Super SeaKing
V7 Sonar

Product Manual

Tritech

Outstanding Performance in Underwater Technology

A Moog Inc. Company

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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:

Address	Tritech International Ltd
	Peregrine Road
	Westhill Business Park
	Westhill, Aberdeenshire
	AB32 6JL, UK
Telephone	+44(0)1224 744 111
Email	tritech-support@moog.com
Website	www.moog.com/tritech

Prior to contacting Tritech International Ltd please ensure that the following information 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 information 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 end user'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.

1.1   Overview

The V7 Super SeaKing DST mechanical scanning sonar offers enhanced performance and the option of Ethernet communication for high speed scanning over short ranges. Retaining dual frequency capability, the Super SeaKing DST can achieve 300m range at 325kHz, with increased image intensity and with improved mid-water target discrimination capability at 675kHz.

The SeaKing is further enhanced with a software controlled power isolation switch for Auxiliary Port output.

Ideally suited for ROV/AUV obstacle avoidance, target recognition and harbour surveillance, the Super SeaKing DST can be supplied to operate down to 4000m or 6800m. Aluminium and Titanium housings are available as well as a number of connector options.

The default configuration of the Super SeaKing DST utilises Tritech's propriety connector, upgraded to provide Ethernet communication capability while retaining all of the benefits of this industry recognised connector.

With the option of Ethernet, ARCNET, RS232 and RS485 communications, the Super SeaKing DST is simple to install on ROV/AUVs of all types. Utilising the latest electronics and composite transducer technology the Super SeaKing DST provides increased target definition at all ranges. This market leading product continues to deliver the clearest image available by utilising Compressed High Intensity Radar Pulse (CHIRP) technology, a technology that helped define the Super SeaKing DST as the preferred mechanical scanning sonar.

CHIRP technology dramatically improves the range resolution, providing greater definition at long range, compared with conventional sonars. Resolution can be improved by a factor of five times.

The Super SeaKing DST is the standard obstacle avoidance sonar for many global ROV fleets. A modular transducer design, long life slip ring assembly and the use of the latest electronics ensures the Super SeaKing DST maintains its reputation for providing exceptional reliability.

Dual Frequency	*Range*	*Range Resolution*
325 & 675 *kHz*	0.4 - 300 *meters*	0.015 *meters*

Related Products

PA500/6 Altimeter

Super Seaking V7 Bathy

Seaking Side Scan

Gemini Multibeam Sonars

1.2   Technical Specifications

4000m Aluminium Housing
Dimensions in millimetres.
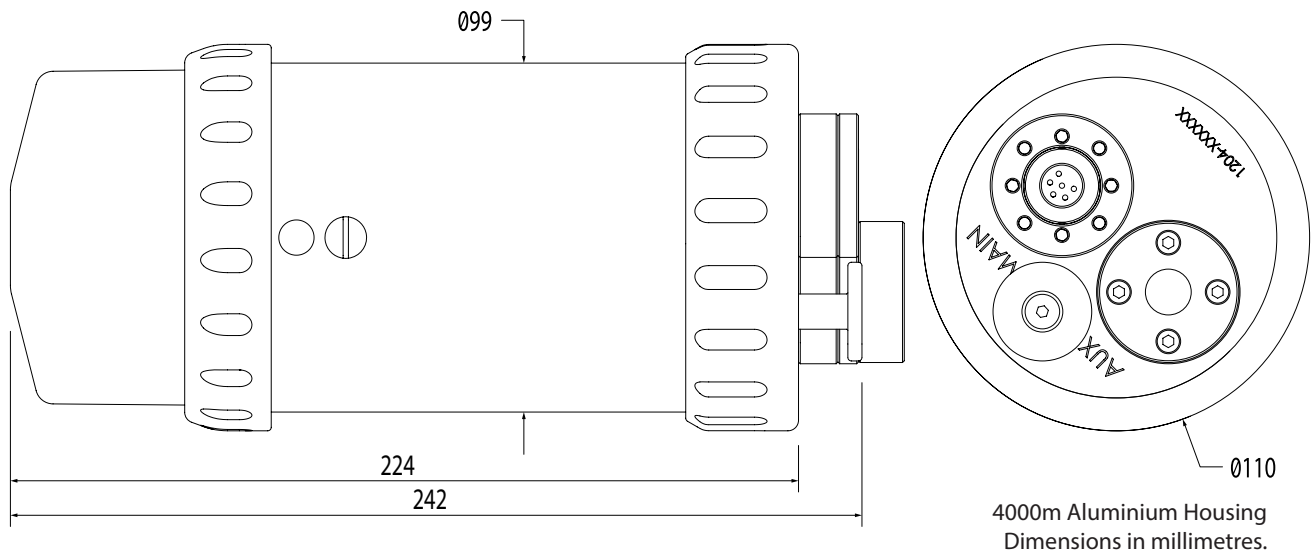
Physical Properties	Super Seaking V7 (Aluminium)	Super Seaking V7 (Titanium)	Super Seaking V7 (Titanium)
Depth Ratings	4000m	4000m	6800m
Weight in air	3.0kg	4.1kg	4.8kg
Weight in Water	1.4kg	2.5kg	2.9kg
Temperature Ratings	Operating -10°C to 35°C, Storage -20°C to 50°C		

SeaKing Acoustic Properties	Low Frequency 325kHz	High Frequency 675kHz
Chirp Frequency	50kHz centred on 325kHz	50kHz centred on 650kHz
Beamwidth	20° vertical, 3.0° horizontal	40° vertical, 1.5° horizontal
Pulse length	400µs	200µs
Range	0.4m - 300m	0.4m - 100m
Source level	210dB re 1µPa at 1m	

Display Characteristics	Low	Med	High	Ultra
Mechanical resolutions	3.6°	1.8°	0.9°	0.45°
Scanned sector	Variable up to 360°			
Continuous 360°	Yes			
Sector offset mode	Yes			

Electrical and Communication			
Power Requirement	Main		20VDC to 70VDC @ 8w
	Aux		Pass-through from Main as standard
Communications	S11332 ETH	Main	Ethernet & Serial RS232/RS485
		Aux	Serial RS232/RS485
	S11332 ARC	Main	ARCNET & Serial RS232/RS485
		Aux	

2.1   Hardware Installation

The sonar should be mounted using suitable pipe clamps, or similar to firmly secure it to the vehicle. Tritech recommends the use of 3mm insulating rubber spacers to aid grip and prevent damage to the anodised coating.

It's recommended, during installation, that the Sonar be positioned so it has an unobstructed view of the intended scan area, while also avoiding prop-wash from thrusters. Ensure the Super Seaking V7 is protected from possible impact damage.

During Installation, be sure to safeguard against damage to the protective anodised coating on the main housing. Any chips or scratches may lead to corrosion of the housing which may impact the performance of the system.

> ⚠ **Caution**
> Non-metallic clamps are preferred when securing the Sonar, however, if metallic clamps are to be used they must be electrically insulated to protect the housing.
> **Avoid any clamping material that may contain brass or bronze.**

Mate connectors/blanks ensuring the washers are in places and have been greased and the securing screws have been tightened.

> ℹ **DO NOT OVER-TIGHTEN RETENTION SCREWS.**
> If using a Seacon connector, you are reminded that the retention ring should be finger tight. Applying too much pressure risks damaging the connector.

Run cables to junction box for integration to your system, securing to the vehicle as you go. Check that the cables and connectors are not subjected to excessive strain and are not kinked or bent excessively. The safe bend radius of the V7 cables is 100mm.
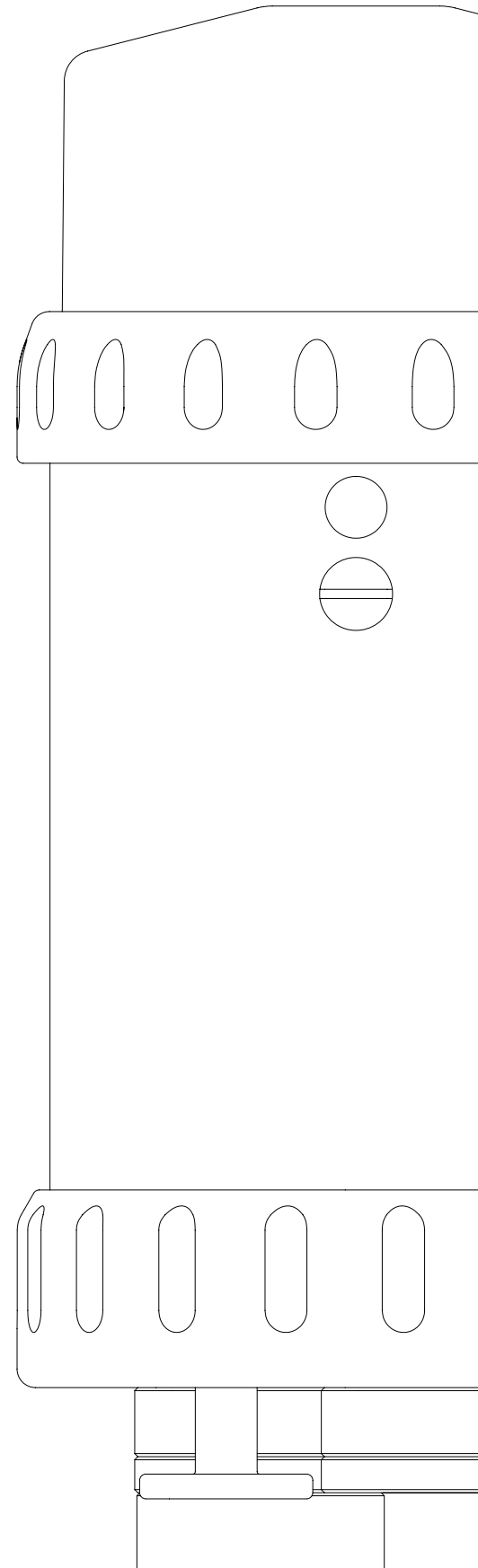
The Super Seaking V7 Series systems are designed to operate from a smoothed DC power supply. If using a rectified transformer PSU, the output of the PSU must have a filter capacitor of not less than 470μF, for each unit being powered.

If an unregulated PSU is used, the voltage value measured during power on/off and running conditions at the unit should be within the voltage range specified for the system.

When powering the unit(s) down a long lead or umbilical, the maximum recommended resistance of the power line must not exceed 10Ω for one unit, 5Ω for two units and 3Ω for three units.
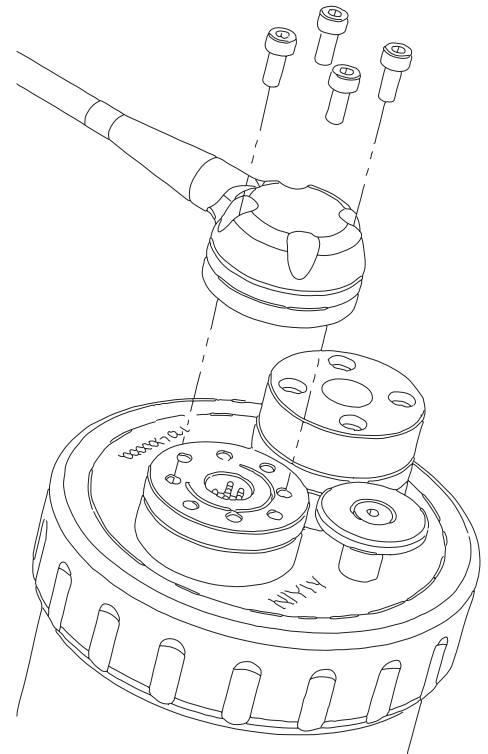
2.3   Electrical Connections

The Super Seaking V7 is supplied with a polyurethane jacketed cable whip as standard fitted with a Tritech connector at one end. Depending on the specification of the system, the cable will either need to be terminated to a suitable connector or may be supplied already terminated.
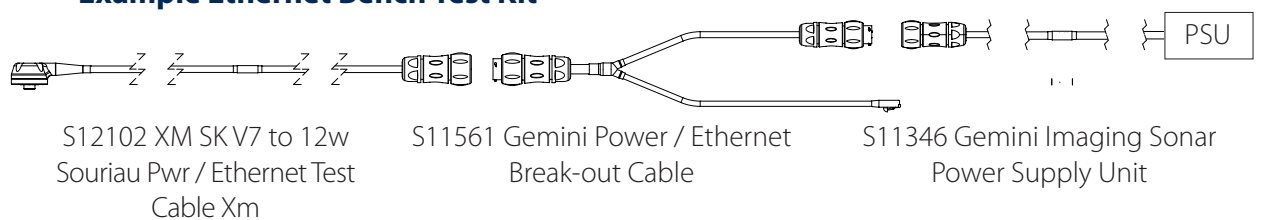
The standard Tritech connector may be disconnected from the unit by unscrewing the four M4, cuphead retaining screws and removing the connector from the water block that is fitted to the end-cap, do not remove the water block.

While the cable is removed the exposed connectors should be fitted with appropriate blanking caps to prevent the ingress of dirt or moisture.

For devices fitted with non-Tritech connectors this procedure will vary. For information on Tritech Standard wiring, connectors and pinouts please refer to Section 2.6 of this manual.

Example Ethernet Bench Test Kit

S12102 XM SK V7 to 12w Souriau Pwr / Ethernet Test Cable Xm	S11561 Gemini Power / Ethernet Break-out Cable	S11346 Gemini Imaging Sonar Power Supply Unit

> **Note**
> The above example is not intended tfor use in wet conditions and is intended for dry testing only. Never subject the Gemini PSU or Souriau connectors to water.

2.4   Communications Configurations

The V7 is a direct replacement for a V6 sonar, with the exception of customers requiring Ethernet capability. This will require either a proprietary Tritech V7 connector or a compatible connector and cable harness. ARCNET and Serial comms protocols are still supported..

Super Seaking V7 Sonar can be configured as Ethernet and Serial RS232/485 or as ARCNET and Serial RS232/485 communication protocols. There is no combined ARCNET and Ethernet option.

See section on software setup for guidance on configuring your network.

Ethernet & Serial (RS232/RS485)

When connecting via Ethernet, the Sonar can communicate at 100MB/s.

If the Sonar shares it's Ethernet link with other high bandwidth devices, such as video cameras, it is recommended that a gigabit (or faster) network interface be used to the surface to reduce possible network congestion. As standard we Tritech set the sonar IP address to 192.168.2.17 and subnet mask to 255.255.255.0.

ARCNET & Serial (RS232/RS485)

The Super Seaking V7 Sonar can be set to form part of an ARCNET multidrop network of sensors that are normally interfaced to a Surface Control Unit (SCU) through an internal DA-15 ARCNET interface (AIF) port or through the DA-15 AIF port on a SeaHub.

Normal communication with the sonar head is via a customised version of the ARCNET network system and requires a good quality balanced twisted pair cable. There is also an option to run a single head from a serial RS232/RS485 connection.

> **Note**
> The ARCNET system requires termination resistors to be fitted at each end of the umbilical. Please refer to Appendix A, ARCNET Termination for more details of the termination requirements.

## 2.5   Ground fault Monitoring

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

The wiring diagrams below refer to the V7 Tritech connector on the main port and show the standard Tritech connector wiring on the Aux port. Other connector options are available upon request, please contact our sales team for full details.

> **WARNING**
>
> Application of reverse supply voltage to the unit or supply voltage across any of the communication connections may lead to equipment damage not covered under the warranty conditions.

> **Note**
>
> Ethernet communications require the use of V7 cables ARCNET and Serial Communications are compatible with both V7 and Standard Tritech cables.

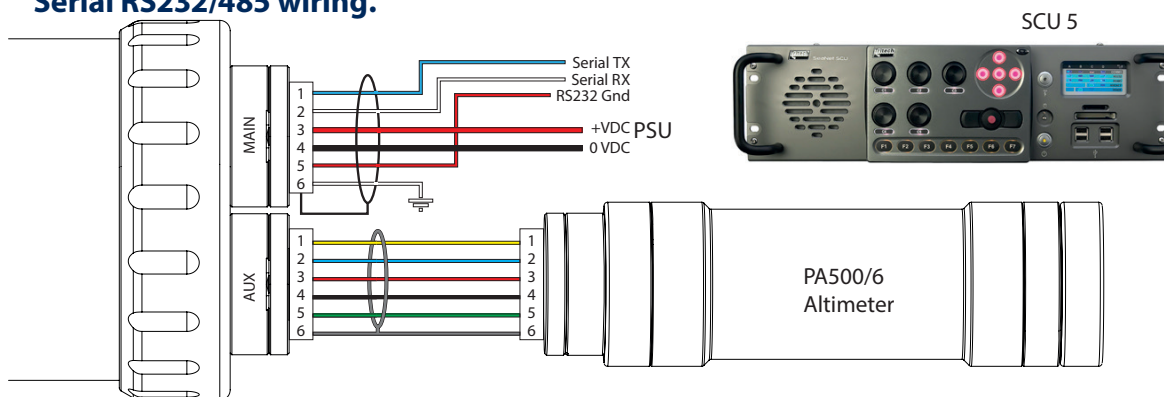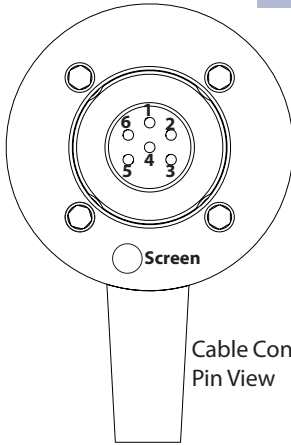### Ethernet Wiring.
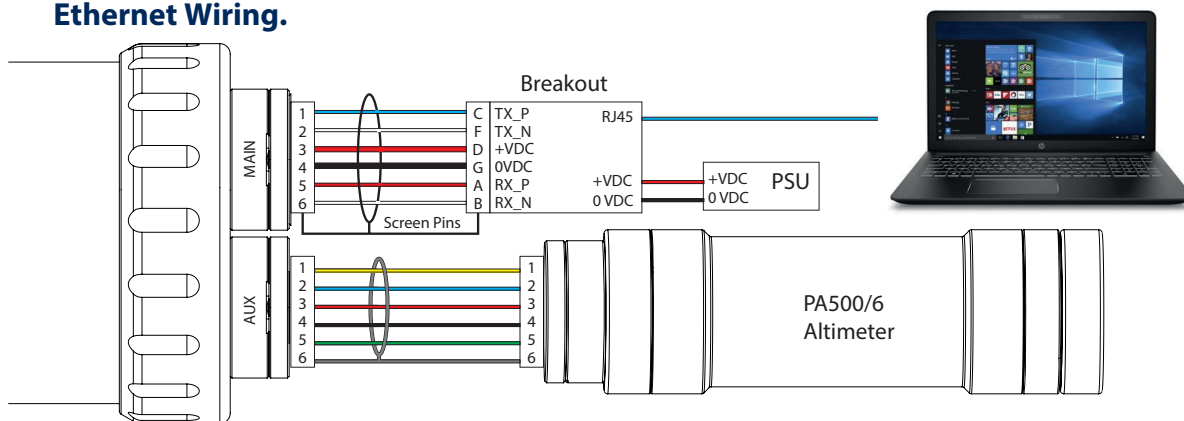
ARCNET Wiring.
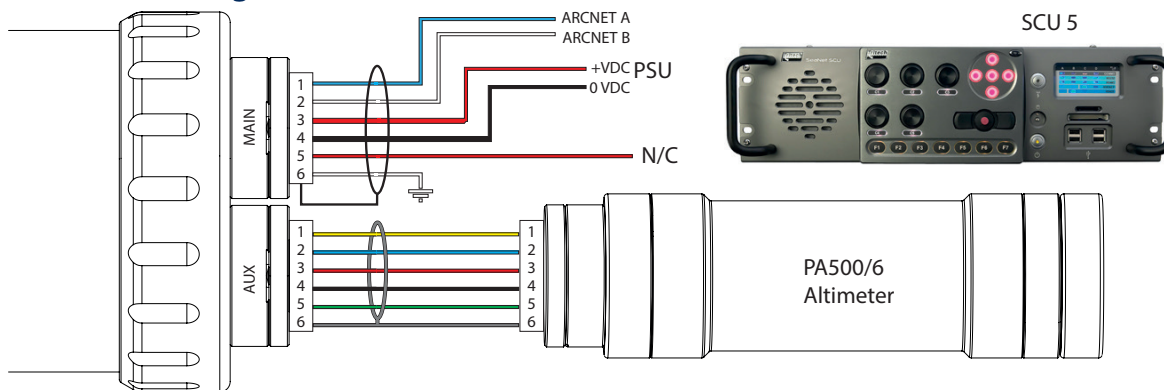
Serial RS232/485 wiring.

2.7   Tritech V7 Connector


Screen

Cable Connector
Pin View

The V7 cable connector has the addition of the screen contact in the outer ring of the connector. This makes contact with the chassis ground of the system which is required when using Ethernet Comms.

When using ARCNET and Serial Communications systems, standard cables are compatible.

V7 Cable Pin-Out

Contact	Pin-Out				Cable		
	ARCNET	RS232	RS485	V7 Conn. Ethernet	Conductor Colour V6	Conductor Colour V7	Conductor Diameter
1	A	TX	A	TX_P	Yellow	Blue	UTP #1: 0.22mm^2 / ~24 AWG
2	B	RX	B	TX_N	Blue	White	UTP #1: 0.22mm^2 / ~24 AWG
3	+VDC				Red	Red	0.5mm^2 / ~20 AWG
4	-VDC				Black	Black	0.5mm^2 / ~20 AWG
5	N/C	RS232 GND	NC	RX_P	Green	Red	UTP #2: 0.22mm^2 / ~24 AWG
6	Earth			RX_N	Screen	White	UTP #2: 0.22mm^2 / ~24 AWG
Chassis Earth Connection					Screen / Drain Wire		Foil Screen with Drain wire 0.022mm^2

2.8   SeaKing Magnetic Reset
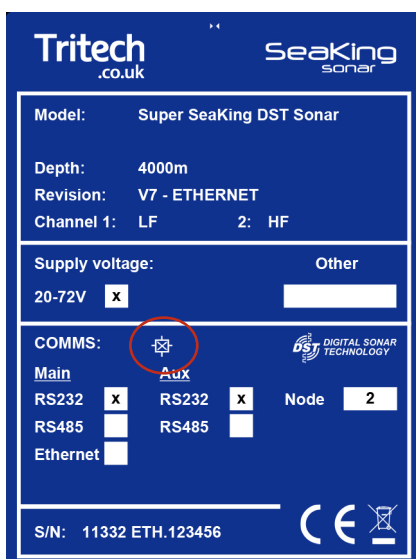
If the comms mode or baud rate of a system has been changed to an unknown state, there is a quick solution to reset the communications protocol to a base RS232 Baud 115200.

Do not apply power just yet.

Return to 'Seanet Setup'.

Ensure the Com Port of the device is setup and enabled

Place a S11247 magnet on the Reset symbol on the label (Circled in red).

Hold the magnet in position and power up the instrument.

When the node appears in Seanet Setup, remove the magnet.

If after 15 seconds, the device does not appear in the Seanet Node list, ensure magnet is aligned correctly and cycle the power.

3. Software Installation

Genesis is Tritech's proprietary software which enables control and communication to our full range of products. Genesis is capable of displaying and outputting multiple sensors simultaneously. This means the user can have Bathy, Sonar and altimeter data all displayed on the same screen.

3.1   System Requirements

In order to install and run Genesis to its full potential, the operating system should meet the following system requirements:

	Minimum	**Recommended**
Processor	2GHz	Intel i7™ Quad Core
RAM	4GB	8GB
Graphics	3D hardware accelerated graphics card	
OpenGL	Version. 2.0	Version 3.3
Display	800x600 32bit (True) colour	1920x1080 32bit (True) colour
Disk space	300 MB free for program installation. 500 GB (SSD recommended) for data recording and storage.	
Operating System	Microsoft Windows 7 and later	
Serial	RS232 or RS485 Hardware Based or USB Converter	
Networking	100BASE-TX Ethernet	1000BASE-T Ethernet

3.2   Genesis Software Installation.

Tritech Software is provided with each purchase of our equipment either on CD-ROM or USB memory sticks.

Ensure any previous version of Genesis has been uninstalled and the computer restarted prior to the installation of a new version

Updates and latest versions of software can also be downloaded from the Tritech website www.moog.com/tritech

Once installed, you can launch the application from the desktop icon or from the Start menu in windows.

Updates

Download the latest software versions from www.moog.com/tritech

Tritech International Ltd continually develop our software so it is recommended to check the website for updates regularly.

3.3   Software Overview

Genesis is a GUI-based software application written and supplied by Tritech to control and display data from our portfolio of equipment which includes imaging sonars and other sensors.

Built upon decades of experience, Genesis has been engineered as an easy to understand GUI that makes adding and configuring devices on your system simple and hassle free. With Genesis, you have the power not only to log, review and manage sensor data, but to also live stream, record and playback multiple camera feeds in the main GUI window. In short, Genesis provides a single interface to display the data you need, where you need it.

Full details of Genesis can be found in the Genesis software manual 0716-SOM-00001and Quick-start Guide.

3.4 Windows Setup

Ethernet Protocol Settings

The Ethernet adapter needs to be setup on the host PC to be in the same IP address range as the sensor being attached. Using Ethernet comms, allows multiple sensors to be integrated using standard networking equipment.

The TCP/IPv4 network configuration of the host network adapter (PC, SCU or similar) should be set to an IP address of 192.168.2.xxx with a subnet mask 255.255.255.0. Do not use the IP address for any of the sonar devices or reserved addresses xxx.2.17, xxx.2.200, xxx.2.201 or the "Obtain an IP address automatically" option.

A minimum 100BASE–TX link is recommended. Ethernet enabled Tritech Systems Require 100Mbps in order to function correctly and may not work on lower 10BASE–T lines. It's not recommended to connect Tritech units through a network hub, a network switch is recommended to be used instead.

> **Note**
>
> A network hub broadcasts to all its ports and thus shares its bandwidth with each of the ports . If multiple devices are connected then the bandwidth allocation will be shared between devices, and so the bandwidth per device will drop.
>
> A network switch records the MAC addresses of the devices connected so when a frame of data is received the data is sent to the appropriate port rather than broadcast. This means that each port on a network switch will have the maximum amount of bandwidth.

Windows Firewall Settings

Check your anti-virus settings. Firewalls will see the data from the network and may stop the broadcast message. Occasionally a firewall will allow the broadcast message but will stop the repetitive, high data rate sonar imagery packets from the sensor believing it to be a denial of service attack. If this is the case, to "Allowed Apps" in windows and add permissions to the firewall settings for Seanet Software.

Serial Comms Setup

COM port allocations vary depending on the computer you use. They can be found by opening Windows Device Manager where there is a list of COM ports called Ports (COM & LPT).
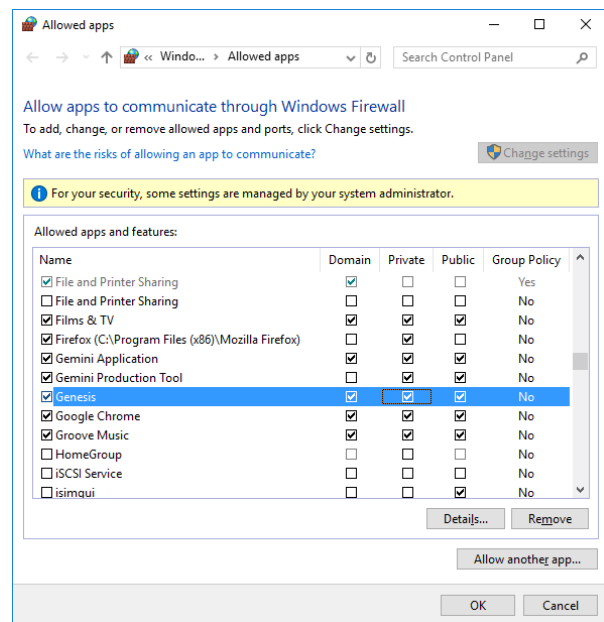
> **NOTE**
>
> When using ARCNET It is worth noting that a SeaHub or Tritech SCU is required to interface with the sensor. This is because Tritech use our own proprietary version of the ARCNET protocol.
>
> Wiring diagrams and pin-outs can be found in section 2.6 of this manual.

4. Genesis Comms Setup

The Genesis software package from Tritech allows the control, configuration and display of Tritech imaging and survey sensor data from within a single software environment. The Following section will guide you through the process of setting up your system to communicate with your chosen devices.

4.1 Main GUI window
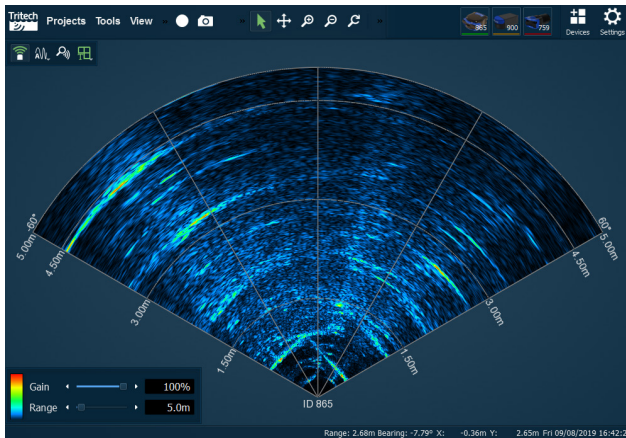
Devices are automatically added into Genesis as they are connected to the system via the Ethernet or Tritech USB Adapter (720im).

A Tritech SCU (Surface Control Unit) or a Tritech Seahub is required when connecting devices using the ARCNET communications protocol.

The main window area will display the default output configuration for the specific devices you connect.

The image to the left shows the default device window layout for a Gemini 720ik sonar which is similar for the other Gemini devices.

4.2 Ethernet Protocol Settings

As standard all Ethernet enabled Tritech Sensors are set in the IP range of **192.168.2.XXX** with a subnet mask of **255.255.255.0**. It is therefore necessary to configure the host network to the same IP address range as the sensors being connected. This can be setup in the following way.

- Open the network and sharing centre in Windows.
- Double click on the Ethernet connection.
- Choose properties in the pop-up dialogue.
- Double click the text that says "TCP/IPv4".
- Check "Use the following IP address".
- Set the IP address to 192.168.2.50
- Set the subnet mask to 255.255.255.0
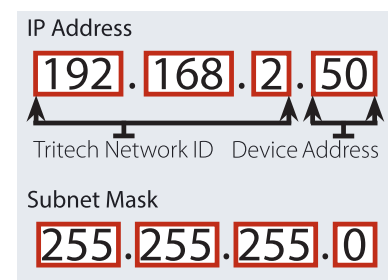
To avoid IP conflict and issues, make sure that each device on the network has a unique IP address. The addresses xxx.2.16, xxx.2.17, xxx.2.200, xxx.2.201 are reserved by the system so do not set to these. Make sure the option to "Obtain an IP address automatically" is disabled.

4.3 Windows Firewall Settings

Check your anti-virus settings. Firewalls may stop the repetitive, high data rate sonar imagery packets and prevent the broadcast message.

Occasionally a firewall may allow the broadcast message but stops the high data rate from the sensor believing it to be a denial of service attack.

If this is the case, navigate to "Allowed Apps" in windows and add permissions to the firewall settings for Genesis Software.
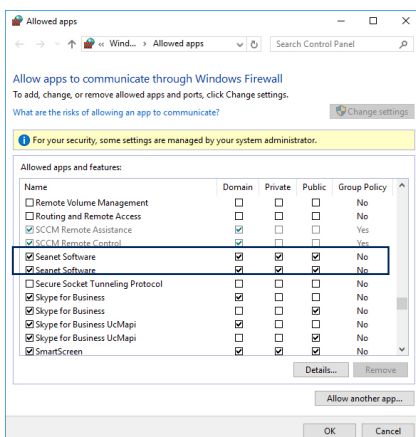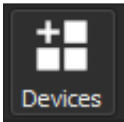
> **Note**
> When using Ethernet, V7 cables must be installed on your system

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4.4 Adding a Serial Device

To add a serial device to your system, the com port settings must configured within Genesis. The following section outlines the process of adding devices to your serial network.

Clicking on the "Devices" button in the top right of the Genesis GUI will bring up the Device configuration window with a list of all Genesis compatible Tritech Devices.
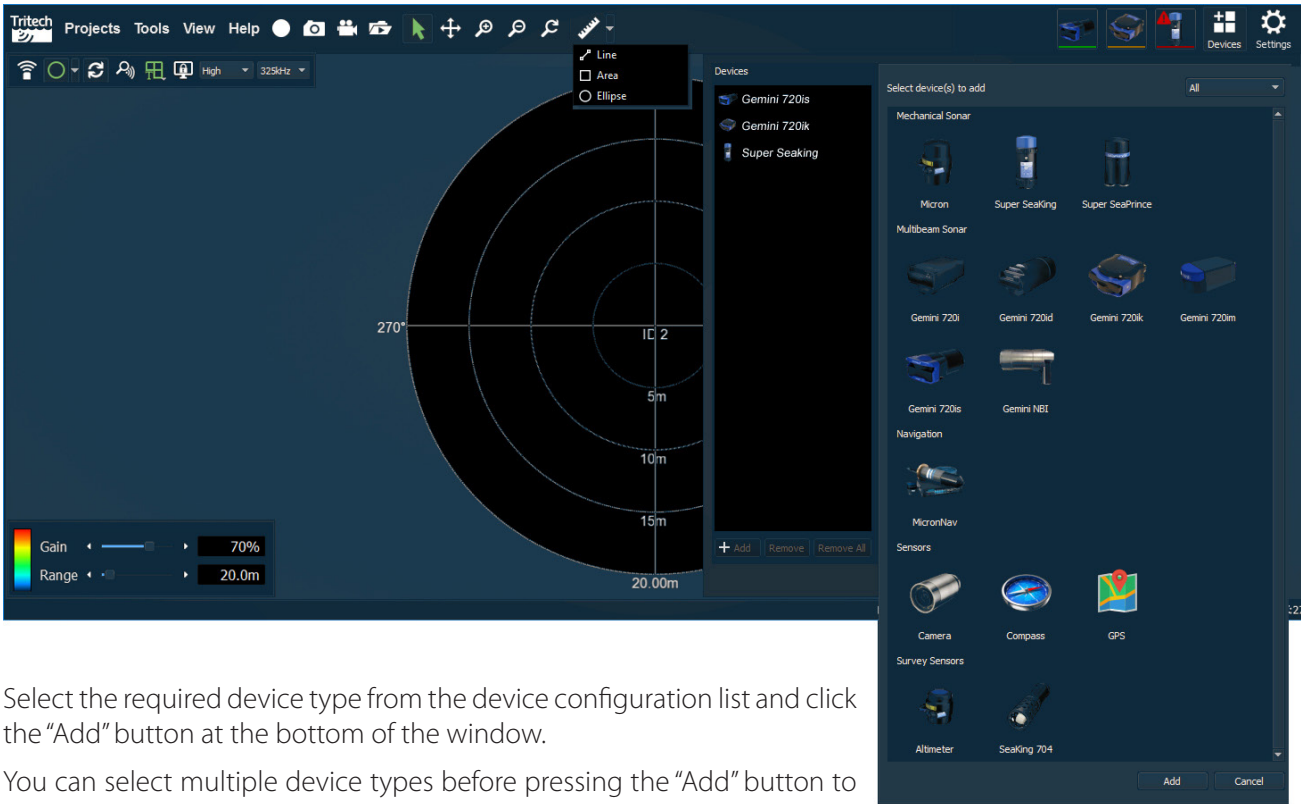
Select the required device type from the device configuration list and click the "Add" button at the bottom of the window.

You can select multiple device types before pressing the "Add" button to add multiple devices at the same time.

Once added, devices appear in the device list on the left of the configuration window.

Selecting a device in this list will bring up the configuration and properties window for that device.

The "General" Tab shows the basic device information including the Node, Status, Firmware Version and the connection settings

Clicking the "Port" Drop-down lets you select between Serial, Ethernet and ARCNET communications protocols.

Update the Serial port and baud rate information with your device settings. As soon as Genesis establishes comms, the device icon will change from red and appear as "Online" in Genesis.
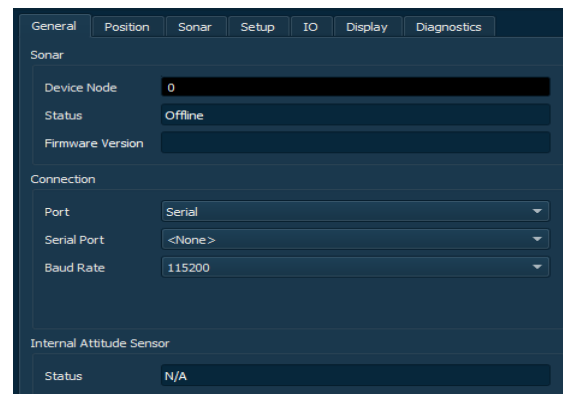
4.5 Device Icon Colour

There are three colours to indicate the status of your device in Genesis.

Green - the device and system are online and data is being received at the topside control.
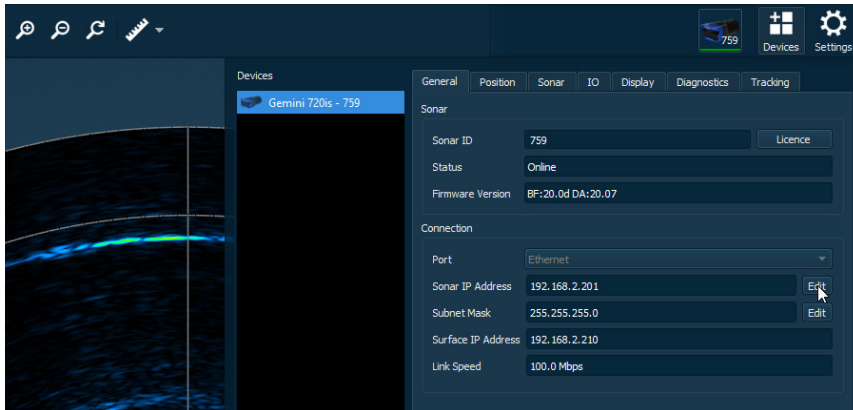
Amber - Shows good communications with the device and the system is ready to go online

Red - Indicates there is no communications to the device. Confirm connections and settings.

To avoid IP conflicts in your system, each device must have a different IP address to allow them to communicate with Genesis.

When running multiple devices it may be necessary to change the IP address of a connected device.

To do this, ensure the device is online and select the device status icon in the toolbar to show its properties and select the "General" tab.

The IP Address can be adjusted and saved to the device. in the "General" tab of the Device Configuration Window.
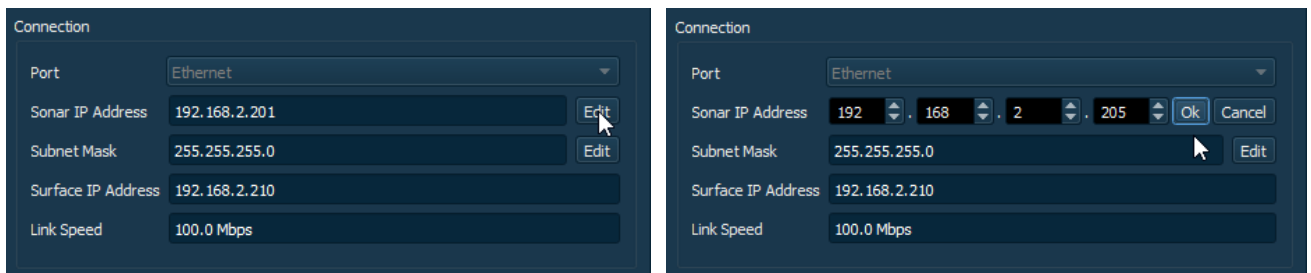
If two devices with the same IP address are connected at the same time neither will communicate with Genesis. Therefore, it is necessary to disconnect one of these devices and only connect the device you intend to modify.

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

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

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

> **Note**
>
> A special yellow waterblock is available from Tritech International Ltd which contains an in-line impedance of 39Ω which will enable quick and easy installation of the subsea termination resistor.
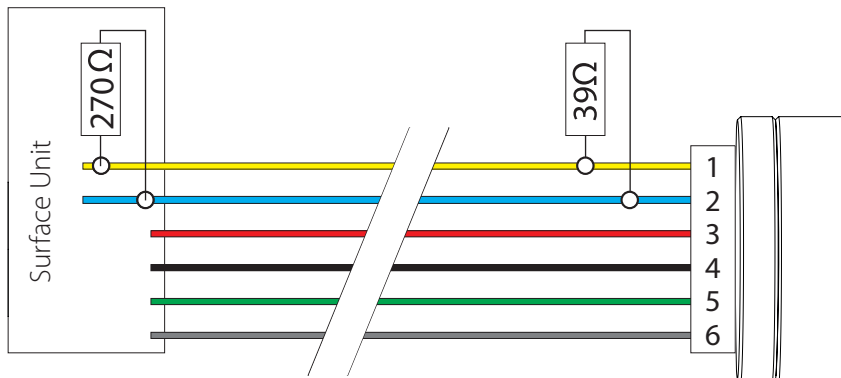
Waterblock Connectors	
1	ARCNET A
2	ARCNET B
3	+V DC
4	-V DC
5	RS232 GND
6	Earth/Screen

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

> **Note**
>
> If there are more than one sensors connected then the sub-sea resistor should be fitted at the junction box or splice of the cable.