SeaKing Subsea Junction Box

Product Manual

0374-SOM-00017, Issue: 01

Tritech

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Help & Support

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

Tritech International Ltd can be contacted as follows:

	Mail	*Tritech International Ltd* Peregrine Road Westhill Business Park Westhill, Aberdeenshire AB32 6JL, UK
	Telephone	+44 (0)1224 744111
	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.

1. Introduction

1.1. Overview

The Tritech Subsea Junction Box provides the connection interface to the Tritech range of networked survey suites. The Junction box provides the main telemetry link to the surface and acts as the splitter for connecting several networked sensors together to be controlled from this single telemetry link to the surface. At the surface, the Tritech Surface Control Unit (SCU) provides the user interface for controlling and displaying the array of sensors connected together on the ROV or deployment vessel. This range of networked sensors includes Imaging Sonars, Profiling Sonars, Bathymetry and Oceanographic packages.

The Junction Box can be connected to a Tritech Seanet survey package which offers ARCNET, a long-line, high-speed telemetry interface providing the capacity for transferring large streams of sensor data. The Junction Box telemetry link to the surface can be configured to either 2-wire ARCNET or 3-wire RS232.

Note

The Junction Box can be configured to communicate to the surface using RS232 or ARCNET, whilst communicating to each of the connected Sensor heads over the ARCNET LAN.

1.2. Key Features

Functionality

The Junction Box is pressure rated to a maximum depth of 4000m and can be installed in any suitable location on the ROV. It provides the subsea split to the SeaKing sensor suites, with connection for up to a maximum of 4 sensors.

Telemetry Options

The Junction Box communicates with the surface over a 2-wire ARCNET/RS485 or a 3-wire RS232 telemetry link.

ARCNET communications require termination resistors to be installed.

Power Distribution

The Junction Box is powered from a DC supply of range 21 to 30V DC. This DC supply is then distributed to the SeaKing Sensor heads via each connection port on the Junction Box.

Note

Sensor heads will require 24VDC and a 4-head sensor suite would require approximately 2A at this voltage level.

Fuse Protection

Each of the head connection ports have an internal fuse on the 24V power rail. These fuses are rated to 3A and are included to help protect the head and Junction Box in the event of water ingress to cable or connectors.

1.3. System Compatibility

The Junction Box can be used in a Seanet survey package to connect together SeaKing sensors.

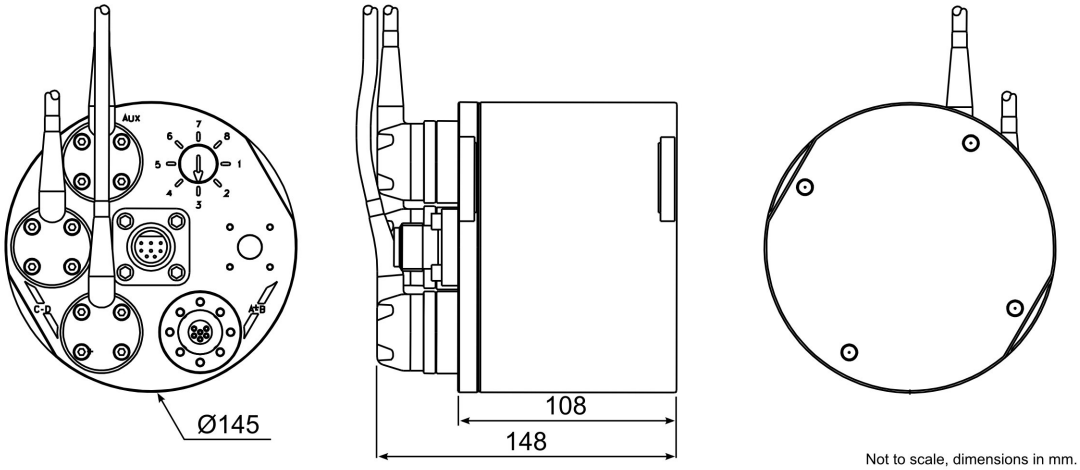
Seanet uses the ARCNET communications protocol at either 156kbit·s^{-1} or 78kbit·s^{-1}. At full speed the maximum cable length is 1500m and at half speed it is capable of operating over 2500m

1.4. Configuration

All telemetry and power options on the Junction Box are configurable via a pressure rated dial switch on the outside face. Later models have a blue cap fitted over the switch to allow improved immunity to water ingress.

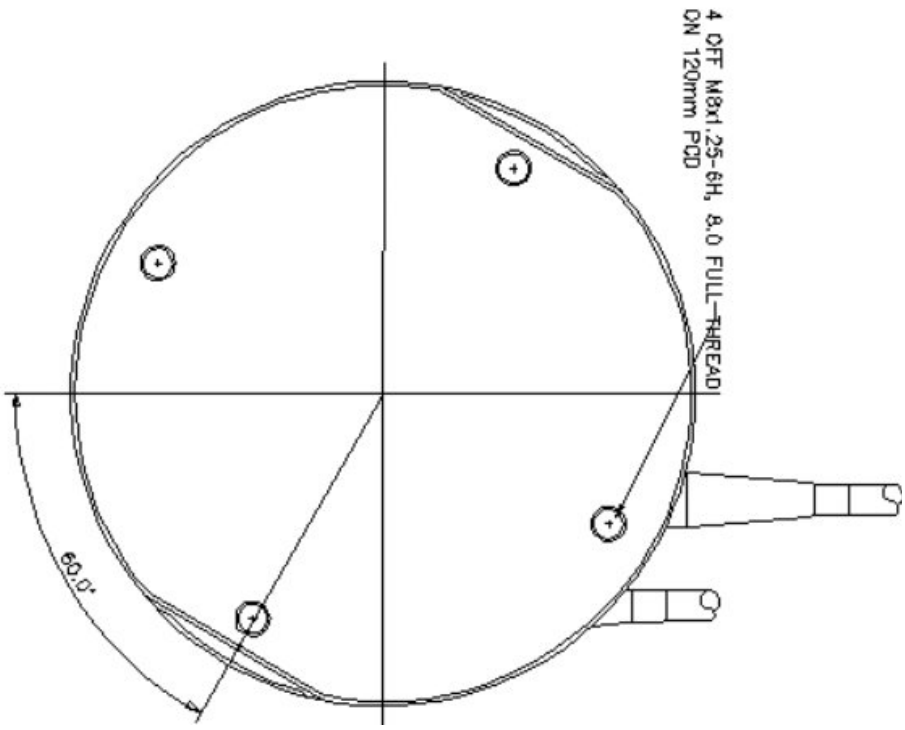
2. Specification

2.1. Dimensions



Not to scale, dimensions in mm.

2.2. Mounting Holes



2.3. Physical

Weight in air	3.8kg
Weight in water	1.9kg
Depth rating	4000m
Materials	Anodised aluminium
Operating temperature	-10 to 35°C
Storage temperature	-20 to 50°C

2.4. Electrical and Communication

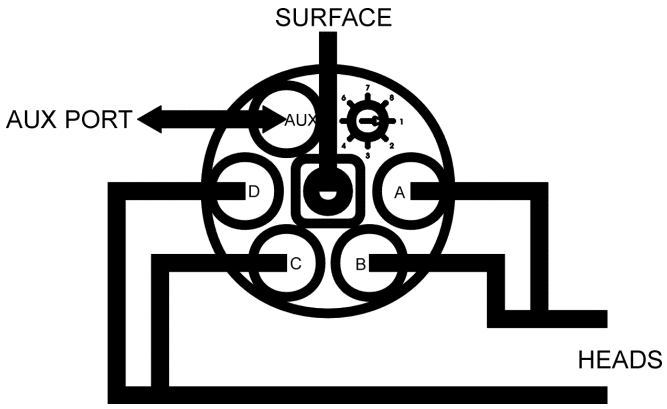
Sensor connectors	4 x Tritech 6 pin
Input voltage	24 – 30V DC
Current drain	2A with 4 sensors (typical)
Interface cables	4 x 6m Tritech cables
Main connector	8 pin mini Burton (5506-1508)
Communication protocols	ARCNET, RS232
Compatibility	Compatible with Tritech sensor suites from SCU-3 onwards

3. Basic Installation

3.1. Overview

The Junction Box can be installed at any convenient location on the ROV, preferably central to the SeaKing heads that will be connected. There are 4 mounting holes (M8 x 1.25-6H) located on the base. The Junction Box should be provided with adequate lengths of cables in order to connect the SeaKing heads. These cables are available from Tritech in lengths of 1, 2, 4 or 6 metres (contact Tritech for more information).

The junction box provides the power and telemetry for up to 4 SeaKing heads as follows:



Surface telemetry to and from the Surface Control Unit (SCU) is connected through the central 8-pin Burton connector. This telemetry can be either asynchronous RS232 or ARCNET LAN.

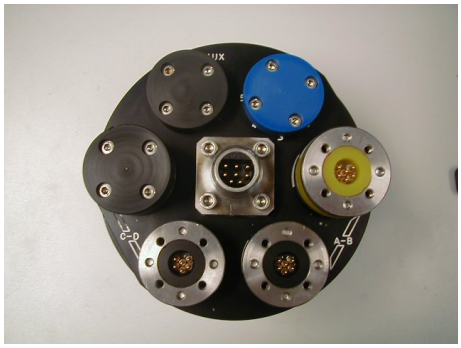
The 8-pin Burton connector also doubles as the input port for system power. The Junction Box 21 to 30V DC. This power input is then distributed to all four of the 6-pin Tritech head interface ports (A, B, C and D).

3.2. Switch Options

The rotary dial switch on early models was exposed and can be easily set. Newer models feature a blue pressure cap over the switch for added protection. To access the switch remove the 4 M4 socket cap bolts which affix the blue cap to the Junction Box lid.

Note

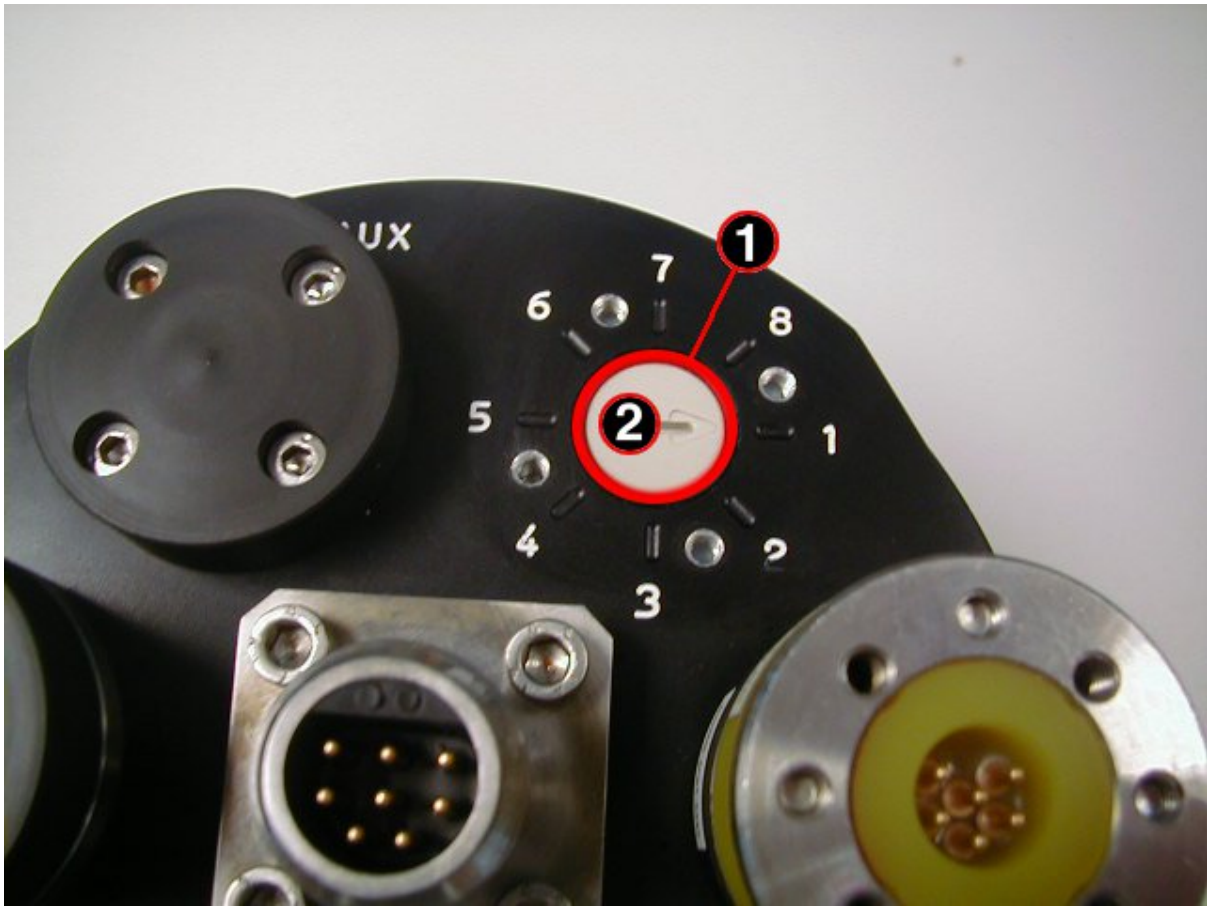
The switch should be adjusted with the key provided, however, if this is not available a suitable 1.2 x 6.5mm flat blade screwdriver can suffice if used carefully.



Blue cap fitted over switch

Switch adjusted using supplied key

On models factory fitted with the blue cap, always ensure that the O-ring and blue cap are re-fitted prior to immersion.



❶ Ensure O-ring is clean and re-fitted prior to fitting the blue cap

❷ The arrow on the switch indicates the mode selected

Rotary Switch Settings				
Switch Option	**Input Burton (21-30V DC)**	**Output A to D (21-30V DC)**	**AUX protocol**	**AUX power**
1	SeaKing RS232	local ARCNET	RS232	21 – 30V DC
2	SeaKing RS232	local ARCNET	RS485	21 – 30V DC
3	SeaKing RS232	local ARCNET	RS232	12V DC
4	SeaKing RS232	local ARCNET	RS485	12V DC
5	ARCNET	ARCNET	serial disabled	21 – 30V DC
6	ARCNET	ARCNET	serial disabled	21 – 30V DC
7	ARCNET	ARCNET	serial disabled	12V DC
8	ARCNET	ARCNET	serial disabled	12V DC

Dual Profiler Setup

Use ports A & B or C & D for pairs of SeaKing Profilers.

Caution

Ensure power is isolated prior to changing the option switch.

Options 5 to 8 do not output communications to the AUX port, however, the port is still live with the voltage indicated.

Make sure to fit sealed blanking caps and o-rings to any ports that are not in use.

4. Communication Setup

4.1. Overview

The Junction Box can be configured to communicate with the Surface Control Unit (SCU) over RS232 or ARCNET telemetry. ARCNET should be the preferred option since this provides a higher capacity data link which will allow for connection of a larger number of sensors without affecting the update rates. RS232 should only be used when running through a data multiplexer that does not include an ARCNET interface.

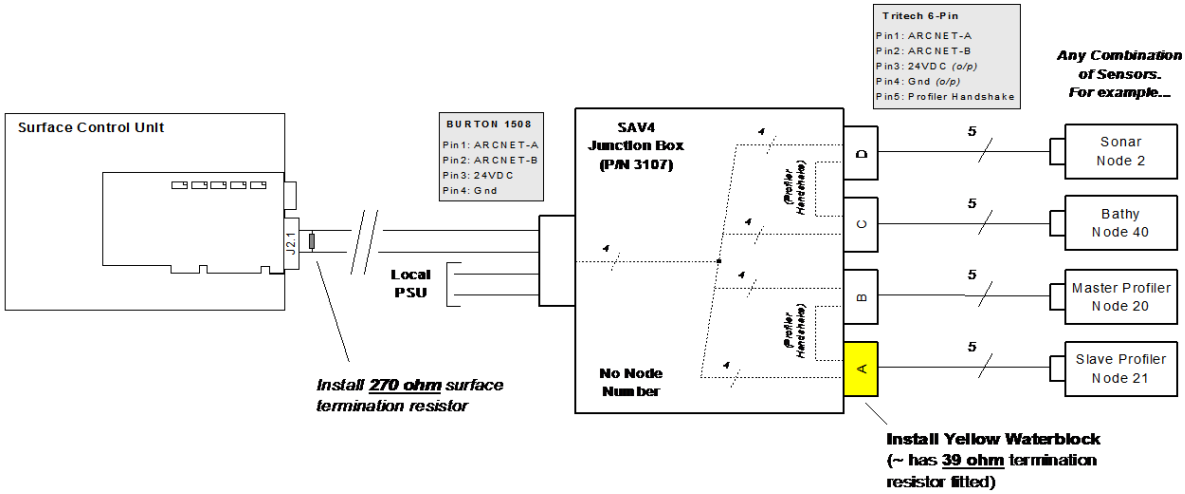
4.2. ARCNET to Surface & ARCNET to Subsea Sensors

In this mode the Junction Box is a dumb terminal which distributes local power and ARCNET telemetry to each of the connected SeaKing sensor heads.

Note

The Junction Box does not have a node number when operating in this mode.

For this setup, select switch options 5, 6, 7 or 8. An example setup is shown (for a larger image please refer to: *Appendix A. Connection Diagrams*)



4.2.1. System Power

For distribution of power to the heads, a voltage input of 21 to 30V DC must be supplied on the input port (Burton connector). For connection of a full suite of sensors the local power supply must be capable of supplying at least 2A at a nominal 24V DC.

4.2.2. System Telemetry

The ARCNET telemetry link requires termination resistors to be installed at either end of the cable in the same was as a standard ARCNET system.

The surface 270Ω resistor can be located in the DA-15 connector shell. This is the connector that mates to the rear of the SCU. The resistor should be fitted between pin 8 and 15 on this connector.

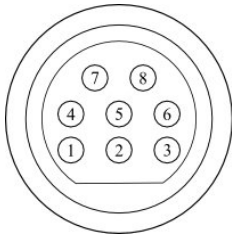
The subsea 39Ω resistor is fitted in the yellow waterblock adapter that is supplied with the Junction Box.

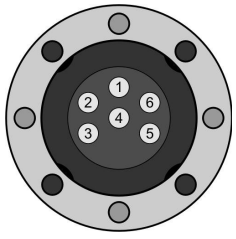
For more information please refer to *Appendix B. ARCNET Termination*

Note

For SeaKing operation the yellow waterblock adapter must be installed at all times and fitted to any of the output head ports (A, B, C or D).

4.2.3. Junction Box Wiring (ARCNET to ARCNET)

Burton 5506-1508 Bulkhead Connector (connection to surface)		
Pin	**Function**	**Diagram**
1	ARCNET LAN A	 *Burton 5506-1508*
2	ARCNET LAN B	
3	24V DC (input)	
4	0V DC	
5	not connected	
6	Chassis Ground	
7	not connected	
8	not connected	

Tritech Waterblock Connector A, B, C or D (connection to sensors)		
Pin	**Function**	**Diagram**
1	ARCNET LAN A	 *Tritech Waterblock*
2	ARCNET LAN B	
3	24V DC (output)	
4	0V DC	
5	Profiler Sync (internal connection between A-B and C-D)	
6	Screen/Chassis	

4.3. RS232 to Surface & ARCNET to Subsea Sensors

In this mode the Junction Box is an intelligent terminal which communicates with each of the connected ARCNET SeaKing Sensors whilst translating the data for transmission to the surface node via the 3-wire RS232 link. The surface node is the ARCNET Interface Card (AIF Card) on the SCUv4 or ARCNET connector on SCUv5/SeaHub.

Note

On the SCUv4 the AIF Card is assigned a Node Number of 255 and on the SCUv5/SeaHub it is assigned to 252.

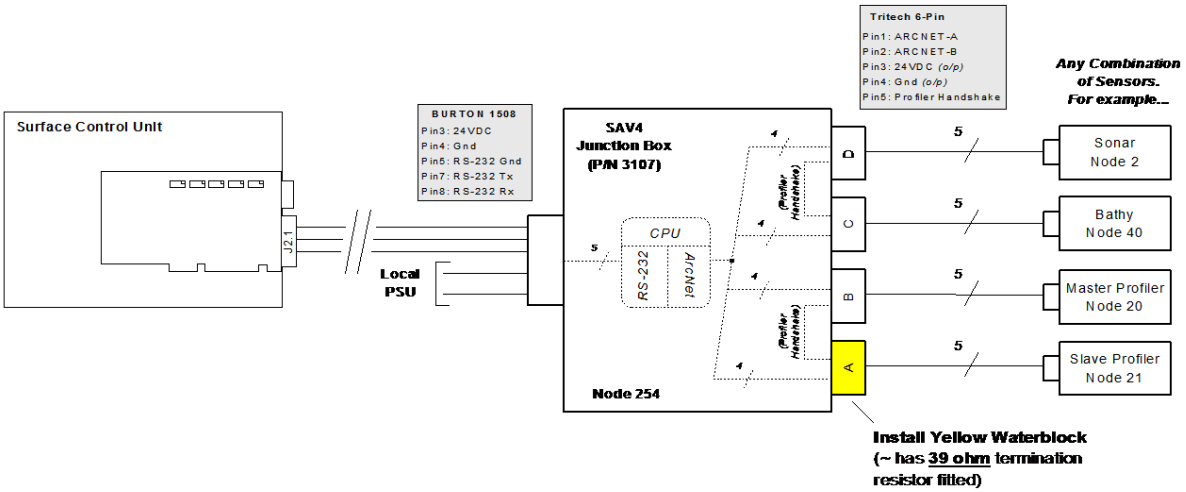
The Junction box is programmed to be Node 254

The Junction Box will communicate with the surface using Node 254 and will receive data packets from each of the connected SeaKing Sensors over an ARCNET LAN. These data packets will be addressed to the surface node (255 or 252) and sent over the RS232 link.

In the opposite direction, the SCU will communicate through Node 254 in order to send any data commands to the SeaKing sensors. The Junction Box will receive its own addressed data packets from the surface and strip off the contained data commands. These data commands are then relayed to the intended SeaKing sensor over the ARCNET LAN. Each SeaKing sensor is programmed with its own unique Node number as follows:

Node number	**Device**
2 – 5	SeaKing Dual Frequency Sonar, SeaPrince, Micron, Hammerhead
10 – 11	SeaKing Sidescan (Towfish)
15 – 16	SeaKing Sub Bottom Profiler
20 – 29	SeaKing Dual Frequeny Profiler
40 – 43	SeaKing 700 Series (Bathy)
252	SCUv5 or SeaHub
254	Junction Box
255	SCUv4 or ARCNET Interface Card (ISA or PCI AIFV4 card in a PC)

For this setup, select switch options 1, 2, 3 or 4. An example setup is shown (for a larger image please refer to: *Appendix A. Connection Diagrams*)



4.3.1. System Power

For the distribution of power to the heads voltage input of 21 to 30V DC must be supplied on the Burton connector. For connection of a full suite of sensors the local PSU must be capable of supplying at least 2A at a nominal 24V DC. In this mode the Junction Box will itself require an additional 150mA at 24V DC.

4.3.2. System Telemetry

The ARCNET telemetry link between the SeaKing sensor heads and the Junction Box requires a single termination resistor to be installed between the 2 LAN wires. This termination resistor should be of value between 39Ω and 100Ω.

For this purpose, a 39Ω termination resistor is fitted within the yellow waterblock adapter that is supplied with the Junction Box.

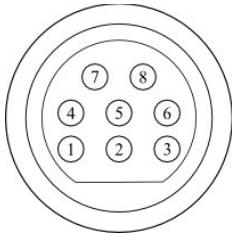
Note

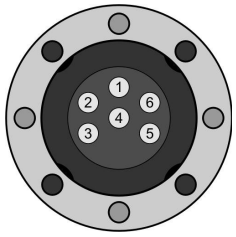
For SeaKing operation the yellow waterblock adapter must be installed at all times and fitted to any of the output head ports (A, B, C or D).

The default ARCNET speed of 156kbit·s^{-1} should be used – there is no need to lower this rate since only short connection cables will be installed between the Junction Box and SeaKing sensors.

The RS232 telemetry link to the surface can be adjusted to suit the modem or multiplexer that is in use on the system. It is recommended that a setting of 115.2kBd be used whenever possible to allow multiple SeaKing sensors to be run at maximum speed and resolution.

4.3.3. Junction Box Wiring (RS232 to ARCNET)

Burton 5506-1508 Bulkhead Connector (connection to surface)		
Pin	**Function**	**Diagram**
1	not connected	 *Burton 5506-1508*
2	not connected	
3	24V DC (input)	
4	0V DC	
5	RS232 Ground	
6	Chassis Ground	
7	RS232 TX	
8	RS232 RX	

Tritech Waterblock Connector A, B, C or D (connection to sensors)		
Pin	**Function**	**Diagram**
1	ARCNET LAN A	 *Tritech Waterblock*
2	ARCNET LAN B	
3	24V DC (output)	
4	0V DC	
5	Profiler Sync (internal connection between A-B and C-D)	
6	Screen/Chassis	

5. Configuring with Seanet Setup

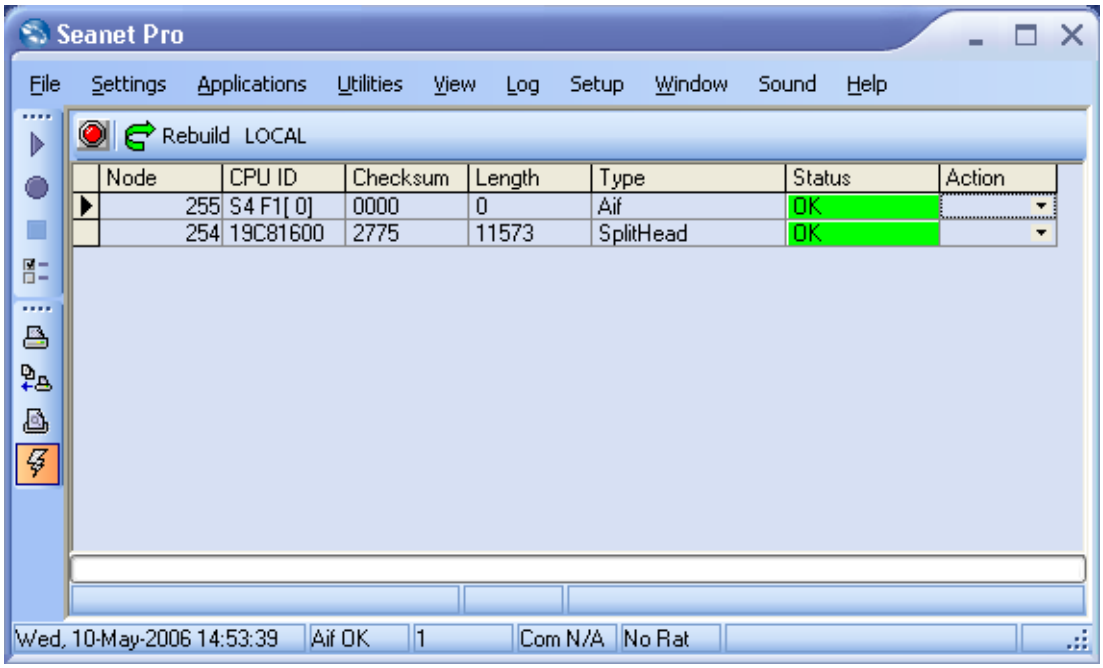
Note

This applies to systems that are set up with an RS232 link form the Junction Box to the Surface Control Unit.

5.1. Check the Connection

After the wiring has been completed and the Junction Box is connected to the SCU, apply power to the Junction Box.

Launch the Seanet Setup program and verify that the Junction Box appears in the Node Table:



- **Node 255** is the surface AIF card and should always appear in the table if using a SVUv4 or AIF card (if using a SCUv5 or SeaHub, this will be **Node 252**)
- **Node 254** is the Junction Box under RS232 surface telemetry control.

Note

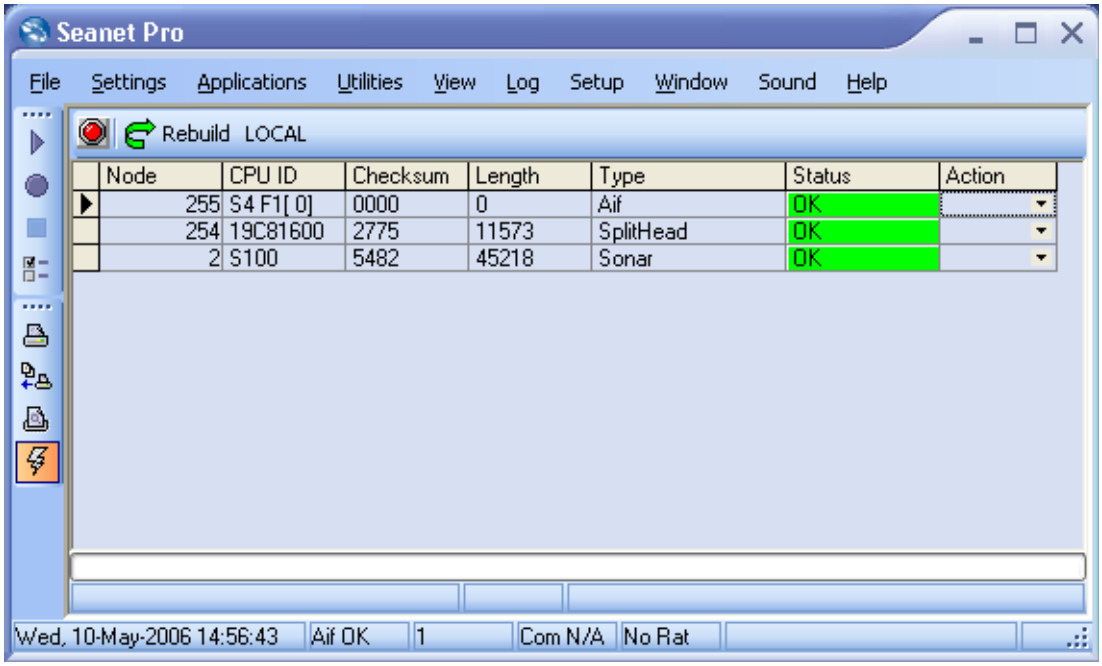
If Node 254 does not appear, first check the connections and power, then refer to section *6 Establishing RS232 Link Using Recovery Mode* for recovery options.

All nodes in the Node Table should appear with the Status column displaying “OK”. If “Update” is displayed instead, highlight the row of this Node and click on “Action”→ “Program”. Click “OK” at the dialog and wait until the “Prog Done OK” status appears and

then press the “Rebuild” button, confirming that the program staus is now changed to “OK”.

With the Junction Box (Node 254) detected and OK, connect any SeaKing sensor heads to the Junction Box (ports A, B, C or D) as required. Ensure that the yellow waterblock adapter is installed on any one of the head ports.

The Node Table should immediately display the node number of the connected SeaKing sensor.



Note

Any connected SeaKing sensor head must be set to ARCNET at full speed 156kbit·s^{-1}. For details how to do this refer to the appropriate sensor head manual.

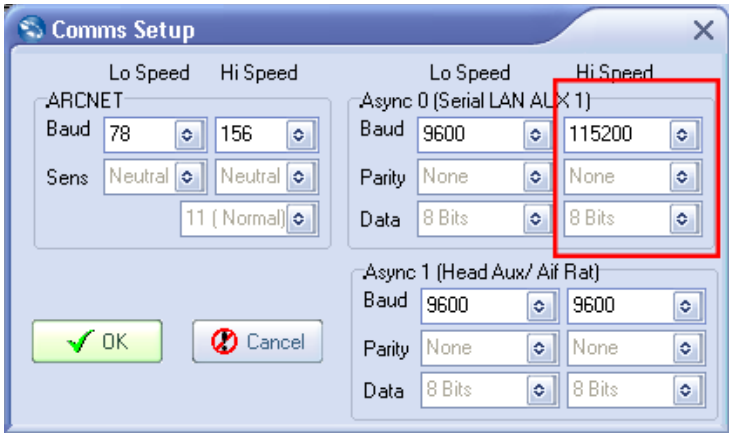
5.2. Changing RS232 Baud Rate

On the Surface Control Unit (SCU) the Seanet Setup utility can be used to change the RS232 telemetry speed between the SCU and the Junction Box. This should normally be left at the maximum speed (115.2kBd), however there may be a case that this speed has to be lowered to accommodate system modems or multiplexers.

5.2.1. To Configure the Junction Box

First establish that the Junction Box appears in the Seanet Setup table as Node 254 as detailed in *5.1 Check the Connection*.

Next highlight the row that contains 254, click “Action”→ “Setup” and click “OK” at the warning dialog. Once the Setup dialog is visible, click on the “Baud Rates” button and this should bring up the Comms Setup dialog:



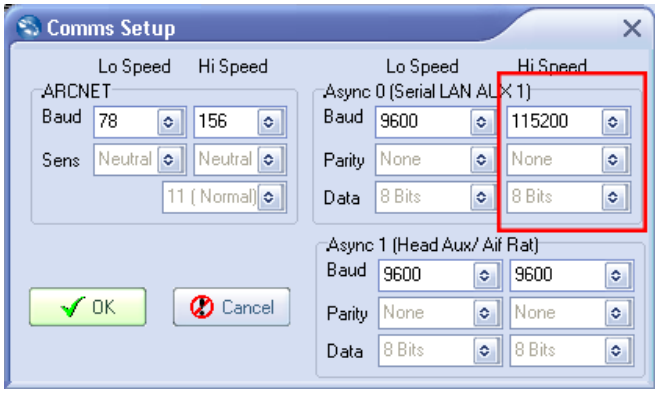
The "Async 0 (LAN)" panel includes the settings for the RS232 telemetry link (highlighted in red). Only the right-hand channel needs to be set with the desired link speed. After the changes have been made, press the "OK" button and click "OK" to exit setup.

Finally, press the "Rebuild" button at the top of the Node Table. Only the Surface AIF Card (Node 255 or 252) will appear in the list now since there is a communication speed mismatch between the devices. The SCU will try to communicate with the Junction Box and display TMO (i.e., time out) errors. These can be ignored for now.

5.2.2. To Configure the Surface Control Unit

As before find the correct Node in the table (255 or 252) and click on "Action"→ "Setup" to open the Setup dialog. Once the dialog is open click on the "Baud Rates" button to open the Comms Setup dialog.

This will look the same as for the Junction Box and it is the same section that needs to be changed:



Make sure to change the speed to match that selected for the Junction Box and then click the "OK" button to exit the Comms Setup dialog and click "OK" again to exit the main Setup dialog.

If the list does not re-populate after 10 seconds, press the "Rebuild" button at the top of the Node Table. Node 254 should now re-appear, confirming that the Surface Control Unit and Junction Box are now communicating over the new telemetry rate.

6. Establishing RS232 Link Using Recovery Mode

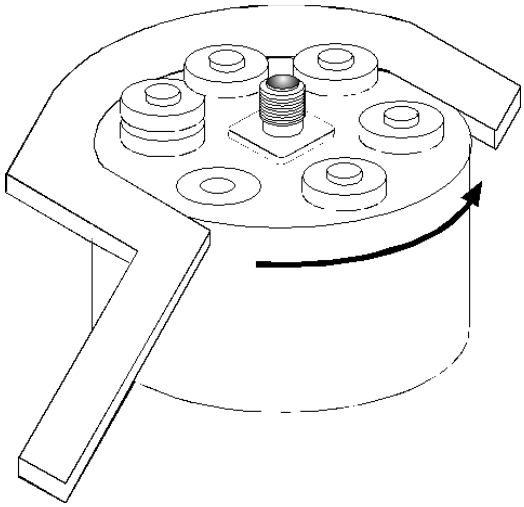
Sometimes it is necessary to enter a special recover mode which communicates using a speed of 9600Bd, these steps should only be followed after all other measures have been taken to re-establish communication with the Junction Box.

Important

These steps require access to the inside of the Junction Box. Appropriate measures should be taken to ensure that the device is protected against static discharge.

6.1. Disconnect and Configure the Junction Box

First, remove the lid of the Junction Box using the special spanner provided:

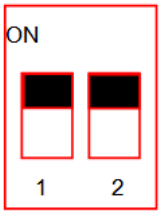


There are 2 circular PCBs fixed to the lid. The smaller of these is the CPUCV3 or CPUV5 PCB. This is the board that contains the baud speed switch (SW1 switch 1)

To enter the recover mode switch SW1 switch 1 to the **on** position.

Note

SW1 is used to select between the 2 preset communication rates for ARCNET and RS232. Since the Junction Box operates ARCNET and RS232 simultaneously, SW1 switch 1 will change both these telemetry speeds at the same time.



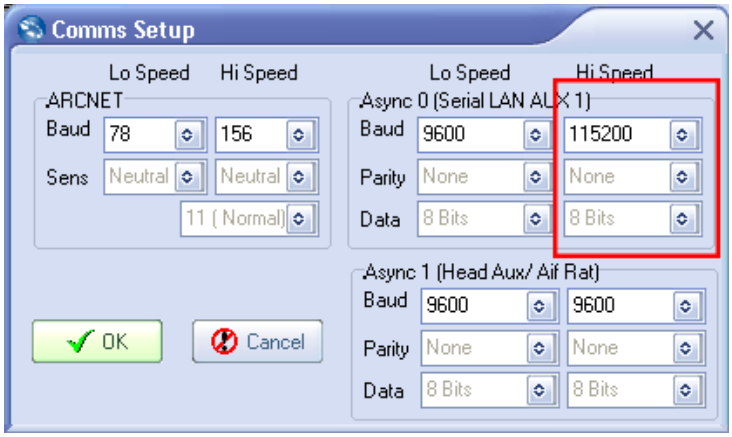
SW1 dip switch	OFF (default)	ON
1	ARCNET: 156kbit·s^{-1} RS232: 115.2kBd	ARCNET: 78kbit·s^{-1} RS232: 9600Bd
2	DO NOT USE	Normal Operation

Once SW1 switch 1 is turned on and the Junction Box is set to 9600Bd the system is ready to be recovered. Do not re-screw the lit back onto the main housing – it will be necessary to re-set the switch again once the recover operation is completed.

6.2. Configure the SCU

In the Seanet Setup program, highlight Node 255 (or 252 if using a SeaHub/SCUv5).

Click "Action"→ "Setup", click "OK" to the warning and then click on the "Baud Rates" button to bring up the Comms Setup dialog.



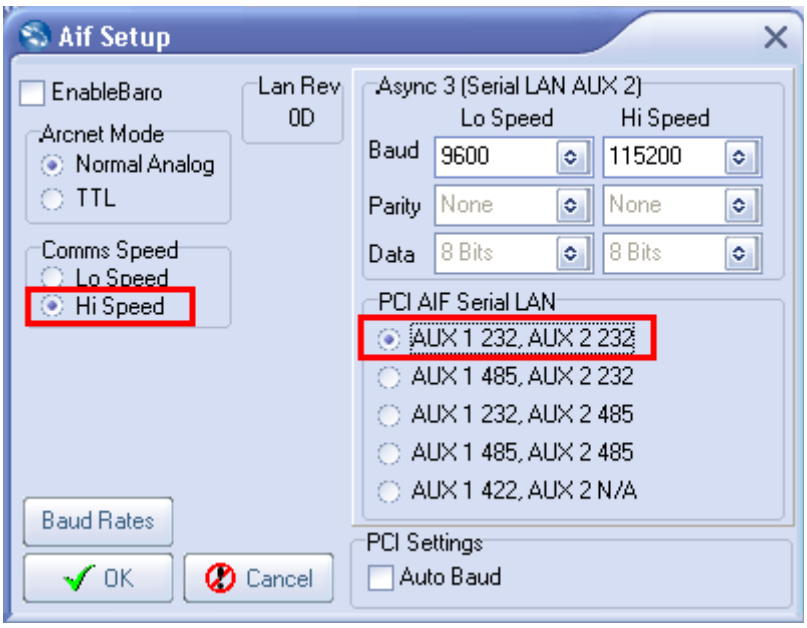
In the Comms Setup dialog, set the right panel of the "Async 0 (Serial LAN AUX 1)" to 9600Bd to enable the emergency recovery speed.

After the changes have been made, press the "OK" button.

6.3. If Using a PCI Card or SeaHub

If the surface control computer has a PCI card fitted then the output is configurable between RS232, RS485 and RS422. This must be set to RS232 to communicate with the Junction Box.

In the "Aif Setup" panel (accessed from Seanet Setup) make sure that the PCI AIF Serial LAN is set to "AUX 1 232, AUX2 232" and the Comms Speed is set to "Hi Speed" as shown:



Once these settings have been confirmed, click “OK” to exit.

6.4. Re-connect the Junction Box

Reconnect the Junction Box and apply power.

The Seanet Setup Node Table should now show Node 254. Press the “Rebuild” button if it does not appear. If Node 254 appears it confirms that the Junction Box and Surface Control Unit are now communicating over the recover speed of 9600Bd.

Note

If at this point the Junction Box does not appear there may be another problem, please contact *Tritech International Ltd.* for further solutions.

6.5. Re-configure the Baud Rate

Once connection has been re-established it will be possible to configure the Junction Box to the desired connection speed by following the steps outlined in *5.2 Changing RS232 Baud Rate.*

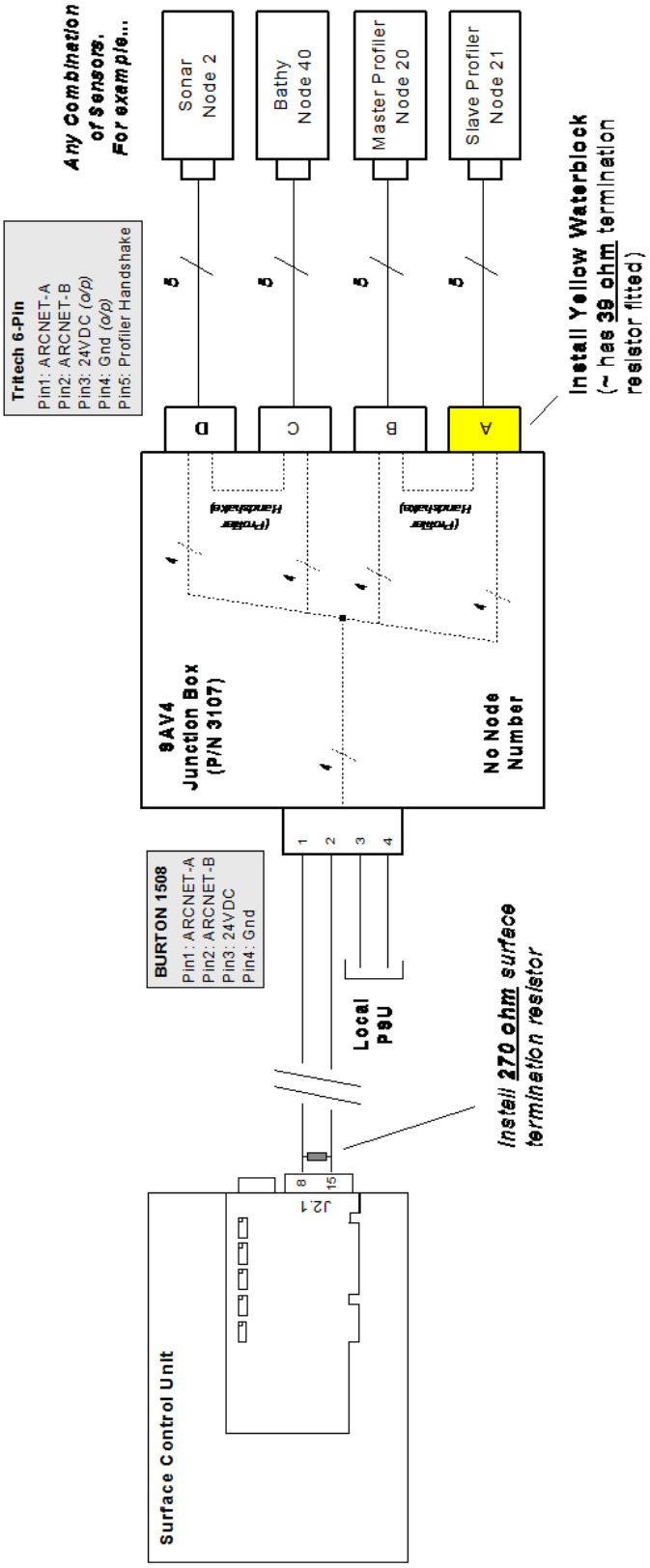
Once the new baud rate has been programmed into the Junction Box, disconnect it and remove power.

Finally, set SW1 switch 1 back to the **OFF** position and close the Junction Box.

Appendix A. Connection Diagrams

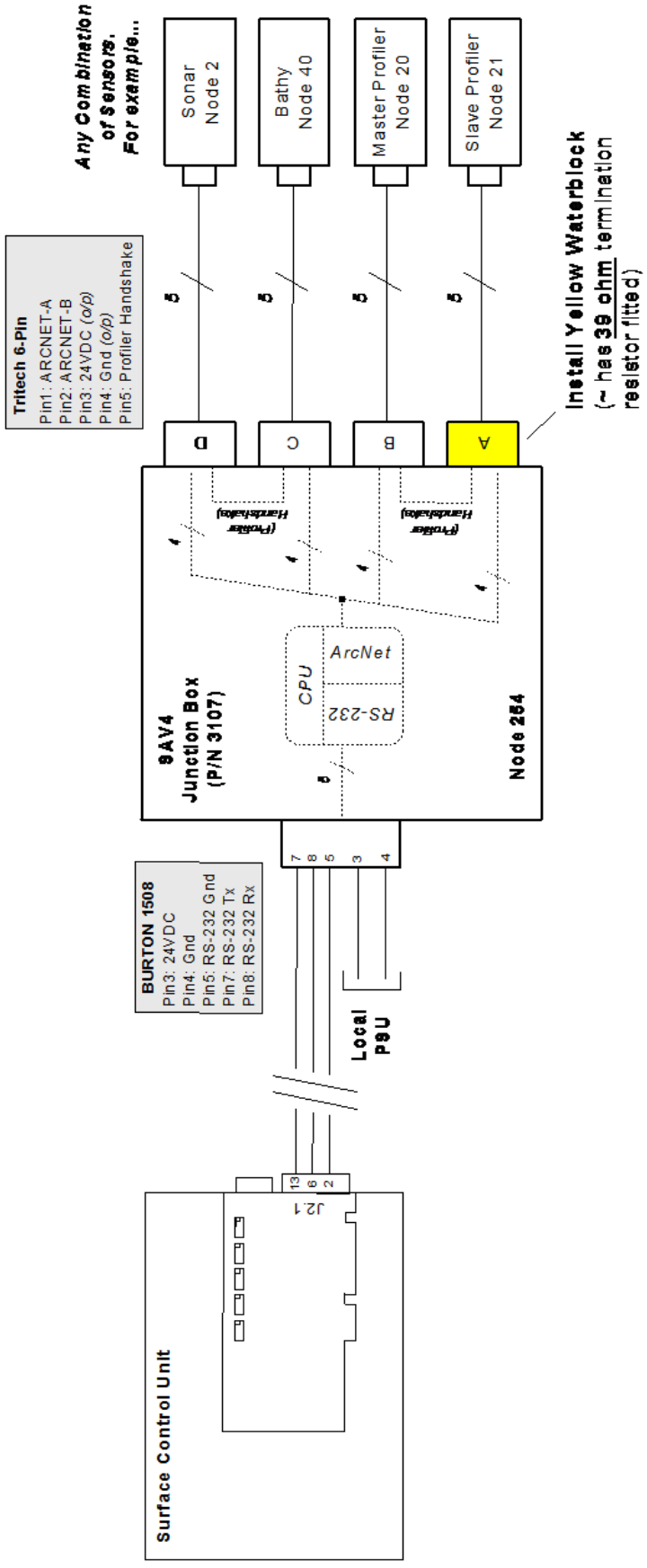
ARCNET surface connection

ARCNET subsea connection

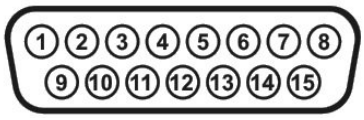


RS232 surface connection

ARCNET subsea connection



ARCNET



SCU DA-15 female connector

Pin	Connection	Pin	Connection
1	not connected	9	+12V DC
2	RS232 Ground	10	VCC
3	Ground	11	LAN EN
4	LAN RX	12	RS232 RTX
5	RS232 CTS	13	RS232 RX
6	RS232 TX	14	LAN PULSE1
7	LAN PULSE2	15	LAN B
8	LAN A		

Note

The DA-15 ARCNET connector can be found built into the rear of the SCUv5, on the SeaHub or on the PCI/ISA add-in card in a SCUv4/PC.

Appendix B. ARCNET Termination

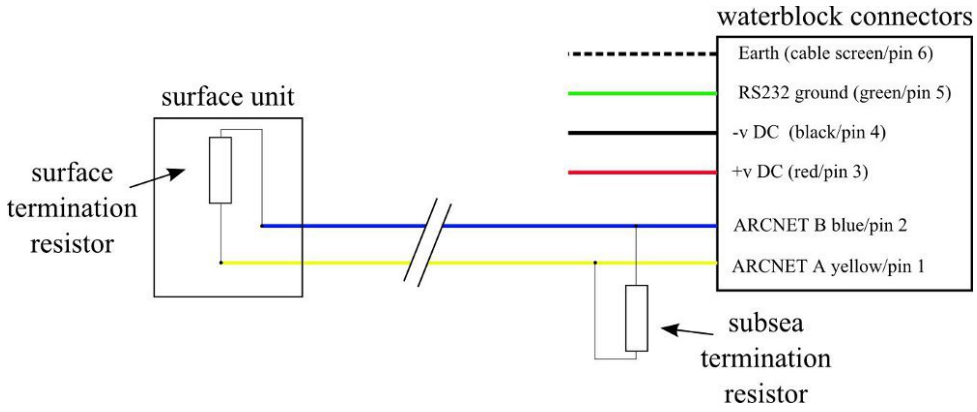
Depending on the cable length the ARCNET communication link requires a termination resistor to be installed at each end of the umbilical cable. Normally this is supplied fitted within the ARCNET cable DA-15 or within the SCU/SeaHub at the surface and is left for the user to fit at the sub-sea end in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

The purpose of these terminations is to attenuate any electrical interference or "reflections" which may occur due to an impedance 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.



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

Note

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

Appendix C. Subsea Junction Box Internal Fuses

The Junction Box is fitted internally with a 3A fuse on each of the head connection ports.

In the event of water ingress to cabling or connectors the fuse will blow and prevent further damage to heads or the Junction Box. Subsequently continued operation can resume on the remaining ports if required until such time as the fuse can be replaced.

The Junction Box should be opened using the supplied spanner and holding the base in a suitable soft jawed vice.

Important

These steps require access to the inside of the Junction Box. Appropriate measures should be taken to ensure that the device is protected against static discharge.

Caution

Precautions should be taken to ensure any o-ring seals are not damaged or fouled prior to reassembly. Keep the equipment in a clean environment during the time that it is open and inspect all seals and sealing surfaces prior to closure.

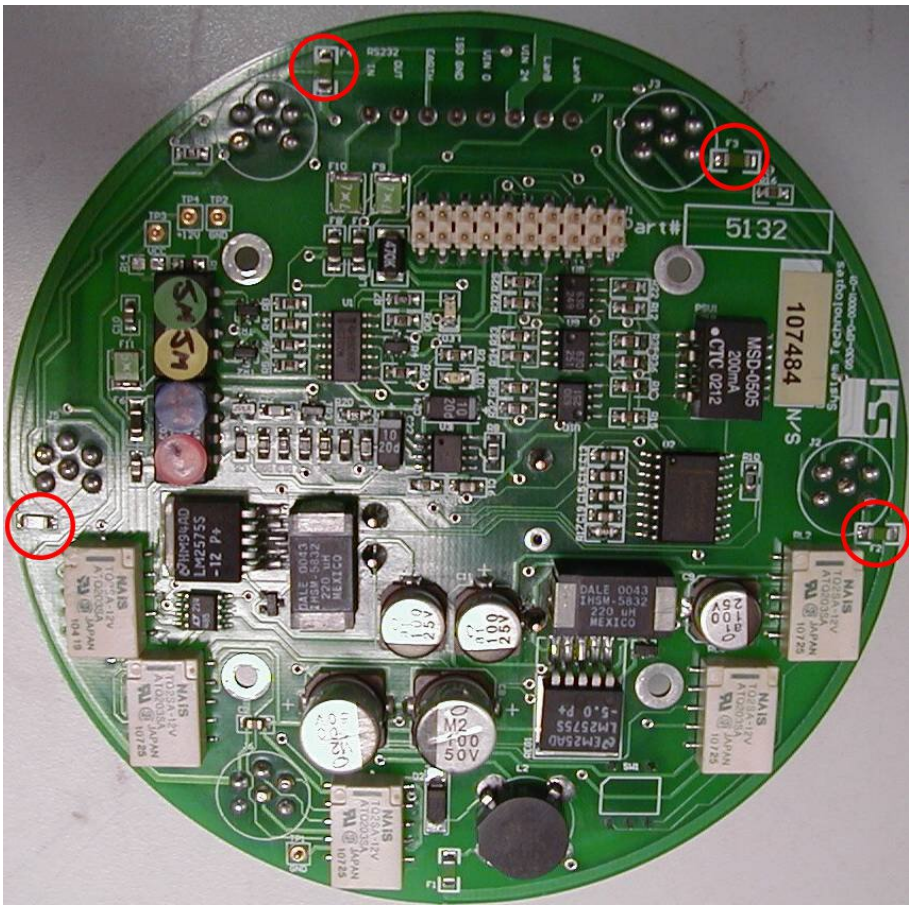
Maintaining water-tight integrity is the responsibility of the user. Internal damage caused by water ingress is not covered by product warranty unless the cause can clearly be identified as a manufacturing defect.

Note

There is no requirement to remove the CPU board from the PCB stack in order to access the fuses, although the pictures below have the PCB removed for clarity.

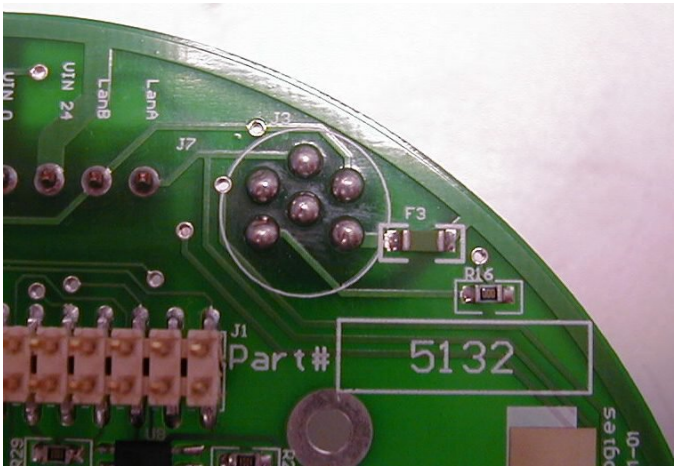
Fuse Location

Each of the 4 SeaKing sensor ports have their own fuse which are located next to the point where the connector is attached to the CPU board as indicated:



Fuse Details

The power fuses are labelled F2 to F5 and are numbered with respect to their relevant port.



Fuse F3 is shown next to port J3

The fuses are not re-settable and should be replaced with an equivalent type:

- Fast acting
- Case size 1206
- 3A
- 63V DC rating

