensure the **Water Depth** slider is set to the maximum to ensure the power level of the WSM 6+ is high enough to be clearly audible.
4. Change the connection baud rate in *6G Terminal Lite* to **1200** using the steps below:

- a. Double-click on the relevant COM port icon  **COM5**
- b. Select **Change Baud Rate**



- c. On the **Baud Rate** combo box, Type **1200** and then click **Connect**.



5. On the **Manual Commands** tab type @ in the text box and then click **Send**. The WSM 6+ should transmit an audible navigation pulse.



6. Using the steps described above, change the baud rate back to its original value (default **9600**).
7. Restore the power and navigation settings back to the desired operational values.

8.4.4 Sensor Test (Type 8370 only)

Use either of the two following procedures to test the sensors on the WSM 6+:

8.4.4.1 6G Terminal Lite

Refer to *6G Terminal Lite*, Section "Sensors Test".

8.4.4.2 iWand Handheld Test Unit

Refer to UM-8315 "User Manual for the Type 8315 iWand", Section "View Sensors".

8.4.5 Release Test (Type 8370 only)

Use either of the two following procedures to test the release mechanism on the WSM 6+:

8.4.5.1 6G Terminal Lite

Refer to *6G Terminal Lite*, Section "Test Release".

8.4.5.2 iWand Handheld Test Unit

Refer to UM-8315 "User Manual for the Type 8315 iWand", Section "Test Release".

8.4.6 Battery Check

The battery voltage is nominally 18.8 V but can rise to 21 V after a full charge. If the displayed voltage is below 18.0 V the battery must be recharged before deployment.

Refer to *6G Terminal Lite*, Section "6G Setup". The battery voltage is displayed on the **Identity** pane.

8.4.7 Firmware Update

The WSM 6+ can accept firmware updates from a PC via the Type 8370-011-01/02 WSM 6+ charger/comms interface, eliminating the need to dismantle the transponder.

To update the firmware, refer to *6G Terminal Lite*, Section "Firmware Update".

8.4.8 Test Report

On completion of functional testing of the transponder a test report can be created in pdf format. The report lists all information displayed on the *6G Setup* tab of the *6G Terminal Lite* software. This report can also be useful as a pre-deployment check or to assist in fault diagnosis.

To create a report, refer to *6G Terminal Lite*, Section "Report Generation".

Section 9 – Fault Diagnosis

9.1 Introduction

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

9.2 Fault Type

9.2.1 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 International Ltd.
	Surface thermocline refracting reply signals	Lower transducer below thermocline
	Noise level at surface transducer too high	Lower the dunking transducer/transceiver or towfish and reduce the surface transceiver gain settings
		Perform a noise check; refer to <i>6G Terminal Lite, Section "Noise Measurement"</i> .
		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; refer to the comms log
	Streaming transducer such that it is facing away from transponder	Add 20 kg of ballast on a 1 m strop from the transducer guard
	Other acoustic systems may be operating in the same frequency band	Check the acoustic spectrum 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

9.2.2 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 too low	Check the battery voltage as reported by the VS reply. Charge the battery
	Transponder may have been moved from original position	Check transponder position
		Check NPL (Navigation Power Level) parameter in CS reply is the same or greater than the TPL (Telemetry Power Level)

9.2.3 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
		Perform a noise check; refer to <i>6G Terminal Lite, Section "Noise Measurement"</i> .
		Set the transponder to high power telemetry transmission using the TPL parameter in the CS command
	Other acoustic systems may be operating in the same frequency band	Check for signals validating by using the noise command on the surface transceiver

9.2.4 Battery Life is Shorter than Expected

Fault	Possible Cause	Action
Beacon is charged for specified amount of time but battery life is not lasting as long as expected	Incorrect charger being used	Check that the Comms/Charger box is the correct part (Dwg 8370-011-01/02) and the PSU being used has the correct rating (1.3 A, 30 V)
	NiMH battery has degraded	Contact your nearest Sonardyne office to get the unit repaired

Section 10 – Spares

10.1 Introduction

When ordering spare parts, you must provide:

- The parts number
- The drawing number (if known)
- The description

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

www.sonardyne.com

Table 10-1 lists commonly available WSM 6+ spares.

Table 10-1 Component Identification

Part No.	Description
Lower Endcap	
312-6874	CON U/W 5W dummy F/M micro Subconn MCDC5F (5-way female dummy plug)
317-5197	CON U/W 8W DUMMY M micro Subconn MCDC8M (8-way male dummy plug)
317-2672	CON U/W 2-8W L/S F/M Subconn collar MCDLSF (Locking sleeve for dummy plug / cable tails)
110-0494	Nylon line 280lb 1.6mmDIA
Miscellaneous	
790-1057	Packing case (holds 2 units) – 4000 m Directional WSM 6+
790-1039	Packing case (holds 2 units) – 1000 m Omni WSM 6+
Battery Charging/PC Comms	
602-0078	WSM 6+ comms/charger assembly – 5-way Subconn
602-0086	WSM 6+ comms/charger assembly – 8-way Subconn
272-0026	PSU 30 V, 1 A
280-4175	PC Cable, 9-way D type, male-female
317-5063	Power Pack ac cable, UK plug
317-5044	Power Pack ac cable, US plug
317-5057	Power Pack ac cable, European plug
Optional Accessories	
317-2824	Subconn MCIL5F (5-way female cable tail + 600 mm)
317-2857	Subconn MCIL5F (5-way female cable tail + 5 m)
317-5115	Subconn MCIL8M (8-way male cable tail + 600 mm)
317-5327	Subconn MCIL8M (8-way male cable tail + 5 m)

Section 11 – Technical Specifications

11.1 Technical Drawings

Figure 11-1 Type 8370-1111 Omni-Directional WSM 6+

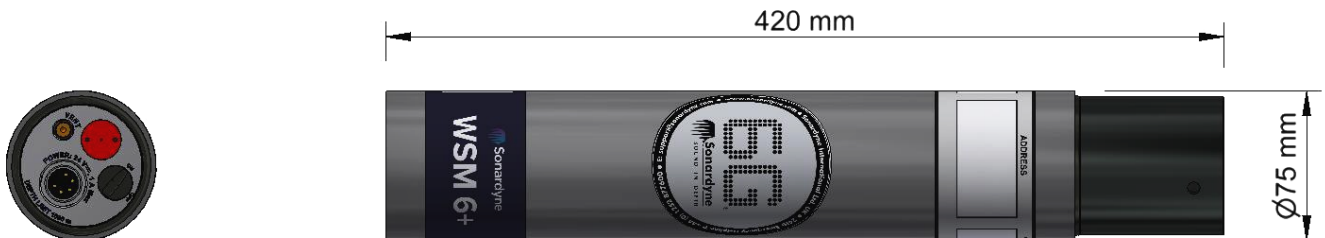


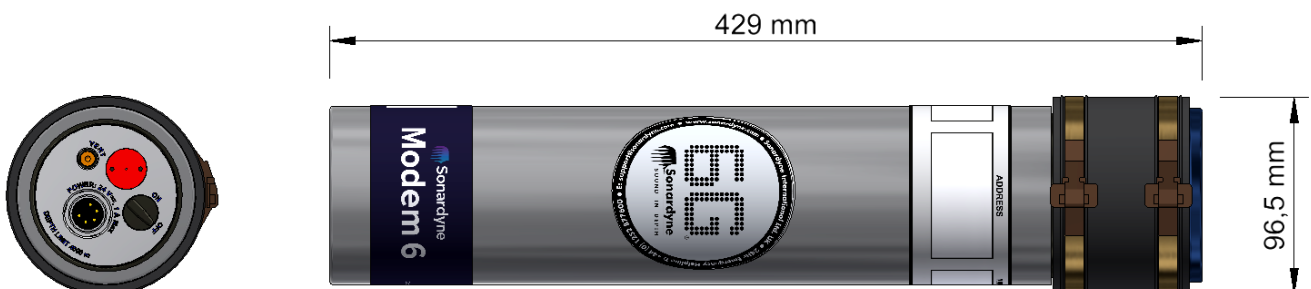
Figure 11-2 Type 8370-4112 Directional WSM 6+



Figure 11-3 Type 8377-1111 Omni-Directional Modem 6 Sub-Mini



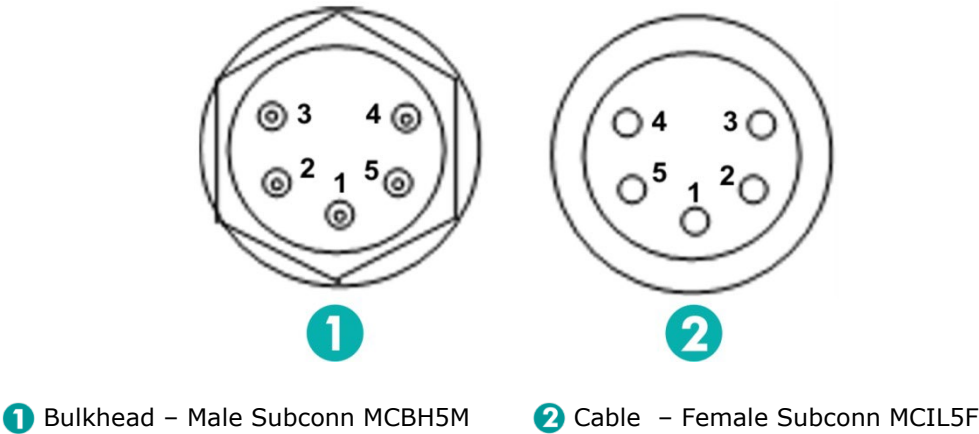
Figure 11-4 Type 8377-4112 Directional Modem 6 Sub-Mini



11.2 Pin-Out Wiring Connections

11.2.1 Type 8370 Standard Housing Wiring Connections

Figure 11-5 5-Way Connector Pin Out and Mating Tail



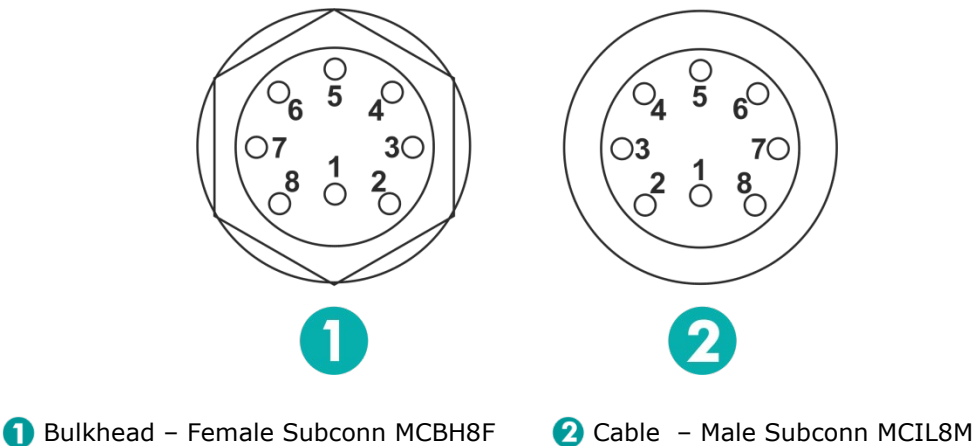
Pin Number	Function
1	Trigger In / Comms In
2	0 V
3	Fast Charge / Comms out
4	External Power 24 V and trickle charge
5	Not used

11.2.2 Type 8377 Standard Housing Wiring Connections

Pin Number	Function
1	RS232 Comms In (Rx)
2	0 V
3	Fast Charge / RS232 Comms Out (Tx)
4	External Power 24 V and trickle charge
5	Not used

11.2.3 External Remote Release Option Wiring Connections

Figure 11-6 8-Way Connector Pin Out and Mating Tail



Pin Number	Function
1	Trigger In / Comms In
2	0 V
3	Fast Charge / Comms out
4	External Power 24 V and trickle charge
5	Auxiliary +ve / Contact B1
6	Auxiliary -ve / Contact B2
7	Primary +ve / Contact A1
8	Primary -ve / Contact A2

11.3 Specifications for Type 8370-1111/4112 WSM 6+

Feature		Type 8370-1111	Type 8370-4112
Depth Rating		1,000 m	4,000 m
Operational Frequency		MF (19–34 kHz)	MF (19–34 kHz)
Transceiver Beam Shape		Omni-directional	Directional
Transmit Source Level (dB re. 1 μ Pa @ 1 m)	External Power	187 dB	196 dB
	Battery	184 dB	193 dB
Tone Equivalent Energy (TEE) ¹ (External Power)		193 dB	202 dB
Receive Sensitivity (dB re 1 μ Pa)		<85 dB	<80 dB
Power Supply		Rechargeable NiMH battery or external. 24 V via ROV umbilical	
Operating Channels		All Sonardyne Wideband HPR 400 channels	
Depth Sensor		$\pm 0.5\%$ full scale (100 bar)	$\pm 0.5\%$ full scale (400 bar)
Operating Life (1 s update rate, max. power, Wideband 2)		>6 days	>3 days
Update Rate (Maximum)		>2 Hz	>2 Hz
Quiescent Life (Battery)		>35 days	>35 days
Connector	5-Way (Standard)	Subconn MCBH5M	Subconn MCBH5M
	8-Way (Burnwire/Motor Release)	Subconn MCBH8F	Subconn MCBH8F
Operating Temperature		-5 to 40°C	-5 to 40°C
Storage Temperature		-20 to 55°C	-20 to 55°C
Mechanical Construction		Anodised aluminium alloy	Anodised aluminium alloy
Dimensions (Length x Diameter)		420 x 75 mm	429 x 96.5 mm
Weight in Air/Water		3.2/1.3 kg	5.5/3.2 kg
Battery Charger		8370-011-01	8370-011-01

¹ WBv2 & WBv1 signals are 2x the duration of Sonardyne tone signals, therefore the TEE figure gives the user an idea of the operational performance when comparing Wideband and tone systems.

11.4 Specifications for Type 8377-1111 Modem 6

Feature	Type 8377-1111	Type 8377-4112
Depth Rating	1,000 m	4,000 m
Operating Frequency	MF (21–32.5 kHz)	MF (21–32.5 kHz)
Transceiver Beam Shape	Omni-directional	Directional
Data Rate (Maximum)	9,000 bps	9,000 bps
Serial Port (RS232)	2,400–115,200 baud	2,400–115,200 baud
Data Buffer/Storage	512 kB	512 kB
Range ²	1–1.5 km	3–4 km
Transmit Source Level (dB re. 1 µPa @ 1 m)	181 dB	187 dB
Receive Sensitivity (dB re 1 µPa)	<85 dB	<80 dB
Power Supply	Rechargeable NiMH battery or external 24 V	Rechargeable NiMH battery or external 24 V
Battery Charge (0-100%)	5 hours	5 hours
Quiescent Life (Battery)	>35 days	>35 days
Connector 5-Way (Standard)	Subconn MCBH5M	Subconn MCBH5M
Mechanical Construction	Anodised aluminium alloy	Anodised aluminium alloy
Operating Temperature	-5 to 40°C	-5 to 40°C
Storage Temperature	-20 to 55°C	-20 to 55°C
Dimensions (Length x Diameter)	420 x 75 mm	429 x 97 mm
Weight in Air/Water ³	3.2/1.3 kg	5.5/3.2 kg
Battery Charger	8370-011-01	8370-011-01

² Depends on ambient noise level and ray bending due to SVP.

³ Estimated weights.

Appendix A – Frequency Tables

A.1 HPR 400 Frequency Table

Chan	First Rx Freq.	Second Rx Freq	First Reply Freq.	Chan.	First Rx Freq.	Second Rx Freq	First Reply Freq.
B12	21000	21500	29250	B51	23000	21000	28750
B13	21000	22000	29750	B52	23000	21500	29250
B14	21000	22500	30250	B53	23000	22000	29750
B15	21000	23000	30750	B54	23000	22500	30250
B16	21000	23500	27250	B56	23000	23500	27250
B17	21000	24000	27750	B57	23000	24000	27750
B18	21000	24500	28250	B58	23000	24500	28250
B21	21500	21000	28500	B61	23500	21000	28500
B23	21500	22000	29500	B62	23500	21500	29000
B24	21500	22500	30000	B63	23500	22000	29500
B25	21500	23000	30500	B64	23500	22500	30000
B26	21500	23500	27000	B65	23500	23000	30500
B27	21500	24000	27500	B67	23500	24000	27500
B28	21500	24500	28000	B68	23500	24500	28000
B31	22000	21000	28750	B71	24000	21000	28750
B32	22000	21500	29250	B72	24000	21500	29250
B34	22000	22500	30250	B73	24000	22000	29750
B35	22000	23000	30750	B74	24000	22500	30250
B36	22000	23500	27250	B75	24000	23000	30750
B37	22000	24000	27750	B76	24000	23500	27250
B38	22000	24500	28250	B78	24000	24500	28250
B41	22500	21000	28500	B81	24500	21000	28500
B42	22500	21500	29000	B82	24500	21500	29000
B43	22500	22000	29500	B83	24500	22000	29500
B45	22500	23000	30500	B84	24500	22500	30000
B46	22500	23500	27000	B85	24500	23000	30500
B47	22500	24000	27500	B86	24500	23500	27000
B48	22500	24500	28000	B87	24500	24000	27500

A.2 Sonardyne Wideband Frequency Table

The acoustic command address set in the unit will determine the carrier frequency of the coded reply and the interrogation signal used in IIS tracking. The CIS setting will determine the carrier frequency of the common interrogate signal used for CIS tracking.

A.2.1 Wideband Address Frequency Chart



Definitions

The following table lists abbreviations and terms used in this manual.

Term	Definition
6+	Sonardyne instruments that can use Wideband 3 enabling sensor data to be embedded in navigation range replies e.g. Compatt 6+ 6+ instruments are also backward compatible with Wideband 2.
6G®	Sonardyne's sixth generation technology hardware platform.
6G Terminal Lite	6G Terminal Lite is an easy-to-use setup and diagnostic tool that provides useful terminal functions for all 6G instruments. It displays key information about the 6G asset being interrogated serially, and also allows for setup, diagnostics and testing prior to deployment of the 6G instrument.
AC	Alternating Current.
CIS	Common Interrogation Signal.
CRS	Common Reply Signal.
HPR	Hydro-acoustic Position Reference.
IIS	Individual Interrogate Signal.
iWand	The iWand is a handheld acoustic transponder test and configuration device developed for use with Sonardyne's 6G instruments.
LED	Light Emitting Diode.
Long Base Line Positioning System (LBL)	A system where two or more transponders are on the seabed. The positions of the transponders are established by a calibration process in a seabed frame. The distances from a transducer to each transponder are measured using a transceiver. The position of the transducer can be computed in the seabed frame. The name comes from the "baselines" joining each transponder.
LUSBL	Long and Ultra Short Base-Line.
NiMH	Nickel Metal Hydride.
PC	Personal Computer.
PSU	Power Supply Unit.
ROV	Remotely Operated Vehicle.
Sonardyne	Sonardyne International Limited and its affiliates.
Sonardyne Wideband®2	6G® transponders and transceivers use Sonardyne Wideband®2 ultra-wide bandwidth signals giving a faster and robust transmission of data, more precise ranging and mitigation from multipath in shallow water and amongst steel structures in deep-water.
Sonardyne Wideband®3	Telemetry protocol available with 6G "+" devices that enables sensor data to be embedded in navigation range replies.
Ultra-Short Base Line Positioning System (USBL)	A transceiver 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. These are used to compute a position of the source signal. The co-ordinate frame is fixed to the transducer array and so heading, pitch and roll offsets must be accounted for.
WSM	Wideband Sub-Mini Transponder (WSM6 predecessor – tone interrogate, wideband v1 reply).
WSM 6+	Wideband Sub-Mini Transponder 6 Plus.

Global Headquarters, UK

T +44 1252 872288
sales@sonardyne.com

Aberdeen, UK

T +44 1224 707875
sales@sonardyne.com

Houston, USA

T +1 281 890 2120
usa.sales@sonardyne.com

Rio das Ostras, Brasil

T +55 22 2123 4950
brasil.sales@sonardyne.com

Singapore, Asia

T +65 6542 1911
asia.sales@sonardyne.com

24/7 Emergency Helpline

T +44 01252 877600
support@sonardyne.com

sonardyne.com

