

Gemini Profiling System

Product Manual

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Table of Contents

Help & Support	6
Warning Symbols	7
I. Introduction to the System	8
1. Introduction	9
1.1. General Overview	9
1.2. Communications	9
1.3. Using with the Tritech SCU	10
2. Example Survey Setup	11
3. Integrating with Survey Software	12
II. Gemini Profiler Head	13
4. Gemini Profiler Specification	14
4.1. Dimensions (Forward Facing Unit)	14
4.2. Dimensions (Downward Facing Unit)	14
4.3. Acoustic Properties	15
4.4. Electrical and Communications	15
4.5. Physical Properties	15
4.6. Sonar Head Pin-Out Diagrams	16
4.6.1. Burton 5506-1508 (Main Port)	16
4.6.2. Burton 5506-1506 (Auxiliary Port)	16
4.7. Cable Specification	17
4.7.1. Ethernet Cable	17
4.7.2. VDSL Cable	17
4.7.3. RS232 Cable	18
4.8. Offsets	19
5. Gemini Profiler Installation	20
5.1. Installing the Sonar Head	20
5.2. Electrical & Communication Notes	21
6. Care & Maintenance of the Gemini Profiler	23
6.1. After using the sonar	23
6.2. If storing the sonar for extended periods	23
6.3. Regular maintenance	23
III. Gemini Hub	24
7. Gemini Hub Specification	25
7.1. Dimensions Gemini Hub	25
7.2. Physical	25
7.3. Electrical and Communication	25
7.3.1. PPS and RS232 Connectors	26
7.3.2. Ethernet Configuration	26
7.3.3. VDSL Configuration	27
8. Gemini Hub Installation	28
8.1. Overview	28
8.2. Mounting the Hub	28
8.3. Electrical and Communication	29
9. Care & Maintenance of the Gemini Hub	31
IV. Gemini Software	32
10. Gemini Software Installation	33

10.1. System Requirements	33
10.2. Installing the Gemini Software	33
10.3. Configuring the Gemini Sonar	33
10.3.1. Check the operation of the Gemini sonar	34
11. Network Configuration	35
12. Gemini Software Operation	36
12.1. Getting Ready to Use the Software	36
12.2. Keyboard Shortcuts	36
12.3. Basic Controls on Advanced Screen	37
12.3.1. Online Button	37
12.3.2. Record Button	39
12.3.3. Player Controls	39
12.3.4. Capture Screen	41
12.3.5. Record as .WMV	41
12.3.6. Invert Display (Up/Down)	42
12.3.7. Flip Image (Left/Right)	42
12.3.8. Draw Grid	42
12.3.9. Zoom Button	42
12.3.10. Log Directory Selector	43
12.3.11. Sound Velocity Indicator	44
12.3.12. Palette Selector	44
12.3.13. Gain Assist	44
12.3.14. Gain Control	45
12.3.15. Range Control	45
12.3.16. Indicators	45
12.3.17. Scan Sector	46
12.3.18. Measurements	47
12.4. Advanced Controls on Advanced Screen	47
12.4.1. Choose and Position the Equipment	47
12.4.2. Units	48
12.4.3. Sound Velocity	48
12.4.4. Compression	49
12.4.5. Inter-ping	50
12.4.6. Reset to Defaults	50
12.4.7. Gain Settings	50
12.4.8. Beam Setup	51
12.4.9. Digitisation	52
12.4.10. VDSL Settings	53
12.4.11. Modify Device Network Details	53
12.4.12. Settings & Display Tabs	53
12.5. Serial Data Input	54
12.5.1. Sensors	54
12.5.2. Gemini Hub	54
12.5.3. COM Ports	56
V. Troubleshooting and Appendices	58
Troubleshooting	59
A. Setting the computer IP address in Windows XP	62
B. Setting the computer IP address in Windows 7	64

C. Setting the Gemini Device IP Address in Gemini Software	66
D. Gemini Software String Decode	67
E. Optional Surface Adapters	68
E.1. Dimensions	68
E.2. Ethernet Adapter	68
E.3. VDSL Adapter	69
Glossary	70

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:

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	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.

Part I

Introduction to the System

1. Introduction

1.1. General Overview

The Gemini 620pd Profiling sonar is a multibeam echo sounder with a wide field of view and rapid update rate able to provide quick feedback to the user.

The Gemini Hub is a rack mountable interface capable of driving two sonar heads, connecting to a network via Ethernet and bringing in sensor data via RS232.

The Gemini Software is a special application which processes the data from Gemini sonars and is capable of outputting this data across a network to be used within survey software packages.

A Gemini Profiling System will comprise the Gemini Profiler, Gemini Hub and Gemini Software. This manual will detail how to set this system up and cover operation of the Gemini Software. It does not detail how the data from the Gemini System will be used within the survey software.

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 (a different cable is required, see Section 4.7, “Cable Specification”).

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. The *Tritech International Ltd* supplied VDSL Hub 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. The sonar can cope with some electrical noise on the link but it may reduce the image transfer rate.



Note

When using an Ethernet connection the Gemini can fully utilise a 100Mbit·s⁻¹ link while returning the sonar data. If it 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 link to the surface to reduce possible network congestion.

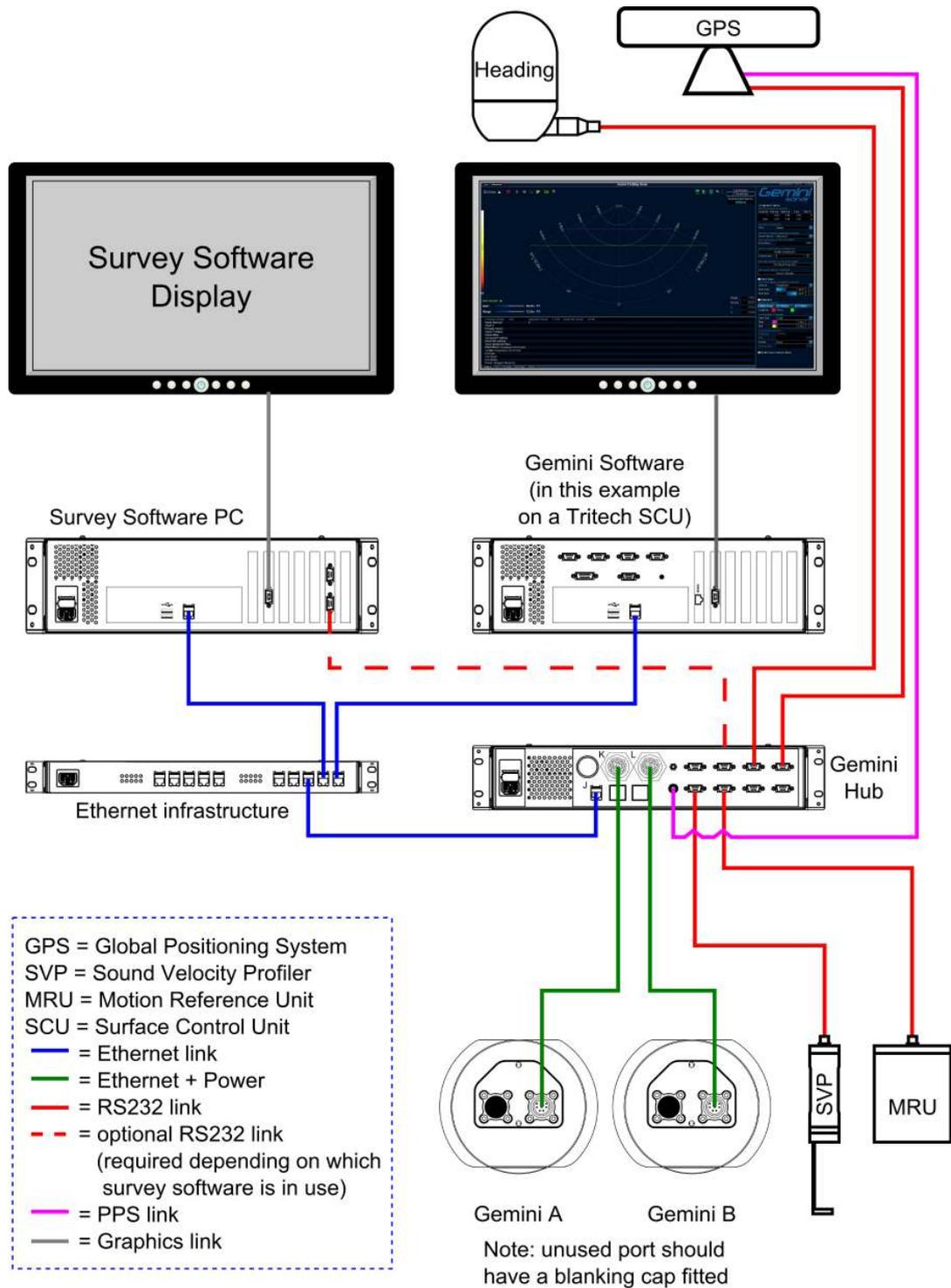
1.3. Using with the Tritech SCU

The *Tritech International Ltd* Surface Control Unit (SCU) is a specially designed rack mountable computer containing embedded software for use with *Tritech International Ltd* sonar equipment. The Gemini range require a higher specification of hardware than other Tritech products so will only work with the later versions of the SCU from SCUv5 onwards (either Windows XP or Windows 7 versions).

The profiling heads should be connected to the SCU through a Gemini Hub or Ethernet/VDSL adapter.

If integrating the SCU into a network (as illustrated in Chapter 2, *Example Survey Setup*) then depending on the configuration it may necessary to use a SCU with an additional network interface fitted or use an external network switch.

2. Example Survey Setup



Note

Tritech International Ltd are able to supply the Gemini Profilers, Gemini Hub and a Surface Control Unit (SCU) but all other hardware shown will be supplied by other manufacturers and is therefore not supported in any depth within this documentation.

3. Integrating with Survey Software

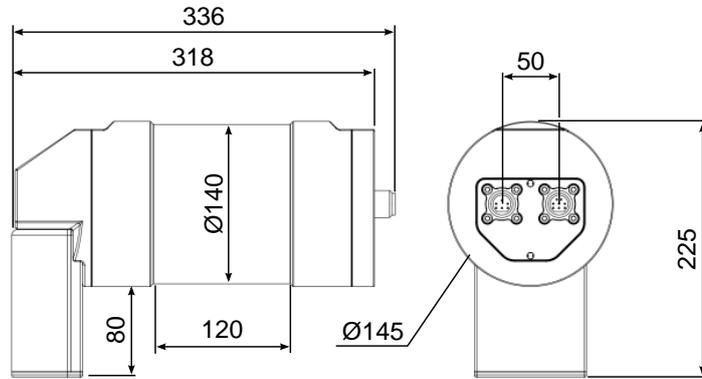
Documentation is available from *Tritech International Ltd* detailing the steps necessary to properly integrate the Gemini Profiler system with external survey packages. For advice please contact *Tritech International Ltd* providing the details for the survey package which is being used or alternatively visit www.tritech.co.uk and download the relevant manuals.

Part II

Gemini Profiler Head

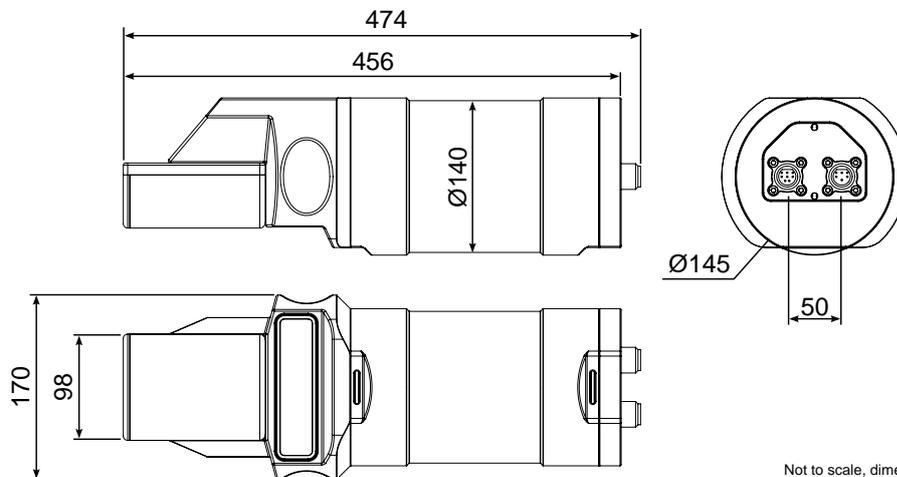
4. Gemini Profiler Specification

4.1. Dimensions (Forward Facing Unit)



Not to scale, dimensions in mm.

4.2. Dimensions (Downward Facing Unit)



Not to scale, dimensions in mm.

4.3. Acoustic Properties

Acoustic Properties	
Operating Frequency	620kHz
Number of Channels	96
Angular Resolution	1.0° acoustic, 0.5° effective
Scanning Sector	130°
Number of Beams	256
Vertical Beamwidth	1°
Range	1.5 to 120m
Scan Rate	2-50Hz (inter-ping time dependent)
Range Resolution	10mm (range dependent)

4.4. Electrical and Communications

Electrical and Communications	
Power Consumption	37W max (range dependent, head unit only)
Supply Voltage	20 - 75V DC
Data Communications	Ethernet (up to 80m) or VDSL (up to 1000m)



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.

4.5. Physical Properties

Physical Properties	
Property	Titanium Body
Weight	14.6kg air, 9.5kg water (forward facing unit) 19kg air, 13kg water (downward facing unit)
Depth Rating	4000m
Materials	Titanium (6 AL-4V)
Finish	Bead blasted
Operating Temperature	-10 to 35°C
Storage Temperature	-20 to 50°C

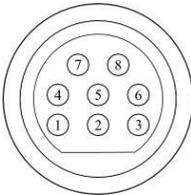
4.6. Sonar Head Pin-Out Diagrams



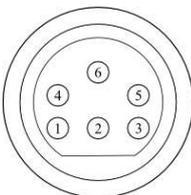
Note

Pin-out diagrams show pin orientation of the connector face on the sonar head.

4.6.1. Burton 5506-1508 (Main Port)

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

4.6.2. Burton 5506-1506 (Auxiliary Port)

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

4.7. Cable Specification

4.7.1. Ethernet Cable

For an Ethernet connection, the supplied cable is described below and should be terminated with an appropriate connector for the intended application.



Note

Ethernet connection requires a shielded cable (of CAT5e standard) 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.

This should be connected to the Burton 5506-1508 (Main port) on the sonar head.

Ethernet Cable Specification		
Burton 55A1-1508	Cable Colour & Specification	Function
1	Red UTP#2 (24AWG)	Ethernet RX +
2	White UTP#2 (24AWG)	Ethernet RX -
3	Blue UTP#1 (24AWG)	Ethernet TX +
4	Red (20AWG)	DC +
6	White UTP#1 (24AWG)	Ethernet TX -
7	Black (20AWG)	DC Ground (0V)
Minimum dynamic bend radius 130mm (static 36mm)		

4.7.2. VDSL Cable

A VDSL connection requires only one twisted pair from the sonar to the surface housed within a 4 core shielded cable.



Note

The signal path should have a characteristic impedance of $110\Omega (\pm 10\Omega)$ for the entire cable run for optimal performance.

This should be connected to the Burton 5506-1508 (Main port) on the sonar head.

VDSL Cable Specification		
Burton 55A1-1508	Cable Colour & Specification	Function
4	Red (20AWG)	DC +
5	Blue UTP#1 (24AWG)	VDSL +
7	Black (20AWG)	DC Ground (0V)
8	White UTP#1 (24AWG)	VDSL -
Minimum dynamic bend radius 129mm (static 35mm)		

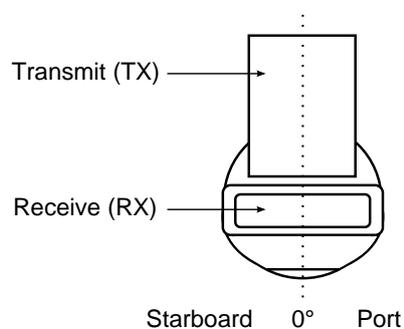
4.7.3. RS232 Cable

The Burton 5506-1506 (Auxiliary port) is designed for use as an interface for auxiliary sensors and is able to provide power and communicate using the RS232 protocol. The cable should be shielded.

RS232 Cable Specification		
Burton 55A1-1506	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)		

4.8. Offsets

The centre line for any offset measurements is considered to be the middle of the receive transducer face as shown.



The view shows the sonar head as it would look from underneath the survey vessel with the front of the vessel at the top of the page, i.e., the sonar transmitter to the fore with the port side correctly aligned on the left.



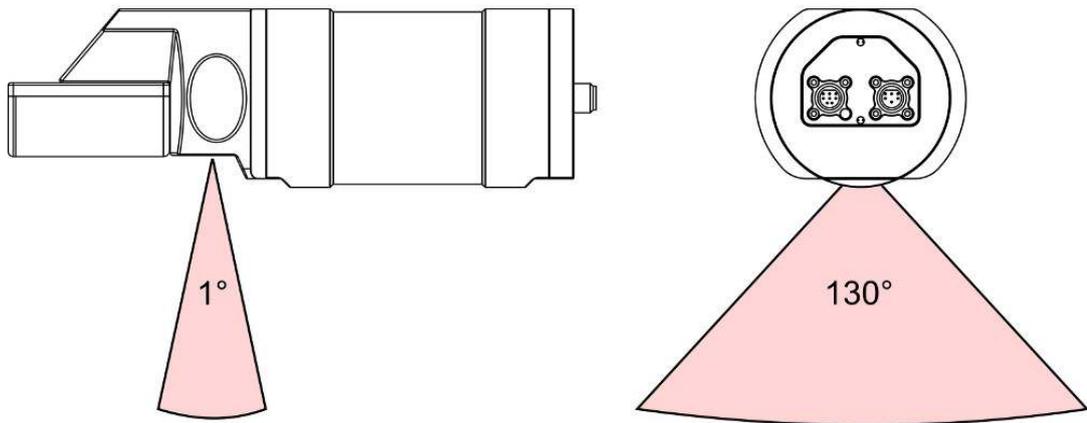
Note

This offset datum applies to both forward and downward facing variants.

5. Gemini Profiler Installation

5.1. Installing the Sonar Head

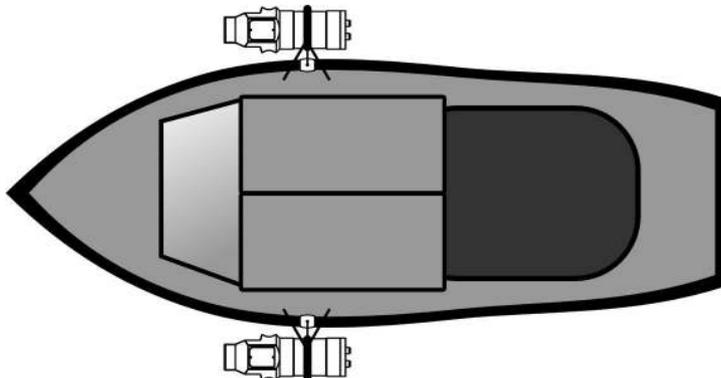
The sonar should be mounted with the transducers facing toward the scene to be profiled (typically the seabed). The scanning sector is orientated with the arc of the transmitter and the vertical beamwidth is at right angles to this arc, such that side and end-on views of the sonar cone are as follows:



For Vessel Installations

The profiling heads can be installed over the side of the survey vessel or within a moon pool if one is available. Installation within a moon pool will provide a more stable operating environment but it must be ensured that the sonar path to the seabed is clear and not obstructed by the vessel hull.

For over the side installation the profiling heads would normally be mounted such that the connector end-cap is facing the stern and have to be mounted to a rigid mounting on the side of the vessel.



**Note**

The use of guy lines or flexible fixings is not recommended.

If the fixing mechanism is designed such that the profiling heads can be withdrawn from the water but left in place on the side of the vessel then consideration should be given to the installation of a suitable cover to protect the head when not in use. The head should be clamped securely around the main part of the body tube. 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.

**Note**

Non-metallic clamps are preferable; if metallic clamps are used they should be painted or lacquered with at least two or three coatings.

For ROV Installations

The sonar heads should be mounted in the correct orientation along the trim of the vehicle and it should have an unrestricted view of the seabed.

The head should be clamped securely around the main part of the body tube. 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.

**Note**

Non-metallic clamps are preferable; if metallic clamps are used they should be painted or lacquered with at least two or three coatings.

5.2. Electrical & Communication Notes

The unit is designed to be operated either by itself or in tandem with another profiler and both connected to a Gemini Hub unit (full details of the Gemini Hub can be found within Chapter 8, *Gemini Hub Installation*).

**Note**

An optional Ethernet or VDSL adapter and test cable can be supplied for deck testing, please contact *Tritech International Ltd* for more details.

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. Use Dust Caps and keep connectors clean to prevent damage in storage and service. 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 port *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.

6. Care & Maintenance of the Gemini Profiler

6.1. After using the sonar

Make sure that after using the sonar head that it is washed down with fresh water and check the unit for any signs of obvious damage. Pay particular attention to the transducer head and free any organic matter which has become trapped. Once the unit is clean; dry thoroughly and place in storage container.

6.2. If storing the sonar for extended periods

Make sure that the sonar is completely dry (if necessary leave to air-dry before stowing). Pack into storage container along with several pouches of silica gel.

6.3. Regular maintenance

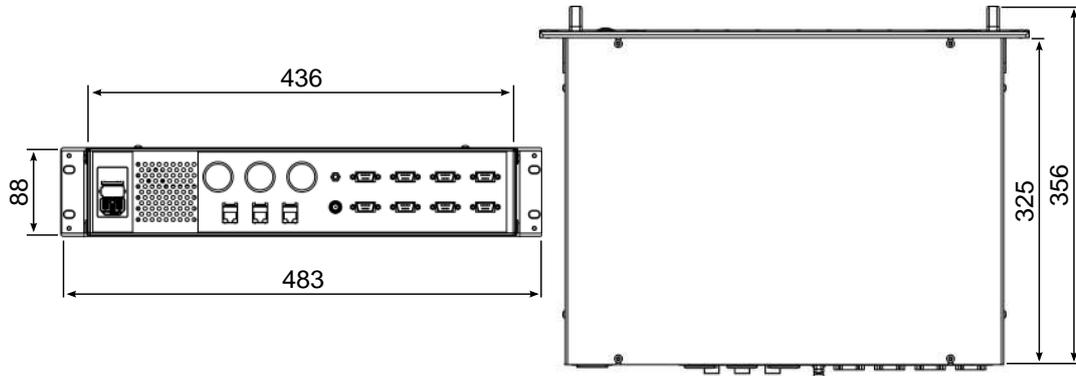
There are no user serviceable parts inside the sonar and it is not necessary to take it apart for any maintenance tasks. In light usage as long as the unit is washed thoroughly with clean fresh water after every use and dried before storage no further maintenance is required. If the unit is in regular use, or submerged routinely for extended periods, it is advisable to arrange for an annual service to be carried out by *Tritech International Ltd* This service will enable the unit to be checked thoroughly or for any worn parts to be replaced and will enable long-term trouble free operation of the sonar head.

Part III

Gemini Hub

7. Gemini Hub Specification

7.1. Dimensions Gemini Hub



Not to scale, dimensions in mm.

7.2. Physical

Weight	6.5kg
Materials	Aluminium and stainless steel
Operating Temperature	5 to 40°C
Storage Temperature	-20 to 50°C
Operating Environment	Indoor use only.

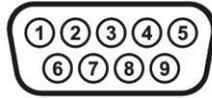
7.3. Electrical and Communication

Power Consumption	120W maximum
BNC PPS Voltage	5V TTL
Supply Voltage	90-264V AC at 47-63 Hz
Main Fuses	4A, 250V 5x20mm glass ant surger
Communication Ports	1 x Gigabit Ethernet (RJ45) 2 x Ethernet or VDSL (Souriau) 8 x Serial RS232 (DE-9) 1 x BNC (for GPS PPS data)

7.3.1. PPS and RS232 Connectors

PPS data (5V TTL signal) from a GPS device should be fed into the BNC port on the rear of the Gemini Hub which is marked `Time Sync`

Data from ancillary sensors should be fed into the DE-9 RS232 ports.



PORT A - H
DE-9 male connector

Pin	RS232	Pin	RS232
1	‡	6	‡
2	RX	7	RTS
3	TX	8	CTS
4	‡	9	‡
5	Ground		
‡ = connected for handshaking only.			

7.3.2. Ethernet Configuration

In Ethernet configuration the Gemini Hub will have an RJ45 Ethernet port (`Port J`) which is for connection to an IT infrastructure. It will also have two Ethernet ports, as detailed below, which provide power and communications to the Gemini heads.

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		

Using cabling provided by *Tritech International Ltd* it is possible to connect the Ethernet `Port K` or `Port L` into an IT infrastructure also (if for example the Gemini Sonar is on the other side of a network hub or switch). These cables are designed such that the power output from the connector is disabled so it is safe to connect into a router or other network device.



Note

The data from ancillary sensors connected to the PPS port or RS232 ports of the Gemini Hub will be output on Port J so it is essential to make sure that this connection is fed into the computer or network where the sensor data is to be used. Due to the higher quantity of traffic through this port a Gigabit link is recommended to ensure sufficient bandwidth.

7.3.3. VDSL Configuration

In VDSL configuration the Gemini Hub will have a single Ethernet port (Port J) which is for connection to an IT infrastructure. It will also have two VDSL ports (Port K and Port L), as detailed below, which provide power and communications to the Gemini heads.



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.

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

8. Gemini Hub Installation

8.1. Overview



Warning

The Gemini Hub is intended for INDOOR USE ONLY and should not be placed in a position where it could get wet.

The Gemini 620pd is designed to be used as part of a survey system and is supplied with the Gemini Hub unit to enable multiple sensors to be connected through an Ethernet link to an IT infrastructure.

All status indication is by front panel LEDs which illuminate depending on the operating conditions.

8.2. Mounting the Hub

The Gemini Hub should be rack-mounted in a suitable frame designed for industrial computer equipment and fixed in place using the four mounting holes on the front panel. The handles are to aid insertion into a rack system and are not designed to be used as a means for carrying the Hub.



Caution

The power lead should be plugged into a suitable location to allow for access and disconnection at all times to provide a method of cutting power to the unit and should be labelled to identify it as the disconnecting device.



Warning

This unit requires an earth connection and the power lead must be plugged into an earthed power socket using a three pin plug.

The rack unit should be adequately ventilated to provide cooling to the system and the vents should be clear of any obstruction. An internal fan is present within the hub and care should be taken to ensure the air supply is appropriately dry and filtered.

8.3. Electrical and Communication

DE-9 Serial Connectors

Ports A to H are for serial devices and work on the RS232 protocol. The corresponding LED on the front panel (A to H) indicate:

- RED Receiving data.
- GREEN Transmitting data.
- ORANGE Receiving and Transmitting data.

Ethernet and VDSL Connectors

The Ethernet and VDSL ports will be in the same location on the rear of the Hub and are marked as Port K and L. The Hub will be configured for either Ethernet or VDSL operation and it is not possible to change between the two.

The connector should be wired according to the pin out specification found in Chapter 7, *Gemini Hub Specification*. The Hub can provide power as well as communications to the sonar head (on both VDSL and Ethernet). If using with an existing IT infrastructure (i.e. the sonar head is located on the other side of a network switch) then it will be necessary to construct a cable that does not connect to the power output. *Tritech International Ltd* can provide such a cable.

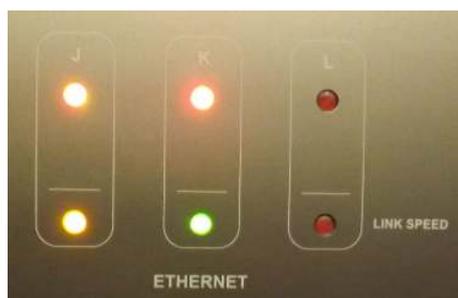
Port J is for connection to an Ethernet infrastructure and it carries data from all of the connected sensors on the Hub (including data from the DE-9 ports and timestamping data generated by the signal on the BNC port) and as such it should be connected to a Gigabit Ethernet connection.

During operation the status of the three ports will be displayed on the front panel of the Gemini Hub. The top row of LEDs are for Link Status - the LED is red for receive and green for transmit. The bottom row is for link speed and is as follows:

Port J	RED = 10Mbit·s ⁻¹
	ORANGE = 100Mbit·s ⁻¹
	GREEN = 1000Mbit·s ⁻¹

Port K & L	RED = 10Mbit·s ⁻¹
Ethernet	ORANGE = 100Mbit·s ⁻¹
	GREEN = 1000Mbit·s ⁻¹

Port K & L	Shows link speed of internal connection between VDSL and Ethernet, if dark or erratic this may indicate an internal fault with the Hub.
VDSL	



Time Sync Port

The internal clock in the Hub is capable of time-stamping the data provided to the host computer, however, a much more accurate option is to use an external clock.

The port uses a BNC connector and accepts standard 5V TTL PPS (Transistor-Transistor Logic Pulse Per Second) data from a GPS device (the GPS will also have to be connected to a free RS232 port on the Gemini Hub).

Earth Point (rear panel)

The hub unit is fitted with an earth point on the rear panel.



Caution

This earth point is a functional earth and not a protective earth. For protective purposes the earth should be connected in the normal way through the protective earth terminal housed within the IEC power socket.

9. Care & Maintenance of the Gemini Hub

There are no user serviceable parts within the Gemini Hub and no maintenance should be required.

The unit should be operated in a rack mount which is dry, free from excessive dust and has a good supply of cool air.



Caution

Do not expose the Gemini Hub to moisture.



Warning

Do not remove the cover of the hub unit - doing so may expose the user to risk of electrical shock

If it becomes necessary to change the main fuse of the unit the following procedure should be used:

1. Turn off power and remove the power lead from the unit.
2. Locate the fuse holder in between the switch and the power-in socket.
3. Pull out the fuse holder and replace fuses with two of the correct specification (see Section 7.3, "Electrical and Communication").
4. Re-insert the fuse holder and ensure it is properly seated.
5. Re-connect the unit and test operation.

Part IV

Gemini Software



10. Gemini Software Installation

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

10.1. 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)
Operating system	Windows XP 32bit	Windows 7 32 or 64bit

10.2. Installing the Gemini Software



Note

Always make sure that the latest version of the Gemini software is in use. The latest version can be downloaded from www.tritech.co.uk

The Gemini software is also supplied with the sonar on a USB memory stick as a Windows Installer Package (known as an .msi file). Doubling clicking the installation file will start the Windows Installer and install the software onto the computer. During installation follow the installer instructions, if required making any appropriate selections, to install the software.

10.3. Configuring the Gemini Sonar

The Gemini head uses Ethernet to communicate between the head and 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 network, the IP address of the Gemini needs to be set to a suitable value for that network. The subnet mask needs to be appropriate for the users 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 Gemini. 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 head on the network.

For the correct way to set up the Gemini Profiler network please refer to: Chapter 11, *Network Configuration*

For instructions on setting the computer and sonar head 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*.

10.3.1. Check the operation of the Gemini sonar

If the correct changes have been made to the Gemini Sonar 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. If the head is able to communicate, it will be listed in the status window and automatically go online after five seconds.

11. Network Configuration

To properly configure the Gemini devices on a network it will be necessary to set the IP addresses of the devices in the correct order otherwise a situation may arise where a particular device is unreachable. If a device does become unreachable then it may be necessary to separate it from the rest of the system to undergo fault finding.



Setup on a complex network

The steps outlined here assume that the network consists only of the computer running the Gemini software, the Gemini Hub and a single Gemini Profiler. If the system is more complex it may be necessary to turn off or disconnect ancillary devices in order to simplify the connection and configuration process. If two Gemini Profilers are in use then it will be necessary to connect them *one at a time* otherwise communication with them will not be possible because they will both be using the default IP address.

To set the IP address of the Gemini System devices:

1. Set the IP address of the computer 192.168.2.100 with a subnet mask of 255.255.255.0
2. Change the IP address of the Gemini Profiler from the default value (192.168.2.201) to the desired value. The status information will remain in the Gemini Software but it will no longer be possible to communicate with the Gemini Profiler at this point.
3. Set the IP address of the Gemini Hub from the default value (192.168.2.101) to the desired value and close the Gemini Software
4. Set the computer to the desired IP address (on the same subnet as previously set for the Gemini Profiler and Hub)
5. Restart the Gemini Software and both the Hub and Profiler should now be able to communicate.



Note

For instructions on setting the computer IP address please refer to Appendix B, *Setting the computer IP address in Windows 7* or Appendix A, *Setting the computer IP address in Windows XP*.



Note

For instructions on setting the Gemini Hub or Gemini Profiler IP address please refer to Appendix C, *Setting the Gemini Device IP Address in Gemini Software*.

12. Gemini Software Operation

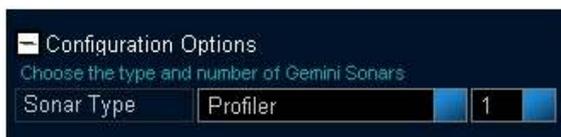
12.1. Getting Ready to Use the Software

Before starting, check that the software is running in Profiler mode. The title bar of the program should read **Gemini Profiling Sonar**:



Gemini Profiling Sonar

If the titlebar is different, then it will be necessary to change the software to operate in Profiler mode by selecting Profiler from Configuration Options (on the Advanced screen):



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.



Note

The User screen is not considered separately within this document - the User screen has a subset of the controls for the Advanced screen with no added functionality.



Note

To gain access to the online help press the F1 button on the keyboard.

12.2. Keyboard Shortcuts

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

Ctrl f	capture screen to file	F7	toggle logging of data
a	increase gain	z	decrease gain
d	increase range	c	decrease range
g	increase aperture	b	decrease aperture

12.3. Basic Controls on Advanced Screen



The cone in the middle of the display will show the sonar image that the Gemini Sonar is producing and the digitised points from the strongest returns. Around this display are the most commonly used controls. The CRP is shown as a small red circle.

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 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 sonar display are the indicators showing the pointer position within the display area.

To the bottom and on the far right are the advanced controls for configuring the profiling system which are detailed in Section 12.4, “Advanced Controls on Advanced Screen”.

12.3.1. 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.

12.3.2. 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 12.3.10, “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.

12.3.3. 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

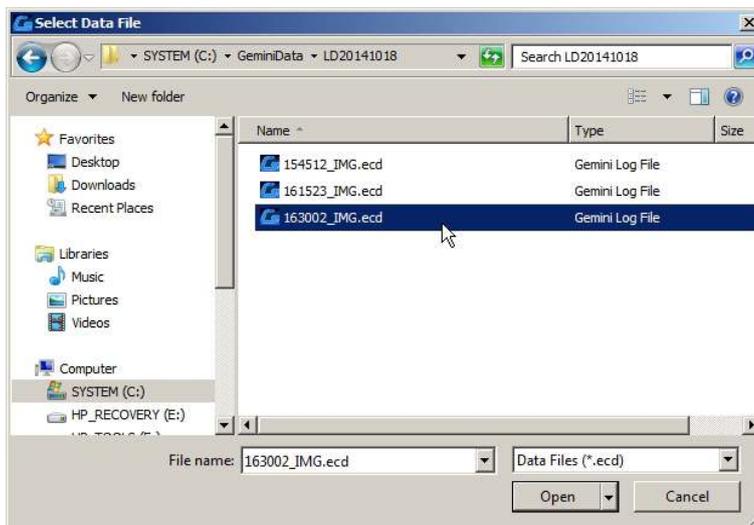
The Stop button stops file replay and resets the play progress to the start.

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 be 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.

12.3.4. 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.



12.3.5. 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.



12.3.6. Invert Display (Up/Down)



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

12.3.7. 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.

12.3.8. 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.

12.3.9. Zoom Button

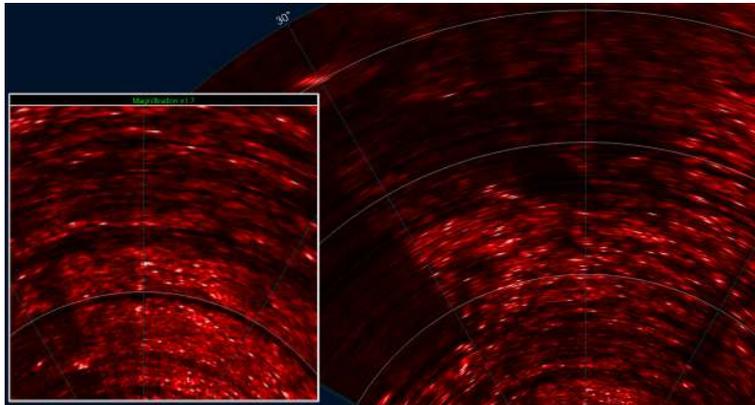


The Zoom button looks like a magnifying glass. When this button is clicked, a zoom window opens which shows the data around the mouse pointer in more detail, as the following image shows.

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.



12.3.10. Log Directory Selector

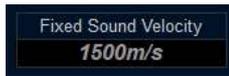


The Log Directory selector shows the currently selected directory which will be used to save data recorded by the software. For a description of how the directories and files used by the software when recording data refer to Section 12.3.4, “Capture Screen” and Section 12.3.5, “Record as .WMV”.

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.



12.3.11. Sound Velocity Indicator

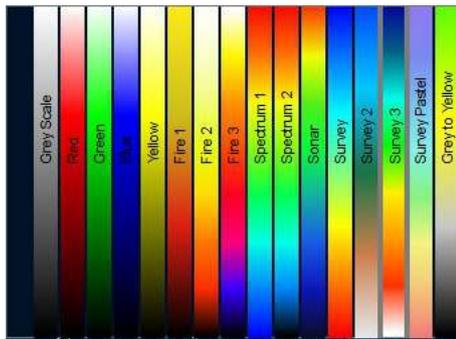


The sound velocity indicator at the upper right hand side of the display shows the sound velocity used by the Gemini Profiler whilst producing the sonar image. The Gemini Sonar can use a fixed, user-entered, value for the sound velocity or an externally measured velocity from a Sound Velocity Probe (SVP). The SVP can be connected through the Gemini Profiler Auxiliary port, any serial port on the Gemini Hub or any serial port on the host computer.

12.3.12. 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.



Note

A contrasting colour scheme should be chosen for the image palette and targets (see Section 12.4.9, “Digitisation”) in order to be able to see the digitised points clearly.

12.3.13. 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.

12.3.14. 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 decibel value between 0dB (no gain being applied) and 96dB (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).



Note

The gain control is only for the display image and has no effect on the digitisation of targets.

12.3.15. 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).

12.3.16. Indicators

Range	14.65m
Bearing	52.78°
X	-11.66m
Y	-8.86m
Intensity	-65dB

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 CRP). The pointer position is expressed as a range / bearing pair, and as a Cartesian co-ordinate (X, Y).

The target intensity local to the point will also be shown.

12.3.17. Scan Sector

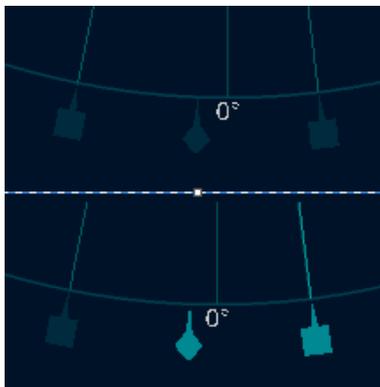


Note

If the Spacing is set to Fixed (Low Bandwidth) in Beam Setup then sector adjustment is not available and the full scan width will be used.

Around the edge of the sonar cone there are three handles that allow the scan sector (also known as the aperture) to be adjusted. Adjusting the scan sector can be useful if the area of interest is narrow such as a pipe trench (the beam setup will also require adjustment, see Section 12.4.8, “Beam Setup”).

Click and hold the mouse over one of the handles. The clicked handle, and any other handles that will move when the mouse is dragged, will be highlighted. Square shaped handles adjust the edges of the scan sector. Diamond shaped handles adjust the centre of the scan sector.



Drag the mouse to move the handle to the desired location and then release the mouse button. There will be a short delay (depending on network bandwidth) while the sonar is updated with the new scan sector.

It is possible to adjust the scan sector using the keyboard by pressing 'b' or 'g'.



Note

It is possible to adjust both the left and right sides of the scan sector symmetrically by holding down the `shift` key on the keyboard while moving the handle.



Note

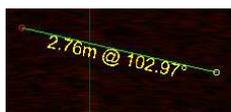
If multiple sonars are in use and the scan sector adjustment handles are overlapped by another image, the handle underneath can be accessed by holding down the control key (`ctrl`) on the keyboard while selecting the handles. If the control key is not held when the mouse is clicked the measurement function will be activated instead.

12.3.18. 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.

12.4. *Advanced Controls on Advanced Screen*

The `Configuration Options` pane is on the far right of the display area and provides advanced control of the sonar display as well as the data which is to be output to the 3rd party survey software.

12.4.1. Choose and Position the Equipment

Equipment positions should be given relative to the vessel CRP which is typically chosen to be at the vessel Centre of Gravity (COG). This equipment setup will also need to be entered into the hydrographic survey software package.



The configuration options allow for the selection and configuration of the profiling heads. Each head that is part of the system can be configured and the first step is to select the Sonar ID of the head to be altered. Each head can then be positioned in relation to where it is within the system (i.e. offsets can be input to compensate for the profiling heads being positioned either side of a vessel) by choosing the fore/aft (Fwd (m)) and port/starboard (Stbd (m)) offsets. The depth can also be set (Depth(m)) and the amount of roll for each individual head. If using a motion reference unit the position of this can be set by inserting values into the MRU row of the table.

12.4.2. Units

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



Note

The units selection only affects the screen display. Output to the hydrographic survey package is always in SI units.

12.4.3. Sound Velocity



Note

The Sound Velocity controls are used to set how the Gemini obtains the sound velocity at the receiver face. This is critical for producing the sonar image/profile. Incorrect sound velocity cannot be corrected with post-processing.

The Gemini Profiler 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 $1499.2\text{m}\cdot\text{s}^{-1}$ 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 $1400\text{m}\cdot\text{s}^{-1}$ to $1588\text{m}\cdot\text{s}^{-1}$, it will give a warning to the user and use a default value of $1499.2\text{m}\cdot\text{s}^{-1}$.

12.4.4. 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.



Note

RLE applies to the image data only and has no effect on the digitised targets.

12.4.5. Inter-ping

For selectable fixed rate pinging to synchronise ping rate with vessel speed - setting to a minimum will make the sonar ping at the highest frequency allowable by the system.



When a Gemini Profiler is online the main display will show an Image and Target rate.



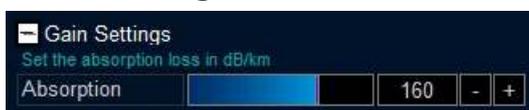
Green text means that the actual ping rate has achieved the set inter-ping time and red text means it has not (and is pinging as fast as it is able to). Typically in a survey a regular ping interval is desired for the targets.

The target rate is not limited by network bandwidth since the target detection (digitisation) is performed in the sonar head. Network bandwidth only limits the image transfer rate. The image transfer rate will be reduced if there is insufficient bandwidth available to send every image to the software, however, every image is still acquired internally by the sonar and digitised.

12.4.6. Reset to Defaults

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

12.4.7. Gain Settings

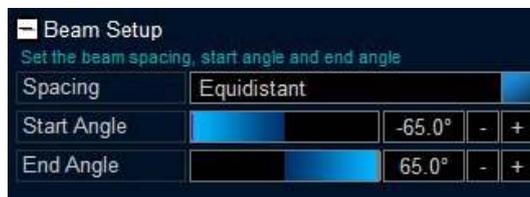


Absorption

As sound from the Gemini Profiler transmitter travels through the water, the amplitude of the received reflected sound pulse reduces over range due to absorption and spreading losses. The Gemini Profiler compensates for these losses by applying a time varying gain curve to the received signal such that the measured reflectivity of a target is not dependent on the range at which the that target is viewed.

The absorption loss coefficient (between 70 and 200 dB km⁻¹), must be set so that the Gemini Profiler can correctly compensate for the absorption losses. The absorption loss coefficient will vary depending on the temperature and salinity of the water, and should be given at the acoustic frequency of 620kHz.

12.4.8. Beam Setup



The Beam Setup options allow control of the sector which is scanned by the Gemini sonar, this can be useful if the area of interest is quite narrow, such as a pipe trench. To vary the start and end of the scan sector simply drag the sliders sideways or use the + and - buttons to increment the values one step at a time. The maximum range is from -65° to +65°.

The Spacing option allows configuration of the beam spacing:

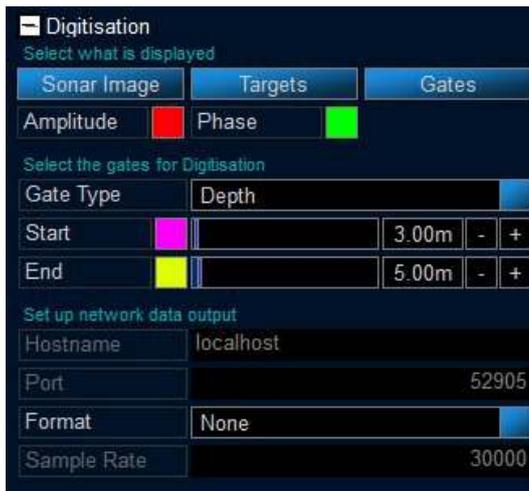
- **Equidistant** beams are arranged so that they intersect a flat sea floor at equal distances apart (more beams at the edges of the image than in the centre).
- **Equiangular** the beams are spaced with an equal angle between them.
- **Inverse Sinusoid** is the Gemini default and concentrates more beams in the centre of the image.
- **Fixed (Low Bandwidth)** useful only for very low bandwidth systems, will disable some of the configuration options.



Note

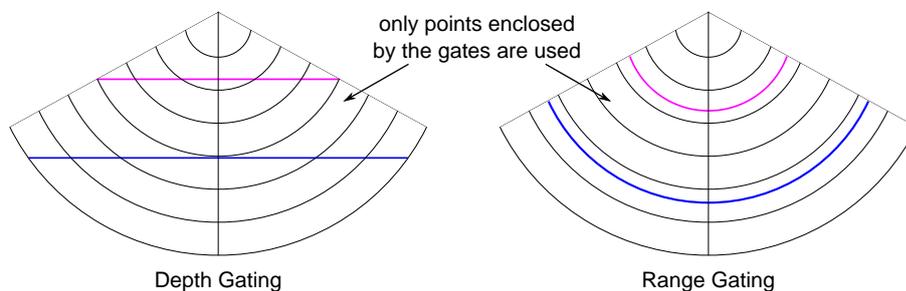
The Scan Sector can also be adjusted using the handles on the scan display, or using the keyboard shortcuts 'b' and 'g'.

12.4.9. Digitisation



It is possible to configure the display to show the Sonar Image, Targets and Gates. When the Sonar Image is turned off (when the button is "on" it has a blue background) and the Targets option selected the display will only show the digitised return points (i.e., extraneous detections will be filtered out and not displayed).

If the depth of the terrain to be profiled is known to lie between two ranges then the range gates can be set and displayed by selecting the Gates button. The gates can be set either using a Range value or Depth value.



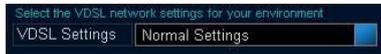
Note

The gates are always in use for target detection (i.e., targets will not be displayed outside these gates). For targets and gates, the Display button only affect the displaying of the data, however, to reduce network bandwidth, the button for Sonar Image enables or inhibits the data transmission. If the sonar image data is inhibited during logging it will not be available for playback.

The network data output format will be determined by the survey software which is running on the network computer and for most cases Tritech will be the correct choice. If using survey software that does not have a Tritech specific configuration available then it is possible to emulate a Reson R-Theta or RI-Theta format. For more details of integration of the Tritech Gemini software with survey applications please refer to Chapter 3, *Integrating with Survey Software*.

12.4.10. 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.

12.4.11. 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.

12.4.12. Settings & Display Tabs

The settings and display tabs are at the bottom of the display window and are for displaying information about the connected sonar(s) and also for configuration of external devices, such as the Gemini Hub unit.

Sonars

Application Version	: 1.16.31		Gemini DLL Version	: 1.07.97	
Sonars Detected	8				
Sonar ID	134	173	166		
Firmware Version	72nd: 01.1f	166: 01.1f	166: 01.1f		
Sonar IP Address	192.168.2.209	192.168.2.206	192.168.2.204		
Subnet Mask	255.255.255.0	255.255.255.0	255.255.255.0		
Connected IP Address	192.168.2.2	0.0.0.0	0.0.0.0		
Sonar MAC Address	00:50:c2:b9:40:86	00:50:c2:b9:40:ad	00:50:c2:b9:40:a5		
Sonar Operational Status	Online - Out of water	Offline	Offline		
PSU/PCATx Temperature (% of Limit)	39 / 37 / 0	40 / 38 / 0	39 / 35 / 0		
Amplifier Temperatures (% of Limit)	0 / 0 / 0 / 0	0 / 0 / 0 / 0	0 / 0 / 0 / 0		
Link Type	Ethernet	Ethernet	Ethernet		
Link Speed	100 Mbps	100 Mbps	100 Mbps		
Link Quality	100%	---	---		
Packet / Dropped / Reset (L)	236003 / 0 / 0 (0)	384 / 0 / 0 (0)	384 / 0 / 0 (0)		

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. With multiple sonars connected the software can display all sonars and simultaneously output the digitised return points from all sonars to the survey software.

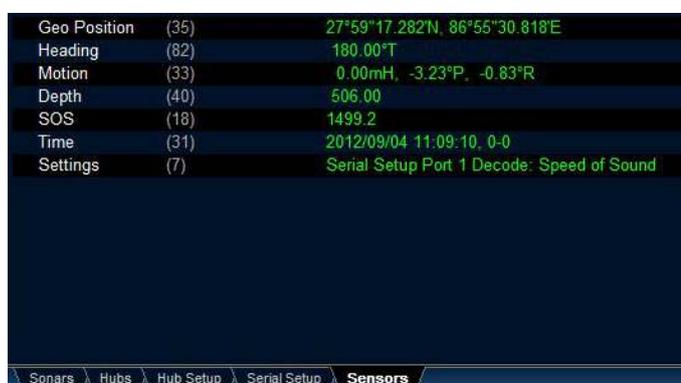
If more than one Gemini Sonar is connected and powered, its details will appear on the System Data screen. The currently active sonar will have green text and the dormant sonar(s) will be in yellow.

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

12.5. Serial Data Input

12.5.1. Sensors

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



Geo Position	(35)	27°59'17.282N, 86°55'30.818E
Heading	(82)	180.00°T
Motion	(33)	0.00mH, -3.23°P, -0.83°R
Depth	(40)	506.00
SOS	(18)	1499.2
Time	(31)	2012/09/04 11:09:10, 0-0
Settings	(7)	Serial Setup Port 1 Decode: Speed of Sound



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.

12.5.2. Gemini Hub

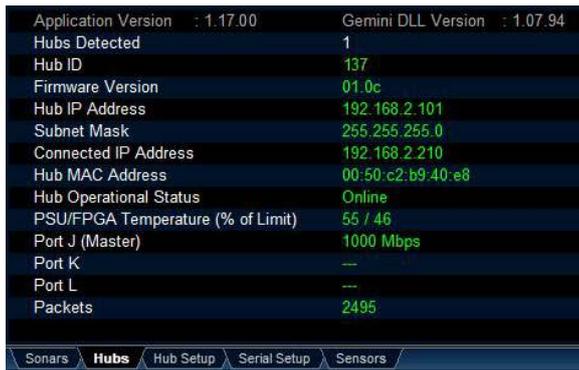


Note

The Gemini software only supports connection to *one* 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.

To enable communication with the Hub click on the Enable Comms button. To make sure the correct Hub is being used, an ID can be entered by clicking in the Hub ID text field.



- 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 normal, binary only used by Simrad EM3000). Echoing the data provides an alternative option to using a serial splitter cable where a single data feed is required to be input both to the Gemini system and to other systems.
- 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.
Pulse-Per-Second (PPS) Edge	Select <code>Positive</code> edge or <code>Negative</code> edge to match the signal polarity of the GPS receiver output. If no PPS signal is connected to the Gemini Hub select <code><none></code> .
Time Synchronisation	Select <code>GPS</code> to use the <code>\$GPZDA</code> time strings from the GPS receiver (this is the normal/default setting). The <code>PC Clock</code> setting should only be used where a GPS time string is not available. The PC clock is not sufficiently accurate for use during a survey and timing errors are likely to be introduced if this setting is used.
Network data output	This is only enabled when the <code>Digitisation</code> network data output format is first set to <code>Tritech</code> (see Section 12.4.9, “Digitisation”). The setting controls how RS232 serial data received by the Gemini Hub is retransmitted over Ethernet to the survey software. This data can also be disabled if it is not required by the survey software.



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.

12.5.3. COM Ports

The `Serial Setup` tab is where all the ports (both connected to the PC and ports on the Gemini head) are configured.

The COM ports can be enabled by selecting the `Enable Comms` button on this tab.



Note

For survey work it is preferable to connect all serial sensors to the Gemini Hub so that the data can be accurately time stamped. Data received on COM ports can not be time stamped as accurately which may introduce timing errors in the survey results.



- 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 normal, binary only used by 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.

Part V

Troubleshooting and Appendices

Troubleshooting

The software reports that no sonars are detected

VDSL System – Check all cabling between Gemini Hub and the sonar and verify that the sonar is powered correctly with appropriate voltage at the sonar. If the VDSL cables are OK and 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.



Note

It may take up to 1 minute to establish a stable VDSL link.

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.



Note

If a fault with the Gemini Hub is suspected the sonar head should be connected directly to the computer using an optional Gemini Ethernet/VDSL adapter and bench test cable. Contact *Tritech International Ltd* for more details.

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 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 specification.

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.

Gemini software display is choppy or freezes

The most likely cause for this is an inadequate graphics card. This will be especially evident if using a laptop computer as the main operating PC and it will be necessary to choose one that has a dedicated graphics chip (the Intel 2000/3000 chips that use part of the main CPU for graphics processing are inadequate). For desktop computers installation of a dedicated 3D graphics card is recommended (with optimum results being obtained by using a high resolution screen connected with a digital interface such as DVI). Additionally, make sure that the rest of the computer meets other minimum required specifications outlined in Chapter 10, *Gemini Software Installation*.

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.

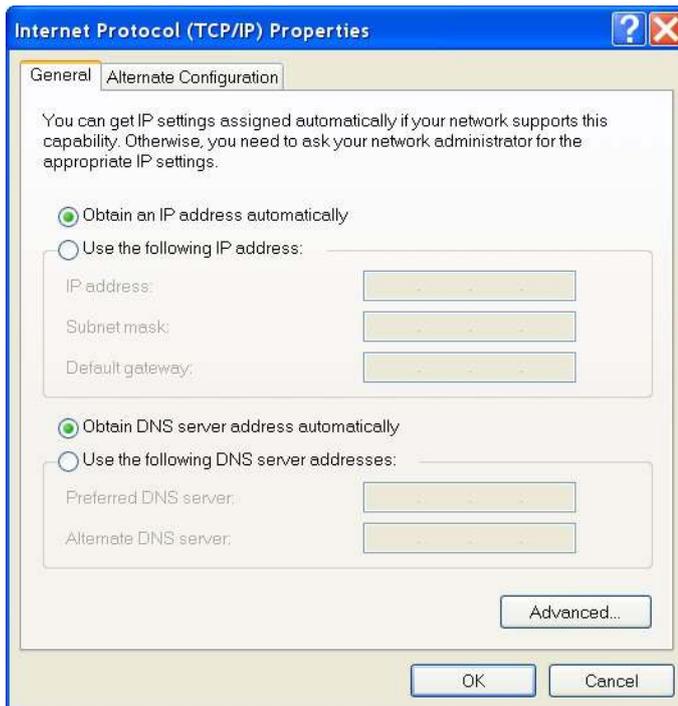
If the computer is connected to a network already, disconnect it from that network.

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:

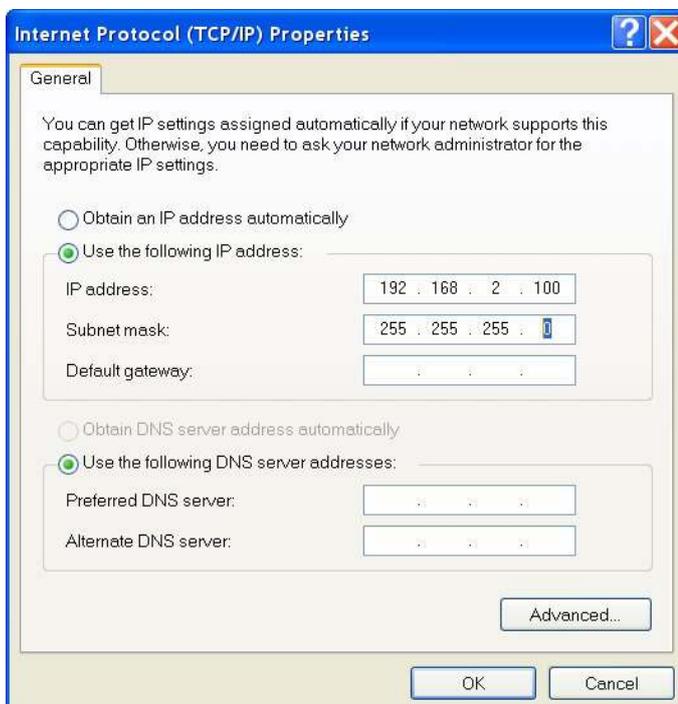


Scrolling the "This connection uses the following items" box will reveal an item titled "Internet Protocol (TCP/IP)". Click this item to select it, and then press the Properties button. The following dialog should open:



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:

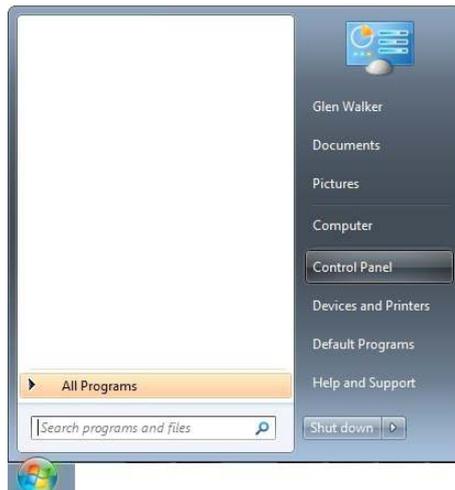


Appendix B. Setting the computer IP address in Windows 7

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.

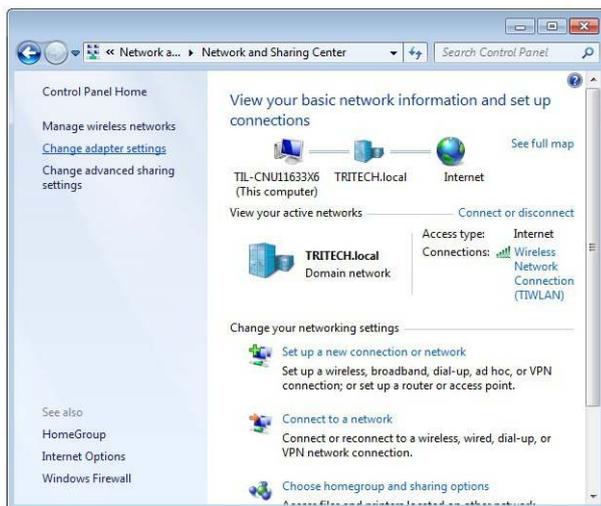
First click on the Start Menu and select Control Panel.



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



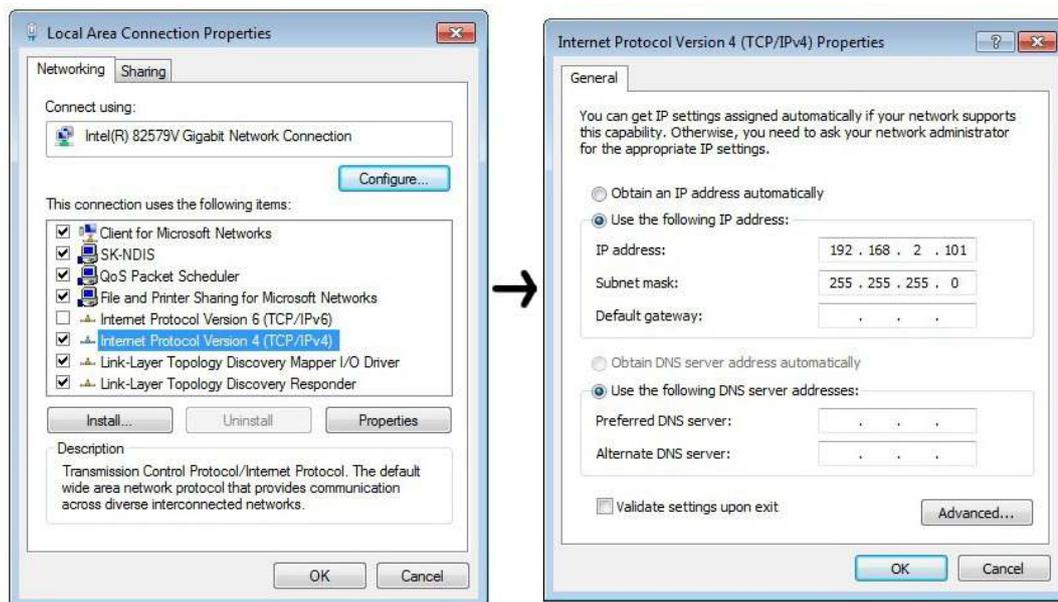
This will bring up the Network and Sharing Center which allows configuration of any networks on the computer. Click on Change adapter settings on the left-hand pane.



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. 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
CDL1	Heading, Pitch, Roll	Haaa.aP+ccc.ccR+eee.eeT...
Simrad EM3000	Heading, Heave, Pitch, Roll	n/a



Note

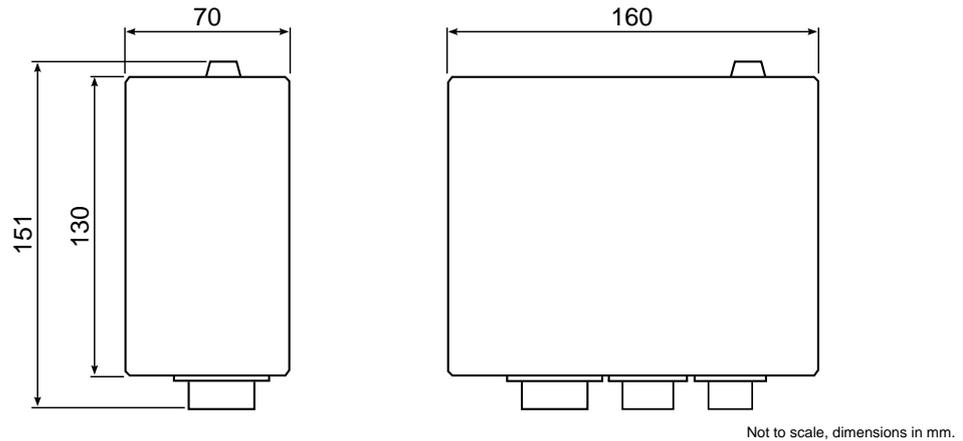
With the exception of Simrad EM3000 (which is in binary format) all of the above strings are in ASCII format and use <CR> as the synchronisation character.

The above data is a snapshot which may not reflect the current status and there may be more input options available.

Appendix E. Optional Surface Adapters

The Gemini Profiler can optionally be supplied with either a VDSL or Ethernet adapter to be used with a single Gemini head to allow configuration of the unit.

E.1. Dimensions

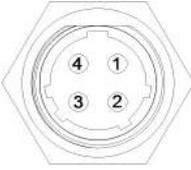


E.2. Ethernet Adapter

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

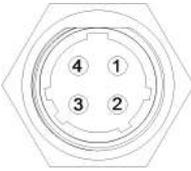
Pin	Function	Diagram	Photograph
1	DC Ground		
2	DC +		
3	not connected		
4	not connected	Souriau UTS7124P	

E.3. 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		

VDSL DC Connector

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

Glossary

ASCII	American Standard Code for Information Interchange - a character encoding scheme originally based on the English alphabet.
AWG	American Wire Gauge
BNC	Bayonet Neill-Concelman - a coaxial signal connector
CAT5e	Category 5 enhanced - a standard specification for Ethernet cables.
CPU	Central Processing Unit, the processor of a computer.
CRP	Central Reference Point
CTS	Clear To Send (data)
dB	Decibel - a logarithmic unit that indicates the ratio of a physical quantity, usually power or intensity, predominantly used in acoustics, electronics and control theory.
DC	Direct Current
DE-9	A 9 pin D shaped connector commonly used for serial communications on computers.
DVI	Digital Visual Interface, a standard connector for connecting from a computer to a monitor.
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 <i>Tritech International Ltd</i> 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.
IEC	International Electro-technical Committee

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
LED	Light Emitting Diode
MB	Megabyte = 1000kB
Mbit·s ⁻¹	Megabit per second - data transfer rate equal to 1000 kilobits per second.
MRU	Motion Reference Unit
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
PPS	Pulse Per Second
PSU	Power Supply Unit
RAM	Random Access Memory
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.
RTS	Request To Send (data)
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.

SI	International System of Units - a system of measurement based on the metric system.
SVP	Sound Velocity Probe
TTL	Transistor Transistor Logic - a signal that can be input to the Gemini to trigger advanced functions.
TX	Transmit (data)
USB	Universal Serial Bus.
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 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 $18\text{Mbit}\cdot\text{s}^{-1}$ and downlink speeds of $50\text{Mbit}\cdot\text{s}^{-1}$.
WMV	Windows Media Video - a compression format for several proprietary codecs developed by Microsoft for storing video files.