Gemini Imaging Sonar

Product Manual

Outstanding Performance in Underwater Technology

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Table of Contents

Help & Support

First please read this manual thoroughly (particularly the Troubleshooting section, if present). If a warranty is applicable, further details can be found in a Warranty Statement at the end of the manual.

Tritech International Ltd can be contacted as follows:

	Mail	*Tritech International Ltd* Peregrine Road Westhill Business Park Westhill, Aberdeenshire AB32 6JL, UK
	Telephone	++44(0)1224 744 111
	Fax	++44(0)1224 741 771
	Email	support@tritech.co.uk
	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.

Included Equipment

Note

Each Gemini Sonar head is able to use either the VDSL or Ethernet communications system and therefore may be converted with the addition of the appropriate peripherals.

The following equipment may be included:

1. Gemini sonar head (either shallow or deep rated)
2. Surface adapter (either VDSL or Ethernet)
3. Gemini PSU for use with surface adapter
4. Bench testing cable (either VDSL or Ethernet)
5. Blanking cap for unused connector (may be included in an accessories kit with spare O-rings)

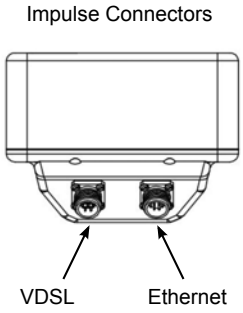
Also provided will be a sonar head flight case, Gemini software, Seanet Pro software and documentation. The latest documentation and software updates are available through www.tritech.co.uk.

Note

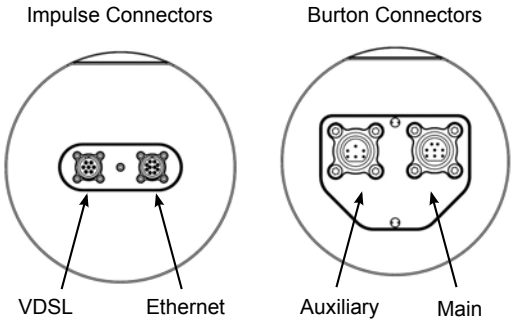
For part numbers for ordering replacement parts please refer to the original purchase documentation or contact *Tritech International Ltd* support to discuss upgrade options.

Head Variations

Gemini 720i (300m depth rating)



Gemini 720id (4000m depth rating)



Finished in titanium (silver/grey) or aluminium (black anodised)

1. Introduction

1.1. General Overview

The Gemini is a 2D imaging sonar. It is a multibeam sonar, offering a 120° field of view with update rates of up to 30Hz giving rapid feedback to the user (hardware is capable of 30Hz, Seanet Pro is limited to 15Hz).

The system consists of the Gemini sonar head(s) and either Gemini or Seanet Pro control and display software. The software communicates with the sonar over Ethernet (100Mbit s^{-1}), or Very high speed Digital Subscriber Line (VDSL) via a VDSL to Ethernet converter.

The software is Windows based and will run best on a display of resolution 1280x1024 or greater with 32-bit colour resolution.

1.2. Communications

There are two connection options, 100Mbit s^{-1} Ethernet and VDSL. The sonar will automatically detect which connection is available and switch to that connection.

The VDSL option allows a single twisted pair to be used for communication to/ from the sonar at high speeds dependent on the length and quality of the cable (see Chapter 2, *Technical Specification* for details). The *Tritech International Ltd* supplied VDSL Adapter Unit takes the two wire VDSL input and bridges it to Ethernet for simple connection to a PC.

VDSL maximises the data rate by testing the quality of the connection at start up and adapting the speed accordingly. With VDSL there is a trade off between link speed and noise immunity. There is a setting in the software that allows optimisation to cope with the level of noise introduced by other parts of the system.

Note

The red LED on the VDSL adapter box may light up to indicate that the link is experiencing higher levels of electrical noise. The sonar can cope with some electrical noise on the link but it may reduce the ping rate.

When using an Ethernet connection it should be noted that the Gemini Sonar can fully utilise a 100Mbit s^{-1} link while returning the sonar data. If the Gemini Sonar is to share an Ethernet link with other high bandwidth devices, such as video cameras, it is recommended that the 100Mbit s^{-1} devices share a gigabit (or faster) link to the surface to reduce possible network congestion.

1.3. Electrical Connection

If the Gemini head is fitted with the Impulse connectors; only one of the connectors can be used at a time for communication with the surface, however, power can be supplied on either connector. When using a Gemini head fitted with a Burton connector the main port is used for communication and power and the auxiliary port is used for external devices.

Caution

Power should only be supplied on one connector at a time.

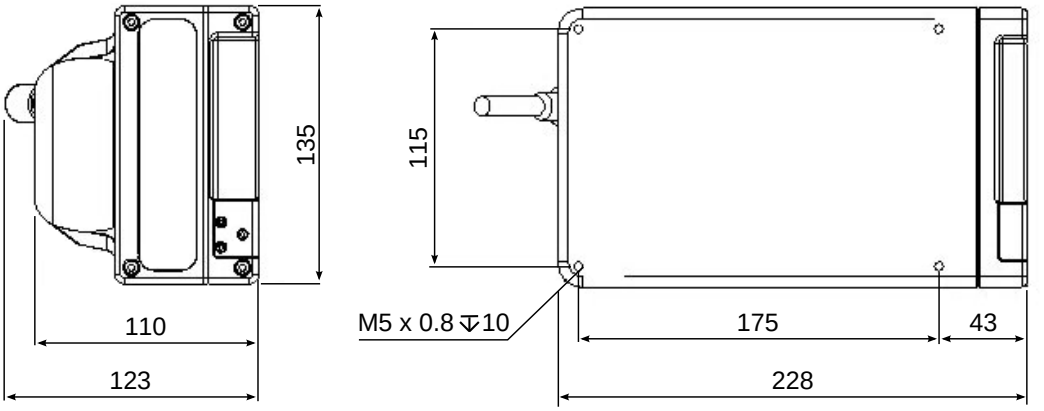
1.4. Software Version

Note

The instructions within this manual apply to software version 1.17.00. Please visit www.tritech.co.uk for the latest software.

2. Technical Specification

2.1. Gemini 720i



Not to scale, dimensions in mm.

Acoustic	
Operating Frequency	720kHz
Number of Channels	96
Angular Resolution	1.0° acoustic, 0.5° effective
Scanning Sector	120°
Number of Beams	256
Vertical Beamwidth	20°
Range	0.2m to 120m
Scan Rate	5-30Hz (range dependent)
Range Resolution	8mm (range dependent)

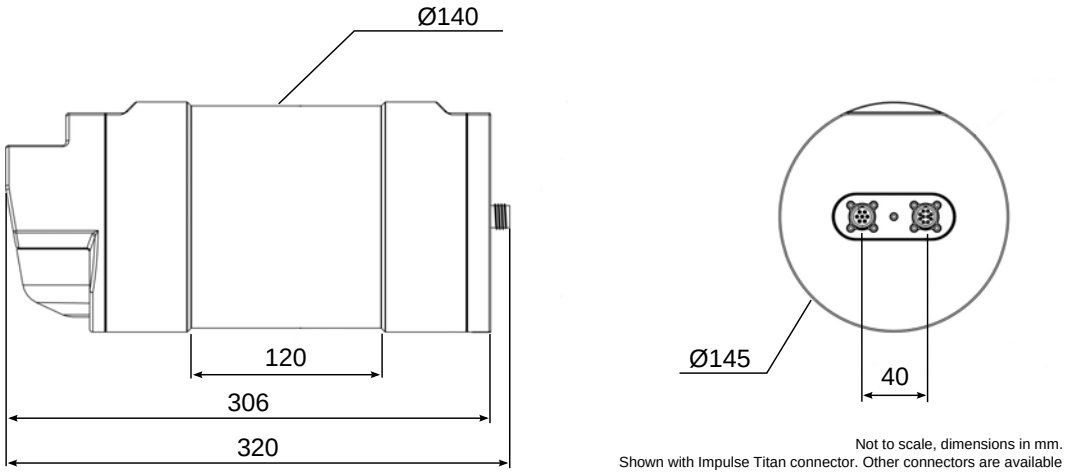
Electrical and Communication	
Power Consumption	35W max (ping rate dependent, head unit only)
Supply Voltage	20 - 75V DC
Data Communications	Ethernet (up to 80m) or VDSL (up to 1000m)
Additional I/O	RS232, Isolated TTL in/out

VDSL Cable Length

Maximum length for VDSL and power is 300m, if power is provided locally (e.g., by the ROV) then maximum cable length for VDSL communication only is 1000m.

Physical	
Weight	3.9kg air, 1.2kg water
Depth Rating	300m
Materials & Finish	Aluminium alloy (6082T6) hard anodised
Operating Temperature	0°C to 35°C
Storage Temperature	-20°C to 50°C

2.2. Gemini 720id



Not to scale, dimensions in mm.
Shown with Impulse Titan connector. Other connectors are available

Acoustic	
Operating Frequency	720kHz
Number of Channels	96
Angular Resolution	1.0° acoustic, 0.5° effective
Scanning Sector	120°
Number of Beams	256
Vertical Beamwidth	20°
Range	0.5 to 120m
Scan Rate	5-30Hz (range dependent)
Range Resolution	8mm (range dependent)

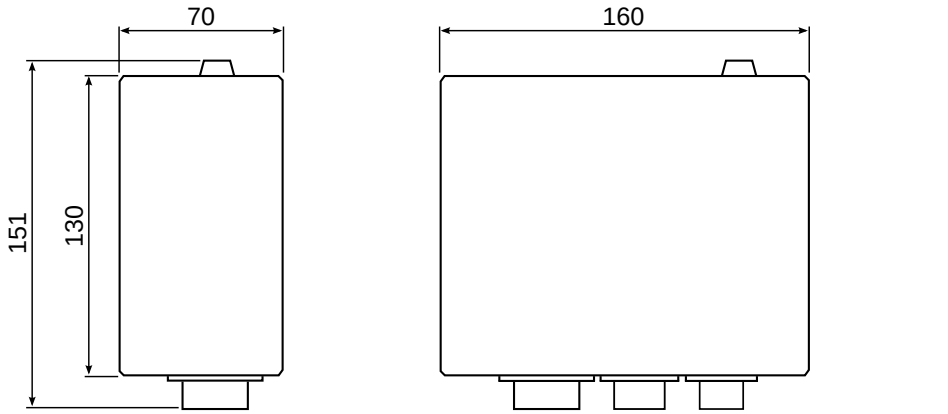
Electrical and Communication	
Power Consumption	35W max (ping rate dependent, head unit only)
Supply Voltage	20 - 75V DC
Data Communications	Ethernet (up to 80m) or VDSL (up to 1000m)
Additional I/O	RS232, Isolated TTL in/out

VDSL Cable Length

Maximum length for VDSL and power is 300m, if power is provided locally (e.g., by the ROV) then maximum cable length for VDSL communication only is 1000m.

Physical		
Property	**Aluminium Body**	**Titanium Body**
Weight	8kg air, 3.5kg water	12kg air, 7.5kg water
Depth Rating	4000m	4000m
Materials	Aluminium alloy (6082T6)	Titanium (6 AL-4V)
Finish	Hard anodised	Bead blasted
Operating Temperature	0°C to 35°C	
Storage Temperature	-20°C to 50°C	

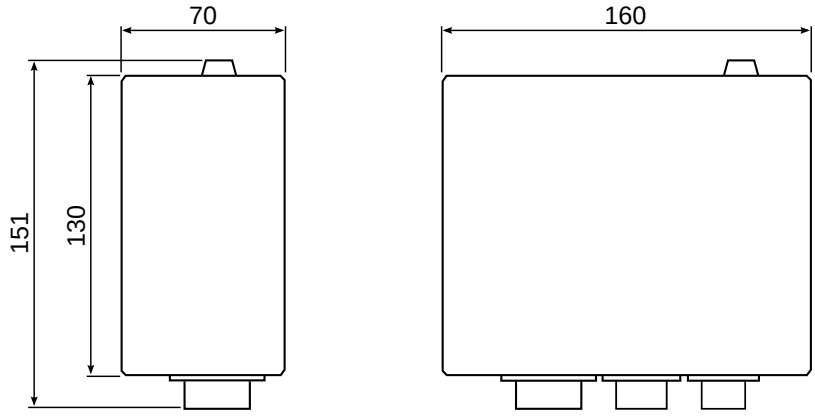
2.3. VDSL Adapter



Not to scale, dimensions in mm.

Weight	1.1kg
Materials	Enclosure: Aluminium alloy (AC-44300), Connectors: thermoplastic
Finish	Powder Coated
Operating Temperature	0°C to 35°C
Storage Temperature	-20°C to 50°C
Power Consumption	3.8W
Supply Voltage	22 - 75V DC
Data Communications	Ethernet (10/100) Base-T (80m) VDSL (up to 1000m)
Connectors	Souriau UTS7124P (mates with UTS6JC124S) Souriau UTS7147S (mates with UTS6JC147P) Souriau UTS718RJFN (mates with UTS6JC18RJN25)

2.4. Ethernet Adapter



Not to scale, dimensions in mm.

Weight	1.1kg
Materials	Enclosure: Aluminium alloy (AC-44300), Connectors: thermoplastic
Finish	Powder Coated
Operating Temperature	0°C to 35°C
Storage Temperature	-20°C to 50°C
Supply Voltage	22 - 75V DC
Data Communications	2x Ethernet (10/100) Base-T (80m)
Connectors	Souriau UTS7124P (mates with UTS6JC124S) Souriau UTS71412S (mates with UTS6JC1412P) Souriau UTS718RJFN (mates with UTS6JC18RJN24)

3. Hardware Installation & Configuration

Caution

Although the sonar head is rugged, it should be handled with care, particularly the connector and receiver/transmitter elements. It is strongly recommended that a substantial guard is fitted over the sonar to protect the transducer from impact damage.

3.1. Installing the Sonar Head

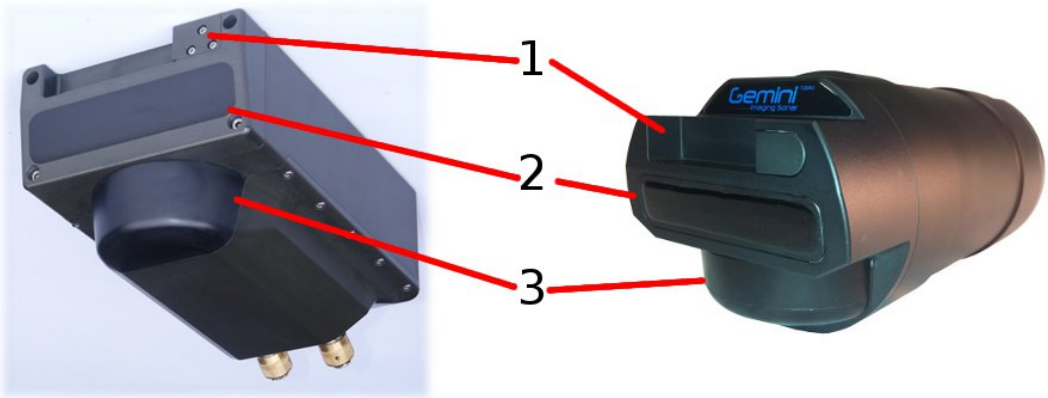
The transducer should be mounted with the transmitter element on the bottom. The transmit and receive elements are internally angled down at 10° which should be taken into account when mounting the Sonar.

For the 720i there are 4 tapped M5 holes (10mm deep) on the top surface that are to be used for mounting the sonar.

Any metallic clamps should be electrically insulated from the sonar body by either rubber or plastic strips or mounting brackets of at least 3 mm thickness and extending at least 3 mm beyond the clamp boundary to reduce any galvanic corrosion effect. Non-metallic clamps are preferable; if metallic clamps are used (especially if they are not aluminium) they should be painted or lacquered with at least two or three coatings.

Caution

Any alloy containing copper such as brasses or bronze should be avoided because they will severely corrode the aluminium body.



1. Sound Velocity Probe
2. Receiver Elements
3. Transmitter Elements

3.2. Electrical & Communication Notes

Either an Ethernet or VDSL cable whip is supplied with the appropriate connector fitted to one end. The other end should be terminated with a suitable connector for the user application.

Connector Maintenance Guidelines

Mating surfaces should be lubricated with 3M Silicone Spray or equivalent, DO NOT GREASE. Connectors must be lubricated on a regular basis. Lubricate O-rings with Dow Corning #111 Valve Lubricant or equivalent. O-rings can be seriously degraded if exposed to direct sunlight or high ozone levels for extended periods of time. Clean plugs and receptacles with soap and fresh water.

Caution

When attaching a connector make sure that both connector and socket are completely dry. Any water trapped in the connection could result in an electrical short.

Caution

If the Gemini has two ports then the unused connector must have a blanking cap fitted prior to immersing in water. Failure to do this will cause permanent damage.

Caution

If using alcohol or IPA to clean out the connector take care that it does not come into contact with any other part of the sonar. If an O-ring is present it should be first removed and discarded and the new O-ring only inserted after the IPA has evaporated.

Ground Fault Monitoring

The power supply within the Gemini includes an electrically isolated DC-DC converter front-end. There is a small capacitive connection between the isolated ground and the sonar chassis which should not noticeably affect any impressed current ground fault indicator (GFI) equipment.

Power

Caution

Never try to make the Gemini work down a long cable by increasing the PSU output voltage above 75V DC.

Warning

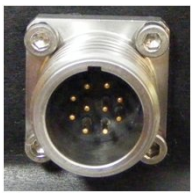
The Gemini PSU that is supplied with the Gemini system is intended for INDOOR USE ONLY and should not be placed in a position where it could get wet.

3.3. Sonar Head Pin-Out (Impulse Titan Connector)

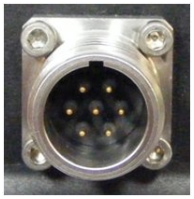
Note

When fitted with the Impulse Titan style connector the VDSL and Ethernet are on separate ports but cannot be operated at the same time. Whichever port is not connected can be connected to RS232/TTL auxiliary devices.

3.3.1. Impulse Titan MKS-310-FCR (Ethernet Port)

Pin	Function	Diagram	Photograph
1	Ethernet RX +		
2	Ethernet RX -		
3	Ethernet TX +		
4	DC +		
5	DC +		
6	Ethernet TX-		
7	DC Ground		
8	DC Ground		
9	TTL Ground		
10	TTL IN	Impulse Titan MKS-310-FCR	

3.3.2. Impulse Titan MKS(W)-307-FCR (VDSL Port)

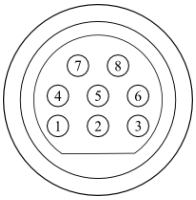
Pin	Function	Diagram	Photograph
1	DC Ground		
2	DC +		
3	RS232 RX		
4	RS232 TX		
5	RS232 Ground		
6	VDSL +		
7	VDSL -	Impulse Titan MKS(W)-307-FCR	

3.4. Sonar Head Pin-Out (Burton Connector)

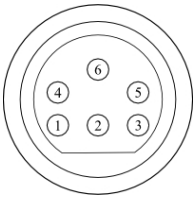
Note

When fitted with the Burton style connector the VDSL and Ethernet are both on the `MAIN` port of the sonar. The `AUXILIARY` port is only for the RS232 and TTL connection.

3.4.1. Burton 5506-1508 (Main Port)

Pin	Function	Diagram
1	Ethernet RX +	 5506-1508
2	Ethernet RX -	
3	Ethernet TX +	
4	DC +	
5	VDSL +	
6	Ethernet TX -	
7	DC Ground (0V)	
8	VDSL -	

3.4.2. Burton 5506-1506 (Auxiliary Port)

Pin	Function	Diagram
1	RS232 RX	 5506-1506
2	RS232 TX	
3	DC +	
4	DC Ground (0V)	
5	RS232/TTL Ground	
6	TTL IN	

3.5. Cable Specification

3.5.1. Ethernet Cable

For an Ethernet connection, the supplied cable is described below and should be terminated with an appropriate connector for the intended application, for example, an RJ45 connector for integration into a PC network.

Note

Ethernet connection requires a minimum of CAT5e shielded cable for the entire cable run (max 80m), lengths of untwisted cable around connectors must be kept to an absolute minimum. Untwisted lengths will cause poor or intermittent operation.

Ethernet Cable Specification			
Impulse Titan MKS-310-FCR	**Burton 55A1-1508**	**Cable Colour & Specification**	**Function**
1	1	Red UTP#2 (24AWG)	Ethernet RX +
2	2	White UTP#2 (24AWG)	Ethernet RX -
3	3	Blue UTP#1 (24AWG)	Ethernet TX +
4	4	Red (20AWG)	DC +
6	6	White UTP#1 (24AWG)	Ethernet TX -
7	7	Black (20AWG)	DC Ground
Minimum dynamic bend radius 130mm (static 36mm)			

3.5.2. VDSL Cable

A VDSL connection requires only one twisted pair from the sonar to the surface.

Note

The signal path should have a characteristic impedance of 110Ω (±10Ω) for the entire cable run for optimal performance.

VDSL Cable Specification			
Impulse Titan MKS(W)-307-FCR	**Burton 55A1-1508**	**Cable Colour & Specification**	**Function**
1	7	Black (20AWG)	DC Ground
2	4	Red (20AWG)	DC +
6	5	Blue UTP#1 (24AWG)	VDSL +
7	8	White UTP#1 (24AWG)	VDSL -
Minimum dynamic bend radius 129mm (static 35mm)			

3.5.3. Burton 55A1-1506 (Auxiliary) Port Cable

An RS232 serial connection or TTL connection is possible to enable the use of an auxiliary device or sensor connected in series with the Gemini head. A cable to connect to the `Auxiliary` port is available from *Tritech International Ltd* with the following specification:

Note

It will be necessary to terminate this cable with an appropriate connector for the sensor which is to be used.

Burton 55A1-1506 Auxiliary Cable Specification		
Pin	**Cable Colour & Specification**	**Function**
1	Red UTP#2 (24AWG)	RS232 RX
2	White UTP#2 (24AWG)	RS232 TX
3	Red (20AWG)	DC +
4	Black (20AWG)	DC Ground (0V)
5	White UTP#1 (24AWG)	RS232/TTL Ground
6	Blue UTP#1 (24AWG)	TTL In
Minimum dynamic bend radius 130mm (static 36mm)		

3.6. Surface Adapter Pin-out Diagrams

Note

For all system types the connection to the surface computer or IT infrastructure from the Gemini Hub, Ethernet or VDSL adapter should be via a shielded Cat5e cable fitted with an RJ45 connector.

3.6.1. Ethernet Adapter

Sonar Head Connector

Pin	Function	Diagram	Photograph
A	Ethernet RX+		
B	Ethernet RX -		
C	Ethernet TX+		
D	DC +		
E	DC +		
F	Ethernet TX -		
G	DC Ground		
H	DC Ground		
J	not connected		
K	not connected		
L	not connected		
M	cable screen	Souriau UTS71412S	

Ethernet DC Connector

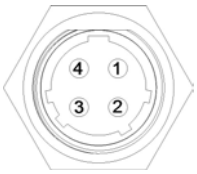
Pin	Function	Diagram	Photograph
1	DC Ground		
2	DC +		
3	not connected		
4	not connected	Souriau UTS7124P	

3.6.2. VDSL Adapter

Sonar Head Connector

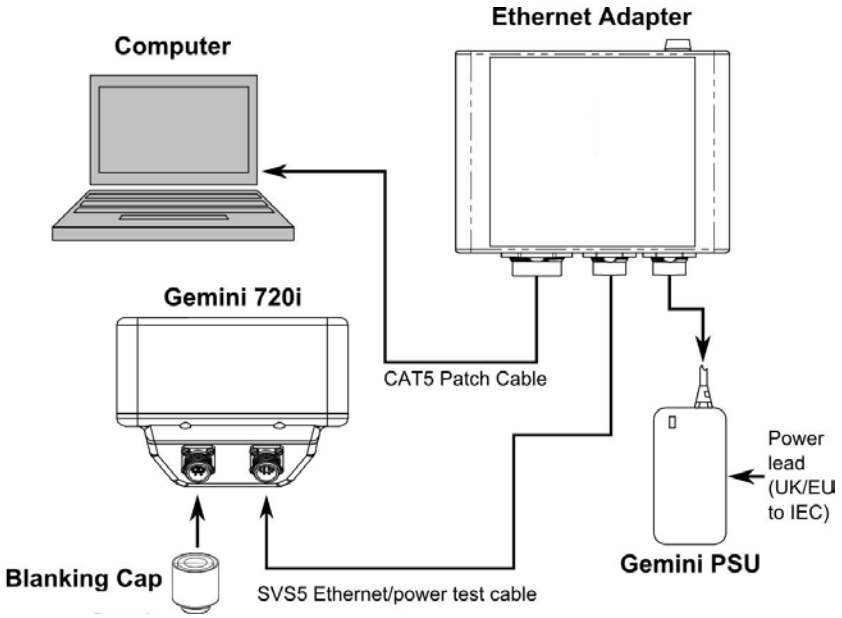
Pin	Function	Diagram	Photograph
1	DC Ground		
2	DC +		
3	not connected		
4	VDSL +		
5	VDSL -		
6	not connected		
7	cable screen	Souriau UTS7147S	

VDSL DC Connector

Pin	Function	Diagram	Photograph
1	DC Ground		
2	DC +		
3	not connected		
4	not connected	Souriau UTS7124P	

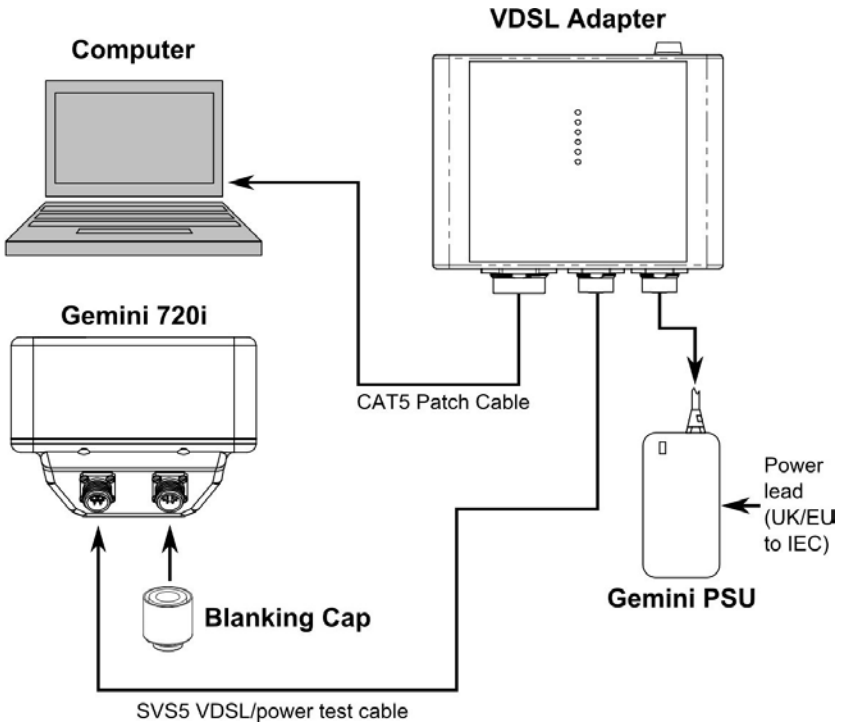
3.7. An Example Ethernet Setup

Test or bench setup for the Gemini Sonar system using Ethernet communications via the Ethernet adapter unit (Gemini 720i shown).



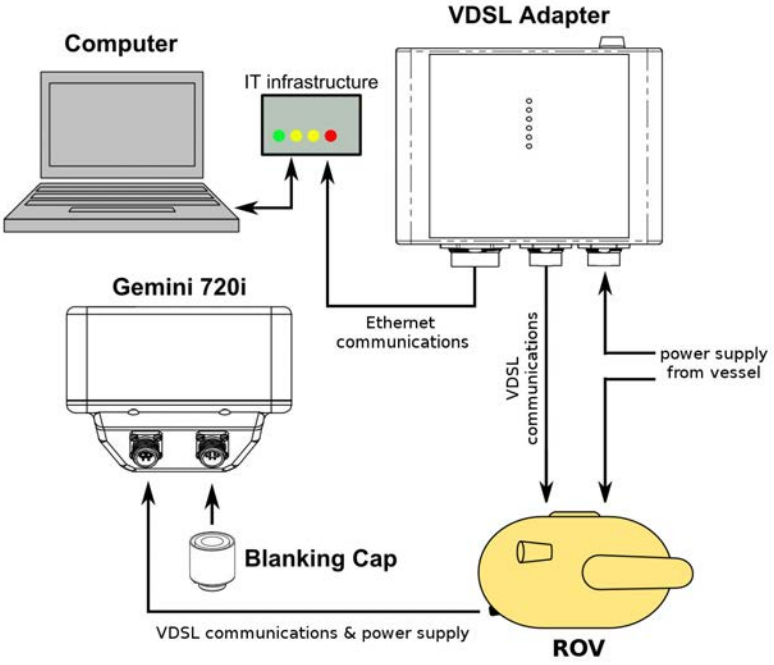
3.8. An Example VDSL Setup

Test or bench setup for the Gemini Sonar system using VDSL communications via the VDSL adapter unit (Gemini 720i shown).



3.9. An Example ROV Setup

An example of connections for an ROV, with the Gemini Sonar system using VDSL communications via the VDSL adapter unit (Gemini 720i shown).



3.10. Multiple Head Installation

It is possible to control and display up to four Gemini heads from one computer using the Gemini software. In order to do this extra hardware will be required to connect the extra Gemini heads to the system as detailed:

Using the Gemini Ethernet Interface Box	The Ethernet Interface Box will output to a standard Ethernet connection so on a system with multiple heads it is possible to connect these to an Ethernet switch. The Gemini sonar is capable of utilising the full bandwidth of the 100Mbit s^{-1} (fast Ethernet) connection so any switch or hub (and subsequent infrastructure) used should be rated to Gigabit speeds in order to be able to cope with the data.
Using the Gemini Hub	Available as a separate item from *Tritech International Ltd* is a Gemini Hub which is capable of powering and communicating with up to two Gemini sonars. The hub also provides RS232 ports for connecting additional sensors to the system (such as GPS or navigation sensors). For more details of the Gemini Hub please refer to the Gemini Hub manual or contact *Tritech International Ltd*.

4. Gemini Software Installation

The Gemini head is supplied with software to control the functions of the sonar and to display the captured images. The software is supplied as an installer package which installs the software and a number of supporting files and documentation.

Note

The software is also available for download from www.tritech.co.uk

4.1. System Requirements

	Minimum	Recommended
Processor	2GHz	2GHz dual core
RAM	1GB	2GB
Graphics	3D hardware accelerated graphics card.	
Display	1280x1024 (32bit colour)	1600x1200 (32bit colour)
Disk space	Install is 20MB, greater than 160GB recommended for log files	
Networking	100Mbit s^{-1} (fast Ethernet)	1000Mbit s^{-1} (Gigabit Ethernet)
Software	Windows XP 32bit	Windows 7 32 or 64bit

4.2. Installing the Gemini Software

The Gemini software is supplied on a USB memory stick as a Windows Installer Package (with the *.msi* file extension). Doubling clicking the installation file will start the Windows Installer and install the software onto the computer. Older units were supplied with a CD-ROM and it will auto-run upon disc insertion, if using a CD-ROM based installation, consider updating to the latest version of the software from www.tritech.co.uk. During installation follow the installer instructions, if required making any appropriate selections, to install the software.

4.3. Configuring the Gemini

The Gemini head uses Ethernet to communicate with the computer running the Gemini software. Depending on the configuration of the system, this may be partly carried over a VDSL link. Before the head can be connected to the LAN, the IP address needs to be set to a suitable value for that network. Also the subnet mask needs to be appropriate for the network and the address chosen.

Configuring the IP address of the Gemini is a four stage process. Firstly the IP address of the computer is set to a value which will communicate with the head. The Gemini software is then used to change the IP address of the Gemini. The third stage is to reset the IP address of the computer. The final stage is to check the operation of the Gemini on the network (by running the Gemini software and verifying that the Gemini head is able to communicate).

The following instructions use addresses 192.168.2.201 for the Gemini and 192.168.2.100 for the computer. These addresses are only appropriate for a new Gemini which has just been delivered from the factory. If the IP address of Gemini has already been changed, an appropriate address for the computer will need to be selected first to allow communication with the Gemini before it can be configured.

The Gemini head should be given an IP address appropriate for the network it will be running on. The address at manufacture is 192.168.2.201 and the process of setting the sonar IP address involves talking to the unit via the 192.168.2.201 address to change the IP address to a value suitable for the network.

Note

For instructions on setting the computer and Gemini IP address please refer to Appendix A, *Setting the computer IP address in Windows XP* or Appendix B, *Setting the computer IP address in Windows 7* and Appendix C, *Setting the Gemini Device IP Address in Gemini Software*.

4.3.1. Check the operation of the Gemini

If the correct changes have been made to the Gemini it should now show as connected in the Gemini software. If nothing is displayed, check that all values entered were correct and it may be necessary to rerun the Gemini software to establish a link. The Gemini software retains its settings between runs, and so all the values which were used whilst the Gemini was programmed will be retained.

When the Gemini software is started, select the `Advanced` tab to show details of the connected Gemini and if it is able to communicate, it will be listed in the status window and automatically go online after five seconds.

5. Gemini Software Operation

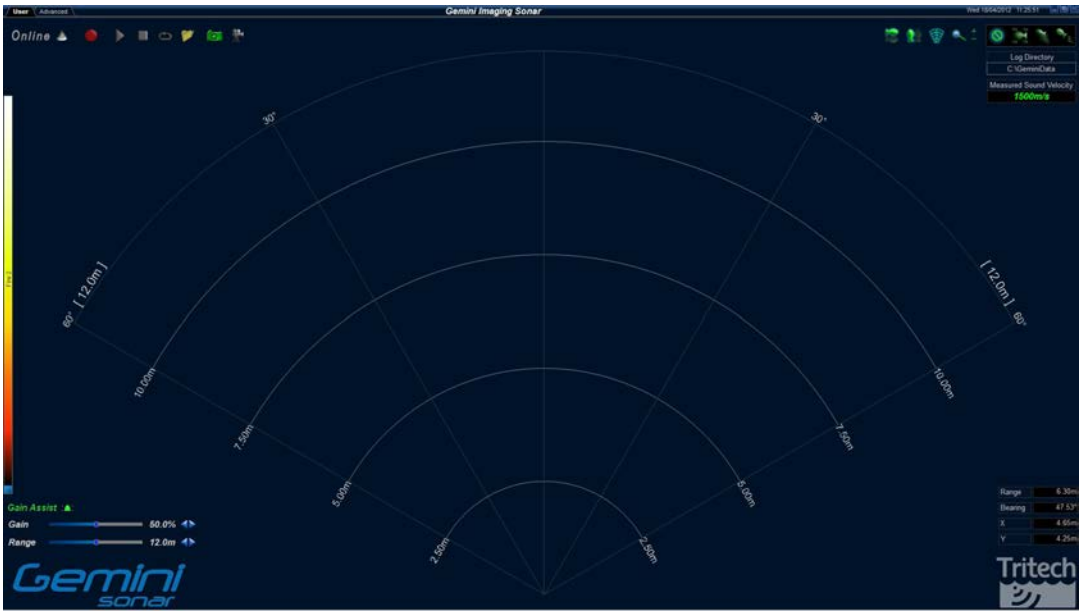
Note

To access the online help hover the mouse pointer over a control and press the F1 key.

When the Gemini software is running, it presents a choice of two screens, which are selected by clicking on the tabs at the top left hand of the screen. The two screens are the `User` screen and the `Advanced` screen. The `User` screen allows the maximum amount of screen to be used for data display and the `Advanced` screen enables adjustment of the sonar settings.

5.1. User Screen

5.1.1. Overview



The 120° cone in the middle of the display shows the sonar image that the Gemini Sonar is producing. Around this display are the most commonly used controls.

On the upper left hand corner are the controls for starting the sonar imaging, starting the software logging of the images received from the sonar, replaying previously logged data, and capturing images.

On the upper right hand corner are the controls for arranging the display, selecting the post processing filtering to be applied to the image, and selecting the directory data is to be logged to. The indicator for the sound velocity is also situated in this area of the screen.

In the middle of the left hand side of the screen is the palette selector.

On the lower left hand side of the screen are the range and gain controls for the sonar.

On the lower right hand side of the screen are the indicators showing the pointer position within the display area.

Note

If serial sensor data is available and enabled from the `Advanced` tab, a subset of the data will be shown at the bottom of the `User` screen as well.

5.1.2. Online Button

The `Online` button starts communication with the sonar. When the software is started the sonar will not be running and the `Online` button and image (a small sonar cone) will be grey. Clicking the `Online` button will start the Gemini Sonar imaging; the button and the sonar cone image next to it will change to green. Clicking the button a second time will stop communication with the sonar, and the button and sonar cone will return to grey.

If the `Online` button is pressed while no sonars are visible to the Gemini software, the following message will be displayed.

Clicking OK will acknowledge the message, and the software will not go online.

If the `Sonar ID` entered in the Sonar box of the configuration settings is not one of the sonars visible to the Gemini software when the Sonar button is pressed, the software will present one of two messages.

If only one sonar is visible, the software will offer the chance to start imaging from that sonar.

Clicking `Yes` will cause the software to select the sonar which is visible to it. Clicking `No` will acknowledge the message, and the software will not change the selected sonar and will not go online.

If the sonar is not able to connect due to being on a different network or having different network settings the following will be displayed:

Note

To correctly set up the network refer to Appendix B, *Setting the computer IP address in Windows 7* (or Appendix A, *Setting the computer IP address in Windows XP*) and Appendix C, *Setting the Gemini Device IP Address in Gemini Software*.

5.1.3. Record Button

The `Record Button` (a large red dot) controls the recording of the image being displayed by the software. When the software is started it will not be recording data and the `Record Button` will be a dark red dot. When the button is clicked the software will start recording data and the button will be highlighted. Recording can be stopped by clicking on the button again.

The `Log Directory` selector controls which directory the data is recorded in. The directory displayed in the `Log Directory` selector is the root directory where all recorded data will be stored. Below that, a directory will be created using the current date, and each log data filename will include the time when recording started. For more details see Section 5.1.12, “Log Directory Selector”.

The software has a maximum file size for the logged data files. Once this size has been reached, the software will stop logging to the current file and open a new file to resume logging.. The name of the new file will be based on the time the file was opened. If data is logged for a significant period of time, a number of files will be created, each with a different filename indicating when the data was first logged to that file.

For example, if the `Log Directory` selector is showing that the directory selected is `C:\GeminiData`, and recording was started at 4:30:02pm on 18th of October 2014, the data would be recorded in the file 163002_IMG.ECD in the directory `C:\GeminiData\LD20141018`.

The software will automatically create any directories needed for recording.

5.1.4. Player Controls

The player controls manage the replay of sonar images previously recorded by the software.

From left to right they are Play, Stop, Repeat and Open. The controls that are enabled will depend on what the software is doing, for example, it is not possible to do anything with the player controls whilst the software is acquiring images from the Gemini sonar, nor is it possible to open a file whilst another file is already playing.

Play Button

The Play button is a play/pause control for the file player. When the data from a file is loaded but not playing, the image is a green triangle.

Clicking the image will start the file playing and the image will change to a Pause control (two vertical lines).

Clicking the image again will pause the file replay and the image will change back to the Play control (triangle).

Stop Button

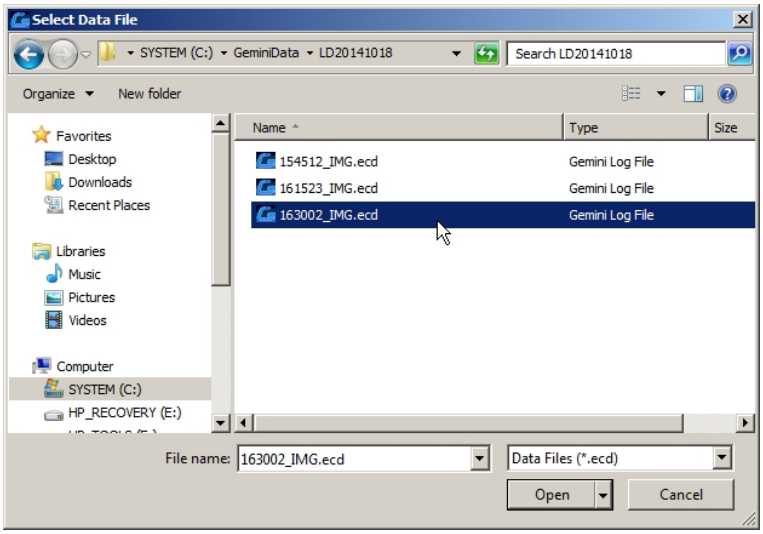
The Stop button stops file replay and resets the play progress to the start.

Repeat Button

If the Repeat button is active and the player reaches the end of the file it is playing, it will return to the start of the file and continue. Clicking the Repeat button will alternate between the repeat being active and inactive.

Load Button

When the Load button is pressed, the software will open a file selector to allow the user to select a previously recorded data file to be replayed. To replay the data recorded at 4:30:02pm on 18th October 2014, file selector would look like this and the file 163002_IMG.ecd should be selected.



When replaying a log file, the filename, together with the date and time of recording, will be displayed at the bottom of the screen (below the sonar image) in green text, for example:

Frame Number and Speed Control

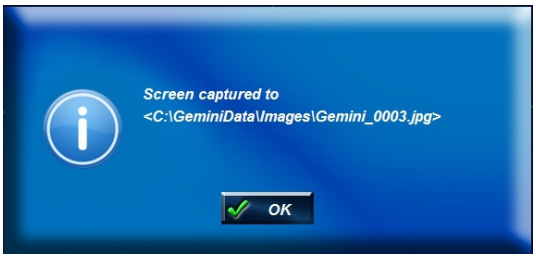
The `Frame` control is a slider bar which allows the user to move quickly around the file that has been loaded. The number at the right hand end is the currently displayed frame number from the file. The slider can be grabbed to move quickly to any position in the file, whilst the two arrows at the end of the slider can be used to precisely position the frame being displayed in the file. The frame number can be changed whilst the file is playing or paused. This control only appears when a file has been loaded.

The `Speed` control changes the replay speed of the data being replayed by the software. The maximum speed is 5 x (500% as indicated by the number at the right hand end of the slider bar). The slider can be grabbed to change the replay speed quickly, whilst the two arrows at the end of the slider can used to precisely control the replay speed. The replay speed can be changed whilst the file is playing or paused. This control only appears when a file has been loaded.

5.1.5. Capture Screen

The `Capture Screen` button sits to the right of the player controls and looks like a camera. When this button is clicked it will take a full screen image of the Gemini software screen. This image is stored as a JPEG image in the Images sub-directory of the log data directory, with a filename of `Gemini_nnnn.jpg`, where `nnnn` is an incrementing index number for the image. For example using a logging directory of `C:\GeminiData`, the first image captured would be stored in the file `C:\GeminiData\Images\Gemini_0001.jpg`

When the image has been captured, the Gemini software will display a message (as below) giving the name of the file. This message will be displayed for five seconds and then will close automatically.



5.1.6. Record as .WMV

The `Record as .WMV` button also sits to the right of the player controls and looks like an old fashioned movie camera on a tripod. WMV capture is only available when a file is being replayed, WMV capture cannot be performed on live sonar data.

When a file has been loaded and the playback of the file has been paused or stopped, the WMV capture button will be enabled. When the WMV capture button is clicked, the WMV capture process will take over the replaying of the data. The WMV capture process is ended when the WMV capture button is clicked for a second time.

The frame counter will be visible during the WMV capture to allow the selection of the part of the file to be captured. The WMV will be captured so that the replay will occur at approximately real time and it is not possible to change the speed of the playback during capture.

The WMV file that is generated is stored in the Images sub-directory of the log data directory, with a filename of `Gemini_nnnn.wmv`, where `nnnn` is an incrementing index number for the video. For example using a logging directory of `C:\GeminiData`, the first WMV file generated would be stored as `C:\GeminiData\Images\Gemini_0001.wmv`

When the WMV file has been captured, the Gemini software will display a message (as below) giving the name of the file. This message will be displayed for five seconds and then will close automatically.

5.1.7. Invert Display (Up/Down)

The Invert Display (Up/Down) button, when clicked, inverts the image displayed by the software.

5.1.8. Flip Image (Left/Right)

If the sonar is mounted upside down, the software has the ability to flip the image from left to right as viewed on the computer screen so that the image still appears correctly oriented to the user. The illustration above shows the button in the non-flipped state.

5.1.9. Draw Grid

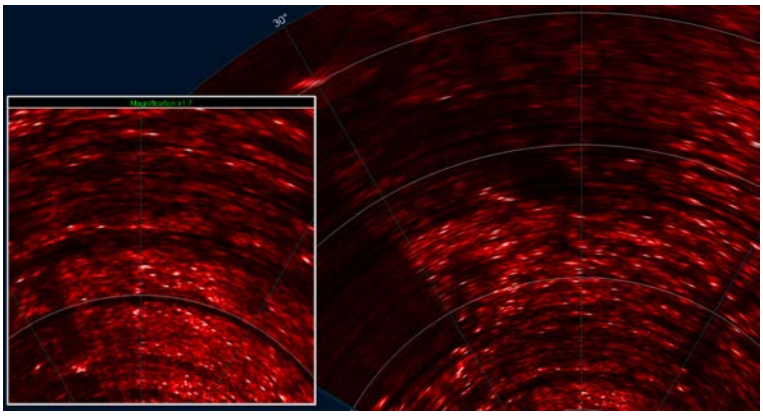
The Draw Grid button, when clicked, draws the range and bearing grid on the image displayed by the software. The illustration above shows the button in the on state.

5.1.10. Zoom Button

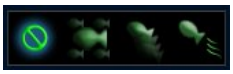
The Zoom button looks like a magnifying glass. When this button is clicked, a zoom window opens which shows the data around the mouse pointer in more detail, as the following image shows.

The zoom window positions itself to either the left hand side or the right hand side of the screen so that it does not obscure the sonar image. The magnification level of the window is changed by using the mouse wheel, or by using the + and – buttons next to the zoom button. The magnification level can be changed between 1.5x (minimum magnification)and 40x (maximum magnification).

Clicking within the sonar arc will lock the zoom at that point. Clicking outside of the arc will release the lock and the zoomed area will follow the mouse pointer.



5.1.11. Filter Selector



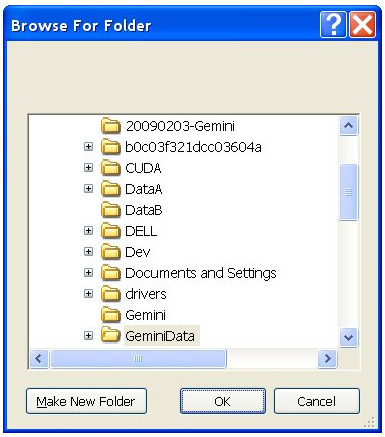
The Gemini software allows three filters to be applied to the image after it has been received from the Gemini Sonar and also to replayed data. From left to right, they are None, Average, Persistence, and Movement.

There are controls on the advanced screen to change the setting for each of the filters and they are described in more detail in Section 5.2.2, “Configuration Options Screen”.

5.1.12. Log Directory Selector

The Log Directory selector shows the currently selected directory which will be used to save data recorded by the software. For a description of how the directories and files used by the software when recording data refer to Section 5.1.5, “Capture Screen” and Section 5.1.6, “Record as .WMV”.

When the text below the Log Directory box is clicked (i.e. clicking on `C:\GeminiData` on the screen example above) a directory selector to allow the selection of a directory to be used to log the data to.



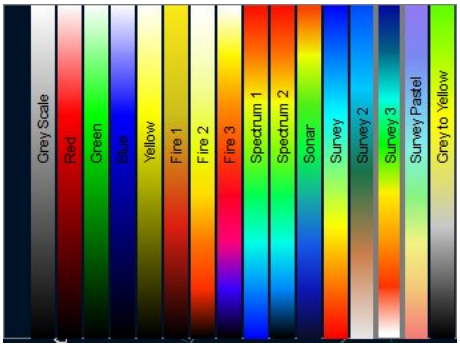
5.1.13. Sound Velocity Indicator

The sound velocity indicator at the upper right hand side of the display shows the sound velocity used by the Gemini Sonar whilst producing the sonar image. The Gemini Sonar can use a fixed value for the sound velocity or an automatically measured velocity.

5.1.14. Palette Selector

The Gemini software is supplied with a number of palettes which are used to show the different intensities in the sonar image in different colours. The palette bar on the left hand side of the screen shows the mapping currently being used.

Clicking on the palette bar opens a palette selector which allows the selection of the palette to use. As the mouse is hovered over the different palettes, the sonar image will preview that palette.



5.1.15. Gain Assist

By default this is turned on as indicated by green text. When turned on the Gemini will automatically reduce a high gain setting on range lines where bright targets are observed. This improves the clarity of the target, but can give the effect of dark bands in the background image. When turned off the Gemini will always use the gain slider setting. If bright targets are observed and a high gain setting is used, the target will appear to spread out in the displayed image.

Note

The Gain Assist setting can be changed during operating the Gemini live and when replaying logged data but cannot be changed for log files created with software versions prior to 1.16.0 for which it will always be turned ON.

5.1.16. Gain Control

The Gain slider at the bottom left hand side of the display is used to change the gain level being used by the Gemini sonar, and is expressed as a percentage between 0 (no gain being applied) and 100 (full gain being applied).

The gain can be changed by either clicking on the dark blue indicator showing the current gain position in the slider and dragging it left or right, or by using the arrows at the end to change the gain one step at a time. The arrows are designed for fine

control of the gain and operate one step per click and clicking on the arrows and holding them down will have no effect.

The gain can also be altered using keyboard shortcuts ('z' to decrease gain, 'a' to increase gain).

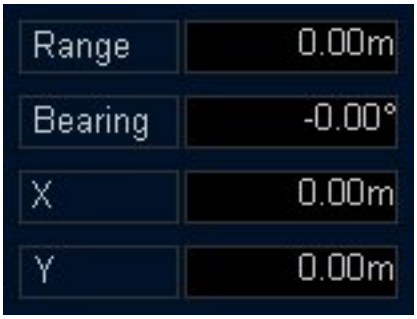
5.1.17. Range Control

The Range slider at the bottom left hand side of the display is used to change to the range of the image being acquired by the Gemini Sonar.

The range can be changed by either clicking on the dark blue indicator showing the current range position in the slider and dragging it left or right, or by using the arrows at the end to change the range one step at a time. The arrows are designed for fine control of the range and operate one step per click and clicking on the arrows and holding them down will have no effect. The range control has been implemented with a logarithmic scale so that the smaller values of range can be more precisely selected.

The range can also be altered using keyboard shortcuts ('c' to decrease range, 'd' to increase range).

5.1.18. Indicators

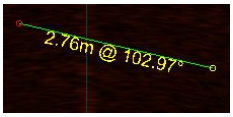


When the mouse pointer is within the ‘cone’ on the sonar display (that is over the displayed sonar image), the indicators at the bottom right hand side of the screen will show the position of the mouse pointer relative to the origin of the display (that is relative to the Gemini Sonar). The pointer position is expressed as a range / bearing pair, and as a Cartesian co-ordinate (X, Y).

5.1.19. Measurements

When the mouse pointer is within the cone on the sonar display (that is over the displayed sonar image), measurements can be taken from the display. A single click on the cone will show the position of the click.

Clicking at one point on the cone and holding the left mouse button down whilst moving the mouse will give a measurement between the two points.



When any measurement has been taken, clicking outside the cone will turn the measurement off.

5.1.20. Warnings

If the Gemini detects that it is not immersed in water, the warning “Out of water” will be displayed in the centre of the scan image:

The sonar will continue to operate, but will heat up more rapidly than if it was in water, and it may reach a temperature where it will automatically shut down to protect itself. If this happens, it will not be possible to communicate with or operate the Gemini until it has cooled to a safe temperature.

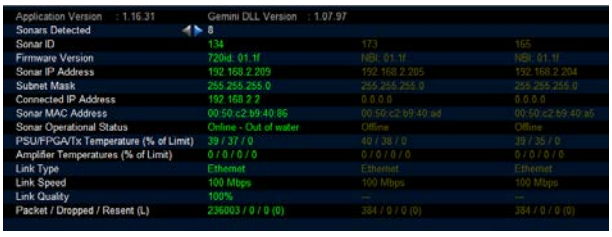
5.2. Advanced Screen

The Advanced screen is accessed by clicking the Advanced tab at the upper left hand corner of the screen.

The Advanced screen shows more details about the Gemini system, and allows certain options in the software to be configured. The screen is split into three areas. On the main part of the screen is the User area, which has been previously described and which operates in exactly the same way as the full screen User area.

The lower left hand area of the screen shows the system data screen which displays various items of data sent by the Gemini Sonar. The right hand side of the screen has various items which the user can configure to control the software and the Gemini Sonar.

5.2.1. System Data



The first line on the screen gives the versions of the elements which make up the Gemini software and the other lines show status information from the Gemini Sonar (or Sonars) connected to the system. More than one Gemini Sonar can be communicating at any one time and the Gemini software will display the images from up to a maximum of four of the sonars.

If more than one Gemini Sonar is connected and powered, its details will appear on the System Data screen. The currently active sonar will have green text and the dormant sonar(s) will be in yellow.

For a multiple sonar setup the arrows allow the list of sonars to be scrolled.

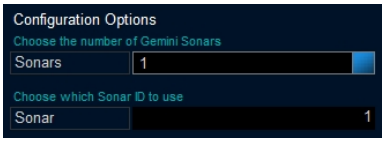
5.2.2. Configuration Options Screen

The final area of the Advanced screen is the Configuration Options screen, which is at the right hand side of the Advanced screen, and allows the configuration of the operation of both Gemini software and sonar.

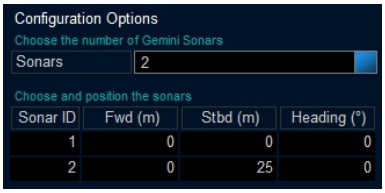
The `Configuration Options` allow the user to select which Gemini Sonar to use, select the Sound Velocity to be used during image processing, use data compression, lower the acquisition speed, modify the post processing filtering options, and finally to change the network settings.

Sonar Selection

The Sonar ID of the Gemini Sonar is used to determine which sonar will be used as the source of images displayed by the software. The Sonar ID is available on the system data area of the Advanced screen, and should be entered in the Sonar box.



The number of sonars can also be selected (up to 4) and each can have an ID. If more than one sonar is present the ID selection field will change to allow the sonar to be positioned on the display with an offset and rotation.



The Gemini software will retrieve the IP address and Subnet Mask for the chosen Gemini Sonar (if the sonar is visible to it) and use them to communicate with the Sonar.

Note

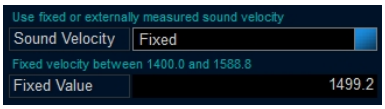
If the sonar is operating and `Online` has been selected then it will not be possible to change the ID until the sonar is taken off-line.

Units

The Units control selects between Metric or Imperial units. These are then applied to range lines and any measurements which are taken.

Sound Velocity

The `Sound Velocity` controls are used to set how the Gemini obtains the sound velocity which is used in producing the sonar image. The Gemini can either use a fixed sound velocity (in which case the sound velocity to be used is entered in the `Fixed Value` box below the sound velocity selector), or use a measured sound velocity.

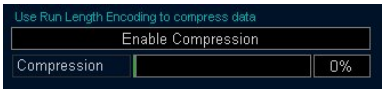


The above example shows the fixed sound velocity selected, and a value of 1499.2m s^{-1} will be sent to the Gemini Sonar. The software will round the value entered and the actual value used will be displayed on the `Sound Velocity` display on the `User` screen.

When using a fixed sound velocity, the software will check the value entered and if it falls outside the range 1400m s^{-1} to 1588m s^{-1}, it will give a warning to the user and use a default value of 1499.2m s^{-1}.

Compression

Run Length Encoding (RLE) is a technique that is used to compress the image data as it is transferred between the Gemini head and the software, thus reducing the bandwidth required on the connection between the two. RLE in Gemini is a lossy compression technique, a level can be applied which means that all data below that level is set to zero and then the compression is applied. Increasing the RLE level will increase the efficiency of the compression (and hence reduce the bandwidth required to transmit the image data) but will remove more and more of the lower levels from the data (initially reducing the noise but quickly removing smaller objects/weaker targets from the image).



`Enable Compression` toggles the compression when clicked (black background to the button means compression is off, blue background means compression is on). The `Compression` control sets the level applied by the run length encoding; this is the value below which the data is treated as zero rather than the actual data value.

The live image displayed by the Gemini software shows the effect of the compression immediately.

Note

The compression is applied in the link from the Gemini head to the software, therefore compression cannot be applied to data that has already been recorded, and if data has been recorded with compression applied, the compression cannot be removed from the data.

Acquisition Speed

The software gives the user the option to slow down the rate of data acquisition of the Gemini as another technique to lower the bandwidth required for transmitting the data. The `Half Speed Acquisition` button is used to apply this, when this button is clicked, the software will reduce the speed of acquisition of images to approximately half its maximum rate.

Note

Reducing the acquisition speed can also be useful if acoustic multipath is causing false moving/transient targets to be observed in the sonar image.

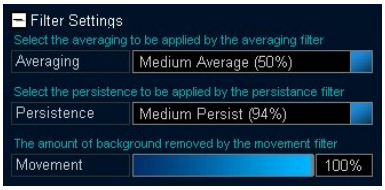
The Half Speed Acquisition button, when clicked, alters the rate of data acquisition (black background to the button means full rate, blue background means roughly half rate).

Reset to Defaults

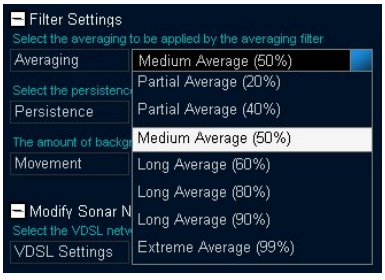
The Reset to Defaults button, when pressed, returns the software settings to their default values.

Post Processing

The `Filter Selector` on the `User` screen selects one of three filters to be applied to the image before it is displayed. The Filter Setting section of the Configuration Options screen allows the settings of these three filters to be changed.

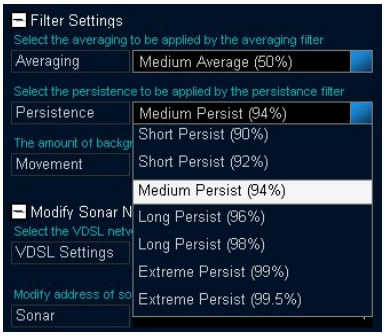


The averaging filter applies an average over a number of images received from the sonar. It has the effect of removing random noise and rapidly moving targets from the image. The Averaging control selects the amount of averaging applied.

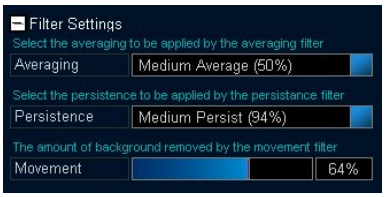


The persistence filter retains decreasing amounts of earlier images as well as the current image. It has the effect of highlighting movement in the images, which

appears as a decaying “snail trail” behind the moving object. The Persistence control selects the amount of persistence applied.



The movement filter highlights the changes between images, showing what is moving between images. The Movement control sets how much background (i.e. non-moving data) is removed from the image. With the Movement control set at maximum, the movement filter removes all the background and so the display only shows targets that are moving between images. With the Movement control set at minimum, the movement filter retains almost all the background (and becomes barely distinguishable from the persistence filter).



VDSL Settings

The Gemini software allows three different settings to be applied to the VDSL link, to cope with different levels of electrical noise experienced by the cable to the sonar. The `VDSL Settings` drop-down allows the selection of which settings are to be applied.

Note

Only if difficulties are being experienced communicating with the Gemini Sonar should the VDSL settings be changed from `Normal Settings` to one of the other values.

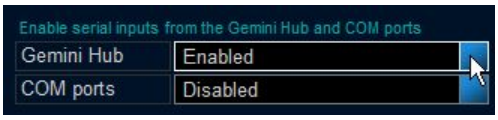
Modify Device Network Details

Appendix C, *Setting the Gemini Device IP Address in Gemini Software* describes in detail how the Gemini Sonar network details can be altered to allow it to work with the desired network. Once the sonar has been successfully configured it should not be necessary to change the settings again unless moving to a different infrastructure.

5.3. Serial Data Input

Data from external serial sensors can be input into the Gemini software and logged as part of the sonar image record.

To enable data input to the system select `Enabled` for either (or both) of the `COM Ports` or `Gemini Hub`. The `COM Ports` drop-down list is for serial ports that are connected to the computer (either natively or through an RS232 to USB converter) and is also for configuration of the RS232 functionality of the Gemini Sonar head. The `Gemini Hub` drop-down list is only for configuration of connected Gemini Hubs.



Selecting `Enabled` for either `Gemini Hub` or `COM Ports` will alter the tab options in the bottom left of the screen. If both are disabled there will be no tabs visible and the status area will only display information about connected Gemini heads.

With `Gemini Hub` selected.

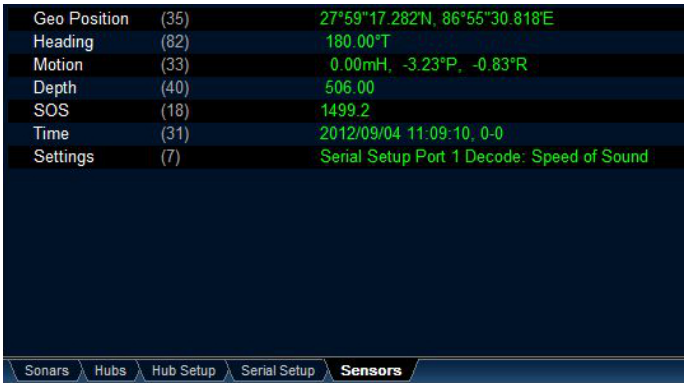
With `COM Ports` selected.

With `Gemini Hub` and `COM Ports` selected.

5.3.1. Sonars & Sensors

The `Sonars` tab is for displaying information and is the same display as when no tabs are present (for a full description see Section 5.2.1, “System Data”).

The `Sensors` tab is for displaying extra information from connected RS232 sensors.



Note

The `Settings` field of the `Sensors` tab is only active if logging is taking place. Within the `Settings` field the actions of the operator are

recorded so that during play back of the log file it is possible to see which settings have been changed.

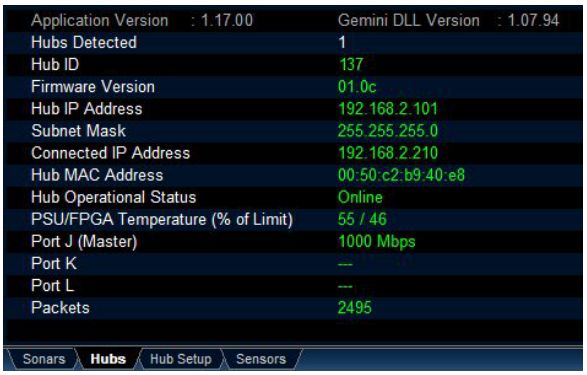
Note

If serial sensor data is shown here, a subset of the data will also be shown at the bottom of the `User` screen.

5.3.2. Gemini Hub

Hubs Tab

The `Hubs` tab shows the status information from any connected Gemini Hubs.



Hub Setup Tab

The `Hub Setup` tab allows configuration of the serial ports on the rear of the Gemini Hub to allow RS232 data to pass through to the Gemini software from external sensors.

Port — The port letter, corresponding to the label on the back of the Gemini Hub.

Mode — Can change between an ASCII decode, binary decode or can echo the data on one of the other ports (ASCII is the default input, only the Simrad EM3000 uses a binary input). Echo is used as an

alternative to a serial splitter cable in systems where the sensor data is also used by another application or device.

Sync	The sync character used to frame the ASCII string.
Baud	The baud rate of the sensor connected to the port.
Decode	The decode definition to apply for the expected receive data on the port.
Max	Set the time in seconds to generate an alarm if no data is received.
Age	The age of the data, shows when the last good data was received (see note below).
Hz	The incoming data rate
String	The incoming data string, check this against the chosen `Decode` if the data indicator is red.

Note

The data age status indicator will show the status of each port. A grey indicator means no data is present, red is for an incorrect data string, yellow indicates an incomplete data string and green is for normal operation.

5.3.3. COM Ports

The `COM Ports` enables one extra tab called `Serial Setup` from where all the ports (both connected to the PC and ports on the Gemini head) are configured.

COM Port	The COM port to use.
...	Open the settings dialog for configuring the port baud rate, data bits, parity and flow control.
Mode	Can change between an ASCII or binary decode (ASCII is the default and binary is only used for the Simrad EM3000).

Sync	The sync character used to frame the ASCII string.
Decode	The decode definition to apply for the expected receive data on the port.
Max	Set the time in seconds to generate an alarm if no data is received.
Age	The age of the data, shows when the last good data was received (see note below).
Hz	The incoming data rate
String	The incoming data string, check this against the chosen `Decode` if the data indicator is red.
Gemini RS232 Ports	The ports on the rear of any connected Gemini heads. This data can be decoded as per the computer COM ports or the data can be routed as an output from one of the computer COM ports (if the data is required on an second computer, for example).

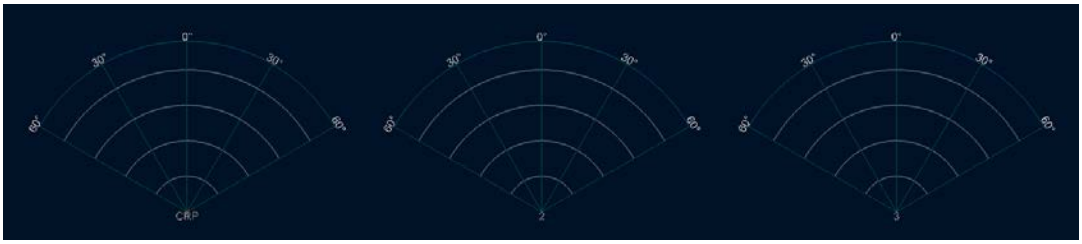
Note

The data age status indicator will show the status of each port. A grey indicator means no data is present, red is for an incorrect data string, yellow indicates an incomplete data string and green is for normal operation.

5.4. Multiple Head Operation

The number of heads connected to a system can be selected using the drop-down list on the right-hand pane of the `Advanced` screen.

The first time the number of heads is altered the sonar display will place the sonars side-by-side in a line. Any subsequent alterations to the position or rotation of each sonar image is stored and recalled when the Gemini software is restarted.



The position of the sonar images can be altered using the text fields listed under `Choose and position the sonars`. Each text field is editable and allows the sonar scans to be moved around in relation to a central reference point. The default is as follows:

Choose and position the sonars

Sonar ID	Fwd (m)	Stbd (m)	Heading (°)
1	0.00	0.00	0
2	0.00	25.00	0
3	0.00	50.00	0

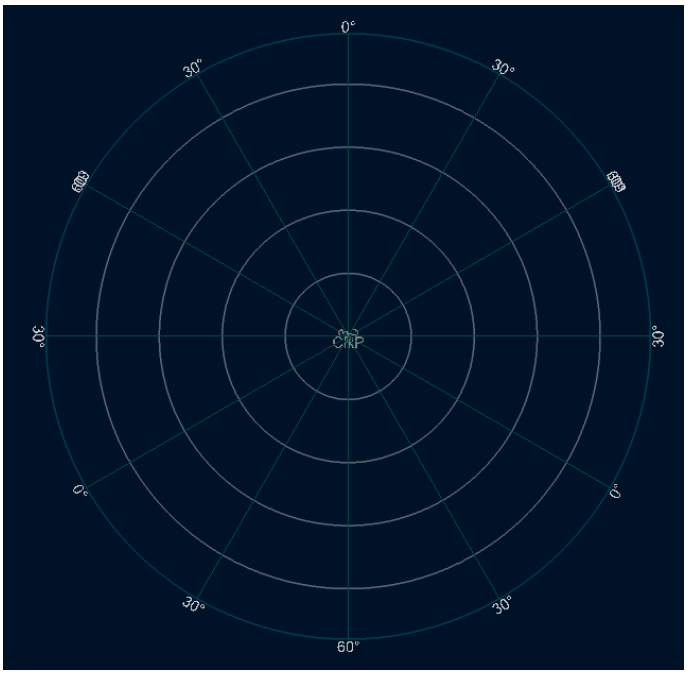
Example Layout

Changing the position values as follows:

Choose and position the sonars

Sonar ID	Fwd (m)	Stbd (m)	Heading (°)
1	0.00	0.00	0
2	0.00	0.00	-120
3	0.00	0.00	120

Will arrange the sonar images in a circle:

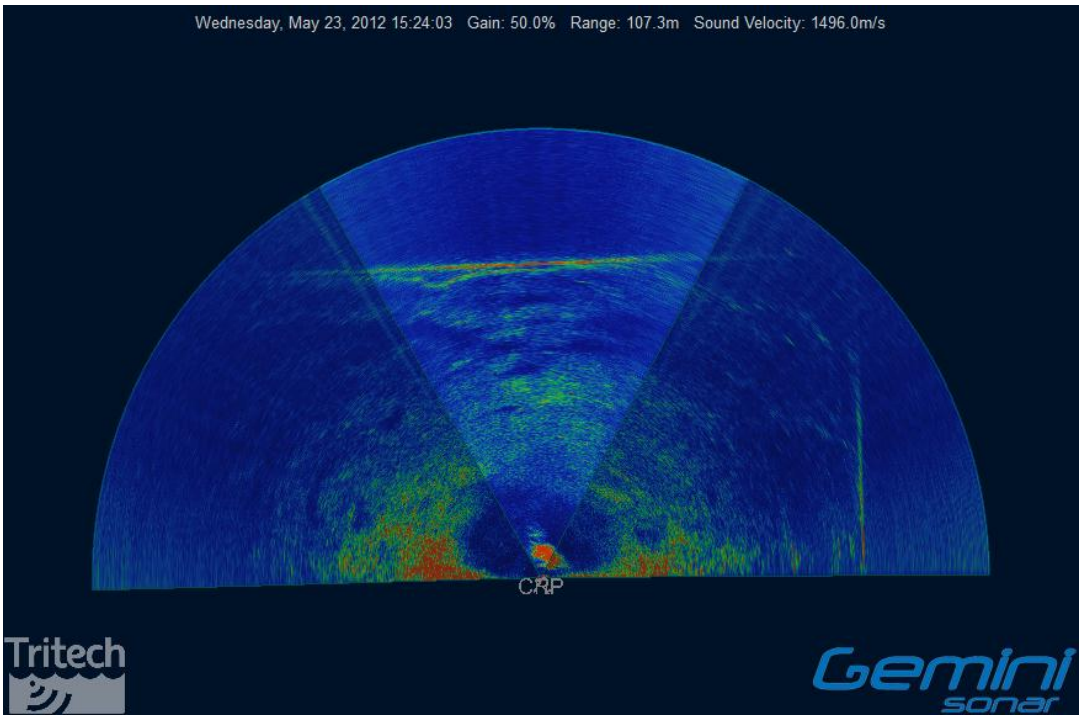


Note

Turning off the range lines and text can improve the display.

In this case, sonar 1 is looking forward while 2 and 3 are looking aft. There is no overlap and each sonar is displaying a full 120° arc.

Overlapping sonars is also possible and any images generated will be a combination of echoes from both heads:



5.5. Offline Mode

If for some reason when the software is started it cannot initialise communications with the Sonar (for example if another instance of the software already running) the following warning will be displayed:

The software will then open with a cut down user interface which will allow the replay of data which have already been recorded, but all the controls associated with the Gemini Sonar will be removed.

Those controls which are present work in exactly the same way as if communications with the Gemini Sonar was possible, and as described earlier in this manual.

5.6. Automatic Online

Once the Gemini Sonar and the Gemini software have been configured so that they can communicate successfully, when the Gemini software is started it will automatically start imaging as soon as it detects the presence of that Sonar. This allows unattended start up of the Gemini software and system.

This functionality can be disabled by adding the command line switch `/noautoonline` to the command which starts the Gemini software.

5.7. Settings Files

The Gemini software stores all the settings in the file `C:\GeminiData\Settings\Gemini.xml`. A backup of this file can be kept as a record of all the Gemini settings. When contacting *Tritech International Ltd* Technical Support it may be necessary to supply a copy of this file.

The Gemini software keeps a historical log of settings files in the folder `C:\GeminiData\Settings`, with folder and file names automatically generated from the date and time. This can be useful for restoration of previously known good settings. To use a previous settings file:

1. Shut down the Gemini software.
2. Delete (or rename) the `C:\GeminiData\Settings\Gemini.xml` file.
3. Copy the historical settings (*.xml) file into the location `C:\GeminiData\Settings` and rename it to `Gemini.xml`
4. Start the Gemini software.

A factory settings file is stored in the install folder (normally `C:\Program Files\Tritech\Gemini\Factory.xml`). To revert completely to the factory settings file:

1. Shut down the Gemini software.
2. Delete (or rename) the `C:\GeminiData\Settings\Gemini.xml` file.
3. Copy the `Factory.xml` file into the location `C:\GeminiData\Settings` and rename it to `Gemini.xml`
4. Start the Gemini software.

5.8. Keyboard Shortcuts

A number of keyboard shortcuts are available for commonly used activities.

F7	Toggle Logging of data
Ctrl F	Capture the screen to file
A	Increase gain
Z	Decrease gain
D	Increase range
C	Decrease range

6. Seanet Pro Installation

The Seanet Pro Windows software will be provided either on an Installation CD-ROM or pre-installed on a Seanet SCU. For the CD-ROM Installation, if Setup does not auto-run on disc insertion, run the SETUP.EXE file from the disc to start the installation and follow on-screen instructions. Details for installing or re-installing software can be found in the System section of the Seanet manual.

The first step is to ensure connection to the sonar is possible by changing the sonar and computer IP addresses so that the Ethernet link can work (since VDSL connections are bridged to Ethernet this also applies if using the sonar in VDSL mode).

Note

For instructions on setting the computer and sonar head IP address please refer to Appendix A, *Setting the computer IP address in Windows XP* and Appendix D, *Setting the Gemini Head IP Address in Seanet Pro*

The final check to see if the correct changes have been made to the Gemini Sonar is to run `Seanet Setup` from the desktop icon to display the Node table. If the change of the sonar's IP address has been successful, the sonar should be listed in the node window.

Note

In order to correctly run the Gemini head on a SCU it will need to be upgraded to the V5 specification. Contact *Tritech International Ltd* for more details of the SCUv5.

7. Seanet Pro Operation

Note

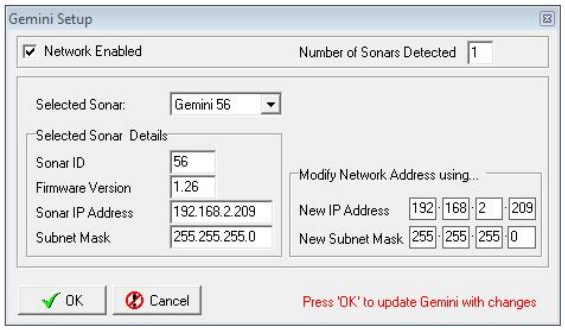
This section details the aspects of Seanet Pro that are specific to the Gemini Sonar. For more general information (particularly if integrating with other devices) please see the Seanet Pro Software Manual which is available online at www.tritech.co.uk

Before starting operations, run Seanet Setup to verify that the Gemini LAN is enabled and any connected devices, including the Gemini sonar, are detected. In Seanet Pro, the Gemini Sonar has been allocated the node range from 100 to 103.

7.1. Seanet Setup for Gemini

Click on `Gemini LAN` from the `Setup` menu.

This will open the `Gemini Setup` page.



Gemini Setup

Network Enabled	Ensure this box is ticked to load the Gemini Connection DLL and start the Gemini Network. The box can remain permanently ticked thereafter.
Number of Sonars Detected	When the network is enabled, this will display the number of Gemini Sonars that are currently detected and broadcasting on the network.
Selected Sonar	The drop-down list will display the ID Numbers of all the Gemini Sonars currently

connected. Select the Gemini Sonar that you wish to configure.

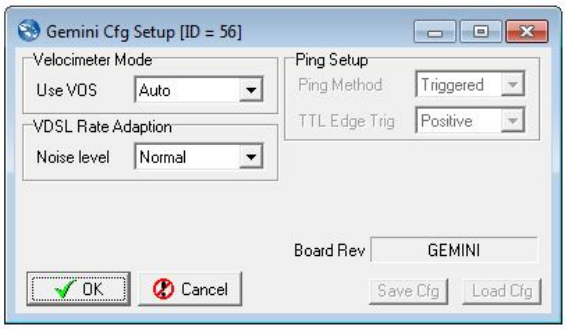
Selected Sonar Details

When the selected item in the 'Selected Sonar' drop-down list is changed, the details of that particular Gemini Sonar will be displayed here. These details include; unique Sonar ID, Firmware Version, broadcasting Sonar IP Address and Subnet Mask.

Modify Network Address

The Sonar IP Address and Subnet Mask should be in the same range as the Computer IP Address and Subnet settings. To program a different Sonar IP Address and/or Subnet Mask into the selected Gemini Sonar, change the values in this panel and then click 'OK' on the main form to upload these changes into the Sonar.

Once the Gemini LAN is enabled and a Gemini Sonar connected and displayed in the Seanet Setup Node Table click on `Setup` in the `Action` column to open the `Gemini Cfg Setup` dialog.



Gemini Cfg Setup

Velocimeter Mode

Set to 'Auto' to apply the in-built velocimeter speed of sound calculation to the sonar data. Set to 'Manual' to revert to a fixed speed of sound. This fixed speed of sound is the manual V.O.S. (Velocity Of Sound) setting configured in the Environment dialog from within Seanet Pro.

Ping Setup

The two modes of operation are `Triggered` and `Continuous`. In `Triggered` mode the Gemini will be sent continual triggers where one trigger will instruct the Gemini to ping once. Each time Seanet receives data for the current 120 degree scan, it will respond and send the next trigger to the Gemini to instruct it to perform the next ping. This turnaround is half duplex in nature. In `Continuous` mode, Seanet Pro sends one command at start-up which instructs the Gemini

Sonar to ping continuously. For both modes an inter-ping time delay is also sent to the Sonar to control the scan update rate. This `InterPing Period` is set in the `Setup` dialog accessed through the `Tools` menu in Seanet Pro.

VDSL Rate Adaption

The Seanet Pro software allows three different settings to be applied to the VDSL link, to cope with different levels of electrical noise experienced by the cable to the Sonar. The dropdown menu allows selection of 'Normal', 'Medium Noise' and 'High Noise'.

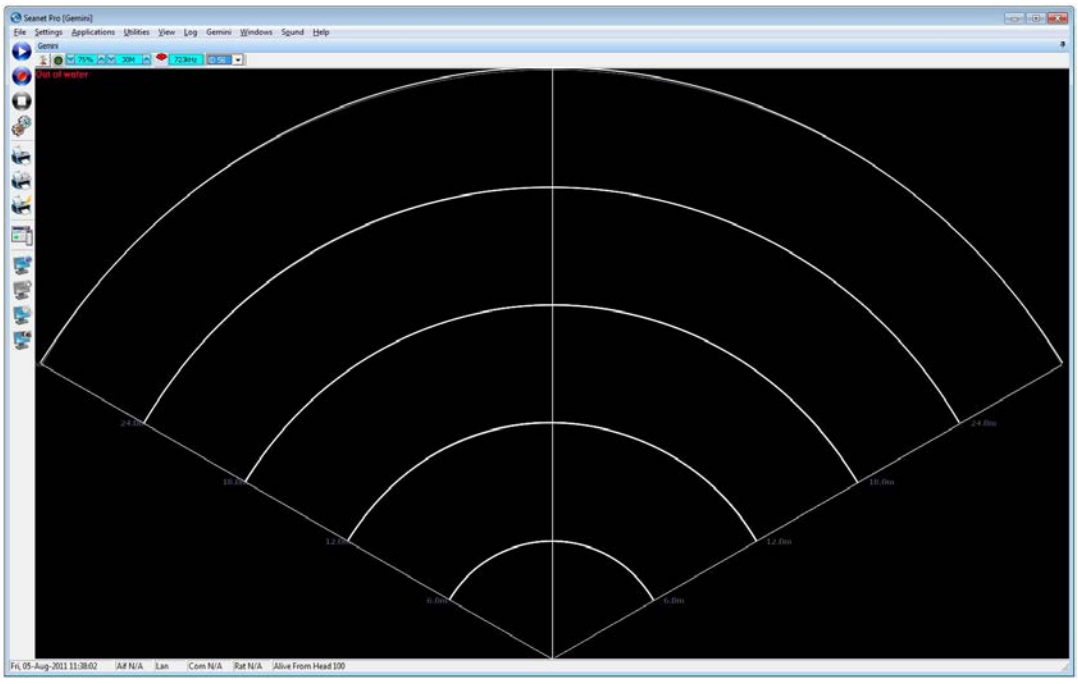
Note

Only change `VDSL Rate Adaption` if difficulties are being experienced communicating with the Gemini Sonar. Whenever a `Medium Noise` or `High Noise` setting is selected, on initial startup of the Gemini, the VDSL communications will take several seconds to find it's optimum rate. During this period of rate adaption, the top-left of the Sonar screen will indicate the status text `Acquiring...` (in red text).

7.2. Gemini Sonar Application

Note

Refer to the Seanet Pro Software Manual manual for a comprehensive description of the menu bar, buttons, status bar and general features. This section shows only those specific to the Gemini Sonar Application.



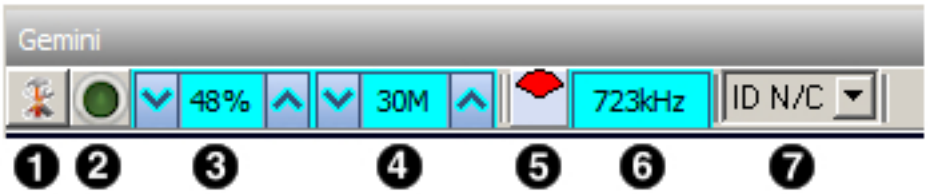
The Gemini Sonar display is very similar to the standard Sonar display used for *Tritech International Ltd* mechanical sonar heads such as SeaKing and SeaPrince. However, the Gemini Sonar has a fixed scan sector of 120° and unlike the mechanical heads does not have option for scan sector size and position adjustments. Therefore these function controls have been omitted from the settings bar.

Note

If a Gemini Narrow Beam Imager is connected then the scan size will automatically update to 130°.

7.2.1. Sonar Settings

The Gain, Contrast and Range controls relate to C1 – C3 respectively on a Remote Access Terminal (RAT). Function buttons F1 & F2 will become active whenever a multi-device or multi-window application is selected from the `Applications` menu. These controls will cycle through and maximise the device windows.



1. `Application Tools` Clicking on the tools icon on the left of the Sonar Settings Bar will open the Application Tools menu

2. `Application On, Off, Pause` This doubles as a pause button and a status indicator. Clicking on the button will pause the signals from sonar to Seanet Pro and pause the screen from refreshing. Green indicates normal operation, red indicates the sonar is paused and yellow shows sonar data from a log replay.

3. `Sonar Gain` (RAT: C1) sets the sonar receive gain as required – typically this is around 20% - 50% but is varied according to water and target conditions and user preference.

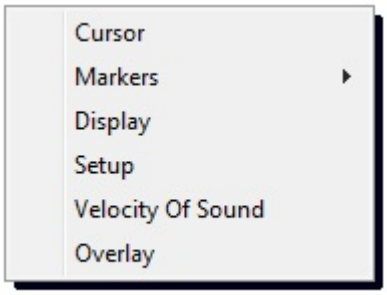
4. `Range` (C3) sets the maximum range the sonar will scan. Long ranges are scanned more slowly than short ranges due to the limit imposed by the velocity of sound in water.

5. `Scanned Area Indicator` indicates, in the colour red, the size and position of the scan sector. This control will always indicate a fixed, forward 120° sector for the Gemini Sonar (or 130° for Gemini Narrow Beam Imager).

6. `Sonar Tx Frequency` This is acoustic Transmit Frequency of the currently connected Gemini Sonar.

7. `Selected Sonar` Use this option to select the sonar ID to display on the main screen, the drop-down list will display the ID of all the Gemini sonars currently connected.

7.2.2. Application Tools



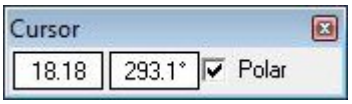
Click on the Tools icon on the left of the Sonar Settings Bar to open the popup menu which includes all the Application Tools for the Gemini Sonar.

Note

The popup menu can also be accessed by a right mouse button click on the Sonar display.

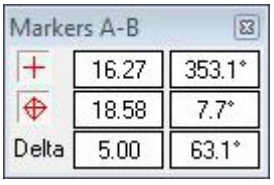
Cursor

Adds the cursor position panel to the sonar display.



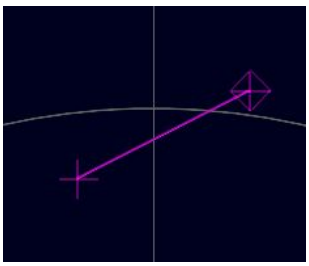
The `Polar` check box changes the output display co-ordinates from Polar (Range & Bearing) format if enabled to Cartesian (X, Y) format if unchecked.

Markers



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

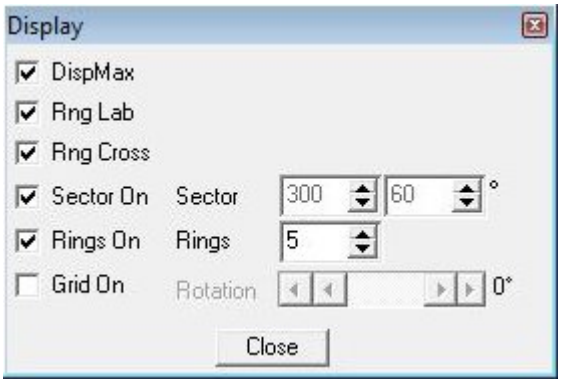
Click on the symbol to deploy on the `Marker` panel and that marker symbol will be dropped at the Origin (0, 0) on the Sonar display. Then, pick up the Marker using the left mouse button and drag it to the position required.



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; A-B, C-D, E-F, G-H. The operation of each set is the same as A-B described above.

Display



Sets up sonar display options.

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

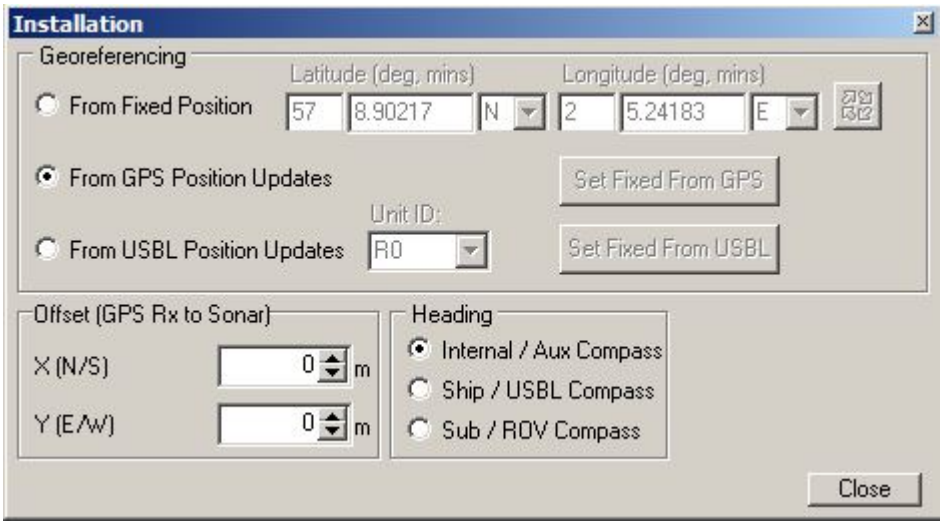
RngLab – Switch the Range Labels On / Off.

Rng Cross, Rings On, Rings, Grid On - Display Grid line options.

Sector On, Sector – Display a Sector overlay with left and right angular limit adjustment (in degrees). (This is fixed to be 120º for Gemini Sonar)

Rotation – Rotational offset to correct Sonar heading – (Disabled for Gemini Sonar).

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.
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 the ROV compass by selecting Sub/ROV Compass.

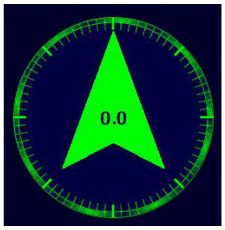
Once position and heading data are present, the Cursor display will be extended to provide position co-ordinates when the mouse cursor is moved around the sonar plotter.

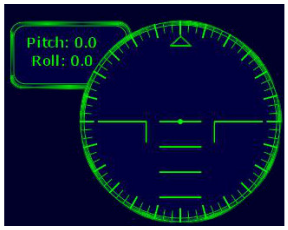
Note

There must be active sonar data, as well as position and heading data, for the position co-ordinates to be reported.

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.

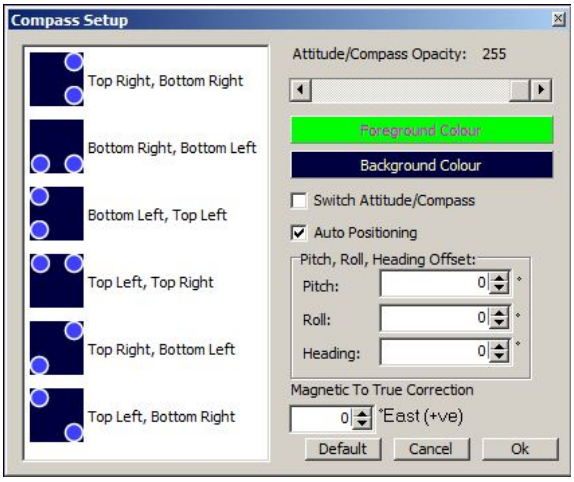




Note

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.

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`

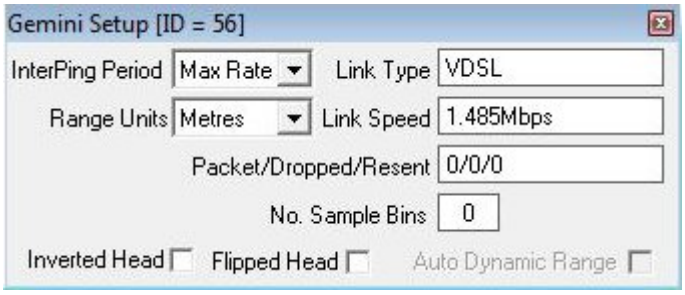
`Positioning` is first de-selected. Also colour and opacity can be controlled through this dialog.

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.

Setup

Sets various Gemini Sonar head options for the currently selected Sonar ID.



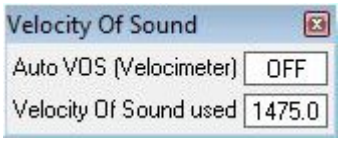
InterPing Period	This sets the time delay between successive Sonar pings. The 'Max Rate' will set the Sonar update rate to fastest achievable (up to 15Hz). Range, plot size and PC CPU specification will limit the maximum achievable rate.
Range Units	Select the display range units. Options are Metres, Feet, Fathoms, and Yards.
Link Type	This indicates the current type of communications link between the Gemini and surface. This can be either direct Ethernet or VDSL.
Link Speed	This is the Uplink transmission speed for the active Link Type. For Ethernet this will be either 10Mbit s^{-1} or 100Mbit s^{-1}. For VDSL this will be a rate that may be adapted according to the VDSL Rate Adaption setting – for the 'Normal' setting, the optimal Link Speed will be applied.
Packet/Dropped/Resent	This indicates, respectively, the Number of Packets transmitted from the Gemini, the Number of Dropped/lost Packets and the Number of Packet Resends attempted.
No. Sample Bins	This is the Number of Samples over the current Range scale.
Inverted Head	If the Gemini Sonar is mounted upside down (that is the sonar is positioned with the transmitter on

the top rather than the design orientation with the transmitter at the bottom), ticking this box will flip the image from left to right, as viewed on the computer screen, so that the image still appears correctly oriented to the user.

Flipped Head — This is used when the Gemini sonar is mounted with the transducer pointing aft instead of forward

Velocity of Sound

This panel displays the Velocity of Sound value being used by the Gemini Sonar. The Gemini is fitted with a Velocimeter which can be enabled/disabled in the `Gemini Cfg Setup` dialog.

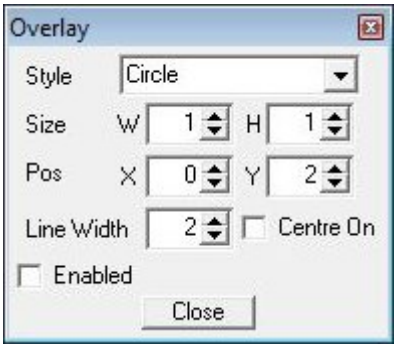


The current displayed Velocity of Sound used value is what was applied to the current sonar scan. If Auto VOS is "OFF" then the Velocity of Sound used is based on the Manual VOS applied in the 'Environment' (e.g. click on 'Settings' – 'Environment' in Seanet Toolbar).

Note

The Gemini Sonar will apply Manual VOS in steps of 3.2m s^{-1}, starting from the minimum limit of 1400m s^{-1}. For example, if 1402.1m s^{-1} was set in the 'Environment' page then Gemini will round to nearest 3.2m s^{-1} step and consequently the 'Velocity of Sound used' will be returned as 1403.2m s^{-1}

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

8. Troubleshooting

The software reports that no sonars are detected

VDSL System – Check the VDSL link light on the Gemini Hub (note that it may take up to 1 minute to establish a stable VDSL link). If there is no VDSL link light then check all cabling between Gemini Hub and the sonar and verify that the sonar is powered correctly with appropriate voltage at the sonar. If there is a VDSL link light then the sonar is operational and the problem will be either the network connection between Gemini Hub and the PC or the network configuration on the PC.

Ethernet System – Check all cabling to the sonar and verify that it is powered correctly with appropriate voltage at the sonar. Also check that the correct cable is in use - for Ethernet systems this needs to be a cable of at least Cat5e standard. If the sonar has successfully established a link then the problem will be with the network settings on the PC.

Note

Ethernet connection requires Cat5e cable for the entire cable run (max 80m) – lengths of untwisted cable must be kept to an absolute minimum.

All Systems – Some firewalls have been known to cause this issue. Contact the network administrator for advice if the sonar is connected to a network where disabling the firewall would present a security risk.

Sonar goes offline while operating on deck

The sonar head outputs heat to the body casing (using it as a heatsink) which is dissipated to the surrounding water during normal operation.

In order to protect the internal electronics from damage due to overheating a thermal cut-off will shut down the sonar if it gets too warm. It will be necessary to allow the unit to cool down before it will operate again.

The unit should not be operated out of water for extended periods.

Sonar is present but will not ping

VDSL System – Check the reported link speed – it must be greater than 10Mbit s^{-1} downstream to function correctly. If it is less than this then the cable run is either too long or the VDSL twisted pair is of poor quality.

All Systems – Check your network settings on the PC. Typing "route print" from the command line will show the PC routing table. The sonar and PC must be on the same subnet and the PC's routing table needs to be set up so that packets are routed correctly to the sonar. If the sonar is receiving ping requests then the IP address of the PC will appear in the "Connected IP Address" field in the advanced settings page of the software.

If the sonar is connected to the PC then the most likely cause is particularly bad packet loss on the network between sonar and PC.

Note

The sonar will only respond to ping requests from IP addresses on the same subnet as the sonar. Some firewalls have been known to cause this issue. To view the computers routing table type "route print" from the command line.

Update rate is slow and there are sometimes large gaps between pings

VDSL System - The VDSL link is susceptible to electrical noise induced by turning other devices on and off such as thrusters on an ROV. If the link keeps going down try using the "Medium Noise" or "High Noise" VDSL setting in the advanced option. Higher Noise settings trade off speed for reliability of the network link. This may reduce the ping rate slightly but the link will be more reliable in the presence of noise. Check all connectors on the VDSL twisted pair, poor contacts have been known to cause this issue.

Ethernet System – There may be noise induced onto the Ethernet cables, be sure to route these as far away as practicable from noise sources.

All Systems – Some poor quality PC network cards have problems with the large data rate from the Gemini sonar and drop a significant amount of packets. If you have large packet loss, try updated network card drivers and a different brand of network card. Also check that the PC and graphics chipset meet the minimum spec.

Velocimeter reports unrealistic speed of sound

This is often caused by bubbles forming on the metal faces at the front of the sonar, particularly if the sonar has been stationary for an extended period of time in a tank. Wiping the surface to remove bubbles should resolve the issue.

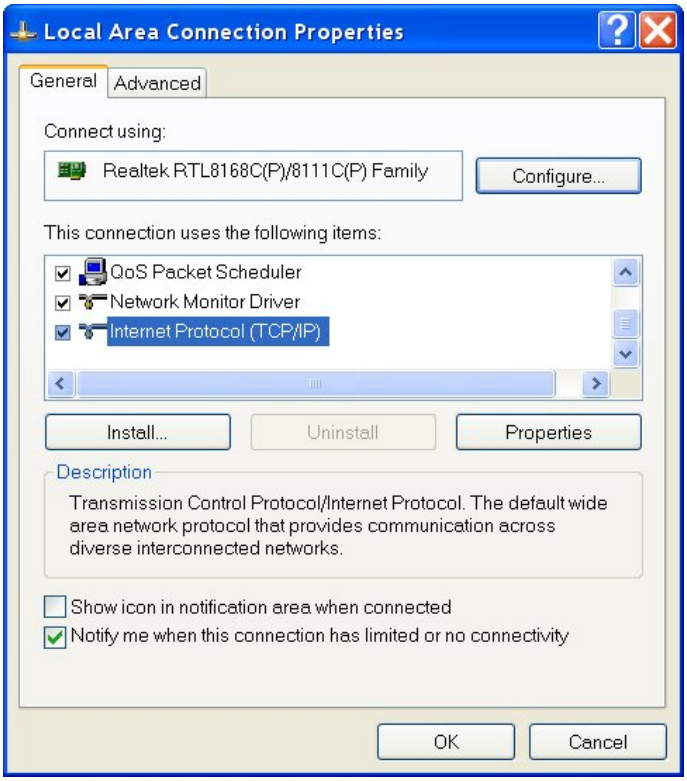
Appendix A. Setting the computer IP address in Windows XP

The following instructions apply to a computer running Windows XP, though the sequence for other operating systems will be similar.

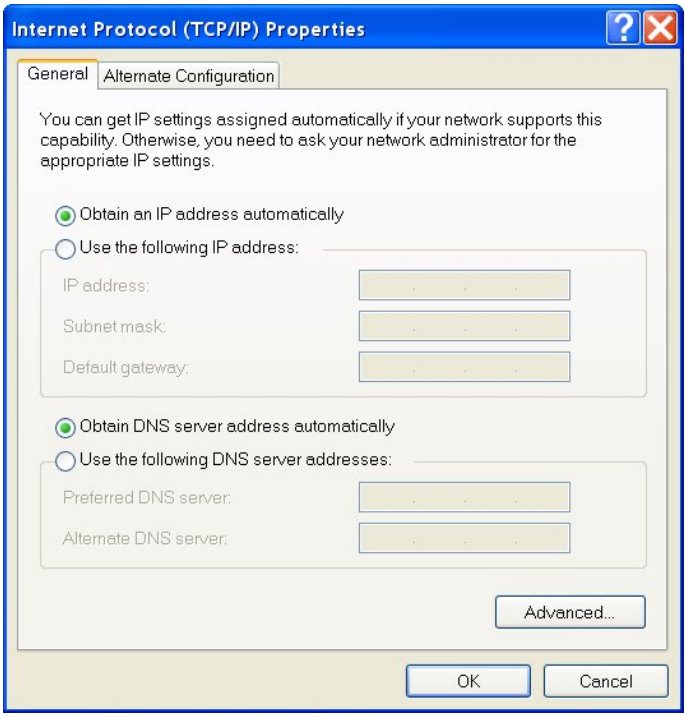
If the computer is connected to a network already, disconnect it from that network.

From the Start Menu select Control Panel. From the Control Panel Explorer window that opens, double click on Network Connections. From the list of available network connections that opens, double click on the Ethernet connection which will be used to connect to the Gemini Sonar.

Click the Properties button on the dialog which opens. This will open a dialog which looks like this:

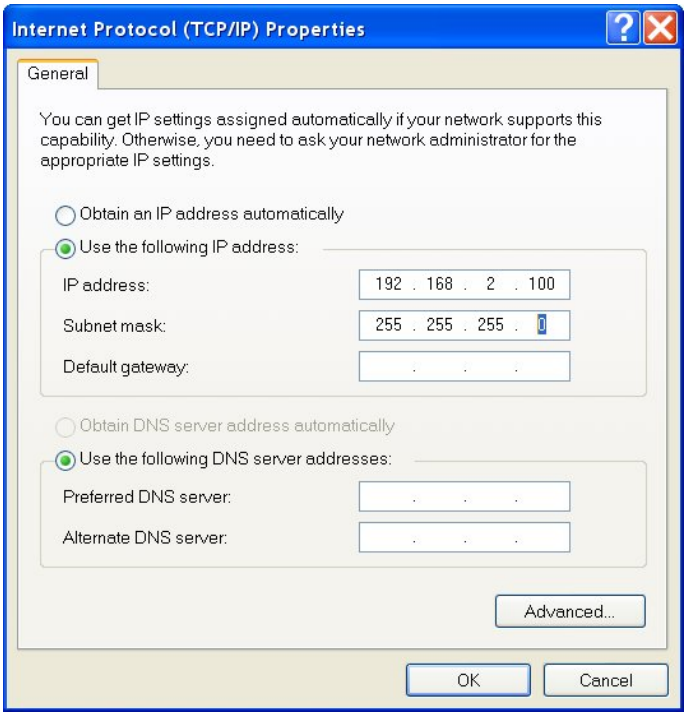


Scrolling the "This connection uses the following items" box will reveal an item titled "Internet Protocol (TCP/IP)". Click this item to select it, and then press the Properties button. The following dialog should open:



Make a note of the settings as currently used by the computer; these will be needed to restore the computer to any existing network. Refer to the appropriate section of this manual for the correct IP address to use.

The following screenshot shows the dialog after those changes have been made:

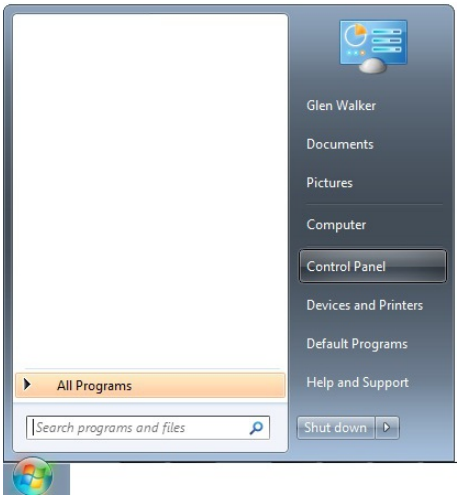


Appendix B. Setting the computer IP address in Windows 7

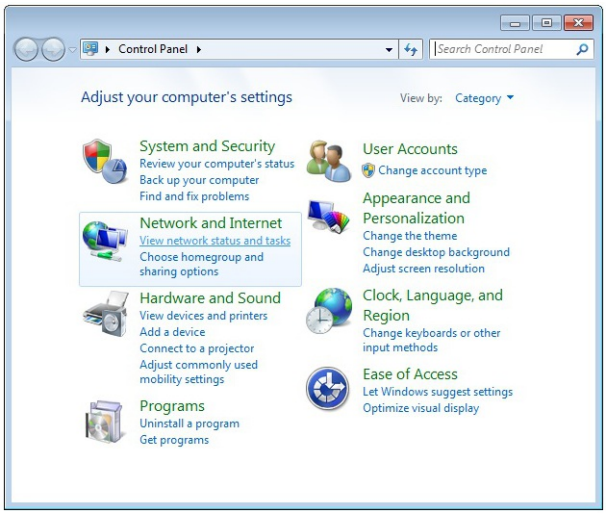
The following instructions apply to a computer running Windows 7, though the sequence for other operating systems will be similar.

Disconnect the computer from any existing network.

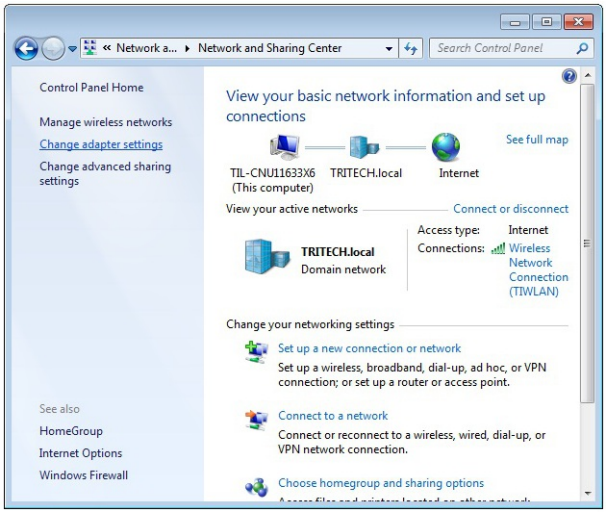
First click on the Start Menu and select `Control Panel`.



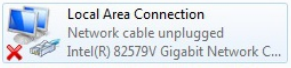
Under `Network and Internet` click on `View network status and tasks`.



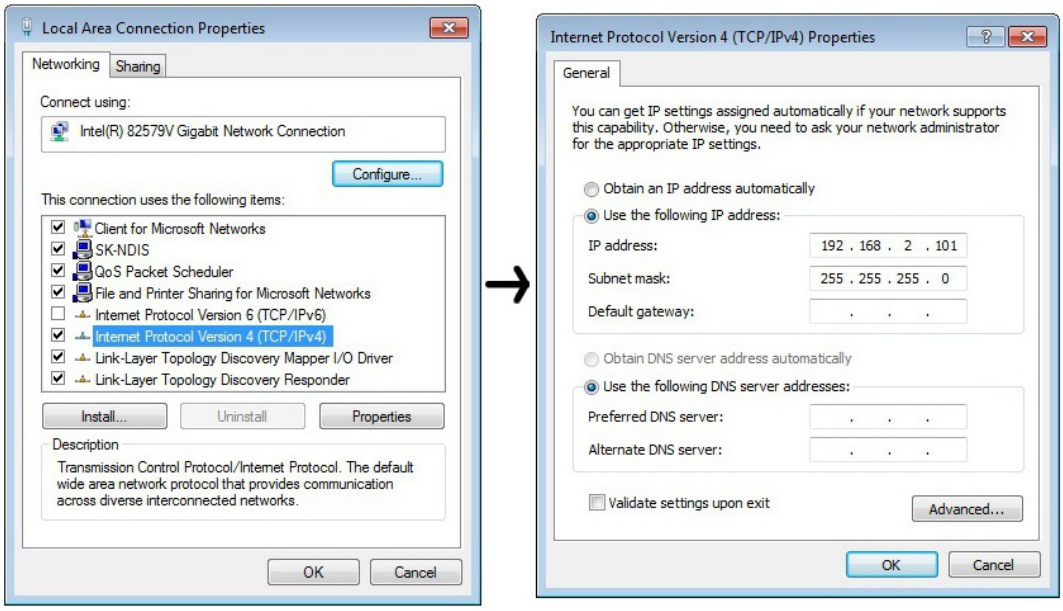
This will bring up the `Network and Sharing Center` which allows configuration of any networks on the computer. Click on `Change adapter settings` on the left-hand pane.



A list of attached network devices should now present itself. Find the one which the sonar is to be connected to and double-click on it.



The `Local Area Connection Properties` dialog should be displayed. Find the entry labelled `Internet Protocol Version 4 (TCP/IPv4)`, select it and then click on the `Properties` button.



In the properties dialog which opens there will either be `Obtain an IP address automatically` or `Use the following IP address` selected. If an IP address is already present, make a note of it before changing any values since it will be needed if the computer is ever restored to the previous network. Refer to appropriate section of this manual for the correct IP addresses to use.

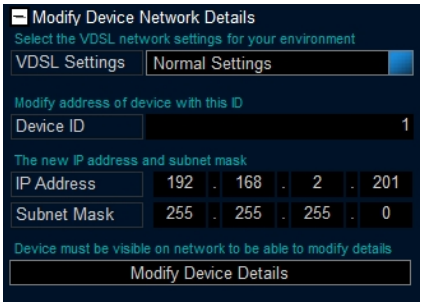
Appendix C. Setting the Gemini Device IP Address in Gemini Software

These instructions are applicable to any Gemini device.

For a Sonar — Enter the ID into the `Sonar` box of the Advanced Configuration options (upper right hand side of the screen).

For a Hub — Enter the ID into the `Hub ID` box on the `Hub Setup` tab.

After starting the Gemini software and connecting a Gemini device click the `Advanced` tab at the upper left hand side of the screen to show the advanced settings screen, and expand the `Modify Device Network Details` area by clicking the + button next to it.



Note

The Gemini device should be connected directly to the computer and any other Gemini devices should be disconnected.

Once the ID of the Gemini has been entered at the top of the screen, the details for the new IP address can be entered. Three items need to be entered, the `Device ID` (to ensure that the correct Gemini is being altered), the new `IP Address` and the new `Subnet Mask`. Once these details have been entered, pressing the `Modify Device Details` button will start the process of changing the IP address. A dialog box will open, requesting confirmation of the change.

Note

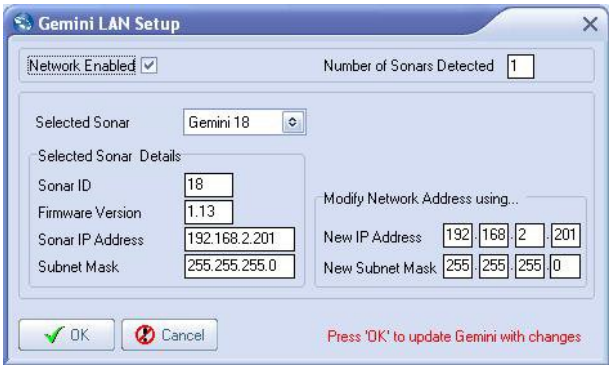
If the Gemini is online then it will not be possible to alter the IP address details. Make sure that the Gemini is offline before trying to change it.

Clicking the `Yes` button will program the new IP address details into the Gemini. The new IP address followed by a reboot command will be sent. When the device reboots it will be using the new IP address, and therefore will not show up on the status display. Once the IP address of the computer has been changed back to its original settings the Gemini should once again appear on the status display.

Appendix D. Setting the Gemini Head IP Address in Seanet Pro

Run `Seanet Setup` and click on `Gemini LAN` in the `Setup` menu.

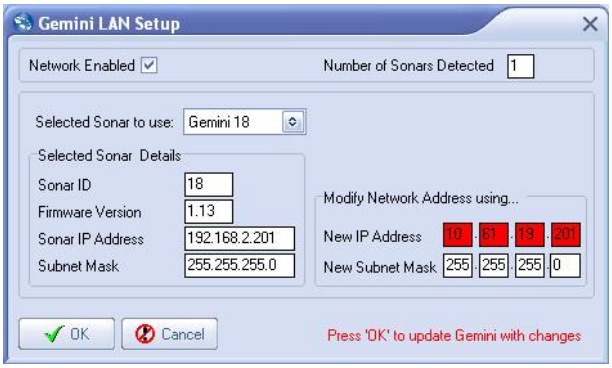
This will open the `Gemini LAN Setup` dialog.



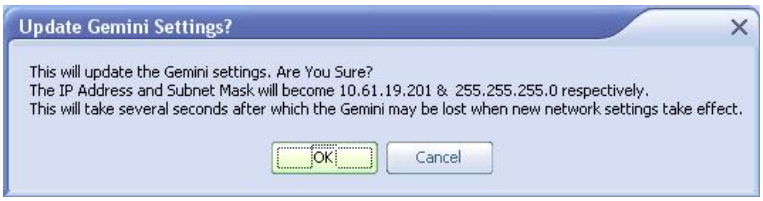
Ensure that the Gemini is connected directly to the computer.

In the `Selected Sonar` drop-down control, ensure that the correct Gemini is selected. The current `Sonar IP Address` and `Subnet Mask` are displayed on the left hand side of the form. These are the settings the selected Gemini is currently programmed with.

In the `Modify Network Address using`... panel on the right hand side, update `New IP Address` and/or `New Subnet Mask`. The text box background colour will change from white to red to indicate a change has been made, as shown below.



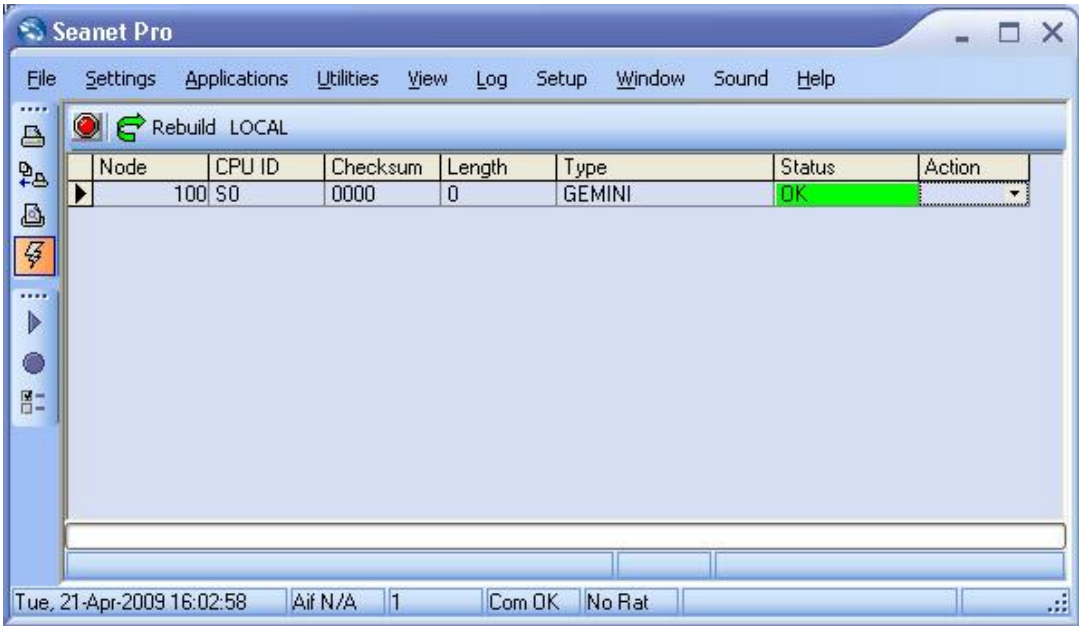
Once these details have been entered, pressing the `OK` button will start the process of changing the IP address. A dialog box will open, requesting confirmation from the user, the box looks like this.



Check that the change details have been entered correctly and click on the `OK` button to accept.

The Gemini node `Status` will change to `Unknown` whilst the new details are being programmed into the Sonar. This will take a few seconds.

When the programming is finished the it may be necessary to reset the computer IP address to enable communication to resume with the Gemini (see the section *Setting the Computer IP Address* for details of how to do this). Once communication has been re-established the following screen shows the sonar is connected:



Returning to `Gemini LAN` from the `Setup` menu should confirm that the changes have been made successfully.

Appendix E. Gemini Software String Decode

The Gemini Software is capable of handling input from various different types of sensors using the following standard strings:

Name	Description	Format/Examples
GPGGA	GPS position	`$GPGGA...`
GPGGA ZDA	GPS position and UTC time	`$GPGGA...` `$GPZDA...`
Digi	Parascientific Digiquartz (depth sensor)	`000.0`
HEHDT	Heading	`$HEHDT...`

OctansAll	Heading, Heave, Pitch, Roll, Surge, Sway	`$HEHDT...`
		`$PHTRH...`
		`$PHLIN...`

OctansGHPR	Heading, Heave, Pitch, Roll	`$HEHDT...` `$PHTRH...`
OctansHead	Heading	`$HEHDT...`
OctansHPR	Heave, Pitch, Roll	`$PHTRH...`
OctansLinear	Heading, Heave, Surge, Sway	`$HEHDT...` `$PHLIN...`
OctansPR	Pitch, Roll	`$PHTRO...`
SonDepth	Depth	`$SONDEP...`
TSS Std 1	Heave, Pitch, Roll	`:000000 -0000H-0000 -0000`
Octans Std 2	Heading, Heave, Pitch, Roll	`:00000 -0000H-0000 -0000F`
AML Smart SVP	Speed of Sound	`0 1500.0`
Speed of Sound	Speed of Sound	`1500.0`
Navi-Pack	Position, Heading, Pitch, Roll	`$G...`
CDL Mini Tilt	Pitch, Roll	`P+0000.0R+0000.0`
Simard EM3000	Heading, Heave, Pitch, Roll	n/a
CDL1	Heading, Pitch, Roll	`Haaa.aP+ccc.ccR+eee.eeT...`

Note

With the exception of `Simrad EM3000` (which is in binary format) all of the above strings are in ASCII format and use <CR> as the synchronisation character.

Glossary

2D	2 Dimensional
ASCII	American Standard Code for Information Interchange - a character encoding scheme originally based on the English alphabet.
AWG	American Wire Gauge
CAT5e	Category 5 enhanced - a standard specification for Ethernet cables.
CD-ROM	Compact Disc - Read Only Memory
CPU	Central Processing Unit, the processor of a computer.
DC	Direct Current
DLL	Dynamic Link Library - Microsoft's implemenation of the shared library, implemented in Microsoft Windows and OS/2 operating systems, filenames have `.dll` extension.
Ethernet	A family of computer networking technologies for local area networks (LANs).
GB	Gigabyte = 1000MB
Gemini	Unless specified this can refer to any of the multibeam sonars in the Gemini range by *Tritech International Ltd* such as the Gemini Imager (720id), Narrow Beam Imager or Gemini Profiler (620pd).
Gemini Hub	A rack mountable device capable of driving 2 Gemini sonars and multiple serial sensors and outputting the data to a PC network.
Gigabit	Measure of transfer speed through Ethernet, usually considered to be 1000Mbit s^{-1}
GPS	Global Positioning System.
IP	Internet Protocol - generally used as a means of addressing individual computers.
IPA	Isopropyl Alcohol (also known as 2-propanol, isopropanol, rubbing alcohol and iPrOH).
IT	Information Technology
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

kB	Kilobyte = 1000 bytes
LAN	Local Area Network
LED	Light Emitting Diode
MB	Megabyte = 1000kB
Mbit s^{-1}	Megabit per second - data transfer rate equal to 1000 kilobits per second.
Multibeam	A sonar which forms multiple "beams" of sound so it can update in real time and does not have to perform a full scan like a traditional sonar.
PC	Personal Computer
PSU	Power Supply Unit
RAM	Random Access Memory
RAT	Remote Access Terminal - the detachable front part of the Tritech Surface Control Unit (SCU) computer. Provides an alternative to using a keyboard and mouse.
RJ45	Registered Jack wiring scheme commonly used to refer to the 8 position 8 contact (8P8C) connector wired for Ethernet communications.
RLE	Run-length Encoding - a form of data compression in which sequences of data that have the same value are stored as a single datum point and count.
ROV	Remotely Operated Vehicle
RS232	Traditional name for a series of standards for serial binary data control signals.
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.
Seanet Pro	The software supplied by *Tritech International Ltd* which is capable of running all the sonar devices.
TTL	Transistor Transistor Logic - a signal that can be input to the Gemini to trigger advanced functions.
TX	Transmit (data)

USB	Universal Serial Bus.
USBL	Ultra Short Base Line (positioning system)
UTC	Coordinated Universal Time (time data closely related to Greenwich Mean Time (GMT)).
UTP	Unshielded Twisted Pair (cable) is a standard cable wiring scheme used for communications cable with no cable screen and no pair shielding (known as Unshielded Unshielded Twisted Pair (U/UTP) under ISO/IEC 11801).
VDSL	Very-high-bitrate Digital Subscriber Line - a method of communicating down un-twisted copper cable at uplink speeds of 18Mbit s^{-1} and downlink speeds of 50Mbit s^{-1}.
VOS	Velocity of Sound
WMV	Windows Media Video - a compression format for several proprietary codecs developed by Microsoft for storing video files.

