

Gemini 720im

Product Manual

0729-SOM-00002-1



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Warning Symbols

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



Note

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



Important

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



Caution

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



Warning

DANGER OF INJURY TO SELF OR OTHERS

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

1. Introduction

The Gemini 720im fuses Tritech's Gemini Multibeam technology with Tritech's Micron technology to create the world's smallest Multibeam imaging sonar. Having a 90° horizontal field of view and 50m end range, with an update rate up to 20Hz, the Gemini 720im brings real-time imaging to places where Multibeam was never possible before. With incredibly compact dimensions the Gemini 720im can be used in applications where size is critical. This makes the Gemini 720im ideally suited for micro ROV/AUV's in addition to applications where space is restricted or weight is critical, including diver helmet and pole mounted applications such as Search and Recovery (SAR) operations.

Operating at 720 kHz, the Gemini 720im augments the successful Gemini range of imaging Multibeam sonars and amalgamates many of the Gemini 720is and Gemini 720ik features into an ultra-compact unit. The Gemini 720im communicates with Tritech's Next Generation Integrated Software Suite Genesis using Ethernet or Tritech's advanced Serial Multibeam Protocol (TSMP).

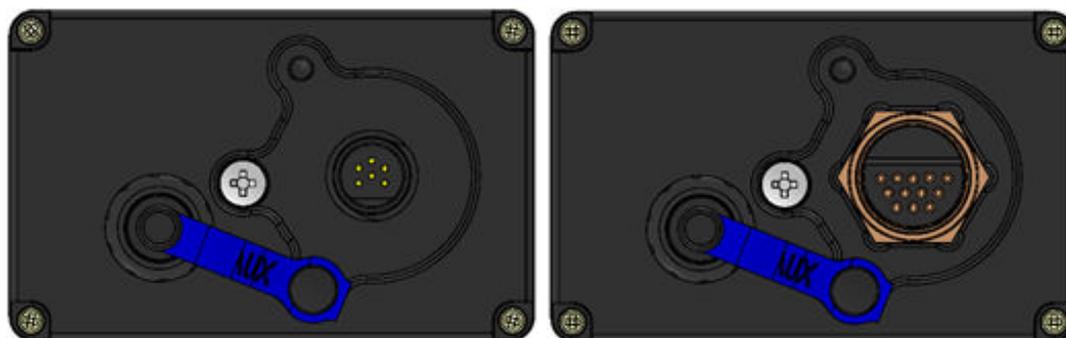
The auxiliary port on the sonar allows for the daisy chaining of sensors including the Micron USBL Modem and Micron Echo Sounder. Advanced adaptive processing ensures that the most detailed image possible is generated regardless of range. This includes automatic switching between Compressed High Intensity Radar Pulse (CHIRP) and Continuous Wave (CW) modes of operation to maximize image definition. Tritech's Next Generation Integrated Software Suite Genesis is supplied with the Gemini 720im and is available from the Tritech website, supporting all Tritech's sensors. There is also a Windows® and Linux Software Development Kit (SDK) for the sonar to allow users to fully integrate the Gemini 720im into a customised system.

1.1. Sonar Variants

The following shows the 3 different connector types and communication protocols associated with them.

Serial Communications (Tritech MICRON or Seacon HUMMER Connector)

RS232 or RS485 configurable

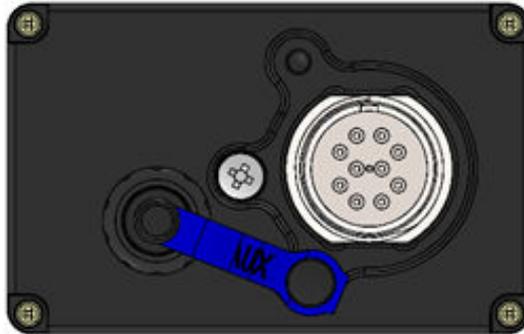


The 720im Micron Connector variant

The 720im Hummer Connector variant

Serial (RS485) and Ethernet (Impulse MKS connector)

Provides both communications options for total flexibility



The 720im MKS Impulse Connector variant

Ethernet Communications (Seacon HUMMER connector)

Operation over standard (100Base-T) Ethernet network



The 720im MKS Hummer Connector variant

For pin out connector information, please see Appendix C, *Connector details*.

2. Getting Started

The following instructions are to help the user connect the system together for the first time and be able to successfully power on the unit. In order to prepare the system and test its functionality before mounting to a vehicle, the 720im requires either an Ethernet or Serial Deck test kit (depending on user requirement). If seeking support from Trittech, reference may be made to bench testing the unit on a short test cable.



A Gemini 720im Bench Test setup

2.1. Serial System Deck Test Kit

The Serial system consists of the following parts:

- A tri-splice Ethernet and Serial Breakout Assembly, enabling connection via a Serial to USB connection - for use in RS232 or RS485 mode
- A Power Supply unit
- A 10 Metre serial test cable



2.1.1. Assembling the Serial System

Step 1: Connect the Breakout assembly to the 10 metre Serial test cable, making sure to properly align the Souriau connector and its keyway.



Female connector of the Breakout Assembly and male connector of the test cable.

A correctly mated Souriau communications cable

Step 2: Plug the connector end of the 10 metre serial cable into the 720im sonar, following the connection procedure for the appropriate connector.



A Serial Hummer Cable ready to be mated to the connector

A correctly mated Hummer cable

Step 3: Connect the power supply unit to the breakout assembly, making sure to properly align the Souriau connector and its keyway.



Female connector of the power supply unit and male connector of the breakout assembly



A correctly mated Power cable

Step 4: Plug the USB connector on the Serial Breakout Assembly into your computer, once this is done a dim orange light will show indicating the system is establishing what communications protocol it is supposed to use.



A USB to serial Converter indicating that it is establishing communications

Step 5: Once the system has established communication, the dim LED on the USB connector will appear brighter to indicate this. The system is now ready to operate with the software, green LED's indicate the transmission and receipt of data. For details of configuring the sonar parameters consult the Genesis software manual - 0716-SOM-00001



A USB to serial Converter indicating that has established communications

2.1.2. Ethernet System Deck Test Kit

The Ethernet system consists of the following parts:

- An Ethernet and Serial Break out Assembly which enables RJ45 connection for Ethernet
- A Power Supply unit
- A 10 Metre Ethernet test cable



2.1.3. Assembling the Ethernet System

To assemble the Ethernet system the process is similar to the Serial system.

Step 1: Connect the Breakout assembly to the 10 Metre Ethernet test cable, taking care to properly align the Souriau connector and its keyway.

Step 2: The connector on the Gemini and the Power Supply cable should be connected, similar to the instructions given for the Serial System setup (see Section 2.1.1, “Assembling the Serial System”).

Step 3: The Ethernet system requires the RJ45 connector plugged into your computer instead of the USB device. If using the system for the first time or after installing new software. See Appendix E, *Setting the computer IP address in Windows® XP* or Appendix F, *Setting the computer IP address in Windows® 7 or Windows® 10* for information on setting up your computers Ethernet network port.

3. Installation

The sonar should be mounted with the receiver element on the top. This is achieved by making sure the blue Gemini logo is uppermost.

The transmit and receive elements are arranged such that they are angled at 0° about the horizontal axis which should be taken into account when 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 different in composition to the material used by the sonar) they should be painted or lacquered with at least two or three coatings.



Caution

The outer case of the Gemini 720im is made of anodized aluminium. When deploying the sonar and fixing to our ROV, avoid alloys containing copper such as brasses or bronze should be avoided.

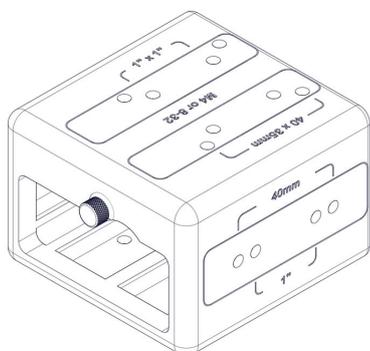
3.1. Installing the Gemini 720im onto your Vehicle

There are multiple ways to affix the 720im onto your vehicle due to its small size and versatility. With this in mind, Trittech have produced the 720im Mounting Bracket Kit to enable the customer to adapt to their application, giving users the ability to angle the sonar at either 0° or 10° upward or downward tilt.

720im Mounting Bracket Kit

The kit comprises of the following components:

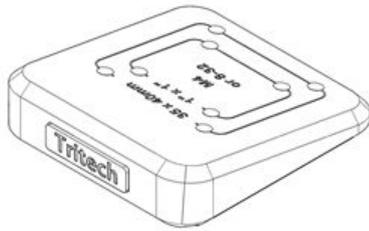
- 1 x Sonar Mounting Bracket
- 1 x Mounting Bracket 10° Adaptor
- 4 x M4 x 10 screws, plus Nyloc nuts
- 1 x Imperial or metric Allen key



Sonar Mounting Bracket

The Sonar Mounting Bracket allows the user to securely mount their 720im within a protective shell via a captive screw. The bracket utilises both imperial and metric fittings to enable the user to fit to their vehicle.

720im Mounting Bracket Kit



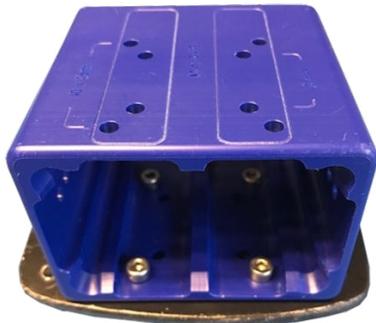
Mounting Bracket 10° Adaptor

This allows the user to easily mount their mounting bracket at either 10° downward tilt for increased resolution or 10° upward tilt for through water imaging.

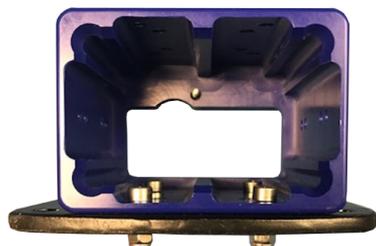
3.2. Fixing the Sonar Mounting Bracket to your vehicle at Zero°



The Sonar Mounting Bracket has both Metric and Imperial mounting hole footprints to allow easy mounting of the adapter. The following instructions assume that holes have been drilled in a mounting plate for your vehicle. See Appendix D, *Mount Bracket details* for the dimensions for imperial and Metric holes. The example in this manual is given using Metric fitments.



Step 1: Place the adapter onto the vehicle/mounting plate as shown and place 4 of M4 x 10 screws into the required mounting holes



Step 2: Underneath this place 4 x M4 nyloc nuts to secure the mounting bracket in place, tighten up with a spanner and 3mm Allen key.

3.3. Fixing the Sonar Mounting Bracket to the 10° Adaptor

In the following examples the 720im is mounted via the 10° tilt adapter to a pre drilled mounting plate for a popular ROV system. See Appendix D, *Mount Bracket details* for the footprint for the holes needed for mount.



The 10° Adapter has both Metric and Imperial mounting hole footprints to allow easy mounting of the adapter. The following instructions assume that holes have been drilled in a mounting plate for your vehicle. See Appendix D, *Mount Bracket details* for the dimensions for imperial and Metric holes. The example in this manual is given using Metric fitments.



Step 1: Place the adapter onto the vehicle or mounting plate and place 4 of M4 x 10 screws into the required mounting holes.



Step 2: Underneath this place 4 of M4 x 10 nyloc nuts to secure the mounting bracket in place, tighten up with a spanner and 3mm Allen key.



Step 3: You are now left with the adapter fitted to the plate and the mounting bracket.

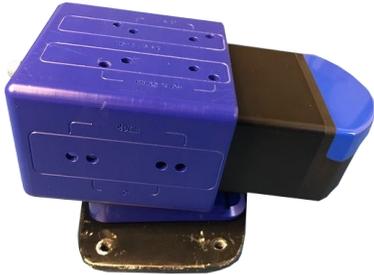


Step 4: Fit the mounting bracket as shown onto the adapter. Making sure that it is facing the correct way up, with the captive screw uppermost.



Step 5: Align the mounting holes that you want to use, place the M4 x 10 bolts into the holes in the mounting bracket and fasten by turning clockwise.

3.4. Mounting the 720im Sonar into the Bracket



Step 1: Insert the 720im as shown into the mounting bracket, making sure that the sonar is facing the correct way up.

Step 2: Align the Sonar mounting hole with the captive screw and fasten by turning clockwise. The captive screw is shown located above the main connector.



The captive screw is shown above the connector unfastened.



A 720im securely mounted inside the Mounting Bracket.

3.5. Clamp Mounting Bracket

The clamp mounting bracket allows the user to quickly mount and dismount a Gemini 720im to their vehicle. To mount the 720im onto the clamp follow the instructions below.



Step 1: Here you have the Clamp bracket and the Gemini 720im needed for mounting the system to your vehicle.



Step 2: Place the Gemini 720im in the clamp bracket, making sure to position as far forward as possible.



Step 3: Move the lever all the way to the left to lock off the mount. The Gemini 720im is now ready to connect its cable.

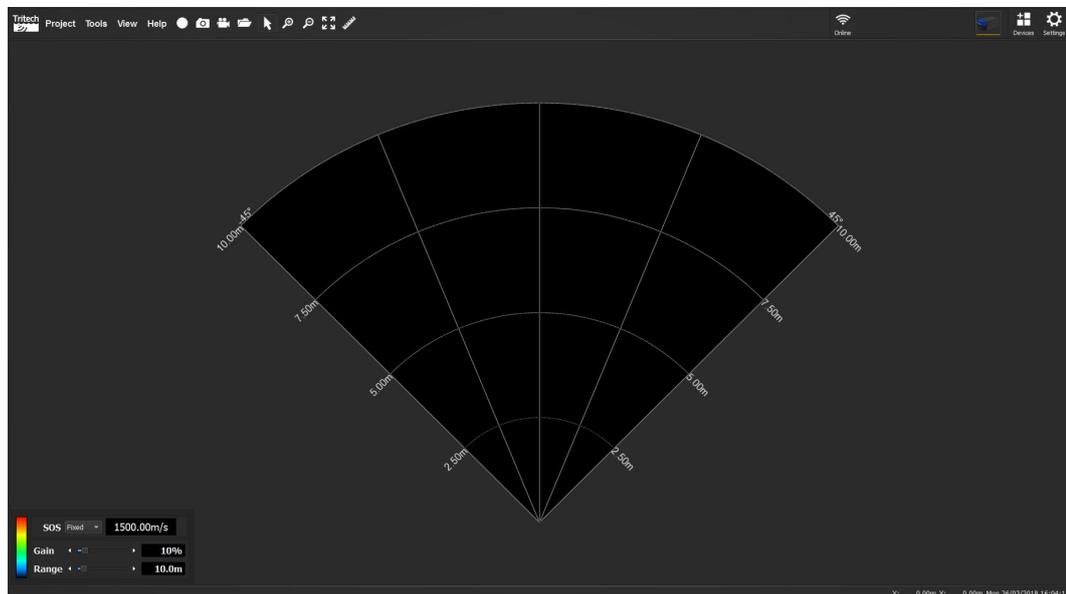
4. Operation

Once fully connected to the PC (see Chapter 2, *Getting Started*) run the Genesis software using the desktop icon: .

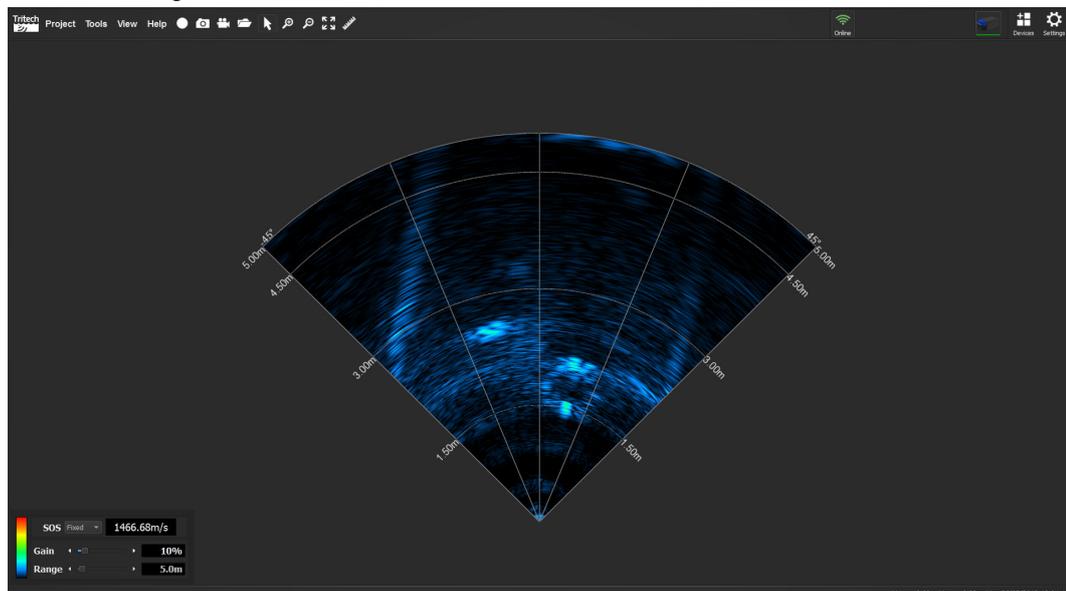
If connecting the Gemini 720im via an Ethernet connection, ensure that the computer IP has been set to the correct range to operate with the sonar. Please see Appendix E, *Setting the computer IP address in Windows® XP* or Appendix F, *Setting the computer IP address in Windows® 7 or Windows® 10* for details on this process.

4.1. First Power On

Genesis will automatically detect any Gemini 720im units connected to your computer and will update its **Device Bar** with all the available units.



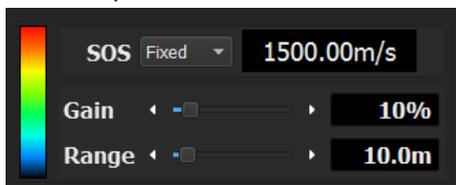
To start seeing data from the Gemini, click on the **Online** button.



4.2. Basic Controls

4.2.1. Sonar Controls

When Genesis shows data from the Gemini 720im it will automatically display the Sonar Controls panel at the bottom left of the View.



The Sonar Controls allow you to alter the operation of the Sonar in order to maximise its potential for your application.

Control	Function
Gain	This control effectively increases the brightness of the image. By changing the gain the Sonar will amplify the incoming signal so that you can better see weak signals. This will also increase the effect of any noise in the system.
Range	This control changes how far the sonar can see. By increasing the range the sonar will visualise further and be able to see targets at greater distances. Increasing the range will affect the update rate of the sonar. Long ranges will mean slower update rates.
SOS	This control changes the speed of sound used by the sonar to generate the onscreen imagery. As the Gemini 720im does not include an inbuilt sensor for this, a fixed value needs to be used. By using the up and down arrows you can adjust the speed of sound in set increments. You can also simply type the desired value into this section. The value can be between $1400\text{m}\cdot\text{s}^{-1}$ and $1589\text{m}\cdot\text{s}^{-1}$
Colours	The Colour palette control changes the colours used to display the imagery on screen. Depending on the strength of the acoustic return, the data will be displayed using one of the colours within the selected palette. Strong returns will tend to be at the upper end of the palette, while weak returns will be at the bottom end. If the data looks dark, with all the returns at the bottom end of the palette, try increasing the gain to brighten the image.

4.2.2. Logging data

To record data from the Gemini 720im, simply click on the **Record** button.



By default, Genesis will start recording into the default storage location. It will display the details of the log file at the bottom left hand side of the screen.

Recording: C:/GenesisData/Log Files/20180227/data_2018-02-27-145544.ecd (2.65MB)

5. Maintenance

5.1. General guidance



Caution

It is essential to have a regular maintenance schedule so that any defects arising from corrosion or erosion can be spotted early and corrected before they cause severe damage to the unit. It is recommended that the unit is annually serviced and can be returned to Trittech International Ltd for this purpose.

Although the Gemini range is not field serviceable regular care and maintenance of the unit should be carried out. Ensuring that the electrical connectors are clean and free of corrosion will aid in preserving the working lifespan of the unit. Particular care should be taken for units that use an o-ring seal on the connectors and blanking caps to ensure that these o-rings are seated properly. Regular visual inspection of the unit around the areas where salt build up can occur will help highlight any potential issues of corrosion and allow for corrective action to be undertaken before any integrity failure of the unit. The mechanical interface between the bulkhead connectors and housing elements should also be inspected.



Caution

It is recommended that Gemini units be returned to Trittech as part of a regular maintenance schedule. An annual return is highly recommended, but this can be lengthened, or shortened, by various factors:

- Frequency of use
- The operating environment (i.e. salinity, temperature)
- The presence of any galvanic action from dissimilar metals, or case voltages

5.2. After using the unit

Make sure that after using the sonar head 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.

5.2.1. Sacrificial Anode Information

There is a zinc alloy sacrificial anode fitted to the rear of the Gemini 720im which is intended to prolong its active life when submerged for long periods of time.

The lifespan of the anode itself will vary greatly depending on the conditions it is exposed to, so it may need to be changed on a relatively regular basis. As a minimum, *Trittech International Ltd* would recommend replacing the anode every year when the sonar is in regular use.

Replacing the Anode



Step 1: Remove the spent or damaged sacrificial anode from your sonar with a cross head screwdriver.

Step 2: Open the replacement spare kit, the part number is shown above. Build the kit with the plastic washer nearest the sonar, anode and then the screw.



Step 3: Fit to the sonar and tighten up the screw.

Spare anode kits can be purchased from *Tritech International Ltd* using the part number: **S11882**

5.3. If storing the unit for extended periods

Make sure the unit is completely dry with no signs of moisture on any of the connectors. Fit all blanking plugs to the unit and pack into an appropriate storage container along with several pouches of silica gel.

6. Troubleshooting

The software reports that no sonars are detected

Ensure that the latest revision of Genesis software is running on your computer. Visit www.tritech.co.uk to download the latest version. 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, 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. 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

Ensure that the latest revision of Microsoft® .NET™ framework has been fully installed onto your PC or laptop. Check your network settings on the PC. Typing "route print" into 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

Ensure that the latest revision of Microsoft® .NET™ framework has been fully installed onto your PC or laptop. Check that there is no other software, or service, that is intensively using

the network connection. Run the PC or laptop with just the Gemini software and verify that the unit's performance has been improved. There may be noise induced onto the Ethernet cables, be sure to route these as far away as practicable from noise sources. 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 updating network card drivers and a different brand of network card. Also check that the PC and graphics chipset meet the minimum spec.

Appendix A. 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 the Warranty Statement, 0080-STF-00139, available upon request.

Tritech International Ltd can be contacted as follows:

	Mail	<i>Tritech International Ltd</i> 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



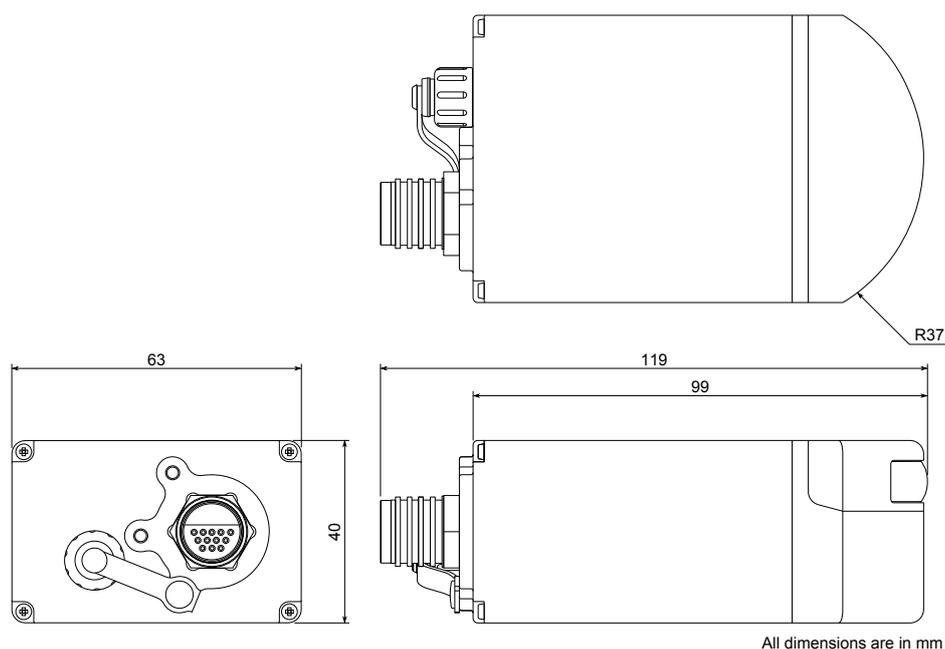
Contamination

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.

Appendix B. Technical Specifications



Acoustic Specifications	
Operating frequency	720kHz
Angular resolution	2.34° acoustic, 0.7° effective
Range	0.2m to 50m
Number of beams	128
Horizontal beam width	90°
Vertical beam width	20° ($\pm 10^\circ$ about horizontal axis)
Update rate (typical operation)	3 to 20Hz (range dependent)
Range resolution	8mm (range dependent)
Mode of operation	CW or CHIRP
Speed of sound	Adaptive beamforming based on user specified speed of sound

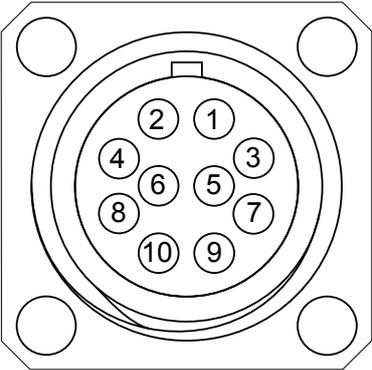
Interface	
Supply voltage	12 to 48V DC
Power requirement	4.5W - 17W (7.5W average) ¹
Main port protocol	Ethernet (100Base-T) and / or Serial (RS232 or RS485)
Auxiliary port protocol	Serial (RS232 or RS485)
Connector type	Main: Seacon HUML-12, Impulse MKS(3) & Trittech Micron Aux: Trittech Micron

Physical Specification	
Depth rating	300m
Weight in air	0.435kg
Weight in water	0.244kg
Temperature rating	-10 to 35°C, -20 to 50°C

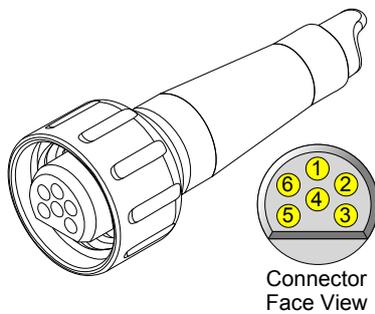
¹ During transmit the sonar draws approximately 17W. The range setting has negligible effect on power consumption.

Appendix C. Connector details

C.1. Impulse MKS Series

Bulkhead Face View	Pin	Function	Cable Face View
	1	Screen	
	2	+V DC	
	3	N/C	
	4	GND	
	5	RS485 A / RS232 Tx	
	6	RS485 B / RS232 Rx	
	7	Ethernet Tx+	
	8	Ethernet Rx+	
	9	Ethernet Tx-	
	10	Ethernet Rx-	

C.2. Tritech Micron



Pin	Function	Colour
1	RS485 A RS232 Tx	Yellow
2	RS485 B RS232 Rx	Blue
3	+ V	Red
4	0V DC	Black
5	RS232 GND	Green
6	Shield	Cable sheath

C.3. Seacon HUML connector

Serial Communications

Cable Face View	Pin	Function
	1	Screen
	2	+V DC
	3	+V DC
	4	GND
	5	GND
	6	Comms GND
	7	RS485 A / RS232 Tx
	8	N/C
	9	N/C
	10	RS485 B / RS232 Rx
	11	N/C
	12	N/C
<i>Blue shell denotes Serial communications</i>		

Ethernet Communications

Cable Face View	Pin	Function
	1	Screen
	2	+V DC
	3	+V DC
	4	GND
	5	GND
	6	N/C
	7	N/C
	8	Ethernet Tx+
	9	Ethernet Rx+
	10	N/C
	11	Ethernet Tx-
	12	Ethernet Rx-
<i>Black shell denotes Ethernet communications</i>		

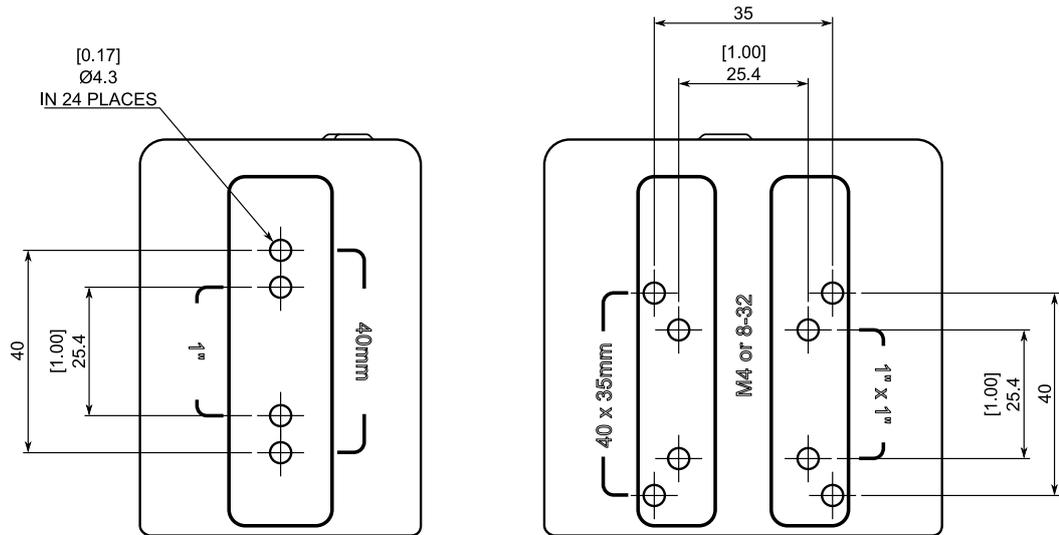
Appendix D. Mount Bracket details

D.1. Sonar Mount Bracket



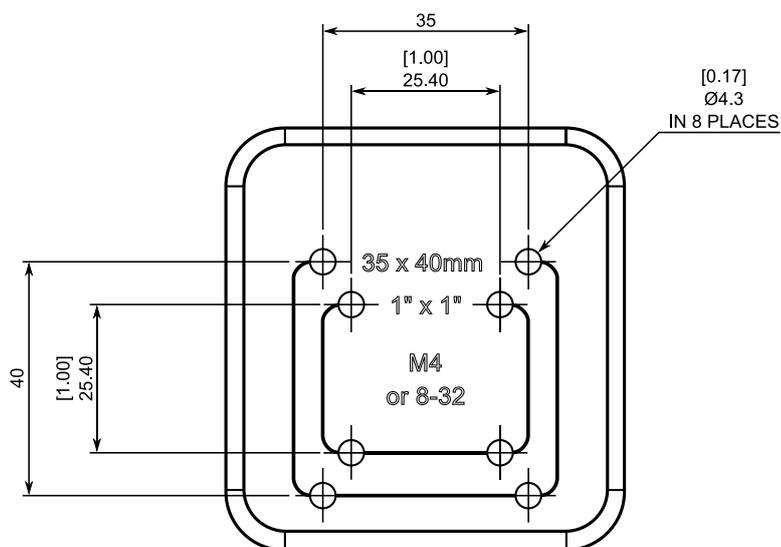
Note

Drawings are not to scale.



HOLE PATTERNS REPLICATED ON OPPOSITE SURFACES

D.2. Mounting Bracket 10° Adaptor



Appendix E. 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.

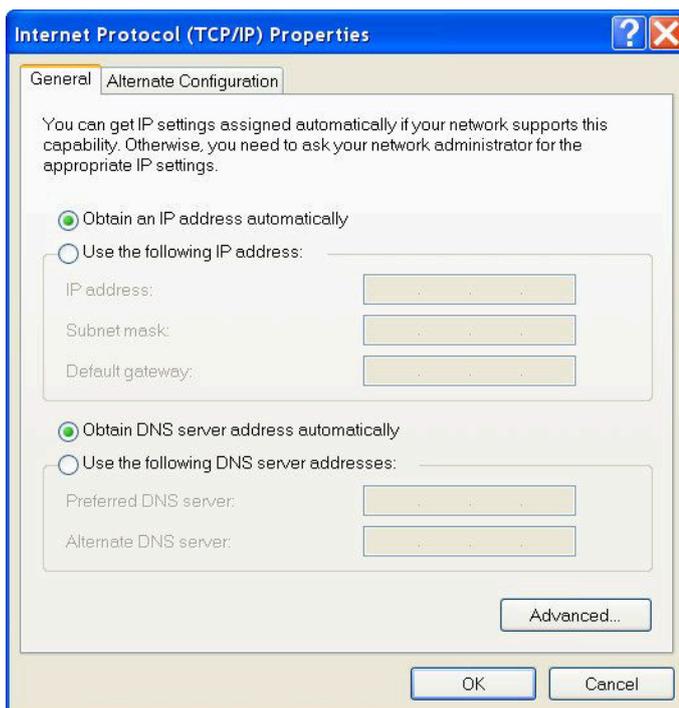
If the computer is connected to a network already, disconnect it from that network.

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 head.

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

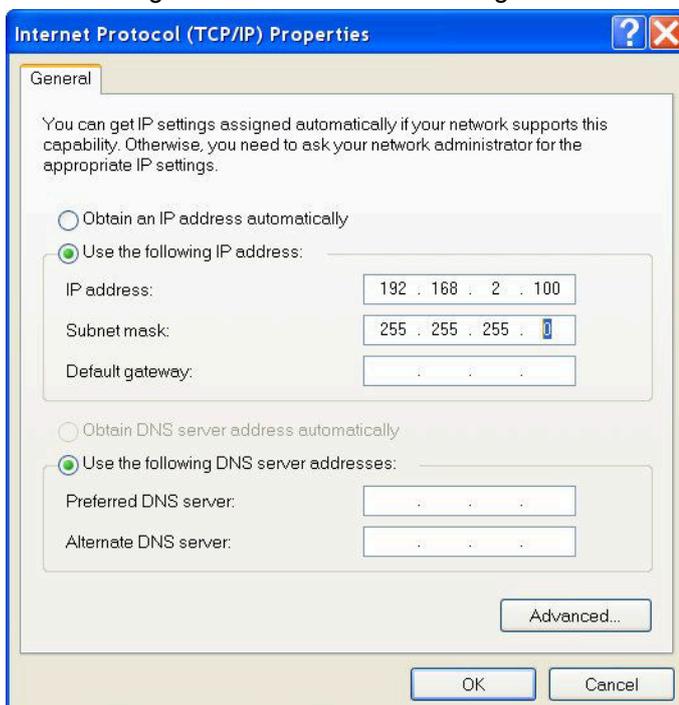


Scrolling the "This connection uses the following items" box will reveal an item titled "Internet Protocol (TCP/IP)". Click this item to select it, and then press the Properties button. The following dialog should open:



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:

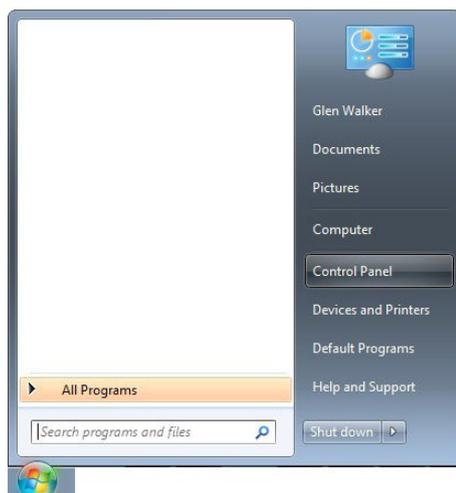


Appendix F. Setting the computer IP address in Windows® 7 or Windows® 10

The following instructions apply to a computer running Windows® 7 or Windows® 10, though the sequence for other operating systems will be similar. All screenshots are from a Windows® 7 installation.

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.



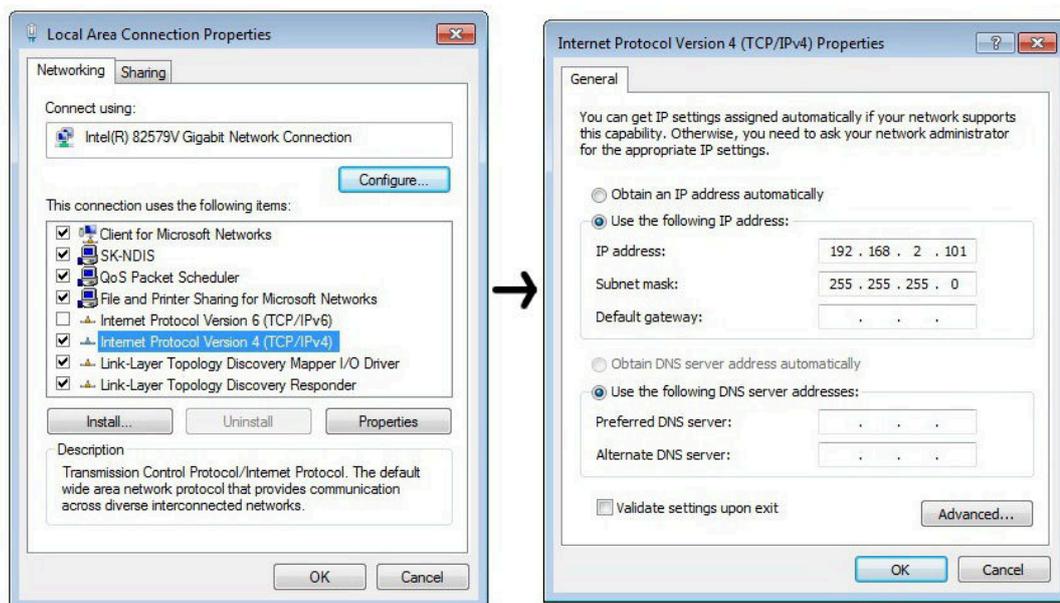
This will bring up the Network and Sharing Center which allows configuration of any networks on the computer. Click on Change adapter settings on the left-hand pane.



A list of attached network devices should now present itself. Find the one which the Gemini head 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.

Glossary

CHIRP	Compressed High Intensity Radar Pulse - a technology for improving image resolution initially used in radar systems but also adapted to sonar devices.
Ethernet	A family of computer networking technologies for local area networks (LANs).
Gemini	Unless specified this can refer to any of the multibeam sonars in the Gemini range by <i>Tritech International Ltd</i> , from the market leading 720is to the world's smallest multibeam - the 720im.
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.
RS232	Traditional name for a series of standards for serial binary data control signals.
RS485	A standard for defining the electrical characteristics of drivers and receivers for use in a balanced digital multipoint system (also known as EIA-485).
TSMP	This is a data transmission protocol developed by Tritech to allow for the transmission of high volume data over a Serial (RS485 and RS232) link thus allowing a Multibeam to run over a simple copper twisted pair when using RS485. The Tritech USB to Serial converter has been developed to provide optimum telemetry performance although the sonar will operate with any high quality Serial interface.
USBL	Ultra Short Base Line (positioning system)