

SeaKing Site Survey System

**Hammerhead Sonar, MicronNav Transponder,
Seanet Pro and Image Tiler Software**

0672-SOM-00001, Issue: 04

Outstanding Performance in Underwater Technology



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Help & Support

First please read this manual thoroughly (particularly the Troubleshooting section, if present).

Tritech International Ltd can be contacted as follows:

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	Website	www.tritech.co.uk

Prior to contacting *Tritech International Ltd* please ensure that the following is available:

1. The Serial Numbers of the product and any *Tritech International Ltd* equipment connected directly or indirectly to it.
2. Software or firmware revision numbers.
3. A clear fault description.
4. Details of any remedial action implemented.



Contamination

If the product has been used in a contaminated or hazardous environment you *must* de-contaminate the product and report any hazards *prior* to returning the unit for repair. *Under no circumstances should a product be returned that is contaminated with radioactive material.*

The name of the organisation which purchased the system is held on record at *Tritech International Ltd* and details of new software or hardware packages will be announced at regular intervals. This manual may not detail every aspect of operation and for the latest revision of the manual please refer to www.tritech.co.uk *Tritech International Ltd* can only undertake to provide software support of systems loaded with the software in accordance with the instructions given in this manual. It is the customer's responsibility to ensure the compatibility of any other package they choose to use.

Warning Symbols

Throughout this manual the following symbols may be used where applicable to denote any particular hazards or areas which should be given special attention:



Note

This symbol highlights anything which would be of particular interest to the reader or provides extra information outside of the current topic.



Important

When this is shown there is potential to cause harm to the device due to static discharge. The components should not be handled without appropriate protection to prevent such a discharge occurring.



Caution

This highlights areas where extra care is needed to ensure that certain delicate components are not damaged.



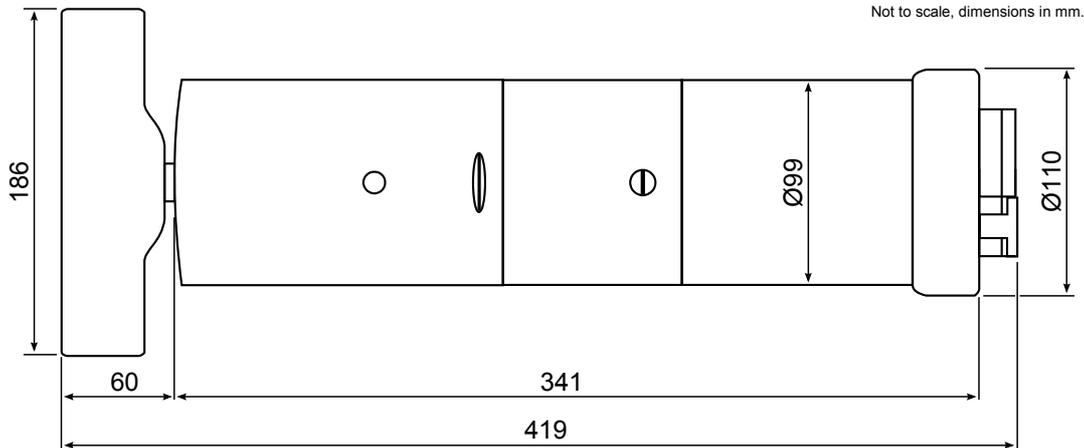
Warning

DANGER OF INJURY TO SELF OR OTHERS

Where this symbol is present there is a serious risk of injury or loss of life. Care should be taken to follow the instructions correctly and also conduct a separate Risk Assessment prior to commencing work.

1. Hammerhead Sonar Specification

1.1. Dimensions



1.2. Acoustic

Operating frequency	675kHz	935kHz
Beamwidth	30° vertical, 0.9° horizontal	20° vertical, 0.6° horizontal
Maximum range	100m	40m
Minimum range	0.4m	
Range resolution	approximately 7.5mm	

1.3. Sonar Display

Range selections	2m to 100m
Scan resolutions	0.225°, 0.45°, 0.9°, 1.8°
Continuous 360°	Yes
Offset sector scan	Yes
Attitude information	Angle of sonar body to vertical (2 axes)
Heading information	Sonar heading with transducer in straight ahead position

1.4. Electrical and Communication

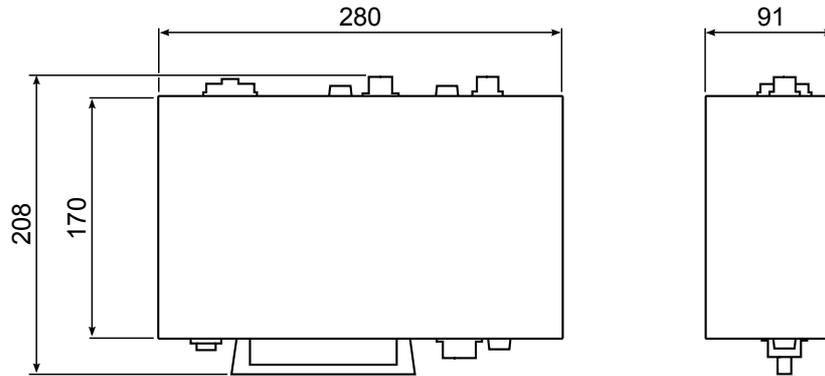
Operating voltage	20 – 72V DC
Power requirement	30W
Communication protocol	RS232, RS485, ARCNET
Connector options	Tritech 6-pin standard (others available on request)

1.5. Physical

Weight in air	6.8kg
Weight in water	3.8kg
Depth rating	700m standard 4000m optional
Materials	Aluminium alloy (hard anodised)
Operating temperature	-10 to 35°C
Storage temperature	-20 to 50°C

2. Hammerhead Interface Box Specification

2.1. Dimensions



Not to scale, dimensions in mm.

2.2. Physical

Weight	2.74kg
IP67 Rating	The Interface Box is sealed against dust and moisture ingress to IP67 standard

2.3. Electrical and Communication

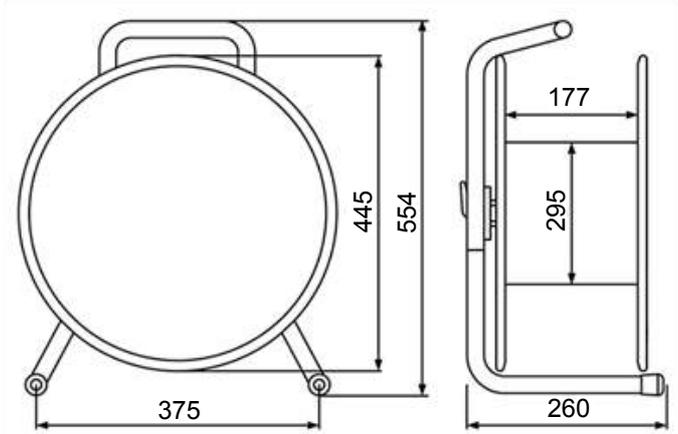
Ports	AC Power, DC Power, USB PC connection, Sonar connection
DC Power draw (idle)	3VA
DC Power draw (load)	42VA
AC Power draw (idle)	17W at 240V AC
AC Power draw (load)	46W at 240V AC
DC Input Voltage	12 – 36V
AC Input Voltage	100 – 240V (50 – 60Hz)



Warning

If operating on 240V AC mains supply (or equivalent from a generator) the Interface Box must not be exposed to water.

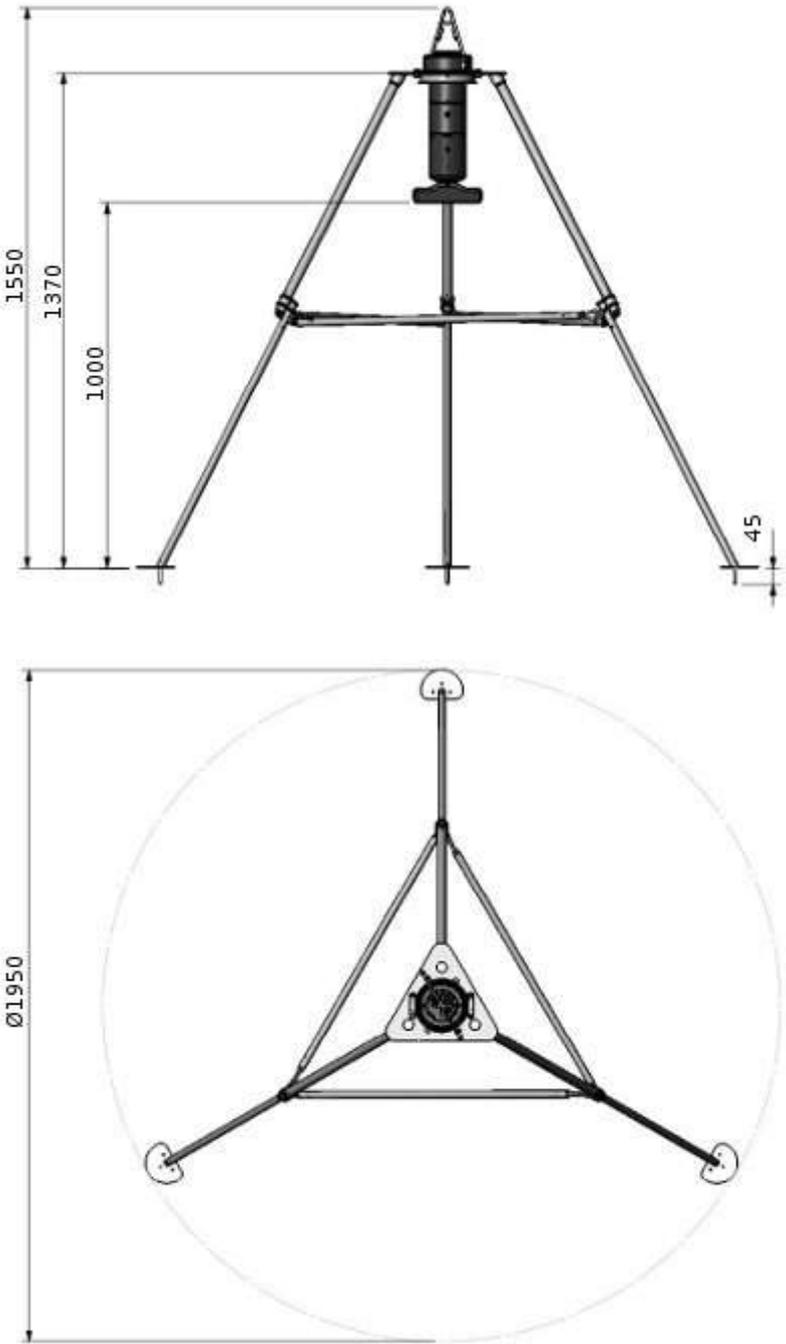
3. Hammerhead Cable Reel Specification



Not to scale, dimensions in mm.

Weight of 100m reel	~13kg
Weight of 150m reel	~16kg
Weight of 200m reel	~20kg
Weight of reel	approximately 6kg unladen
Weight of cable	approximately 0.07kg per metre
Material	Yellow Polyurethane Aramid (Kevlar) fibre braid
Material thickness	1.4mm (nominal)
Cable diameter	7mm (nominal)

4. Hammerhead Tripod Specification

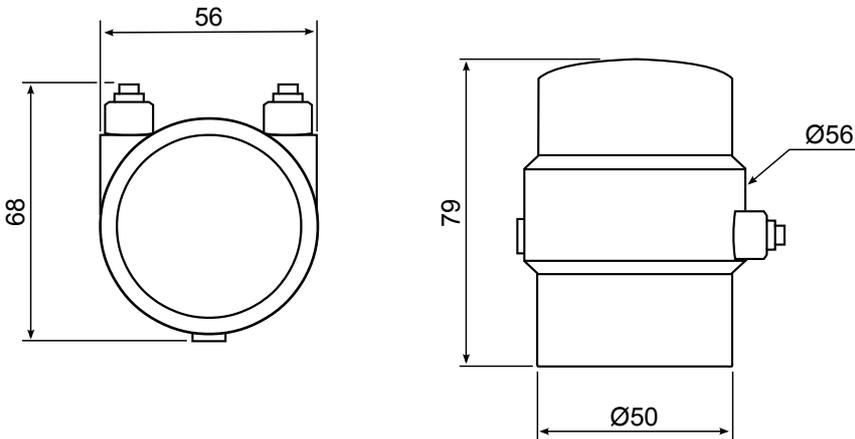


Dimensions are in millimetres

Weight of tripod in air	~9.6kg
Weight of tripod in water	~8.4kg
Material	Stainless Steel

5. MicronNav Transponder Specification (Optional)

5.1. Dimensions



Not to scale, dimensions in mm.

5.2. Physical Properties

Weight in air	225g
Weight in water	70g
Depth Rating	750m

5.3. Acoustic Properties

Beamwidth	Omni-directional
Transmitter Source	169dB re 1µPa at 1m

5.4. Electrical and Communication

Power requirement	12 – 48V DC
Power consumption	3.5W transmitting, 0.28W standby
Data communications	RS232 or RS485

6. Hardware Installation

If the unit has been bought with the optional tripod arrangement it will come supplied with all the necessary fittings to enable the Hammerhead unit to be mounted. For a guide on the assembly of the tripod unit please see *Appendix B. Assembly of Hammerhead Tripod*

The Hammerhead is supplied with a waterblock and connector with a length of polyurethane jacketed cable. If an alternative connector is utilised, a cable may not be supplied and a suitable connector will need to be obtained separately for system integration.

The waterblock is fastened to the connector endcap and provides a 4000m rated pressure bulkhead. This will protect the electronics from water ingress in case the connector is damaged or not fitted correctly. It is not necessary to remove the waterblock when removing the connector. Whenever the connector is removed, blanking plugs should be used to prevent ingress of dirt or moisture to the waterblock.

For mounting on an ROV the head should be secured by clamping on the cylindrical body section such that the transducer head is unimpeded and unshielded. The clamp should be applied centrally to the metal body tube and should not be over-tightened.



Caution

It is recommended that a substantial guard is fitted to the ROV over the scanning head to protect from impact damage. Care should also be taken to ensure the transducer head can rotate freely and will not be snagged by any trailing cables.

7. Mounting

7.1. *Optimal Orientation*

If using with the Tritech International Ltd tripod arrangement the unit is self-levelling to a maximum of 15°. Ensure that the Hammerhead is mounted with the transducer at the bottom.

For ROV installation always mount the Hammerhead so that it is as close to the true vertical as possible in relation to the trim position of the vehicle. The front filling plug and red LED should be aligned with the natural direction of travel of the vehicle.

Errors in the head alignment can give rise to unreliable results.

7.2. *Mounting Material and Suitable Brackets*



Caution

Avoid any metal alloys containing copper such as brass or bronze.

Non-metallic clamps should always be used where possible to prolong the life of the unit and prevent any galvanic corrosion effects. If metallic clamps are used they should be electrically insulated from the sonar body by means of rubber or plastic strips or mount brackets of at least 3mm thickness and extending at least 3mm beyond the clamp boundary. They should also be painted or lacquered with at least three coatings.

8. Electrical and Communication

8.1. Power Requirement

The Hammerhead unit will typically draw 30W of power and requires a regulated DC voltage supply of between 20 and 72V. The optional Hammerhead Interface Box also provides power to the unit as well as a communication link.



Caution

Do not attempt to run at higher voltages to compensate for longer cable lengths. This will also increase the current and potentially damage the sonar head.

8.2. Communication Link

The Hammerhead is normally connected using an RS485 serial link which can be achieved by connecting to the serial port of an SCU, using an RS485 to USB converter or using the optional Hammerhead Interface Box which will provide a USB output to the PC or laptop.

As a single device the Hammerhead will communicate with AutoComms technology which is an automatic setup so there is no requirement to dismantle the unit or manually set any of the communications settings. Set the desired communications protocols in software and the Hammerhead unit will automatically update itself to match.



Note

The AutoComms feature will only work with newer versions of Seanet Pro, so make sure you have the latest version installed.

For AutoComms to function the correct wiring must first be in place and connected prior to applying power.

8.3. Networking



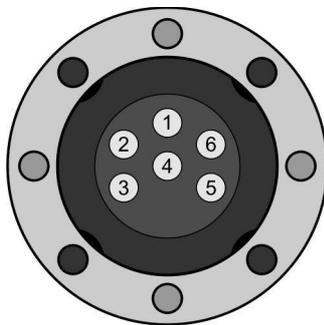
Note

To network the devices, AutoComms will have to be disabled and the communications settings manually selected. Please see the *Appendix F. Networking and Communication* or more information.

The Hammerhead may form part of a network of sensors using the ARCNET protocol. This would normally be interfaced through a Surface Control Unit (SCU) or using a SeaHub device (for detailed setup information please refer to the appropriate SCU or SeaHub manual). Normal communication with the sonar head requires a good quality balanced twisted pair cable.

For mounting on an ROV an optional 4000m pressure rated junction box is also available to provide an RS232 interface to the network of Hammerhead or SeaKing ARCNET devices. Please contact Tritech International Ltd customer support or visit www.tritech.co.uk for details of the sub-sea junction box.

8.4. Waterblock Pin-out Diagram



Tritech Waterblock

Pin	MAIN Port	AUX Port	Cable colour
1	RS232 TX ARCNET A RS485 A	RS232 RX ARCNET A RS485 A	Yellow
2	RS232 RX ARCNET B RS485 B	RS232 TX ARCNET B RS485 B	Blue
3	+DC Power		Red
4	-DC Power		Black
5	Dual Head Sync/RS232 Ground		Green
6	Earth/cable shield		cable screen

8.5. Cable Termination and Limits



Note

Termination resistors are only required for ARCNET communication – a single Hammerhead unit operating on the standard RS485 serial protocol will not need any termination resistors fitted. For detailed ARCNET setup information see *Appendix E. ARCNET Termination*

9. Software Installation



Note

For the latest version of the *Tritech International* Ltd software packages please visit www.tritech.co.uk

The Seanet Pro software will be provided either on an installation CD (for Hammerhead Interface Box to PC) or pre-installed on the Seanet SCU.

For the CD installation, if Setup does not automatically start on disk insertion, run the **run.exe** file from the disk to start the installation. If you need to reinstall the software, this can be accomplished through the normal Windows software removal application.

From the installation main screen it is possible to select the installation of either the Seanet Pro software or the Sonar Image Tiler application.

For more information on installation and operation of the software please see the Seanet Pro Software Manual which is available from www.tritech.co.uk and is pre-installed with Seanet Pro as the interactive "help" feature.

10. Prior to Deployment

On completion of the installation of the sonar, it can be tested in air by powering up the system, entering the "Single Sonar" application of Seanet Pro and observing that the red LED flashes once per revolution of the transducer as it passes the straight ahead position.

Connection to the computer which is to be used should enable confirmation that the signal is being sent and received as desired, however, until the unit is submerged the sonar display will be meaningless.

Bench Testing

If testing the Hammerhead in air prior to use it is recommended to utilise the tripod to support the unit while undertaking the test. Alternatively, if testing on a bench or worktop it is essential that the transducer head is free to rotate.

The Hammerhead should be placed as follows:



11. Deployment

If using the tripod arrangement for deploying over the side of a vessel or dockside it is important to check that the path into the water is clear and free from obstacles prior to lowering over the side. Care should also be taken to ensure that sufficient cable length is available and that there are no snags in the cable. If a Kevlar reinforced cable and arrest system has been purchased then the device can be raised/lowered using the cable, however, it is recommended that a rope or chain is used to prevent the possibility of damage from the cable snapping.

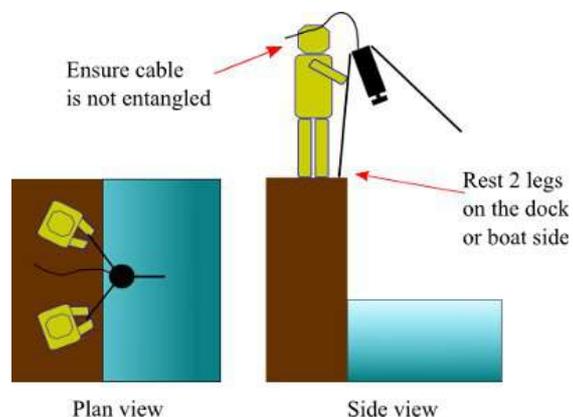


Warning

A minimum of two people should be employed to deploy and retrieve the Hammerhead and tripod and both should be equipped with life-vests.

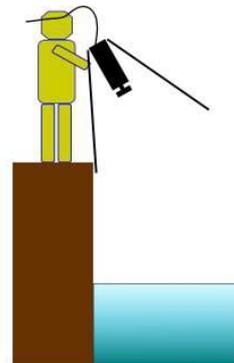
Step 1

Two people should bring the tripod to the waters edge, holding the legs securely



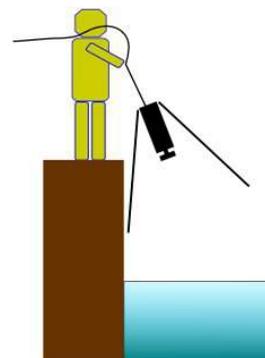
Step 2

Lower the legs over the side of the boat or dock until the rope at the top is easy to grasp.



Step 3

Take a firm grasp of the rope and lower the rest of the way into the water – at this point the second person is not required for lowering and should instead ensure that the rope is free to run.

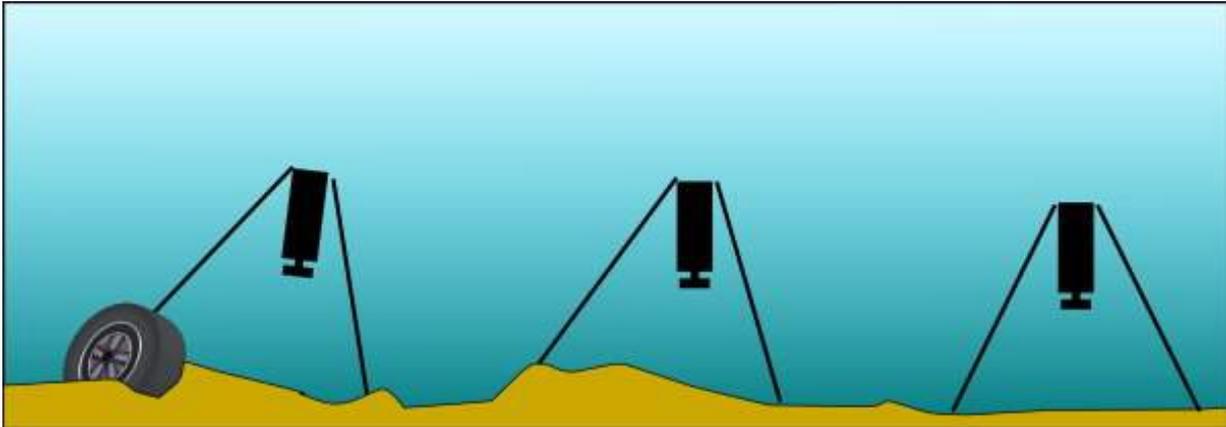




Caution

Do not attempt to lower the tripod using the data cable unless it is Kevlar reinforced and fitted with an arrest system, otherwise it could break or cause damage to the waterblock or connector. If in doubt use a rope attached to the tripod.

Once the tripod has been lowered into the water it is important to ensure that the device is sitting level, while small variations in the seabed can be corrected by the gimbal arrangement of the tripod, any variation greater than 15° in any direction will result in incorrect images on the sonar display. Attitude can be checked using the built-in sensor which is displayed on the main Seanet Pro screen.



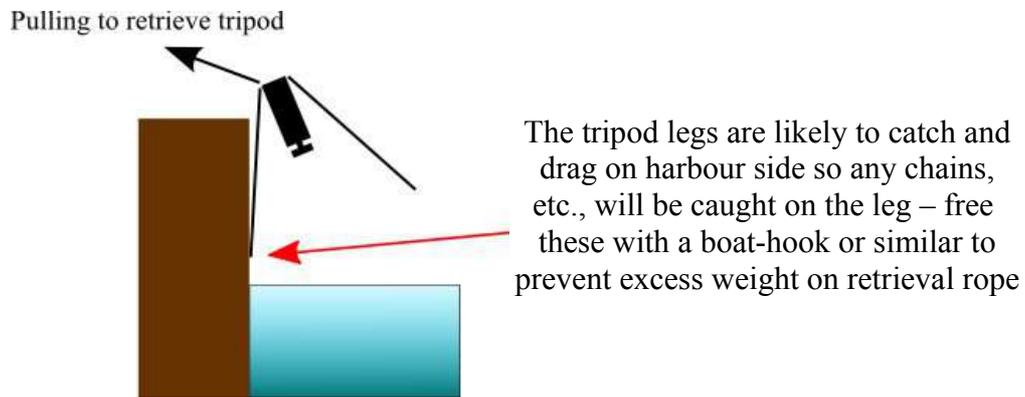
Tripod not level and beyond the 15° range of the gimbal – will result in incorrect images and will have to be moved to a new location.

Tripod not level but Hammerhead has self-levelled due to the gimbal feature.

The perfect scenario where tripod is lowered onto a level seabed.

12. Retrieval

On retrieval of the system it may become snagged with ropes, seaweed or other debris as it is being drawn out of the water. It is advisable to have a boat-hook or other device available to free the tripod legs and enable easy retrieval.



The unit should then be washed down and stored in accordance to the instructions in *22. Maintenance of the Hardware*

13. The MicronNav Transponder

13.1. Overview

The MicronNav Transponder is an optional part of the system that is purchased separately as a part of the MicronNav System. Please contact Tritech International Ltd for more details and refer to the MicronNav System manual for a complete guide on the installation and set up of the MicronNav equipment.

This section details only those aspects of operation and installation that are specific to the SeaKing Survey System and for the sake of brevity it is necessary to leave out many details. Any information which is missing from this manual will be captured in other documents, all of which are available from www.tritech.co.uk.

13.2. Transponder Installation on Tripod

The MicronNav Transponder is designed to fit into a black acetal housing which is screwed onto the Hammerhead tripod, this housing is normally supplied with the tripod.

To attach the MicronNav mount first locate the correct hole on the top plate of the tripod. The correct hole is the one which is away from the gimbal ring locking bolts.

Once the correct hole has been located, hold the bottom part of the MicronNav mount underneath the tripod top plate.



Next place the top section of the MicronNav mount onto the bottom section and screw down.



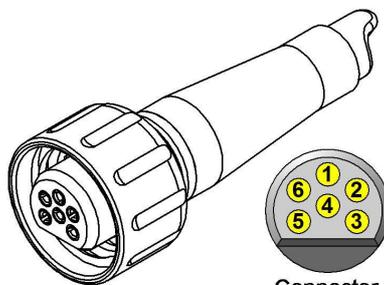
The completed installation of the MicronNav mount should look like this:



13.3. Electrical and Communications

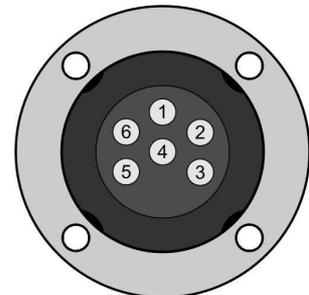
In Transponder mode the MicronNav subsea modem head only requires power supply connections, all communications are achieved through the water.

A suitable connection cable is supplied with the system and is wired as follows:



MicronNav Transponder cable end

Pin	Wire Colour	Function
1	Yellow	n/c
2	Blue	n/c
3	Red	+V DC
4	Black	0V
5	Green	n/c
6	none	screen
<i>n/c = not connected</i>		



Hammerhead AUX port cable end.

13.4. Transponder Operation

Once the MicronNav Transducer is correctly installed on the top of the Hammerhead tripod it will be necessary to configure the rest of the MicronNav System. It may also be necessary to construct a suitable mounting arrangement for the MicronNav Dunking Transducer.

Full details of the correct configuration and mounting arrangements can be found in the MicronNav System Manual (*document reference 0656-SOM-00001*).



Seanet Pro Application

If Seanet Pro has not been used with a Hammerhead and MicronNav before then it will be necessary to set up a new Seanet Pro Application (“Applications” menu and then select “Application Wizard”).

The application should include a “Sonar” (for the Hammerhead) and “MicronNav” (for the Transponder). Once this Application is set up it will be saved automatically and subsequently can simply be selected from the “Applications” menu.

14. Hammerhead Software Features

The Seanet Pro software is used to operate the Hammerhead system and a comprehensive manual for the Seanet Pro software will have been supplied with the system (in electronic format) and can also be found on the *Tritech International Ltd* website. SCU systems generally have an electronic manual already installed by default.

One unique feature of the Hammerhead Sonar is that it is supplied with two operating frequencies of 675kHz and 935kHz – the frequency can be switched by clicking on the number in the main Seanet Pro display or by pressing the "Freq" button on the RAT (button F5).

The default operation of the Hammerhead version of Seanet Pro software has other device options removed from the “Applications” menu but these can be enabled using the “Application Wizard”. This is useful if the Hammerhead is to be used with a MicronNav system or if it were used alongside other *Tritech International Ltd* products like a PA500 altimeter on an ROV.

The Hammerhead device also has the ability to build up a picture of a wide area as a series of "tiles" which are then stitched together in using the Tritech Sonar Image Tiler post-processing software.

Using the Hammerhead and MicronNav along with a GPS device and Sonar Image Tiler software will enable positional recording and charting and can be used to create a detailed record of wreck sites or harbours.

The Hammerhead also incorporates an attitude sensor and compass so these will be displayed by default on the Seanet Pro main screen.



Note

A line of sight has to be maintained between the MicronNav Transducer and Transponder at all times and in particularly noisy environments such as confined or busy harbours the acoustic positioning may be adversely affected.

15. Seanet Setup



If a MicronNav System is installed

If a MicronNav Transponder is in use with the survey system it will be necessary to set up Seanet Pro for use with a MicronNav System as well, so in addition to the following steps to set up for a single Hammerhead the procedures within the MicronNav System Manual (*document reference: 0656-SOM-00001*) should be followed.

15.1. Outline of Procedure

To set up the Seanet Pro system for use with the Hammerhead the following basic procedure should be followed (these points are expanded below):

1. Connect the Hammerhead Interface Box to the computer via USB (no external power to the Interface Box is required at this point).
2. Obtain the COM port number which corresponds to the Interface Box.
3. Configure Seanet Setup to use the correct COM port number.
4. Connect the Hammerhead Sonar to the Interface Box.
5. Provide power to the Interface Box and turn on the Sonar Power switch.
6. Verify that the Hammerhead Sonar is displayed in Seanet Setup.

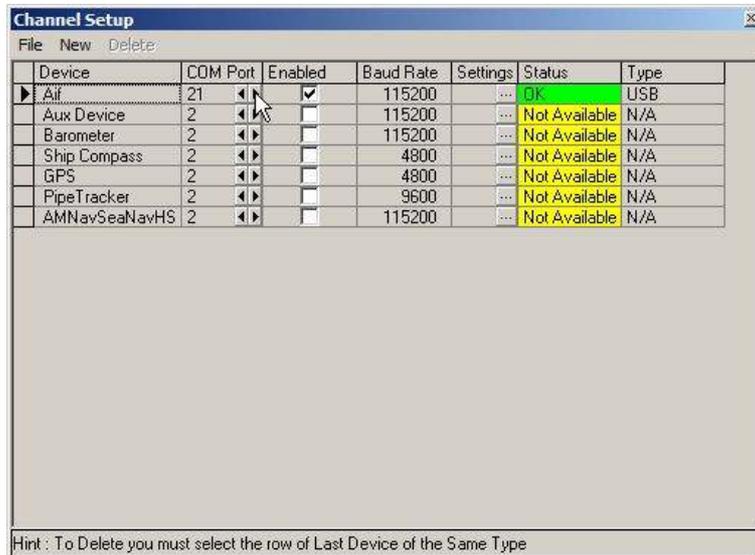
15.2. Connecting the Interface Box

If using a single Hammerhead Sonar and the Hammerhead Interface Box and a default installation of Seanet Pro it will only be necessary to enter Seanet Setup to select the correct serial COM port as detected by the computer. The number of this COM port will vary depending on the individual computer and can be found by navigating to the Windows Control Panel and then the Device Manager under which there is a drop-down list of COM ports called “Ports (COM & LPT)”.

When the Hammerhead Interface Box is connected via USB Windows will automatically assign a COM port to it. If there are several entries in the list the correct COM port can be identified by monitoring the list and unplugging the Interface Box, at which point the corresponding port number will disappear from the list. The Interface Box will be listed as a “USB Serial Port”.

Once the COM port number is known start Seanet Setup by clicking on the desktop icon or through the Start menu. Navigate to the “Utilities” menu and select “Com Setup”.

In the “Channel Setup” dialog which is now displayed find the entry labelled “Aif” (it is the first entry by default) and click on the “Enabled” check box. Once the Aif device is enabled, click on the right arrow in the “COM Port” column to advance the COM port to the correct value (in the example below Windows assigned COM21 to the Interface Box). Once the correct value is selected the Status column will turn green and be labelled “OK” and the Type column will display “USB”.

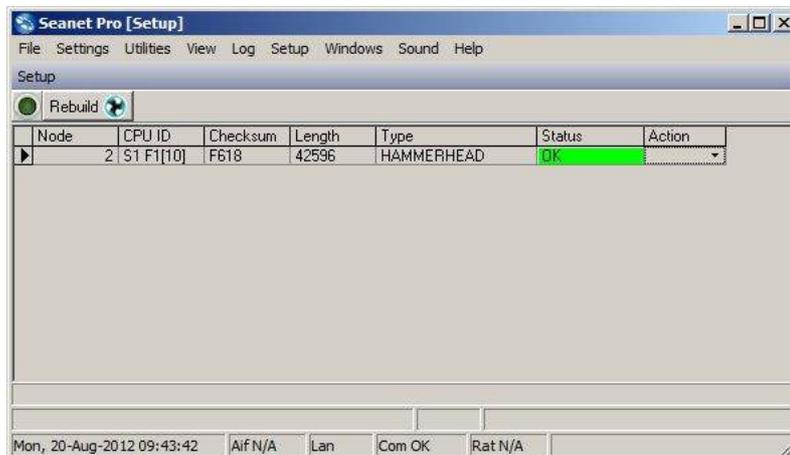


15.3. Connecting the Hammerhead Sonar

Once the Interface Box is correctly configured the SeaKing Hammerhead Sonar should be connected to the Interface Box and power should be provided through either the AC or DC inputs on the rear of the Interface Box.

If the power supply is correct the Power Connected LED will illuminate on the top of the Interface Box and it will now be possible to turn on the sonar by pressing the Sonar Power button on the front.

After a short delay while the Hammerhead Sonar automatically configures itself to the correct communications protocols the sonar head will be displayed in the Seonet Setup dialog box as follows:

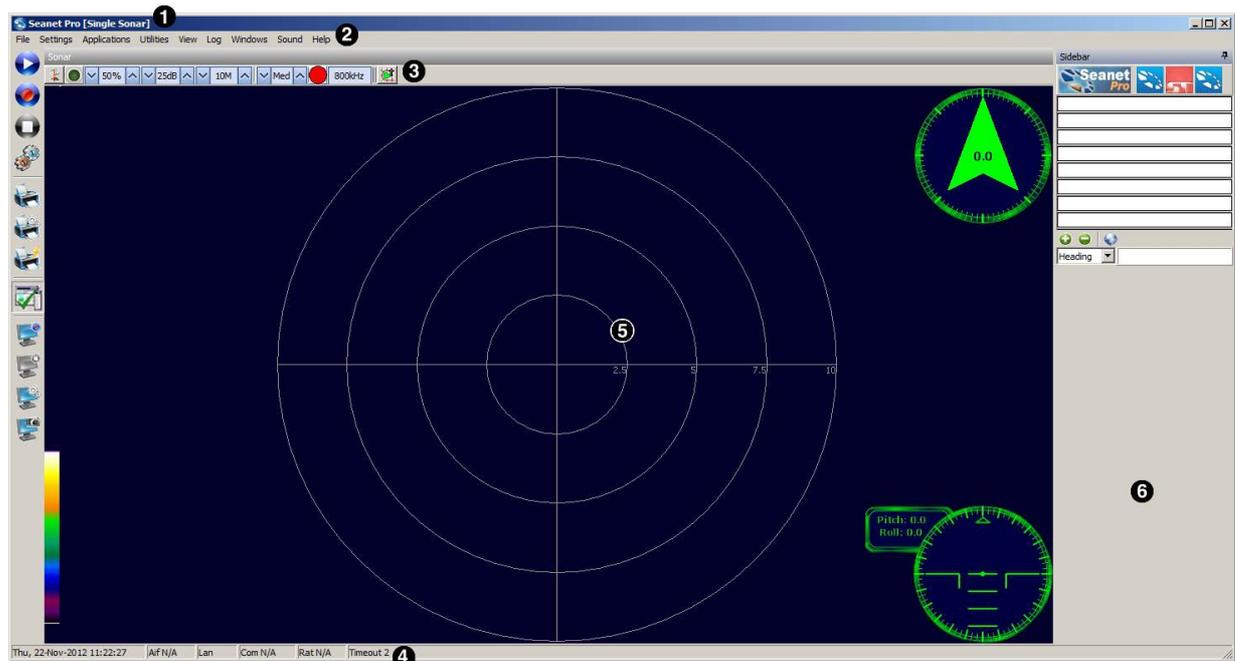


At this point Seonet Setup can be closed and the main Seonet Pro application can be started.

16. Seanet Pro Main Functions

16.1. Main Screen

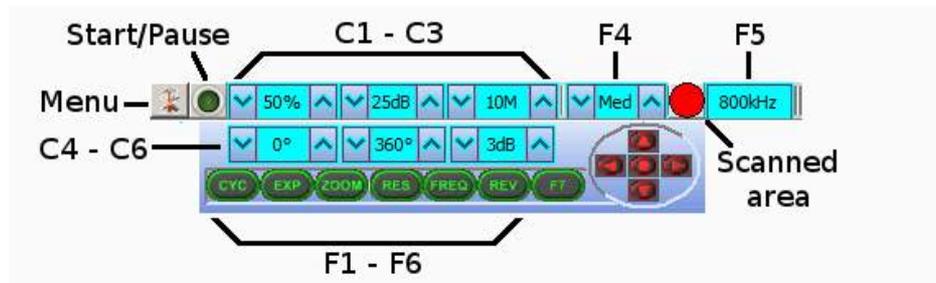
The Seanet Pro application can be run from the Programs group in the Windows Start menu or from the desktop by double clicking on the shortcut icon.



- ❶ Display Header – This part of the screen is used for system/software identification
- ❷ Menu Bar – This is where system setup functions can be accessed. Printing, Application selection, Colour Scheme setup and Logging are some of the features that can be accessed in this screen area.
- ❸ Settings Bar – This is where the sensor can be controlled and configured. The settings bar is on top of every display window for each device that is connected to the system. It includes a Tools Setup button, LED indicator (Pause/Go) and RAT dials and buttons.
- ❹ Status Bar – This part of the screen is used to display system status information, typically interface status, logging status/progress and job specific information
- ❺ Sensor Display Area – This part of the screen is where the main sensor data is displayed. Other pertinent data such as range scale, cursor and status messages pertaining to the sensor may also be displayed within this area.
- ❻ Sidebar – This is where serial input data and custom text can be displayed. This bar can be placed on the left or right side and it can also be hidden.

16.2. Sonar Settings

These controls are displayed on the Sonar Settings bar. When the RAT is used or screen cursor is moved over the Sonar Settings bar, a pop-up control panel will appear which will display the remaining controls. These mimic the positions of the rotary controls (C1 to C5) and function buttons (F1 to F7) on the RAT. Adjustments may be made using the RAT or the on screen controls using the pointer device.



Note

F1 and F2 are not applicable in single window applications, F7 is not used.

- | | |
|----------------------------|---|
| Sonar Gain (C1) | This sets the sonar receive gain as required – typically this is around 50% but is varied according to water and target conditions and user preference. |
| Contrast (C2) | This sets the display contrast between hard and soft targets. Usually set to user preference, it can help find small features in generally featureless situation or exclude clutter from a heavily featured seabed. |
| Range (C3) | This sets the maximum range the sonar will scan. Long ranges are scanned more slowly than short ranges due to the limit imposed by the velocity of sound in water. |
| Sector Scan Direction (C4) | This is used to set the centre of the scanned sector particularly useful when using a narrow sector width to concentrate on a particular feature. A well positioned, narrow sector will allow faster scan updates than a wide sector. |
| Sector Scan Width (C5) | This sets the width of the scanned sector. Typically this will be adjusted according to the required seabed coverage. |
| Display Sensitivity (C6) | This sets the display sensitivity threshold. A low setting will effectively remove very low level returns from being displayed which may include (soft) seabed backscatter whereas a higher setting will start to remove higher amplitude echoes which may include objects of interest. It is normal to keep this at a low setting of no more than 5dB to remove low level ‘noise’. |
| CYC (F1) - Cycle Window | This can be used when one of the display windows is maximised using the Expand (F2) button and will cycle between the Sonar display windows. Also use the F1 button to switch focus between the display windows. The optional RAT controller will |

switch its control to the display that has the focus. Note: clicking on a display with the mouse pointer will also switch focus to that display.

EXP (F2) - Expand Window	This will maximise the current display window that is in focus. Either click on a display window to switch focus to it before expanding, or press the Cycle (F1) button to switch focus to a display window.
ZOOM (F3)	This will toggle the Acoustic Zoom window on/off. This draws a zoom box on the display positioned by the cursor. This control is also toggled via Application Tools – Acoustic Zoom. The Zoom window size and magnification can then be adjusted in ‘Zoom Setup’ in the Application Tools. RES (F4) – Sonar Resolution Resolution toggles through preset step sizes for the sonar scanning. Available step sizes is dependant on the sonar being used. Smaller angles give a higher resolution picture but slower scan speeds. Usually a Lo or Med resolution is used for tracking moving targets and Hi or Ult for detailed examination of static targets.
FREQ (F5) - Sonar Frequency	This toggles between the channels available on the sonar. For a single frequency sonar unit this control will be inactive and will lock to indicate the operating frequency of the sonar.
REV (F6) - Reverse Scan Direction	This allows the operator to instantly reverse the scan direction without waiting to reach the end of the scanned sector.
Sector Quick Select	This group of 5 buttons in the bottom right of the control allows the user to make a quick selection of a full 360° scan or 180° forward, back, left or right. The display view is changed automatically and the appropriate sector width and direction set.

16.3. Status Bar



- ❶ Date and time
- ❷ Status of interface card (AIF card)
- ❸ ARCNET LAN Timeout counter
- ❹ Status of Serial COM ports
- ❺ Status of Remote Access Terminal (RAT)
- ❻ Sensor Status

Various error codes are reported in the status bar at the bottom of the screen. These help the user determine any faults with equipment or cabling, as a guide to making any corrections or replacements.

Status and Error Codes

No Aif	The AIF card is not installed or not configured/enabled correctly. This status will also appear when using the SeaHub serial port interface instead of the AIF card interface.
Rat Ok	Remote Access Terminal (RAT) is connected and communicating okay.
Rat N/A	RAT is not connected or there is a connection problem.
No COM	Will display if only an AIF Card interface is in use or no COM Port has yet been opened (e.g. No “Aif” device yet enabled from Com Setup accessed through the Utilities menu).
Com OK	For SeaHub or COM Port interface; A COM port has been opened and is functioning correctly.
Com Bad	For SeaHub or COM Port interface; The COM port cannot be opened – it may already be in use by another application or may have a problem.
Com AIF Error TMO	For SeaHub or COM Port device interface; the device is not responding (check it is connected and powered).
Timeout x	There is no communication with head node x

16.4. Main Menu



Print – output screenshot to printer

Screen – capture screen to AVI or save screen to Bitmap/Tiff

Exit – used to exit the program



Load/Save Settings – save and load the current display and device settings (up to 8 can be saved).

Environment – used to enter environmental parameters such as system Velocity of Sound

Always on Top – “Main Screen” is always on top of windows desktop



This Menu Item will only be present in Seanet Pro and not from running Seanet Setup from the desktop icon. Application examples include Single Sonar, Sonar Profiler and Sonar Bathy Profiler. There is also an Application Wizard available at the top of the list which can be used to create user applications for required device combinations.



GPS – Pop-up form to display GPS data received through a COM port.

Compass – Pop-up Form to display Compass data received through a COM port.

Auxiliary Device – Pop-up Form to display Aux Device data (i.e. Digiquartz Pressure Sensor or PA/NMEA Altimeter data) received through a COM port.

Com Setup – Configure and Enable COM ports for various serial inputs/devices including GPS, Pipetracker, Barometer and Compass.

GPS Diagnostic – Terminal for viewing received serial data.

Compass Diagnostic – Terminal for viewing received serial data.

Auxiliary Device Diagnostic – Terminal for received serial data.

Barometer Diagnostic – Terminal for viewing serial data.



Sidebar – Enable/Disable the Sidebar. Note: In certain applications, i.e. ‘Sonar Video’, the Sidebar will be opened and docked to the blank ¼ window panel filler.

Toolbars – There are several toolbars containing shortcut buttons which can be displayed in the Menu Bar area or docked to the sides of the Display Area. For details see the "Toolbar Shortcut Buttons" section.



Play – use to play back recorded log data.

Record – use to record Sonar data.

Stop – stop recording and/or Auto Logging.

Setup – select file options for recording log files.

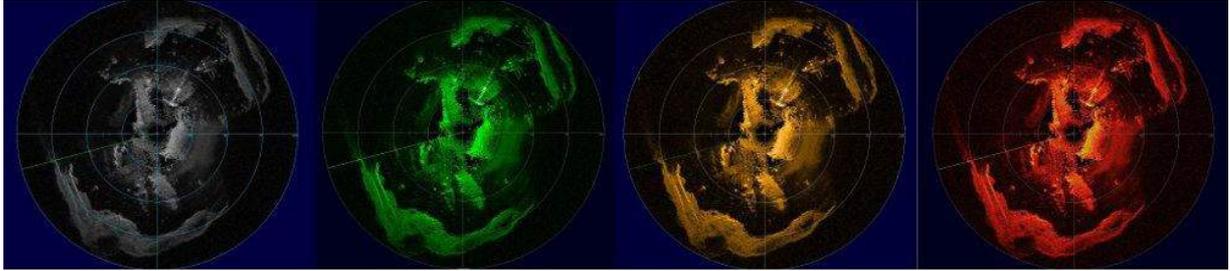


Sonar (this will be renamed for other devices, e.g., “Sidescan”, “Profiler” or “Bathy”).

Colours – use to select a saved colour scheme

Colour Setup – use to configure the existing colour scheme or create a new colour scheme.

Some examples of colour schemes that are available by default:



Windows (only functional in multi-Sensor Applications)

Cycle F1 – Cycle to the next Display Window (can also be done using the F1 key).

Zoom F2 – Enlarge the current Display Window to fill the window, click again to display all the Display Windows (can also be done with the F2 key).

Sonar – Switch focus to Sonar Display window.

Sidebar – Will be replaced with name of another Sensor in a Multi-Sensor Application.



The Sound menu enables an acoustic representation of the visuals presented on the Main Screen of the Seanet Pro application. Clicking on Setup allows configuration of how this sound is represented.



About Seanet – gives details of program and version numbered

Seanet Guide – Seanet help files

System Information – Gives information of computer resources

16.5. Measurement Tool

By left button clicking and dragging on the Sonar display window (or Acoustic Zoom window) an elastic band is laid for range and position measuring of targets.

D_x, D_y = Cartesian co-ordinates of current pointer position relative to Sonar.

R_{ng}, B_{rg} = Polar position of pointer relative to where elastic band was laid.



Note

The range units used are those selected in the Setup menu.

16.6. Toolbar Shortcut Buttons

- ① Play Log File – Opens a dialog window to enable the selection of a V4Log file for playback.
- ② Record Log – File Starts recording a log file, a dialog box will present itself so a name can be chosen for the log file.
- ③ Stop Logging/Playback – Halts the current playback or recording activities.
- ④ Log File Setup – Opens the settings dialog to control how files are logged.
- ⑤ Print – Opens the Print dialog to enable selection of an output printer, paper size, etc.
- ⑥ Printer Setup – Enables printer settings to be changed.
- ⑦ Quick Print – If Quick Print is enabled when Print is selected the dialog box will not appear and instead the printer will use whatever settings have been specified in Printer Setup.
- ⑧ Sidebar – Displays or hides the right-hand sidebar.
- ⑨ Start Screen Capture to AVI – Starts recording an AVI file onto disk (note that this does not include an associated log file).
- ⑩ Stop Screen Capture Stops the recording activity.
- ⑪ Screen Capture Settings – For changing the settings for the AVI recording.
- ⑫ Snapshot – Opens a dialog prompting for a name for either a Bitmap (.bmp) or TIFF (.tiff) image of the sonar screen.



Note

Right-clicking on a space within the button bar brings up a menu to enable different types of buttons to be shown/hidden. This is a duplicate of the Toolbar option located in the View menu.

De-selecting Large Icons is useful if working on a low resolution display.



16.7. Dynamic Range and Sonar Rx Indicator



The dynamic range bar is the A/D sample window (with 64-colour mapping) for the Sonar receive signal (which extends from 0 to 80dB).

To the right of the dynamic range bar is the Sonar receive signal strength indicator (Yellow = Average amplitude over scan-line, Red = Maximum amplitude echo for scan-line).

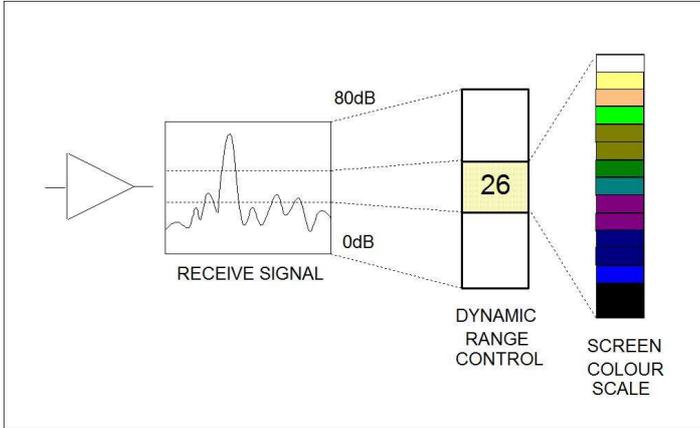
Normally the sampling window should not need to be adjusted from its default position (as shown on the left). However, if used properly, adjusting the sample window can produce better quality imaging.

The dynamic range bar can be adjusted to change Sonar display contrast and sensitivity. Adjustment is made using the left and right mouse buttons.

Contrast adjustment Right-click on the bar and whilst holding down the right button, move the mouse up/down to increase/decrease the size of the bar. The sampling window can be any size between a range of 9 – 25dB. Decrease the size of the sampling window to increase the sonar display contrast. Ideally the control should be set somewhere in the centre of the allowed range (16 – 18dB) to give the best results under most conditions. Select a high value to reduce the contrast of the sonar display.

Sensitivity adjustment Left-click on the bar and whilst holding down the left button, move the mouse up/ down to decrease/increase the Sensitivity of the Sonar receiver. Decreasing the Sensitivity will produce a more saturated display with greater weak-return content. Increasing the Sensitivity will omit background noise and low level returns seen at the receiver

The sonar receiver will accept a return signal in the region of 0 – 80dB. The dynamic range controls are used to adjust the position of a sampling window within the 0-80dB dynamic range band of the receive signal. An idealised representation of the sample window is shown:



16.8. Colour Setup

This is accessed via “Colour Setup” which is found in the “Sonar” menu.

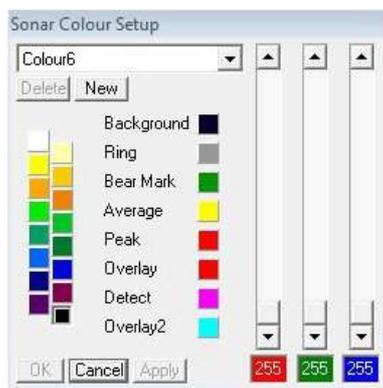


Note

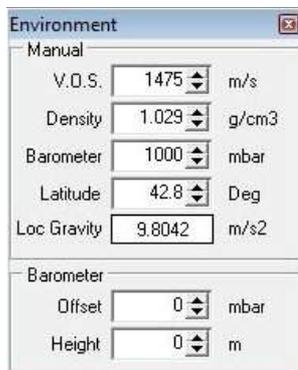
For other device applications such as Profiler, Bathymetric or Sidescan, the Sonar menu item will be replaced with Profiler, Bathymetric, Sidescan as appropriate.

Click on the New button to start a new colour scheme or change the colours of the current scheme (indicated in the drop-down list, Colour6 in this case). There are 7 factory preset colour schemes which cannot be altered. If you try to alter these schemes then a dialog will prompt you to save to a new scheme if and when you try to save or apply changes.

The various colour boxes can be clicked on to configure a new colour for that item. The 3 slider bars are used to set the new RGB colour levels for each item and the Apply button is used to confirm the changes. Clicking on OK accepts all changes and exits the dialog.



16.9. Environment Setup



This is accessed by navigating to “Environment” in the “Settings menu”.

This is where all the environmental values should be applied for use in various device applications. Only the Velocity of Sound (V.O.S) will apply for a Sonar application.

V.O.S. – System value applied to all acoustic devices to correct plotter ranges. Applies to Sonar and Profiler and can also be applied in MicronNav calculations.

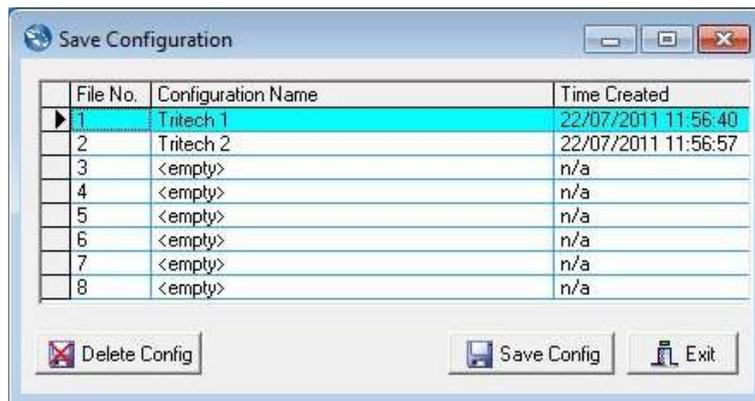
Density, Latitude, Loc Gravity and Barometer can all be ignored for Hammerhead systems.

16.10. Load/Save Settings

This is where the screen configuration can be saved and previously saved configurations can be loaded. This is accessed via the Settings menu on the Menu bar.

Place the mouse pointer over the Load Settings menu item, to bring up a sub-menu listing all the previously stored configuration settings.

There is a default setting that will always appear in the list and cannot be deleted. This is the setting to be used for reverting the system back to factory defaults.



In addition to the factory default up to 8 different configurations can be saved. To save the current application and form layout, click on the Save Config button. A prompt will be displayed to enter the configuration name, with a default name of "User x" initially given, where "x" is the configuration number.



Click on OK to store the current settings to file, where they can later be loaded using the Load Settings. Disused configurations can also be deleted from the Save Configuration form by highlighting the configuration to be deleted and then selecting Delete Config.

16.11. Log Function

This is accessed via the Log menu on the Menu bar:

With Logging de-activated, click on Play to replay a Log file or click Record to start recording a new Log file. When a new Log file is opened for recording, the file name will default to a Date and Time format.

During recording, the Play feature will be locked out and Record option will be ticked,

highlighting a recording is active. During recording the status bar (on the bottom of the display) indicates the current log file size. Clicking on Stop or de-selecting Record will halt recording.

During log file playback, the file details will be displayed in the replay dialog. The Pause button temporarily halts the log file and Continuous Loop plays it continuously. There is also a (clock) button to select play back at real time speed. The slider bar controls the replay speed.



Note

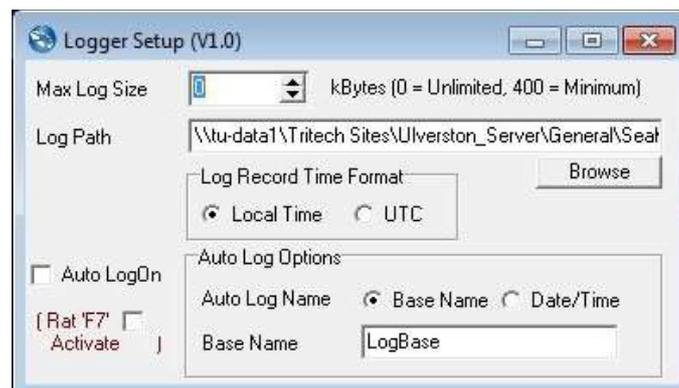
The name of the log file is displayed in the replay dialog caption bar.



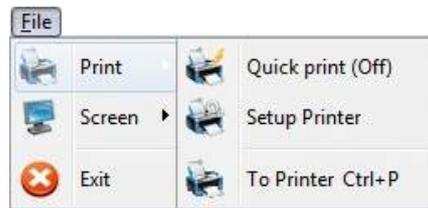
Setup allows the directory where log files are to be stored to be changed and set a maximum file size selected. The time-stamping of saved records can be in either Local or UTC time.

There is an Auto LogOn option to allow auto logging as soon as the system starts. There is a check-box to activate this (On/Off) via the Rat 'F7' button.

The user can specify a Base Name or choose a Date/Time format to prefix the automatically generated file names.



16.12. Print Function



This is accessed by navigating to the File menu and selecting Print

Quick Print On – when printing the Print Setup dialog box will not appear and default printer and its settings are chosen.

Setup Printer – Select and setup the Windows Printer.

To Printer – Print to Windows Printer. When Quick Print On is set to.

Off, a setup dialog will appear allowing the user to select printer and set options before printing.



Caution

Printing may take a few moments during which sonar updates are suspended. It is therefore not advisable to make printouts during actual underwater operations unless it is safe to do so.

16.13. GPS Display

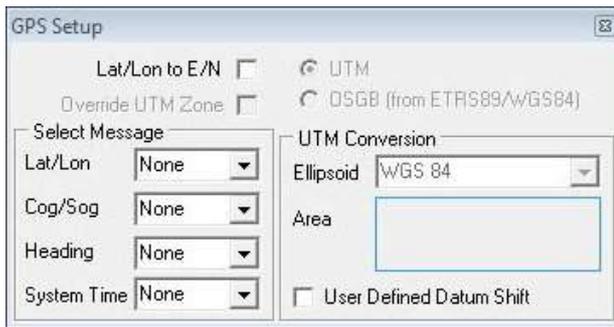
This is accessed via the GPS in the Utilities menu. When enabled the GPS dialog will be displayed:



- ❶ Latitude or Easting
- ❷ Longitude or Northing
- ❸ Zone
- ❹ Course Over Ground
- ❺ Speed Over Ground
- ❻ Heading
- ❼ GPS Input – used to select and configure the GPS input
- ❽ Diagnostics – flashes green when there is an incoming signal

The GPS Setup panel is accessed by clicking on the “GPS Input” button and is where the NMEA 0183 message type can be selected.

All position data updates displayed in the GPS panel will be recorded when the logging function is used to record device data and GPS data.



The GPS Setup panel contains 4 drop-down menus for selecting NMEA 0183 message types for Latitude/Longitude, COG/SOG, Heading and System Time.

It is possible to set the system time via any of the listed NMEA messages and this will update the

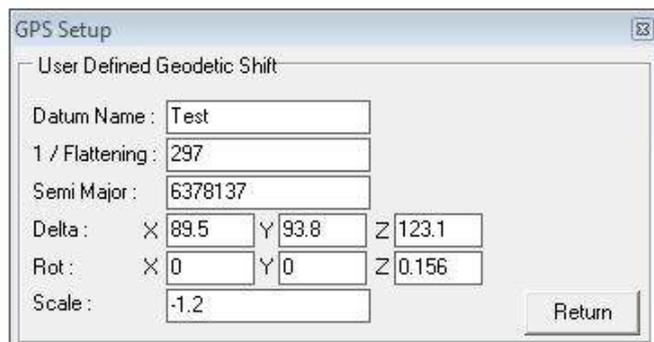
clock within the sensor device. This is used to time synchronise output data strings to a survey computer or if log data containing both device and GPS position data is to be post-processed.

The GPS Setup panel includes the option to convert and display the incoming Lat/Lon positions in Easting/Northing format using a UTM or OSGB conversion. There is also facility to select the particular Ellipsoid to apply in the UTM

conversion equation with option to apply a geodetic datum shift. By ticking the UserDefined Datum Shift check-box, an Edit button will appear:



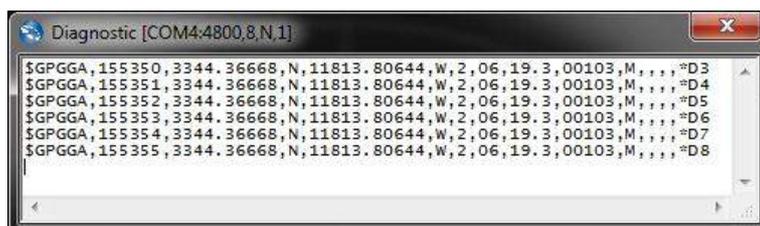
Clicking on this button will display the User Defined Geodetic Shift panel where parameters can be entered for the required datum shift.



Once parameters have been entered, press Return to go back to the previous setup panel.

A terminal window can also be opened to display the incoming GPS data strings. This is opened by clicking on GPS Diagnostic in the Utilities menu.

The terminal window will appear as follows:



16.14. *Aux Device Display*

This is accessed via the Utilities menu by clicking on Auxiliary Device.

When enabled, a pop-up Text Box form will be displayed. This can be used to display ASCII character data from a serial device up to a maximum of 100 characters in length and terminated with a <Carriage Return><Line Feed> (ASCII code 13 followed by code 10).

The Aux Device form can process and display altitude data (in metres), received through a surface COM port, from a PA or NMEA Altimeter; Digiquartz pressure data will also be converted to display a depth in metres. The values entered into the Environment dialog (accessed through the Settings menu) for density, barometer and local gravity will also be applied to the calculation of depth.

- Use As Remote Event to send the Aux device data to the Sidescan Sonar or Sub-Bottom Profiler plotter as a 'Remote Event' for annotation.
- View Raw Data to view the raw data string from known devices such as a PA Altimeter or Digiquartz instead of the Seanet processed string.

All data updates displayed in the Aux Device text panel will be recorded when the logging function is used to record device data.

The Diagnostic Led flashes green when there is an incoming Aux packet. A Terminal window can also be opened to display the incoming data strings. This is opened from the Utilities menu by selecting Auxiliary Device Diagnostic.

17. Application Tools

The Application Tools menu can be accessed by right-clicking on the sonar display or by selecting the Application Tools icon: 

17.1. Cursor

Adds the cursor position panel to the sonar display.



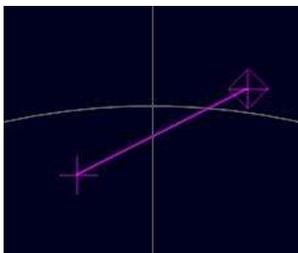
The Polar Check box changes the output display coordinates from Polar (Range & Bearing) format if enabled to Cartesian (X, Y) format if unchecked.

17.2. Markers



Adds A and B markers onto the sonar display, the range and bearing to each marker, separation and relative bearing are shown.

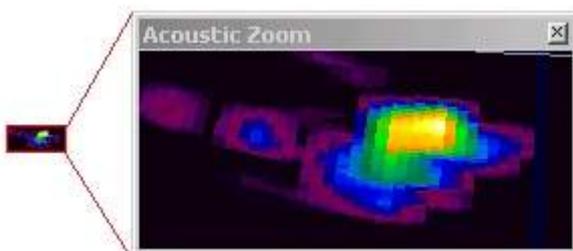
Click on the symbol to deploy on the “Marker” panel and that marker symbol will be dropped at the origin (0,0) on the sonar display. Then, pick up the marker using the left mouse button and drag it to the position required.



When both markers are dropped on the display, a line will be drawn which connects them. The Delta Range and Bearing at the bottom of the panel indicates separation and angle between both markers.

There are 4 sets of markers that can be implemented.

17.3. Acoustic Zoom



“True Sonar Zoom” mode draws a zoom box on the display positioned by the cursor. The sonar will take more samples in the area of the zoom box for target magnification.

“Zoom Setup” sets the size and magnification factor of the zoom box.

The size shows the screen zoomed area (red outline) as a percentage of the Acoustic Zoom display window. The Factor shows the number of zoomed range bins for each normal range bin. For instance, a Factor of 4 will take four times the number of samples in the zoomed area.

17.4. Zoom Setup



Allows the Acoustic Zoom to be configured by selecting a zoom factor or percentage size increase.

17.5. Position

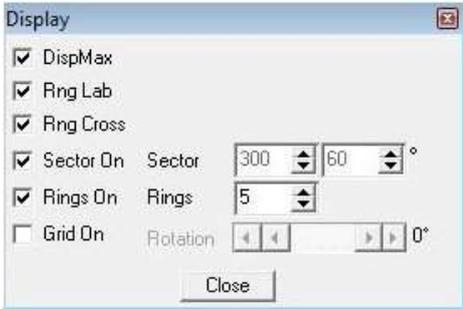
Used to move and size the Sonar PPI display in its display window.

Centre X/Y – Adjust X & Y centre position of the display

Radius – Size of the display.

17.6. Display

Sets up the sonar display options.



DispMax – Tick to expand sonar display vertically to fit the window. If un-ticked will expand horizontally.

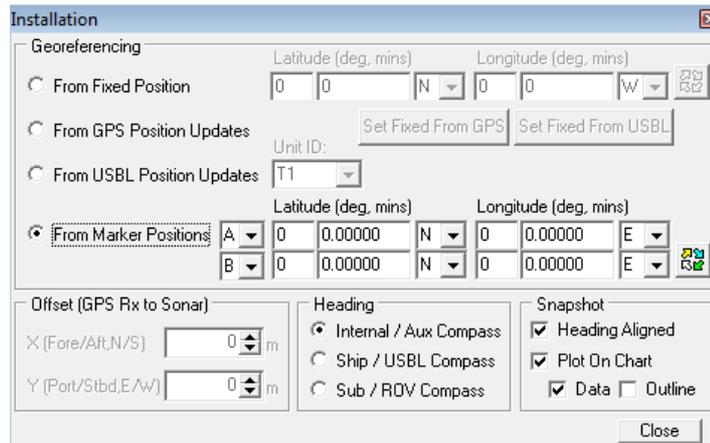
RngLab – Switch the Range Labels On/Off

Rng Cross, Rings On, Rings, Grid On – all of these overlay different features on the display.

Sector On, Sector – Display a sector overlay with left and right angular limit adjustment (in degrees).

Rotation – Rotational offset to correct sonar heading.

17.7. Installation

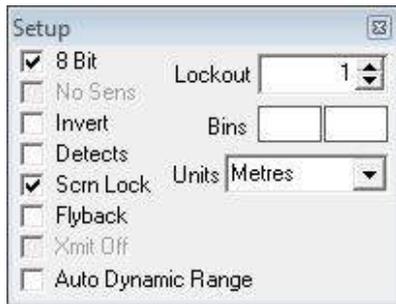


This configures the location of the sonar in the real world and enables the Geo-referencing of sonar targets on the sonar display.

- From Fixed Position** If there is no GPS input, select this option and input the Sonar position in Latitude and Longitude co-ordinates (DegMin or DegMinSec format). A Heading input will also be applied, else a zero degree heading is applied. If present it is also possible to set the fixed position from the USBL or GPS input so that they can be disconnected and the position will remain persistent – simply click the appropriate button “Set Fixed from GPS” or “Set Fixed From USBL”
- From GPS Position Updates** If a GPS input is active, select this option. A Heading input will also need to be active for the Geo-referencing to be functional.
- From USBL Position Updates** If a USBL input is active, select this option. A Heading input will also need to be active for the Geo-referencing to be functional. From Marker Positions This function requires an application with Sonar and Nav displays loaded (e.g., by selecting Settings→Applications→Sonar Nav). The chart of the Nav display is used to obtain the Marker position references to be used in this function. If a Nav chart is not used then the Marker positions must be manually entered in the Sonar display.
- Offset (GPS Rx to Sonar)** X and Y position offsets should be entered if there is any offset between GPS receiver and Sonar (e.g. for a ship hull mounted system). Or, for an ROV mounted sonar, if the GPS position updates are the position of a sub/vehicle then this offset may apply for the separation between a beacon/transponder and the sonar.
- Heading** Use this option to select the source of the heading data. If using a sonar which contains an internal heading and compass device or if the compass is connected to the Aux port of the sonar select Internal/Aux Compass. If the compass device has been connected through a COM port on the SCU or PC, or if a USBL system is in use then select Ship/USBL Compass. If the sonar is mounted to an ROV and both the ROV and support vessel have a compass it is possible to switch to ROV compass by selecting Sub/ROV Compass.

Once position and heading data are present, the Cursor display will be extended to provide position co-ordinates when the mouse cursor is moved around the sonar plotter.

17.8. Setup



8 Bit – Usually checked. Selects the intensity sampling of sonar data (4-bit or 8-bit).

No Sens – Must be off (grayed out as shown) for normal use to synchronise angular head alignment.

Invert – Swaps the display from left to right. Enable if mounted with Sonar boot down.

Detects – Paint the leading edge of strong targets on the screen (only applicable to certain models of sonar).

Scrn Lock – Locks the number of range bins sampled to the screen resolution.

Flyback – Sets the sector scan to flyback instead of scan back. Normally off.

Xmit Off – This option is not available under normal operation. It is a diagnostics level tool that will switch off the Sonar transmitter for test purposes.

Auto Dynamic Range – This will auto adjust the Display Contrast and Sensitivity whilst the Sonar is scanning. Auto adjustment occurs at the end of each full sonar scan.

Lockout – Sets a minimum range for the Detects (always in metres).

Bins – This is the number of samples taken over the current scan-line.

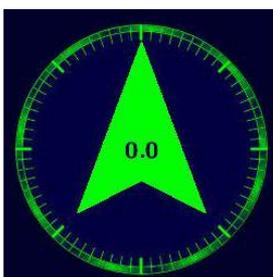
Units – Select the display range units. Options are Metres, Feet, Fathoms & Yards.

17.9. Interpolate



Applies interpolation between adjacent samples on the Sonar display. Blends out contrast and ‘blockiness’ on lower ranges and resolutions.

17.10. Aux Compass



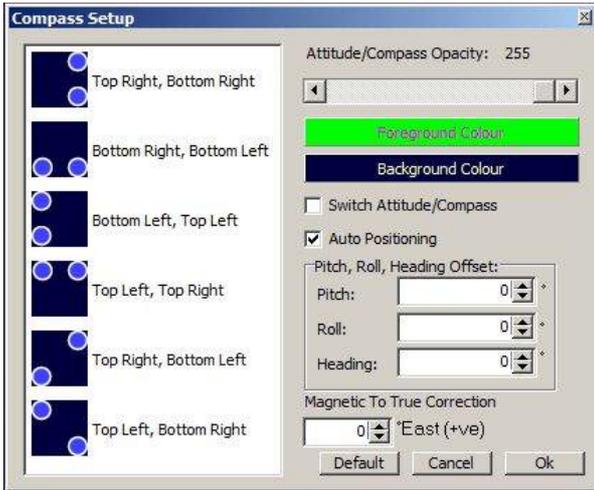
Selecting Aux Compass will place a compass and pitch/roll display on the sonar screen. The data which is displayed is taken from the device selected in the Installation dialog.



Note

The compass and pitch/roll display are never displayed side-by-side as shown here, their position is at the top/bottom right of the screen by default but can be changed using the Compass Settings dialog.

17.11. Compass Settings



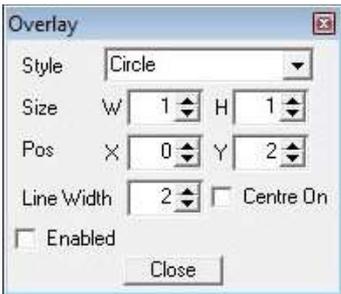
The Compass Settings dialog allows configuration of the compass and pitch/roll sensor display on the main screen. The position can be selected only if Auto

Positioning is first de-selected. Also colour and opacity can be controlled through this dialog.

If more than one sensor is available for selection this should be performed in the Installation dialog.

If an offset is required it can be entered here and the compass can be corrected for displacement of magnetic against True North.

17.12. Overlay



When enabled, this option can be used to place and size an overlay shape or outline onto the Sonar display canvas.

Style – Select the type of shape from; Circle, Rectangle, Triangle.

Size – Set the Width and Height of the shape.

Pos – Move the Shape with X, Y position offset from display origin.

Line Width – Change the line width.

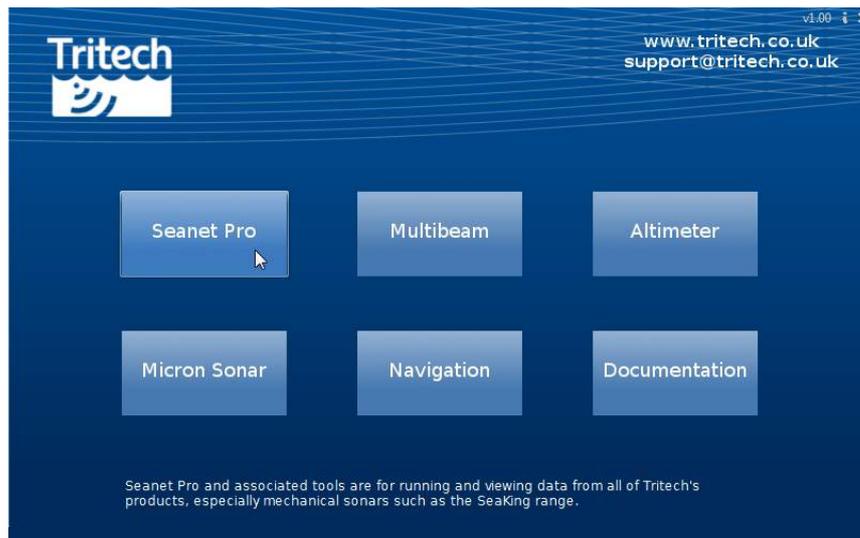
Centre On – Enable centre marker (+) for the shape.

18. Installing the Sonar Image Tiler Software

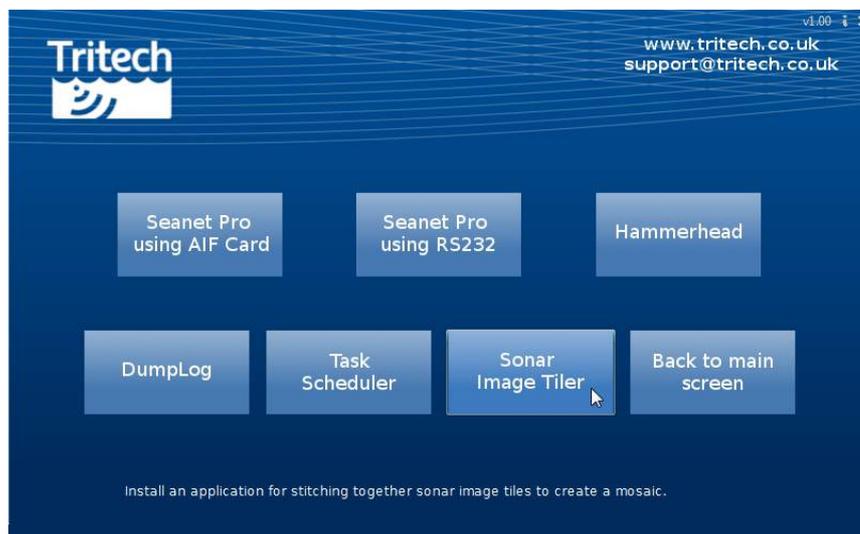
The installer file for the Sonar Image Tiler can be found on the Trittech Software Installation CD or downloaded from: www.tritech.co.uk

The installation CD will auto-run on disc insertion (if auto-run has been disabled launch the “run.exe” program from the root of the CD).

First select the the “Seanet Pro” button to open the correct section:



Next, select the “Sonar Image Tiler” button to begin the software installation:



Note

If installing from the Internet an executable file called “ImageTilerSetup.exe” will be downloaded. Run this file and follow the on-screen instructions.

19. Sonar Image Tiler Software Functions

19.1. Toolbar



- ① Import chart
- ② Export as image
- ③ Save project
- ④ Load project
- ⑤ Clear project
- ⑥ Add tile
- ⑦ Delete all tiles
- ⑧ Reset all tiles
- ⑨ Resize tile
- ⑩ Create mosaic
- ⑪ Save mosaic
- ⑫ Zoom in
- ⑬ Fit to screen
- ⑭ Zoom out
- ⑮ Toggle coordinates dialog
- ⑯ Toggle coordinate system dialog
- ⑰ Toggle tile list dialog
- ⑱ Toggle chart
- ⑲ Show markers
- ⑳ Move marker
- ㉑ Pan tool
- ㉒ Erase tool
- ㉓ Area erase tool
- ㉔ Remove tile background
- ㉕ Export area

19.2. Project Controls

19.2.1. Import/Create Chart



For creating a blank chart or importing a previously created chart. For more information on this function please see *20.2. Create the Background Chart*

19.2.2. Export as Image



If an area is selected this button will export the selected area. If no area is selected the whole chart will be exported.



Note

The markers will be embedded into the image file and if the image is loaded again it will no longer be able to modify or hide them. If exporting the image to use again as a chart the markers should first be hidden (see *19.14. Using Markers*).

19.2.3. Save Project



The first time this is pressed it opens a dialog to name and then save the current state of the chart, tiles and markers as an XML file. Using this option allows the project to be loaded later and the markers or tiles moved or hidden.

Subsequent presses of the button will not prompt for a filename and instead save over the existing project – to save under a different name navigate to the File menu and select Save Project As....



Note

If the tiles have been moved or rotated away from their original positions it will no longer be possible to restore them after the Project has been saved, i.e., the new "original" position which they will be returned to when they are "reset" will be the position which they were in when the Save Project button was pressed.

19.2.4. Load Project



For loading a previously saved Project file. The files are only generated by the Sonar Image Tiler and are in XML format.

For details of the supported file format please refer to: *21.3. Project Files*.

19.2.5. Clear Project



Removes any loaded data and clears the workspace. Any unsaved data will be lost.

19.3. Tile Controls

19.3.1. Add Tile



Opens a dialog to load an image tile. Image tiles must be in the correct format and have an associated world file.

For details of the supported file format please refer to: *21.1. For Loading Tiles.*

19.3.2. Delete All Tiles



Removes all the tiles from the chart. Any unsaved changes will be lost.

To delete an individual tile right-click on it in the “Tile List” dialog.

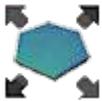
19.3.3. Reset All Tiles



Resets all the tiles using the position, orientation and size from when they were first loaded. If the tiles were loaded as part of a project then they will be reset to the original state that they were when the project was saved.

To reset a tile individually, right click on it in the “Tile List” dialog.

19.3.4. Resize Tile



Tiles can be resized individually using this tool. When the tool is enabled each tile will show a thin red outline with anchors at the corners and side midpoints. The mouse pointer will change to arrows indicating the available resize direction when it is positioned above the resize points. Click, hold and drag to resize the tile. The corner anchors maintain aspect ratio while it is resized whereas the side anchors allow the image to be stretched.

19.3.5. Create Mosaic



This will stitch all the visible tiles together into a single image. If only some of the tiles are to be included the remaining ones should be hidden from view using the Tile List as detailed in *19.13. Tile List Dialog*

19.3.6. Save Mosaic



Saves the newly created mosaic as an image with an accompanying world file which can then be loaded as a tile for future Projects.

Using the Save Mosaic function has the advantage over Create Mosaic in that it does not alter the tiles within the project so they can still be modified if desired. The newly created mosaic is in a completely separate file.

19.4. Zoom Controls

The zoom controls allow the user to Zoom In on an area of the screen by using the button  or by scrolling the mouse wheel forward.

Similarly, zooming out can be accomplished using the Zoom Out button  or scrolling the mouse wheel backwards.

The view can be reset so the chart fits into the window by pressing the Fit To Screen button .

19.5. View/Hide Controls

These controls are the same as those found in the View menu and allow the different dialogs to be shown or hidden from the workspace.

The background chart can be hidden to allow better viewing of the individual tiles by selecting the View/Hide Chart button: .

For more detail on the functionality of the dialogs refer to *19.12. Information Dialogs* and *19.13. Tile List Dialog*.

19.6. Marker Controls

Using these buttons the markers can be shown, hidden or moved. For a full description of the use of markers see *19.14. Using Markers*

19.7. Tile Manipulation Controls

19.7.1. Pan Tool



The pan tool is the default operation and allows the current viewpoint to be moved around by clicking and holding the left mouse button – useful if zoomed in or using a very large chart.

When this tool is selected and the mouse pointer is hovered over the tile handles the functionality will change to that of move a single tile or rotate the tile (depending on where the mouse pointer is located).

This does not alter the *position* of the chart – it simply changes the visible portion on the screen.

19.7.2. Erase Tool



Note

This action cannot be undone. To restore the original tile, the tile has to be deleted and then added afresh.

This tool allows parts of the sonar tile to be removed manually as if using an eraser. To remove a section of sonar tile select this tool then click and drag the left mouse button over the desired area. When this tool is active the mouse cursor should change to an eraser.

If multiple tiles are overlapping the erase tool will work on the uppermost tile only but if a portion is already erased the eraser will start to erase the tile below as well. To avoid accidentally erasing the wrong tile, it is recommended that the tiles that are not being worked on are disabled or hidden using the Tile List (see *19.13. Tile List Dialog*)

19.7.3. Area Erase Tool



Note

This action cannot be undone. To restore the original tile, the tile has to be deleted and then added afresh.

To control the amount of sonar data displayed in a tile the automatic background removal tool uses an intelligent algorithm to determine unwanted sections and remove them from the tile. Unwanted background pieces are those that are typically around the edge of the sonar scan and do not add any detail to the images. In general, acoustic shadows around areas of high intensity should be kept as they add detail and context to the image.

19.8. Image Export Controls



The Image Export Area selection tool enables restricted areas of the workspace to be exported to an image file. The mouse pointer will change to a cross-hair for more accurate selection. To use, simply draw a box around the area to be exported and then press the Export As Image button:



Note

Only when this button is enabled will the selection be used as the export area, otherwise the entire chart will be used.

19.9. Moving Tiles

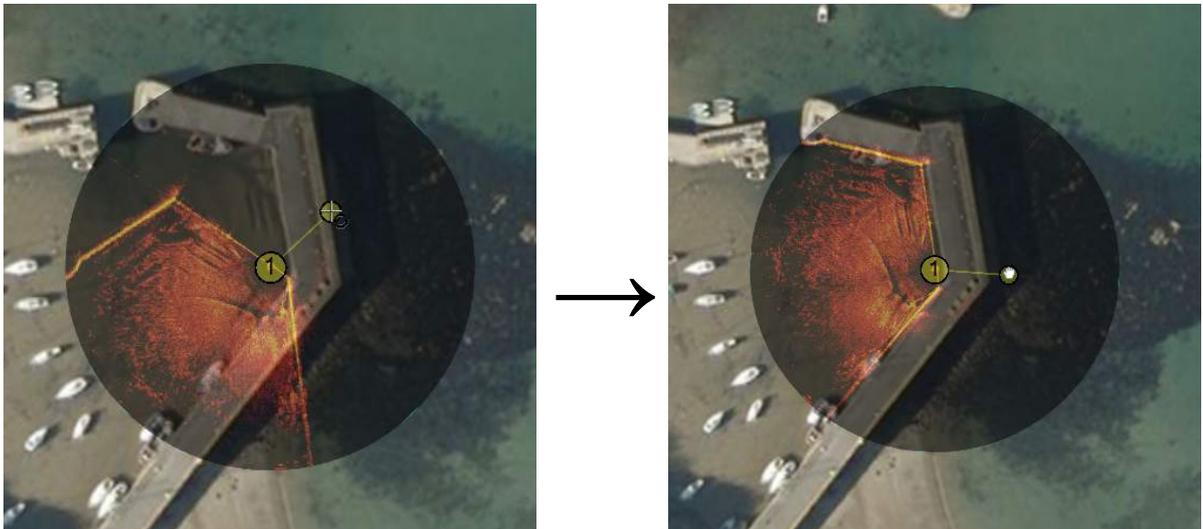
The Pan Tool button  has to be selected for this function to work.

When the mouse pointer is over the centre of the tile it will change to a hand icon. HOLD down the mouse button to drag the tile and position it correctly.

19.10. Rotating tiles.

The Pan Tool button  has to be selected for this function to work.

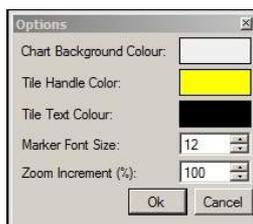
A tile can be rotated by selecting and moving the rotation lever (see below). The mouse pointer will change to show a hand with rotation arrows when it is positioned above the end of the lever. Holding the mouse button down and dragging in a circular motion will rotate the tile:



The amount of rotation will be displayed in the Tile List panel (which can be displayed using the View menu and selecting “Tile List”).

Tile List					
	N ^o	Latitude	Longitude	Rot(°)	Opac(%)
<input checked="" type="checkbox"/>	1	56° 57' 34.3" N	2° 11' 59.9" W	318.38	50
<input checked="" type="checkbox"/>	2	56° 57' 35.5" N	2° 12' 3.8" W	173.57	50

The colour of the rotate handle can be changed by navigating to the Tools menu and selecting Options.



19.11. Create a Mosaic of Tiles

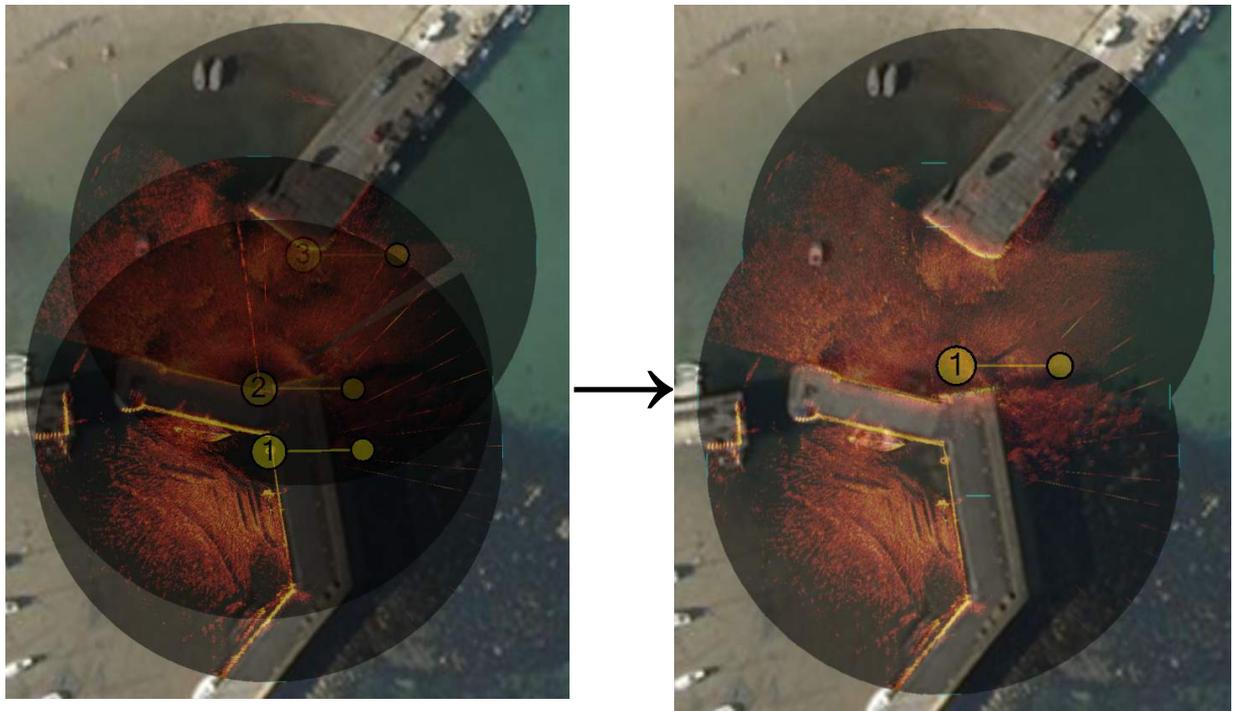
To create a mosaic of tiles it will be necessary to have multiple tiles together within a single geographic region. It will not be possible to create a mosaic if the tiles are very far apart, likely as a result of having an incorrect or corrupt world file which results in their incorrect placement.

Creating a mosaic is a simple process, first arrange the tiles as desired and hide tiles that are not going to be included in the final mosaic, then press the mosaic button on the toolbar  which will start the mosaicking process.



Note

The mosaicking process is irreversible and will result in a new tile created which cannot be split into the original tiles. To restore the original tiles they will have to be re-loaded.



Note

If “Save Mosaic” is pressed instead the output will not be on the screen but to a file so a file chooser dialog will present itself.

19.12. Information Dialogs

There are also three information panels accessible from the toolbar or the View menu: the tile list; mouse position; and the coordinate system used. Both the tile list and the mouse view display the position of tile centres or mouse pointer, respectively, using the selected coordinate system.

19.12.1. Coordinate System

The Coordinate System display can be viewed and controlled by selecting the button  or using the View menu and select Coordinate System option.

This allows the user to choose between using Decimal Degree, Degrees and Decimal Minutes, Degrees, Minutes and Seconds and Universal Transverse Mercator (UTM). Selecting one of these options automatically updates the display in the both the Mouse Position and Tile List display panels.

19.12.2. Mouse Coordinates

The Mouse Coordinates display is also controlled from the View menu and View button collection . It shows the mouse position in the context of the chosen coordinate system.

19.13. Tile List Dialog

The Tile List panel can be made visible using the “View” menu and selecting the “Tile List” option.

Alternatively the Tile List can also be viewed using the button: 



Action on Multiple Tiles

By holding down the shift key on the keyboard it is possible to select multiple tiles in the Tile List and move them up/down the layers together, show/hide them as a group or delete/reset multiple tiles in one go.

Saving the tile will only work on one tile at a time.

19.13.1. Layering Tiles

Layering the tiles determines the order in which they are displayed, i.e., tile 1 is displayed in front of tile 2. The order can be changed by moving tiles up and down in this list, either as individual tiles or in groups.

**Note**

If centre marks or rotation handles obscure one another interaction will occur using the lowest numbered (corresponding to the topmost) tile so it may be necessary to re-order the tiles to gain access to the handles.

Click on the row containing a tile to highlight it and then press either the UP or DOWN arrow to bring the image forward or backward on the display by one layer.

Multiple tiles can be moved in one go by selecting each one and holding down the control key on the keyboard (or by selecting a span using the shift key). Once selected the tiles can be dragged as a group by holding down the mouse button and moving up or down the list to re-order them.

The tiles will be automatically renumbered with the lowest number being the first one displayed.

The tiles can also be controlled using a menu that is accessible by clicking on the tile entry in the list with the right mouse button. Using this method the tile can also be moved immediately to the front or the back of the display stack.

19.13.2. Save Selected Tile

Saving a tile will export it with a new world file so that any changes that have been made to the position or orientation can be preserved.

19.13.3. Delete Selected Tile

Deleting a tile will permanently remove it from the display. Any changes made to it will be lost.

If multiple tiles are selected when this button is pressed they will all be deleted.

19.13.4. Reset Selected Tile

Resetting a tile changes the tile location, orientation and size to the coordinates and rotation value contained in the world file that was originally used to load the tile.

Any subsequent movements or rotations that have been made are lost. If multiple tiles are selected when this button is pressed they will all be reset.

**Note**

If a project has been loaded the tile will be reset to the orientation *when the project was loaded*. Saving the chart and tiles as a project removes the original tile data so to restore the original tile delete it and reload it.

19.13.5. Show/Hide Selected Tiles

Tiles are hidden by de-selecting the check box to the left of the tile number.

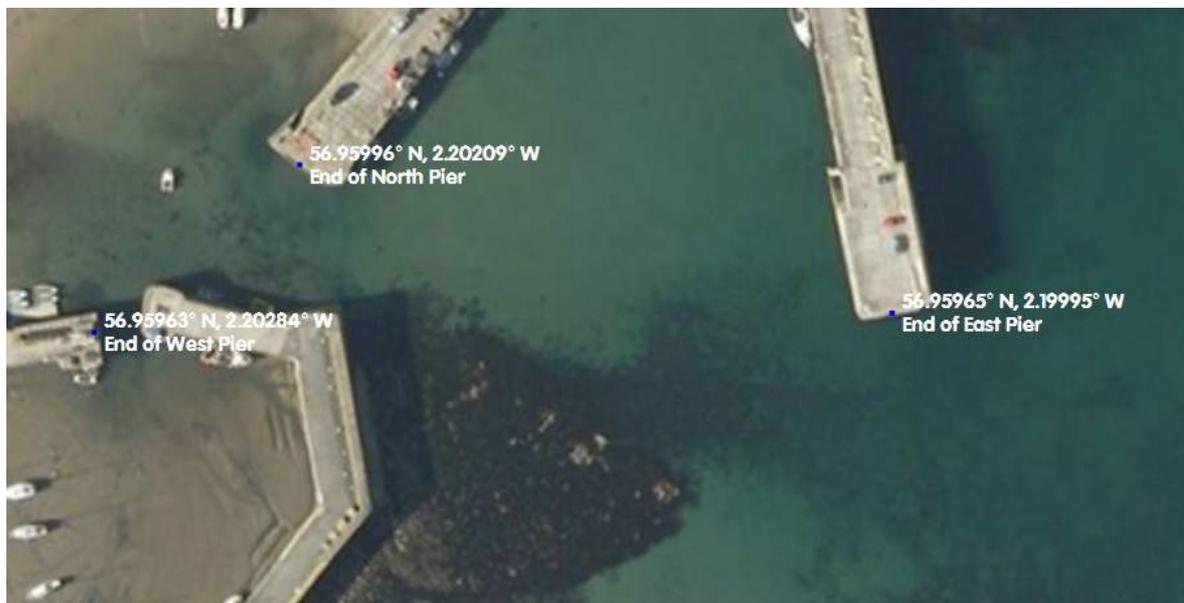
If multiple tiles are selected when this button is pressed they will all be shown/hidden.

19.14. Using Markers

The Image Tiler has the ability to import a marker file which has been saved from Seagnet Pro (marker files have the extension ".mrk") or from a CSV text file (full details of the marker files are in Appendix G, Marker Files).

First create the marker file from the chart in the MicronNav application in Seagnet Pro. Then open the marker file by navigating to Import Marker File from the Tools menu.

The imported markers will overlay the chart:



The positions of the markers is shown next to the location. Markers can be hidden using the button on the toolbar: .

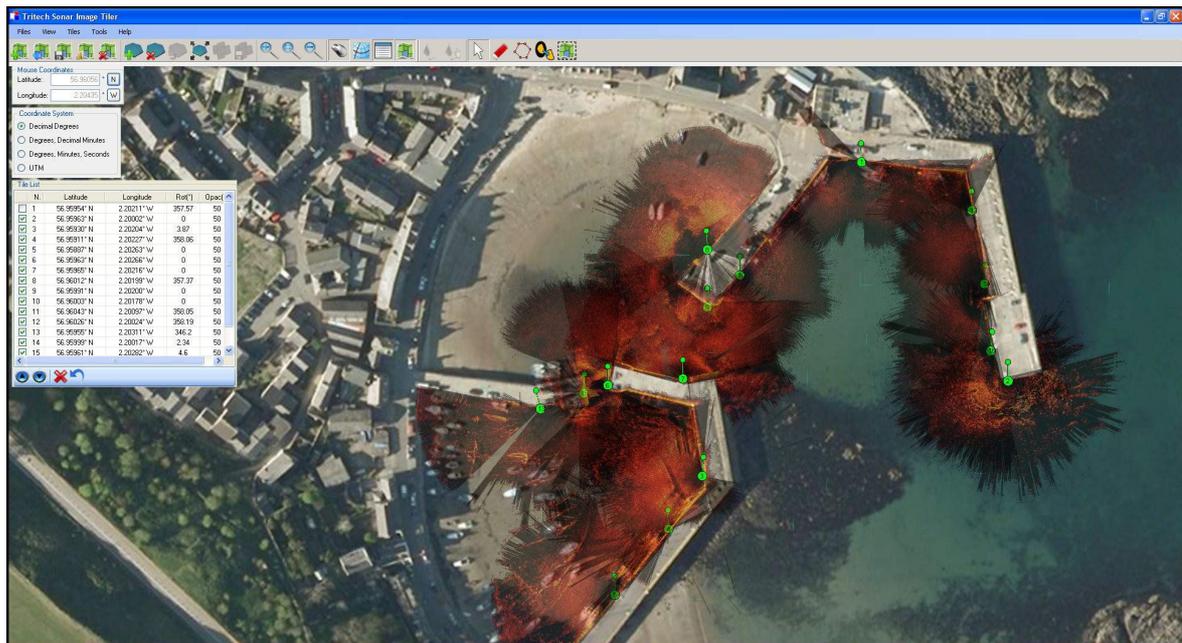
To move a marker first select the move marker button () and then click on the marker and drag it to the new location.



Note

If markers are displayed and Export as Image is selected they will be merged with the background. If the chart is to be used again it will not be possible to move or remove the markers. For this functionality the chart should be saved without the markers or with them hidden. If Save Project is selected the chart, tiles and markers are all saved as individual entities and can be interacted with as normal.

20. Using Sonar Image Tiler to Create a Mosaic



A mosaic as shown above can be created with the Sonar Image Tiler using a background chart, and sonar image tiles with their associated world files. The user must first set a background to place the image tiles. This background is called a "chart"; although if an actual survey chart is not available a blank canvas can be used. There is also the option to use the first added tile as a reference. All image tiles and background chart or blank canvas require geo-referencing. This is done during the creation of the chart by entering Position Co-ordinates for the top-left corner and a chart Width and Height.

With a background chart in place the sonar image tiles can then be loaded and any position or rotation corrections made. The entire chart and tiles, or a selected area, can be exported as an image file and a (separate) world file. This chapter is organised into sections explaining the process of creating a mosaic, the tools available to the user, and also exporting an image or saving the project.



Note

“Load Project” allows a previously created chart, collection of tiles and markers to be loaded for further editing or for selecting an area to be exported as a bitmap.

20.1. Overview of Process

Prior to starting the mosaic process it is necessary to obtain the following:

- An image with GPS data in an associated world file to use as a background. Or appropriate GPS coordinates and geographical dimensions sufficient to encompass all of the sonar image tiles if creating the chart manually.

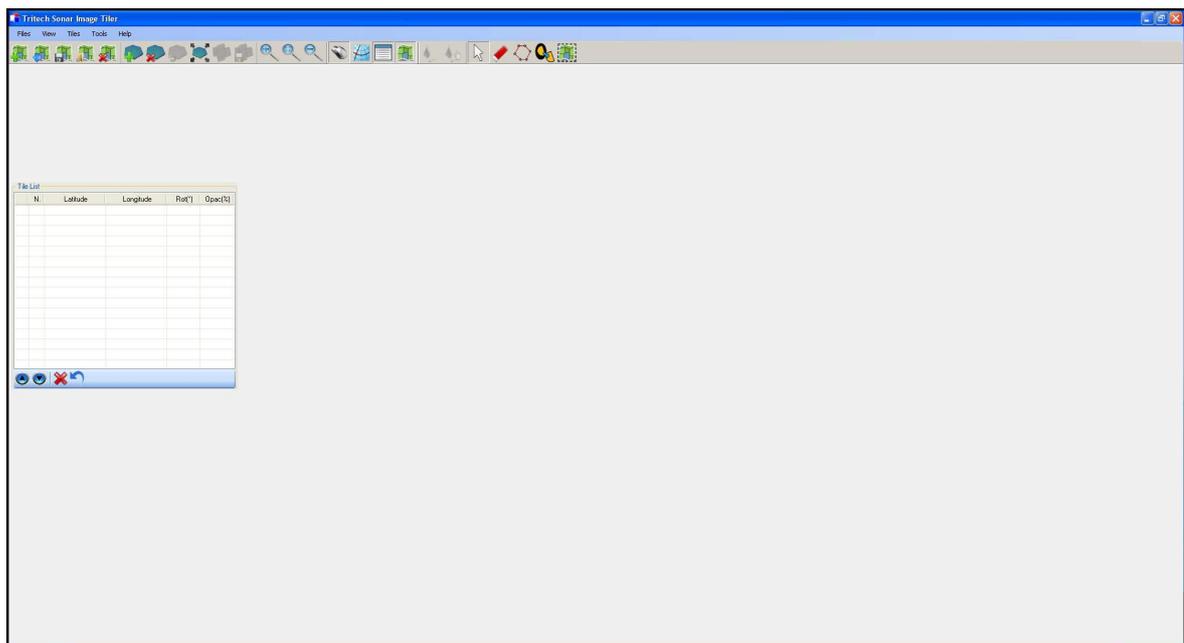
- A set of sonar image tiles from a Seagnet Pro session which include GPS data in accompanying world files.

Given data already created using Seagnet Pro the process for tiling images into a mosaic is as follows:

1. Create a chart: either from an image, import a previously created chart or create a blank chart from GPS data.
2. Load sonar image tiles onto the chart.
3. Manipulate the image tiles to the correct position (if required).
4. Either export the resulting mosaic as a bitmap (with world data) or save as a project (containing a chart and a collection of tiles) to work on again later.

20.2. Create the Background Chart

The Sonar Image Tiler starts with a blank screen:



First create a chart background onto which the sonar image tiles will be placed. If Seagnet Pro is running on the PC and has a chart configured as part of its Nav application then you can select it using the Files menu and Open Seagnet Chart option. If no Seagnet chart is available click on the Import/Create Chart button to set up a new chart background.



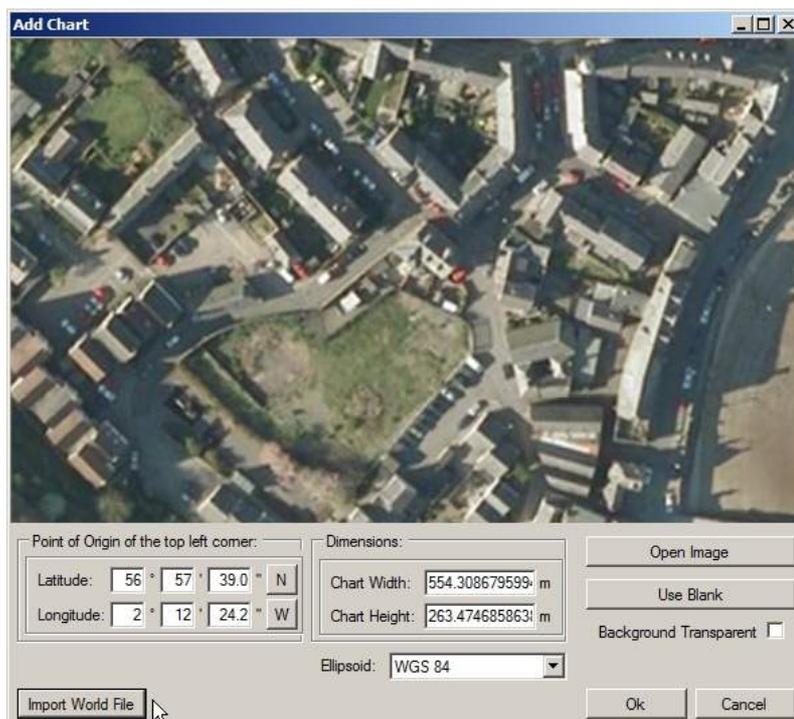
Note

It is also possible to use the first tile as the chart background – see below for the procedure for adding tiles. This tile cannot be moved or rotated and acts as the fixed reference point for other tiles.

In the Add Chart dialog box there are three options for adding or creating a chart. The user can select to use an image with associated world file; an image with manually entered position and scale; or a blank chart with manually entered position data. These options are explained further in the following sections.

20.2.1. Image with World File

Select Import World File for the Open World File dialog and select the appropriate world file. The format of the world file can be either .bpw (bitmap), .jgw (jpeg), .tfw (tiff) or .wld (generic/CAD).



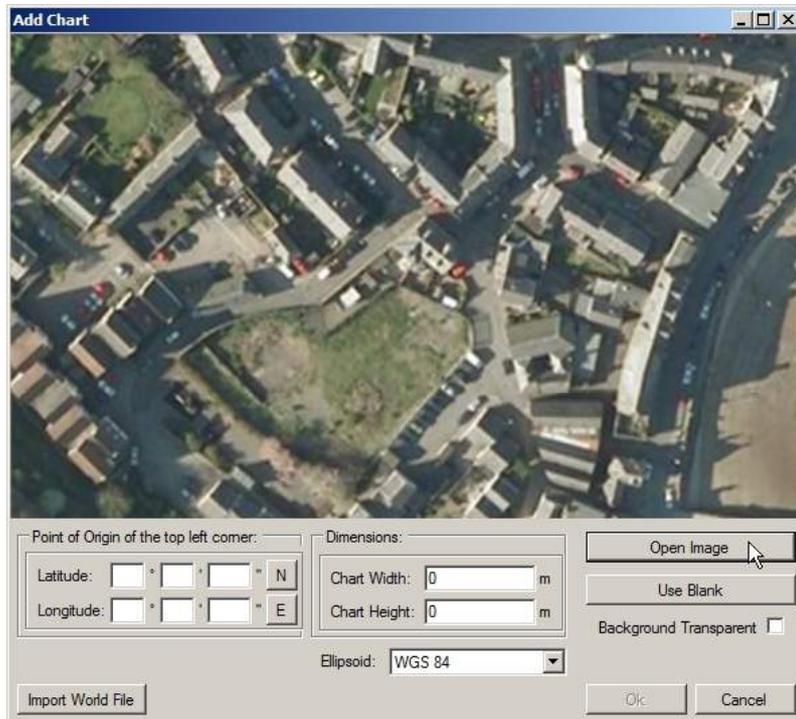
The world file format for x and y co-ordinates can either be in Easting/Northing (E/ N) or Longitude/Latitude (L/L). If co-ordinates are in E/N then a Zone will need to be entered and a reference Ellipsoid selected (for definition of latitude, longitude and elevation).



Verify chart parameters are correct and click “OK” to confirm and load this chart.

20.2.2. Image with Manual Positional Data

First, select Open Image button to bring up the Open Chart dialog and select the required chart image. The image format can either be .bmp (bitmap), .jpg (jpeg) or .tif (tiff).



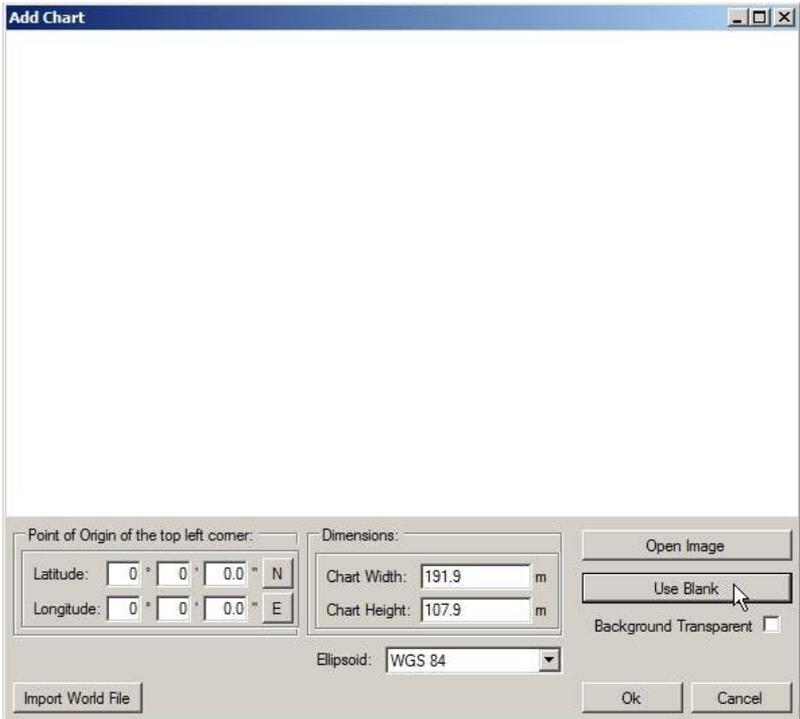
Note

Where an associated world file (matching name) is detected in the same folder as the selected image the chart parameters will automatically be loaded.

Next, enter the Point of Origin co-ordinates and the chart Dimensions. If the Universal Transverse Mercator (UTM) coordinate system is used a reference Ellipsoid will also have to be selected at this point (the default is WGS84 (World Geodetic System 1984)).

20.2.3. Create a Blank Chart

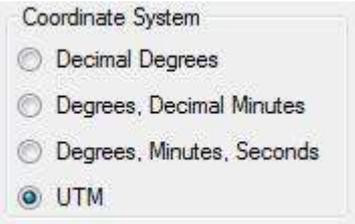
Select Use Blank to create a blank image for the chart background. A default width and height will be set.



The Point of Origin co-ordinates and the chart Dimensions will have to be set. If UTM then also select a reference Ellipsoid at this point (the default is WGS84).

20.2.4. Chart Coordinate System

When creating charts the Point of Origin co-ordinates will be in the format that is currently selected in the Coordinate System panel. To change this select Cancel and navigate to the Coordinate System control (if this is not visible go to the View menu and select Coordinate System).



20.3. Add Image Tiles

Once the chart background has been loaded sonar image tiles can be added. Tiles must be within the same geographic area of the chart background.

Either click on the Add Tile icon, or add the tile through the “Tools” menu and “Add Tile” option.

- A dialog enabling searching and adding of images is shown. The images can be in .bmp (bitmap), .jpg (jpeg) or .tif (tiff) formats. A matching world file is required in the same folder or the image will not load.
- The tile will be added on top of the chart if the geographic co-ordinates are within the background area.
- Simply repeat these steps to add further tiles.

**Note**

Several files can be added at the same time by holding down the `Ctrl` key whilst selecting the images.

20.4. Manipulating Image Tiles

The position information for tiles is dependent on the settings when the tile scans were created.

If the imported position is incorrect the tiles can be repositioned on the chart at any point after they have been added to provide a more accurate mosaic. There are several repositioning functions available: moving, rotating, and resizing. As well as tools to alter the appearance of shadows in tiles: automatic cropping of unwanted shadows, manual eraser, and area erase.

For full details of the possible ways to manipulate the tiles please refer to *19. Sonar Image Tiler Software Functions*.

20.5. Save the Project

Save Project allows the chart to be saved as a chart and a collection of tiles (and any markers) so it can be loaded for editing at a later date. The user is prompted for a file name, with the file type being XML.

20.6. Exporting the Completed Mosaic as an Image

Charts can either be exported whole or areas can be selected and saved. To export the entire image simply select Export as Image from the Files menu. This will then display a dialog prompting for the desired location and name of the file. This output image will have an associated world file so it can be imported into other software packages with the geo-referencing intact.

Note

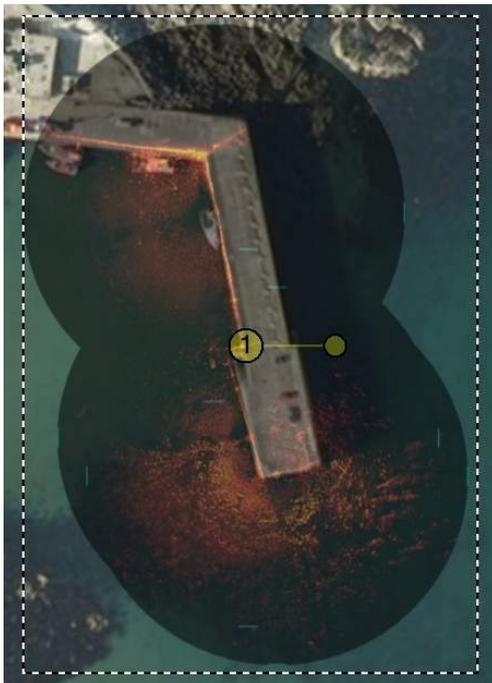
If there is an area selected on the chart, clicking Export as Image will only save what is contained within the selection region. The format of the saved chart will depend on the format of the input chart (i.e., a .bmp input will generate a .bmp output).

To create an output image using the Selection Tool follow these steps:

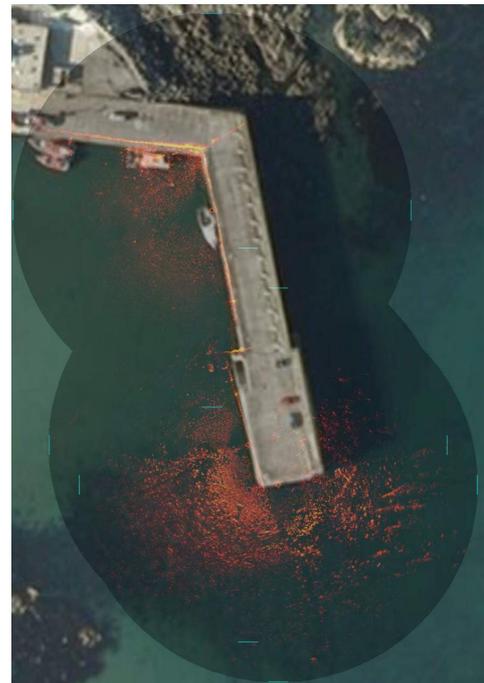
1. Click on the Image Export Area button.
2. Using the left mouse button click and hold anywhere on the chart and then drag the cursor across the screen to create a selection area.
3. Click on the Files menu and go to Export as Image. Enter a filename and select the desired file type (.jpeg, .bmp or .tiff) then click Save. A world file will be created with the same filename as the image file.

Note

There will also be a .kmz file created. This is a Google Earth file format and will allow the image to be viewed in Google Earth.



Selection area within dotted line



Output image

Note

It is also possible to output just the tiles (i.e., without the background chart) by clicking on the Save Mosaic button: 

21. Sonar Image Tiler Supported File Formats

21.1. For Loading Tiles

In order to correctly position the images each image tile file should be accompanied by an equivalent "world file" which contains positional data. This data should come from a GPS linked into Seanet Pro. If a GPS is available Seanet Pro will automatically create a world file with the correct data when a Snapshot is taken.

The following file formats are supported:

Image Type	World File
.bmp	.bpw
.jpeg/.jpg	.jgw
.tiff/.tif	.tfw
.png	.pgw



Note

The image file and world file should have the same filename (i.e., sonar.bmp and sonar.bpw).

The image tiles have to be saved from the latest version of Seanet Pro; if an older version is used they will not open in the Sonar Image Tiler. If in doubt, remove the current version of Seanet Pro and either download the latest version from www.tritech.co.uk or re-install from the CD-ROM which contained the Image Tiler installation program.

21.2. Saving Images or Mosaics

Saving an image can either be the whole chart (with any visible tiles or markers), a marked out section or a mosaic of tiles either way the supported formats are:

.bmp	Bitmap image
.kmz	Google Earth format
.png	Portable Network Graphic



Note

The Sonar Image Tiler will create a matching world file for the image.

21.3. Project Files

The Sonar Image Tiler uses a customised XML format for saving and loading projects. These project files will preserve any tile data or marker data so that they can be manipulated again at a later stage or transferred to another computer for editing.



Note

Due to the fact that the project files contain the data for all the tiles, if the project has many tiles it can result in the production of large XML files.

21.4. Marker Files

Two different marker file types are supported, both of which are in CSV format but with different filename extensions and different complexity.

.mrk Seanet Pro full length marker files

.csv A shortened version of the Seanet Pro format



Note

For full details of the marker file formats please see *Appendix G. Marker Files*.

22. Maintenance of the Hardware

22.1. *After each use of the equipment*

Make sure that after using the sonar head that it is washed down with fresh water and check the unit for any signs of obvious damage.

Pay particular attention to the transducer head and free any organic matter which has become trapped. Once the unit is clean; dry thoroughly and place in the storage container.

If the optional MicronNav Transponder is fitted to the top of the Hammerhead tripod it should be removed from its mounting bracket and both the bracket and the Transponder should be washed thoroughly with fresh water prior to being dried and stowed.

The tripod is made out of stainless steel which will corrode if left in prolonged contact with salt water so it is essential to wash the tripod thoroughly with fresh water and make sure it is completely dry (the tripod is free-flooding so it is advisable to flush fresh water through the pole sections). When drying attention should be given to any places where moisture is likely to collect, such as the joins between leg sections.

22.2. *Regular Maintenance*

There are no user serviceable parts inside the Hammerhead Sonar, Interface Box or MicronNav System and it is not necessary to take them apart for any maintenance tasks.

The tripod should be inspected for any signs of corrosion and the threaded sections of the legs should be treated on a regular basis with an appropriate grease.

The cable on the reel is jacketed with polyurethane and is resistant to corrosion but a regular inspection routine should be established to ensure that the length of cable does not contain any damage (which may occur if snagged or caught on underwater debris).

If the system is in regular use, or submerged routinely for extended periods, it is advisable to arrange for an annual service to be carried out by Trittech International Ltd. This service will enable the equipment to be checked thoroughly or for any worn parts to be replaced and will enable long-term trouble free operation of the SeaKing Site Survey System. For details of the servicing options available contact Trittech International Ltd (see Help & Support for contact details).

23. Storage of Equipment

If storing the equipment for extended periods make sure that it is completely dry (if necessary leave to air-dry before stowing).

Pack into storage containers along with several pouches of silica gel. The original packing containers contain specific foam cut-outs for the storage of the equipment so wherever possible they should be re-used. The foam will absorb moisture so if the cases are allowed to get wet they should be dried thoroughly prior to stowing equipment in them.

Attention should be given to drying the tripod which is free-flooding so will likely contain moisture inside the steel tubing.

The cable is jacketed with polyurethane which is resistant to corrosion but if it is intended to store the reel for an extended period without use then it is advisable to reel out the cable and dry its entire length. This will also give the opportunity to inspect the cable for any damage which has occurred during use.

24. Troubleshooting

The following chapter outlines some problems which can readily be fixed by altering settings or other simple procedures. If any of these solutions do not solve the problem please contact Tritech International Ltd using the contact details listed in Help & Support at the start of this manual.

No World File created by Seanet Pro

Likely caused by a lack of GPS/USBL data.

If using a GPS/USBL ensure that they are connected and set up properly

Check the Installation page to make sure that the correct positioning device is being selected, or that Fixed Position is selected.

Snapshot captures entire Seanet Pro screen

Incorrect registry setting.

Modify the Windows registry using regedit.exe to ensure that the following setting is applied:

```
HKEY_CURRENT_USER\Software\System Technologies\SeaNet\ScrnCapSonarOnly = 1
```

Sonar scan is sluggish or stops moving, but communication link is fine

Entanglement of head with debris, ropes, weeds, etc.

1. Turn off power to the sonar to prevent motor damage
2. Retrieve the tripod or ROV, free the sonar head and examine for any obvious signs of damage
3. Test in air before redeployment

Image appears stretched, distorted or of low range

Hammerhead not sitting level.

1. Check the attitude sensor reading to determine the sonar head level

2. Lift tripod or re-orientate ROV to ensure correct placement and levelling of the sonar
3. If necessary move to a new location to clear any debris or uneven features of the seabed

Continuous "No Comms" message displayed on the Seonet Pro status bar

Communication failure or cable failure.

1. Check power is turned on
2. Check cabling from Hammerhead Interface Box to the PC
3. Ensure power is reaching the unit by checking LED's are lit
4. Retrieve sonar from water and ensure that all cabling is correctly installed and has no splits or ruptures – if necessary remove cable from waterblock to check for water ingress (also check any blanked waterblocks)

Sonar display does not show compass or attitude control and shows many types of device options under Applications menu

The Seonet Pro software in use is the generic version or a previously installed version (i.e., not the one included on the Hammerhead installer CD-ROM)

1. Launch regedit.exe from the Windows Start menu
2. Navigate to the System Technologies tab found under Software
3. Locate the Seonet tag and alter the `CmdLine` so that it contains the value `-H`
4. Restart Seonet Pro and connect to the Hammerhead device
5. The compass can also be displayed or hidden by right-clicking the main sonar screen and selecting Auxiliary Compass

No Internal Compass Heading/Pitch/Roll data is being displayed

Auxiliary Compass not selected or wrong compass selected in Sonar Tools menu, Installation page.

1. Right-click on the sonar display and select Auxiliary Compass

2. Navigate to the Installation page from the Sonar Tools menu and select Internal/Aux Compass. Note that the Ship/USBL Compass will display data from any connected MicronNav system or from an external compass string received through a surface COM Port as configured in Utilities menu and Com Setup
3. If the above steps do not correct the problem close Seanet Pro and open the Seanet Setup application. The Hammerhead device should be detected and listed as Node 2. To access the setup for this click on Action and then Setup to check that the compass settings are correct.

Displaying the output from more than one sonar on the Seanet Pro screen

Installation of the Seanet Pro application from the Hammerhead CD-ROM will result in it loading into a special mode where it only displays one sonar by default – shown in the Applications menu as Single Sonar

1. To display other Trittech International Ltd devices such as MicronNav, Profiler, Bathy, Gemini or Video it will be necessary to create new display applications. This is achieved by selecting Application Wizard from the Applications menu and follow the step-by-step instructions.
2. Other Seanet Pro compatible devices can be brought into Seanet Pro through another communications link or they can be connected onto the same ARCNET network. The Hammerhead will have to be configured manually for networking with ARCNET and instructions can be found in the Appendices.
3. Other device data from 3rd parties such as GPS, Compass, Altitude can be input through a surface COM Port. From the Utilities menu select Com Setup to configure COM ports for these inputs.

No head is detected in the Seanet Setup application when running the Hammerhead with the Hammerhead Interface Box

Data cable or power supply problem

1. Check for either red or green LED's illuminated behind the viewport area on the Hammerhead. If no LED is illuminated check the power cables are correctly plugged in and are not damaged. Also check the cables between the Interface Box and PC/laptop. Make sure that the Power button is turned on.
2. If the LED's are illuminated first check the USB cable is securely connected and then make sure that the correct COM port is selected by navigating to Utilities and Com Setup.

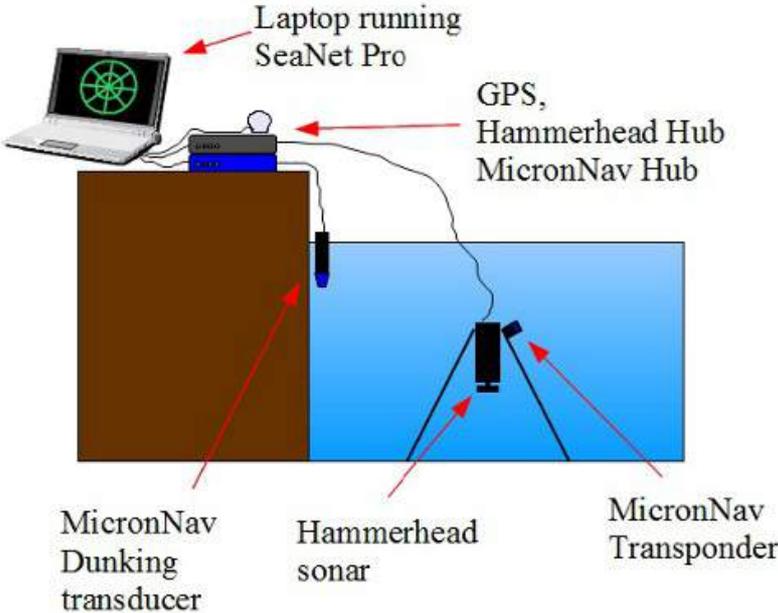
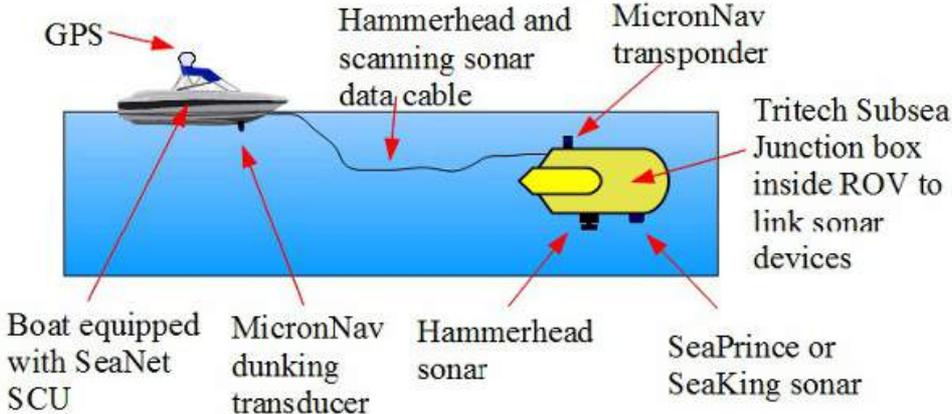
No head is detected in Seanet Setup when running the Hammerhead on an ROV and connected to an SCU using ARCNET communications

Insufficient power or incorrect communications settings

1. First check that the red or green LED is illuminated and if not remove the Hammerhead from the ROV and test on a short test lead. If the unit powers up on a short lead, check the ROV cabling and that it can output at least 30W at 24V. Also make sure that there is only a single yellow waterblock in use.
2. If power is reaching the unit then make sure the communications are set up properly. Ensure that Seanet V2 or newer is installed on the SCU. Make sure that the termination resistors and ARCNET network are set-up properly (see the Appendices for the correct procedure)

Appendix A. Example System Configurations

The Hammerhead unit is equally suited for use either on an ROV or deployed over the side of a vessel or harbour using a tripod to sit on the sea floor. Since the unit is based on existing Trittech International Ltd SeaKing technology it is relatively straightforward to integrate into existing systems or create a mixed system. A couple of examples are presented here.



Note

It may be necessary to use a separate power supply if the auxiliary sonar is rated to a different power rating.

Appendix B. Assembly of Hammerhead Tripod

Step 1 – take the two half-shells and assemble them over the top of the Hammerhead.



Step 2 – Place the gimbal ring over the half-shells, rotate until the screw holes are lined up then insert screws – note the location of the plastic washer.



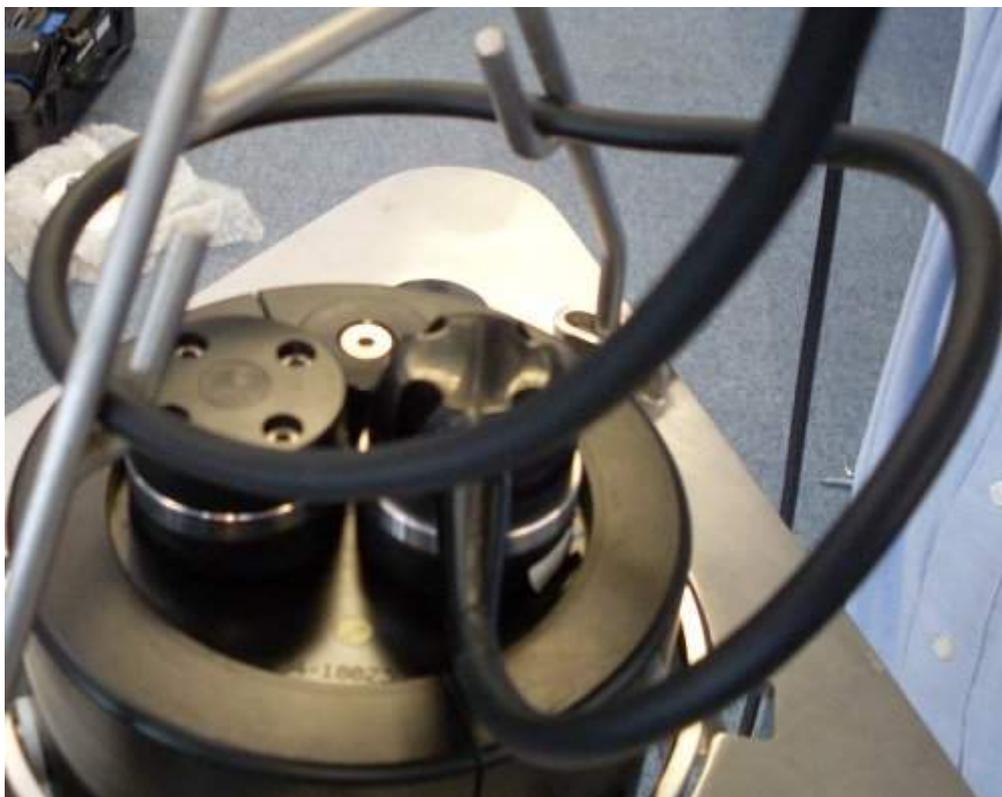
Step 3 – Next take the tripod and assemble the legs, screwing them into the top plate – note that the hook eyes are aligned so the clip can secure both together.



Step 4 – Raise the tripod hook and open the Hammerhead securing lugs as shown, then insert the Hammerhead up through the top plate, rotate and rest in place before fastening the securing lugs.



Step 5 – Finally connect the cable and route as shown to prevent any snagging.



Appendix C. Interface Box Installation and Operation

The Interface Box should be installed as follows:

1. Install the Seonet Pro software from the Hammerhead Installation CD-ROM
2. Plug in the USB lead from the computer to the Interface Box, it will be detected and automatically installed and a new COM port should appear on the computer. Launch Seonet Pro and ensure that this COM port is correctly configured and selected for use with the Hammerhead.
3. Plug in the power supply for the interface box and turn the unit on.
4. Monitor the LEDs on the Interface Box to confirm power and communications are normal, the sonar should start displaying in Seonet Pro in a few moments.



Warning

If operating on 240V AC mains supply (or equivalent from a generator) the Interface Box must not be exposed to water.

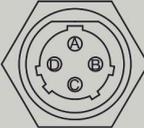
For reference, a copy of the label printed on the bottom of the Interface Box is shown below:



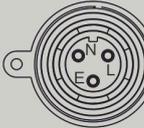
HammerHead Interface Box

www.tritech.co.uk

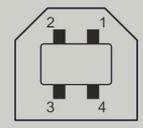
Connector Face Views



DC In



AC in



USB

FUSE	
AC In	2A Quick Acting
DC in	3.15A Anti Surge
Sonar	2A (20x5mm) Quick Acting

For fuse replacement, refer to manual.



Sonar

AC In		DC In	
L	Live	A	NC
N	Neutral	B	+VE
E	Earth	C	NC
		D	-VE
88-264VAC		12-36VDC	
Idle: 17W		Idle: 3VA	
Load: 48W		Load: 42VA	
USB		SONAR	
1	V BUS (+5V)	1	0V
2	-D	2	+VE
3	D+	3	NC
4	GND	4	RS485-A
		5	RS485-B
		6	CHASSIS
		7	NC

SERIAL #:
09575.245101

WARRANTY VOID IF SEAL IS BROKEN

ONLY FOR USE WITH HAMMERHEAD SONAR

CAUTION !

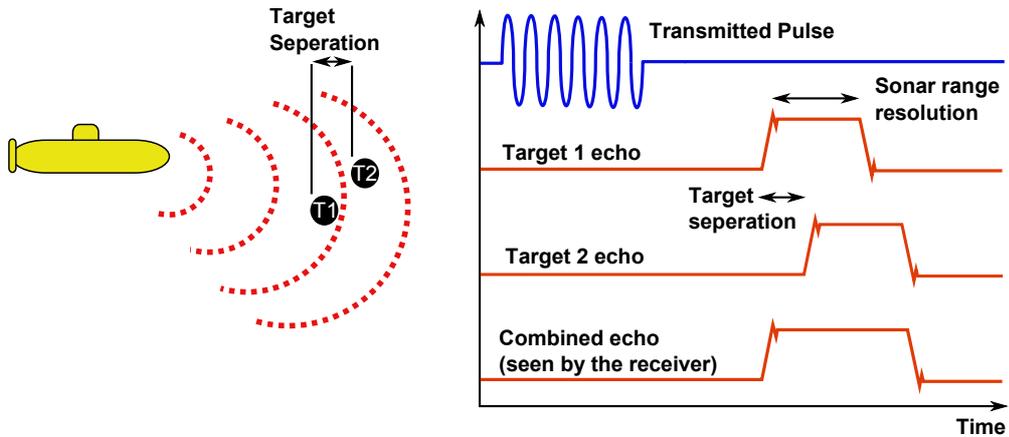
Isolate unit from MAINS & DC supplies before removing cover.




Appendix D. CHIRP Signal Processing

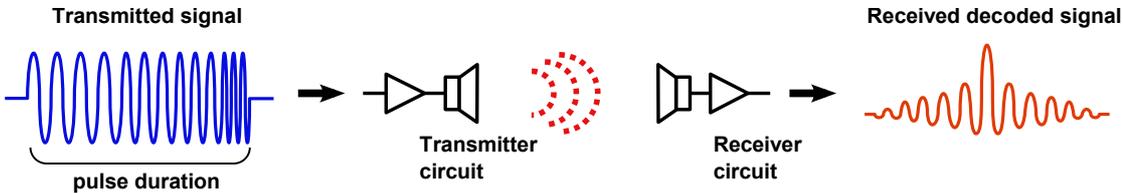
There are several advantages of *Tritech International Ltd* Digital Sonar Technology (DST) which allows the use of CHIRP signal processing technology in order to improve the images generated by the sonar.

In monotonic (single frequency burst) sonar, the range resolution is determined by the length of the transmitted pulse. The smaller the pulse is, the greater the resolution achievable and vice-versa. The smallest pulse length is typically 50µs and velocity of sound in water is approximately 1500m·s⁻¹ which gives a range resolution of 37.5mm. This result effectively determines the ability to resolve separate targets.



Using the example above, if two targets are less than 37.5mm apart then they cannot be distinguished from each other. The net effect is that the system will display a single large target, rather than multiple smaller targets.

CHIRP signal processing overcomes these limitations by sweeping the frequency within the burst over a broad range of frequencies throughout the duration of transmission pulse. This creates a signature acoustic pulse – the sonar knows what was transmitted and when. Using pattern-matching technology, it can now look for its own unique signature being echoed back from targets.



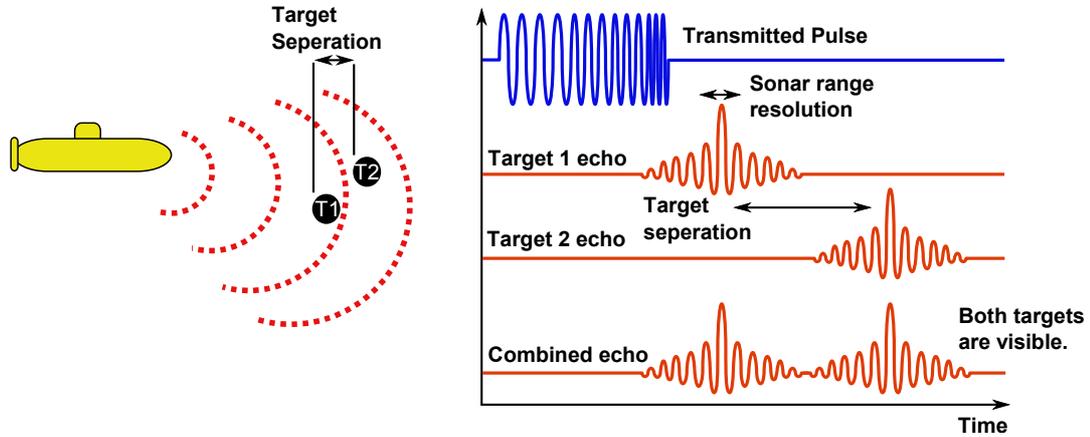
In a CHIRP system, the critical factor determining range resolution is now the bandwidth of the CHIRP pulse which means the range resolution is given by:

$$Range\ resolution = \frac{velocity\ of\ sound}{2 \times bandwidth}$$

The bandwidth of a typical *Tritech International Ltd* CHIRP system is 50kHz

With velocity of sound in water of $1500\text{m}\cdot\text{s}^{-1}$ this gives a new range resolution of 15mm.

This time, when two acoustic echoes overlap, the signature CHIRP pulses do not merge into a single return. The frequency at each point of the pulse is different, and the sonar is able to resolve the two targets independently.



The response from the pattern-matching algorithms in the sonar means that the length of the acoustic pulse no longer affects the amplitude of the echo on the sonar display.

Longer transmissions (and operating ranges) can be achieved without a loss in range resolution.

Additionally CHIRP offers improvements in background noise rejection, as the sonar is only looking for a swept frequency echo, and removes random noise or out-of-band noise.

Appendix E. ARCNET Termination

Depending on the cable length the ARCNET communication link requires a termination resistor to be installed at each end of the umbilical cable. Normally this is supplied fitted within the ARCNET cable DA-15 or within the SCU/SeaHub at the surface and is left for the user to fit at the sub-sea end in a convenient junction box or by use of a special waterblock.

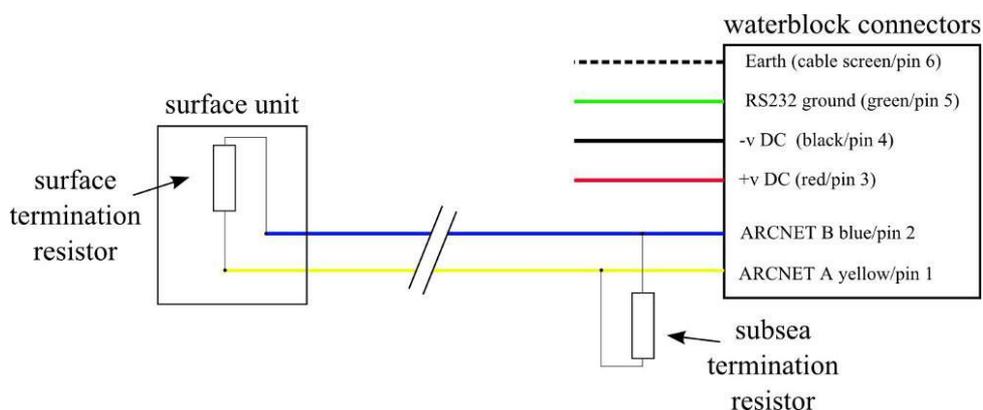
The purpose of these terminations is to attenuate any electrical interference or "reflections" which may occur due to an impedance mismatch and the overall aim is to improve signal quality and negate any effects which might otherwise be felt by other sources of impedance such as from the cable itself.

The diagram below shows best practice to use when installing termination resistors on an ARCNET network of *Tritech International Ltd* sonar products.



Note

A special yellow waterblock is available from *Tritech International Ltd* which contains an in-line impedance of 39Ω which will enable quick and easy installation of the subsea termination resistor.



Cable length	Termination	Baud rate setting
Less than 100m	Single 39Ω subsea resistor	Normal baud rate
100 – 1200m	270Ω at surface and 39Ω subsea	Normal baud rate
1200 – 2500m	270Ω at surface and 39Ω subsea	Half baud rate



Note

If there is more than one sensor connected then the subsea resistor should be fitted at the Junction Box or splice of the cable.

Appendix F. Networking and Communication

Overview

The sonar units fitted with the AutoComms feature enable automatic connection of a single sonar device to a computer without the need to dis-assemble the unit in any way. The sonar scans available comm settings until it finds an active one (the one which is connected to the computer). Once an active one has been found it will set its communication protocols to the correct settings to enable communication with the PC. The AutoComms feature does not work for networked devices though and instead the following procedure should be adopted to allow communication between the sonar heads and surface PC.

The basic procedure is:

1. Set the communication protocols of the surface unit to match the sonar (i.e. if the sonar is communicating on RS232, set the surface unit to RS232)
2. Turn off AutoComms (if present)
3. Change the sonar settings to meet new requirements of the system – at which point it will "disappear" from the computer
4. Repeat for all the sonar devices to be connected
5. Change the surface unit to match the new system settings

Manually Setting Comms



Note

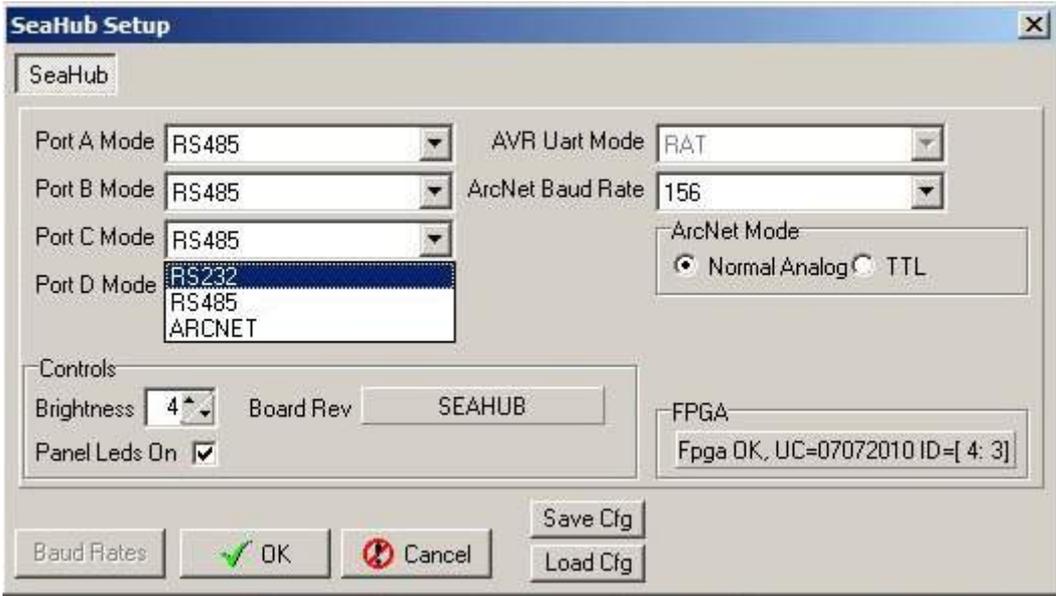
Unless it has been specified differently at time of purchase the factory default settings of all Trittech International Ltd sonars are RS232 serial at 115200 baud so if AutoComms has previously been disabled these settings could be tried first.

Set Surface Unit to Match Sonar

Launch the SeaNet Pro Setup application and then select the Setup option from the Action column.

Type	Status	Action
SEAHUB	OK	Setup
	Timeout	Program
		Change Node
		Program Fpga

A warning should appear to show that the settings are going to be changed, acknowledge this and then select the appropriate setting from the dialog box which presents itself. The example below shows the setting for port C of a SeaHub being changed to RS232 from RS485.



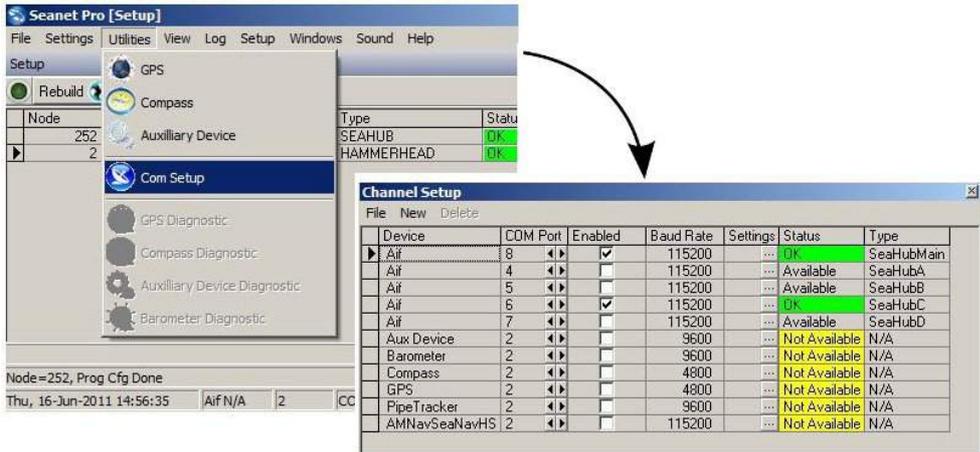
Set Sonar to New Setting

The sonar and SeaHub should both show a Status of OK and have green status colour. Once they are both in this condition select the Setup action for the sonar but this time click on the sonar which will then bring up the Digital Sonar Setup screen:

Type	Status	Action
SEAHUB	OK	Setup
HAMMERHEAD	OK	Program
		Change Node
		Program Fpga



First make sure that the Disable AutoComms option is checked and then change the Comms Mode settings in the bottom right corner. If working on an ARCNET network the baud rates should be changed by clicking on Baud Rates (in the bottom left of the above screenshot). Serial baud rates are set up using the Channel Setup screen which is accessed by returning to the main setup screen and navigating to Com Setup from the Utilities menu:



Note

Repeat the above procedures for all sonar devices on the network and then set the surface control box to match the new communication protocols of the networked devices.

Hard Reset

To perform a "hard reset" and force the sonar back to factory settings first turn it off and then put a strong magnet over the case in the location indicated below. Power the unit up with the magnet held in place and factory settings should be restored.



SeaKing and Hammerhead
Measure 55mm from casing
edge in-line with puller



SeaPrince
Place magnet over the
mark on the casing

Appendix G. Marker Files

Seanet Pro includes the facility to lay a series of markers to label and track objects, points of interest and way positions. These markers can be saved to file for the purpose to re-load at a later date, to form part of a report or for use with the Sonar Image Tiler program.

There are two formats of marker file:

1. A full, comma separated file format with the filename extension .mrk
2. A shortened, comma separated format with the filename extension .csv

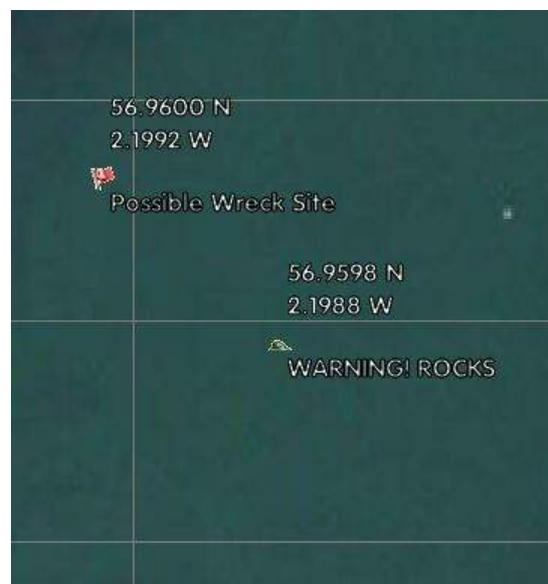
Full Marker File Format (.mrk extension)

This is the format that is native to Seanet Pro and includes full details of the marker configuration. The file is in an ASCII Comma Separated format and contains the following fields:

Index	Value	Description
1	ID	This is a unique string ID. It comprises a 2 letter header ("mk") followed by a DateTime code. Any unique string value is acceptable.
2	Group	This is unused and should be set to 0.
3	X Coordinate	For the .mrk file this will always be output in UTM Easting.
4	Y Coordinate	For the .mrk file this will always be output in UTM Northing.
5	Altitude	This is UTM Altitude and is currently unused.
6	UTM Zone Parallel	Zone latitudinal letter (e.g. 'C' through 'X').
7	UTM Zone Meridian	Zone longitudinal number (e.g 1 through 60).
8	UTM Ellipsoid	Ellipsoid code (0 = Airy, 1 = Australian National, 2 = Bessel1841, 3 = Clarke 1866, 4 = Clarke 1880, 5 = Everest, 6 = GRS80, 7 = International 1924, 8 = Modified Airy, 9 = WGS84).
9	Point Size	Applies to Circle, Square & Triangle shape types only, otherwise set to 0.
10	Date & Time	Date & Time in English(GB) Locale. Format is "dd/mm/yyyy hh:mm:ss"
11	Shape Type	0 = Circle, 1 = Square, 2 = Triangle, 3 = Sonar Range, 4 = Preset Image (see Image Info below).
12	Shape Colour	Applies to Circle, Square and Triangle shape types only, otherwise set to 00000000 (32 bit RGBA).
13	Font Inner Colour	Applies to Comment Text (32 bit RGBA).

Index	Value	Description
14	Font Outer Colour	Applies to Comment Text (32 bit RGBA).
15	Marker Bitwise	Bit 1 = Show Marker, Bit 2 = Show Coordinates, Bit 3 = Show Comment Text (i.e. 00000111 = Show All).
16	Image Info	Presets = Red Flag, Blue Flag, Green Flag, Buoy, Anchor, Rock, Danger, POI, ViewPort, Sonar, Diver, Wheel, Comment or MLO Alternatively can be full path and name of an image file (e.g., 'C:\Image1.bmp').
17	Comment	Comment text.

For example, the following two markers would produce a two line .mrk file as shown:



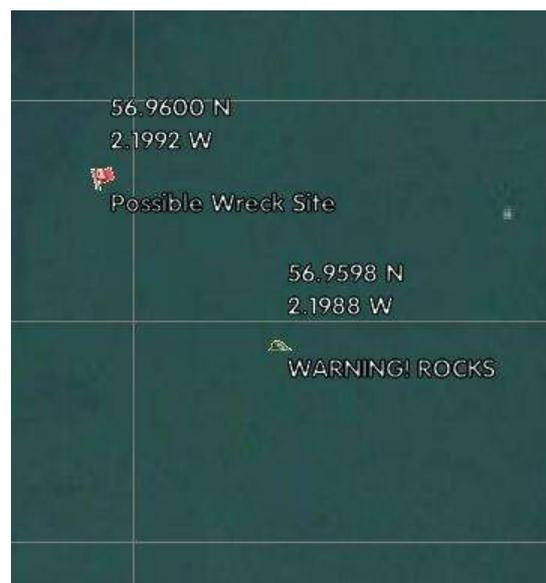
Line 1	mk41149.5595988657,0,548699.614997778,6313221.96999907,- 5.3544902067987E-76,V,30,9,0,28/08/2012 13:25:51,4,00000000,00FFFFFF,00000000,7,Red Flag,Possible Wreck Site
Line 2	mk41149.5605201736,0,548724.213265236,6313198.87994614,- 5.3544902067987E-76,V,30,9,0,28/08/2012 13:27:48,4,00000000,00FFFFFF,00000000,7,Rock,WARNING! ROCKS

Shortened Marker File Format (.csv extension)

This file format is a more concise and usable format, particularly for loading a pre-defined target list into Seanet Pro. The file is in an ASCII Comma Separated format and contains the following fields:

Index	Value	Description
1	ID	This is a unique string ID. It comprises a 2 letter header ("mk") followed by a DateTime code. Any unique string value is acceptable.
3	X Coordinate	For the .mrk file this will always be output in UTM Easting.
4	Y Coordinate	For the .mrk file this will always be output in UTM Northing.
17	Comment	Comment text.
11	Shape Type	0 = Circle, 1 = Square, 2 = Triangle, 3 = Sonar Range, 4 = Preset Image (see Image Info below).
16	Image Info	Presets = Red Flag, Blue Flag, Green Flag, Buoy, Anchor, Rock, Danger, POI, ViewPort, Sonar, Diver, Wheel, Comment or MLO Alternatively can be full path and name of an image file (e.g., 'C:\Image1.bmp').
10	Date & Time	Date & Time in English(GB) Locale. Format is "dd/mm/yyyy hh:mm:ss"

For example, the following two markers would produce a two line .mrk file as shown:



Line 1	mk41149.5595988657,-2.1991799999203,56.9600300036883,Possible Wreck Site,4,Red Flag,28/08/2012 13:25:51
Line 2	mk41149.5605201736,-2.19877999992026,56.9598200036882,WARNING! ROCKS,4,Rock,28/08/2012 13:27:48

Glossary

.bmp	The standard filename extension for bitmap images.
.kml	The standard filename extension for a Keyhole Markup Language file which contains georeferencing data. This file will either be incorporated within a .kmz file or requires an accompanying image file (with the same file name) to be valid. Used by Google Earth.
.kmz	The standard filename extension for a compressed file containing the Keyhole Markup Language file (.kml) and image file. For storing georeferencing data and images in a single file. Used by Google Earth.
.mrk	The standard filename extension for marker files exported from Seagnet Pro, saved as a text file in tabular format with table cells separated by commas.
.png	The standard filename extension for Portable Network Graphics – a bitmapped image format employing lossless compression.
.tiff or .tif	The standard filename extension for Tagged Image File Format.
AC	Alternating Current
AIF	Originally "Acoustic Interface" but also used to refer to "ARCNET Interface" in which case it can refer to either the interface port on a SeaHub or SCU or to the expansion card available for installation into a computer.
ARCNET	Attached Resource Computer NETwork – a network protocol similar to Ethernet but with the advantage of working over much longer ranges.
ASCII	American Standard Code for Information Interchange – a character encoding scheme originally based on the English alphabet.
AutoComms	Hardware developed by Trittech International Ltd for use in sonar heads which enables the sonar to automatically switch to the correct communication protocol to match that of the surface controller.
CD-ROM	Compact Disc Read Only Memory
COM	Short for "communications". When used in the context of computers typically it refers to the Microsoft Windows designation of a serial communications port (in this instance it may be given a number, "COM3", for example). In the context of sonar hardware it can be used to refer to the circuit board that controls the communication to the surface.
CSV	Comma Separated Value – a text file in tabular format with table cells separated by commas, usually given the filename extension .csv but this can vary depending on the application.
DA-15	A 15 pin D shaped connector used mainly for the ARCNET connection on the SCU and SeaHub.
DC	Direct Current
Google Earth	A virtual globe, map and geographical information program, originally called EarthViewer 3D prior to being acquired by Google Inc. in 2004.
GPS	Global Positioning System.

Hammerhead	A survey sonar produced by Trittech International Ltd and part of the SeaKing range. Capable of producing very high resolution sonar images which can then be loaded into the Sonar Image Tiler software as part of a site survey.
JPEG or JPG	Joint Photographics Expert Group – a compression method and file format for image files, files can be stored with either .jpeg or .jpg file extensions
Kevlar	Poly-paraphenylene terephthalamide; high strength, light weight, material branded and sold as Kevlar by DuPont.
LAN	Local Area Network
LED	Light Emitting Diode
MicronNav	An Ultra Short Baseline (USBL) system for location and tracking of ROVs, divers, etc. Consists of the MicronNav 100 surface control unit (similar to the SeaHub but with different functionality) a "dunking transducer" which is mounted on the vessel/dockside under the waterline and a responder which is mounted on the ROV or Hammerhead tripod.
PA500	An altimeter sold by Trittech International Ltd
PC	Personal Computer
RAT	Remote Access Terminal – the detachable front part of the Trittech Surface Control Unit (SCU) computer. Provides an alternative to using a keyboard and mouse.
ROV	Remotely Operated Vehicle
RS232	Traditional name for a series of standards for serial binary data control signals.
RS485	A standard for defining the electrical characteristics of drivers and receivers for use in a balanced digital multipoint system (also known as EIA-485).
RX	Receive (data)
SCU	Surface Control Unit – a specially manufactured computer which is rack mountable and capable of processing the data from the sonar equipment running either Windows XP Embedded or Windows 7 and Seanet Pro or Gemini software.
SeaHub	An alternative to using a Seanet SCU, this device connects to a laptop or PC via USB interface, essentially this takes the signal from the sonar (in RS232, RS485 or ARCNET) and converts it into a signal suitable for the USB port of the computer.
SeaKing	A specific sonar produced by Trittech International Ltd but also refers to the family of sonar equipment manufactured by Trittech International Ltd comprising of the SeaKing, SeaKing DST scanning and profiling sonars and the Hammerhead survey sonar.
Seanet Pro	The software supplied by Trittech International Ltd which is capable of running all the sonar devices.
Sonar Image Tiler	The application developed by Trittech International Ltd to allow georeferenced sonar images to be joined together and placed on a chart as a mosaic.
Trittech	The 4000m depth rated connector developed by Trittech International Ltd for

waterblock	their subsea equipment.										
TX	Transmit (data)										
USB	Universal Serial Bus.										
USBL	Ultra Short Base Line (positioning system)										
UTM	Universal Transverse Mercator coordinate system – a 2-dimensional Cartesian coordinate system to give locations on the surface of the Earth.										
WGS84	World Geodetic System (1984 revision) – a standard for use in cartography, geodesy and navigation and used as the reference coordinate system by GPS devices.										
world file	A file used by the Tritech Sonar Image Tiler program which is designed to accompany an image file and contains geo-referencing data. The file format will have different extensions depending on the format of the image file:										
	<table> <thead> <tr> <th>Image Type</th> <th>World File</th> </tr> </thead> <tbody> <tr> <td>.bmp</td> <td>.bpw</td> </tr> <tr> <td>.jpeg/.jpg</td> <td>.jgw</td> </tr> <tr> <td>.tiff/.tif</td> <td>.tfw</td> </tr> <tr> <td>.png</td> <td>.pgw</td> </tr> </tbody> </table>	Image Type	World File	.bmp	.bpw	.jpeg/.jpg	.jgw	.tiff/.tif	.tfw	.png	.pgw
Image Type	World File										
.bmp	.bpw										
.jpeg/.jpg	.jgw										
.tiff/.tif	.tfw										
.png	.pgw										
XML	Extensible Markup Language. A markup language and file format that is designed to be both human and machine readable.										