Eclipse 3D Imaging Sonar

Product Manual

Document: 0690-SOM-00001, Issue: 01

Outstanding Performance in Underwater Technology

Tritech

Table of Contents

Help & Support

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

Tritech International Ltd can be contacted as follows:

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

Prior to contacting *Tritech International Ltd* please ensure that the following is available:

1. The Serial Numbers of the product and any *Tritech International Ltd* equipment connected directly or indirectly to it.
2. Software or firmware revision numbers.
3. A clear fault description.
4. Details of any remedial action implemented.

Contamination

If the product has been used in a contaminated or hazardous environment you *must* de-contaminate the product and report any hazards *prior* to returning the unit for repair. *Under no circumstances should a product be returned that is contaminated with radioactive material.*

The name of the organisation which purchased the system is held on record at *Tritech International Ltd* and details of new software or hardware packages will be announced at regular intervals. This manual may not detail every aspect of operation and for the latest revision of the manual please refer to www.tritech.co.uk

Tritech International Ltd can only undertake to provide software support of systems loaded with the software in accordance with the instructions given in this manual. It is the customer's responsibility to ensure the compatibility of any other package they choose to use.

Warning Symbols

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

Note

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

Important

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

Caution

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

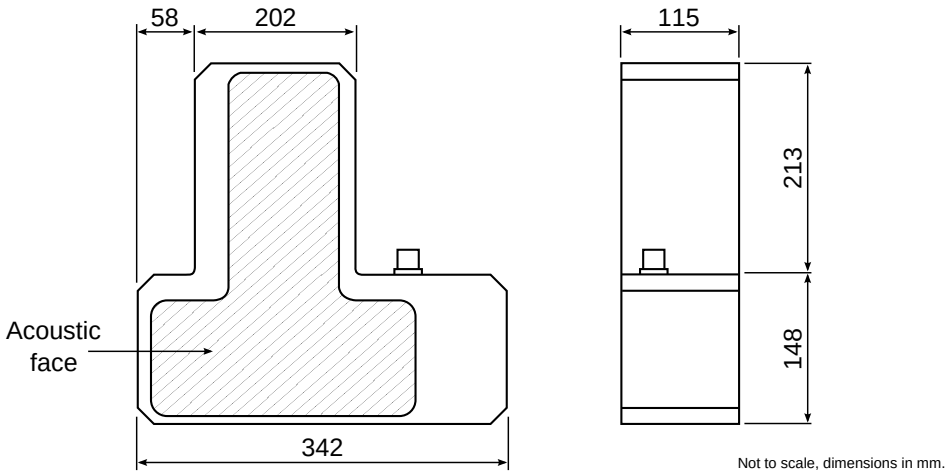
Warning

DANGER OF INJURY TO SELF OR OTHERS

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

1. Specification

Dimensions



Not to scale, dimensions in mm.

Acoustic Properties

Operating frequency	240kHz
Angular resolution	1.5° acoustic, 0.5° effective
Beamwidth	120°
Number of beams	256
Range	120m, 2D forward looking 60m, 2D search 40m, 3D
Scan rate	100Hz at 5m, 7Hz at 100m
Range resolution	2.5cm

Electrical and Communications

Power consumption	60W
Supply voltage	20-28V DC
Communication protocols	Ethernet (100BaseT)

Physical

Weight in air	19kg
Weight in water	9kg
Depth rating	1000m
Operating temperature	-10 to 35°C
Storage temperature	-20 to 50°C

Surface Processing Unit

Dimensions	480x450x180mm (WxDxH)
Weight	14.5kg
Input method	USB keyboard & mouse
Operating system	Microsoft Windows™
Software	Tritech Eclipse Software
Supply voltage	100-240VAC 50/60Hz
Power consumption	170W at 240V AC
Operating temperature	5 to 35°C
Storage temperature	-20 to 50°C

2. Introduction

Eclipse is a 3D imaging sonar with 3D measurement capability. A single housing incorporates transmit and receive multi-beam arrays.

Eclipse uses electronic beam-shaping technology, providing a high performance imaging system which can be used in `3D Volume Visualisation` and `2D Forward Looking` modes.

By electronically steering the beam, a volume is illuminated ahead of the sonar. This is converted, in real time, into a full 3D image. `3D Volume Visualisation` provides a realistic graphical representation of scanned objects.

The sonar data can be motion-stabilised by taking in data from an external motion or tilt sensor.

The sonar data is displayed as a depth palletised 3D volume, where colour represents the difference between the seabed depth and the vehicle Central Reference Point (CRP). Eclipse provides data stream logging and replay as well as having image and volume data snapshot capability. Measurement tools provide range, bearing and relative position to any acoustic target.

The `Volume Visualisation` has a mode which displays all the individual sonar contacts as single points. In this mode it is possible to measure the 3D relationship between two points within the volume.

In 2D mode the Eclipse sonar provides a high update rate which is used to provide display outputs that can be composed of a number of different sonar images, providing better display resolution and filter options such as persistence and movement detection.

Software Version

This manual is applicable to Eclipse software version 2.16.

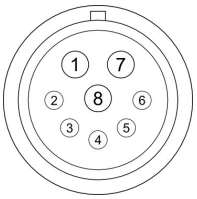
3. Installation

3.1. Cable Specification

The Eclipse system is supplied with two cables, both of which are terminated at one end with a Teledyne Impulse MHDG 3#16 5#20 connector. The 5m cable has bare ends for termination/splicing into the vehicle wiring. The 10m cable is terminated with a Souriau connector which mates to the bench PSU and can be used for testing the Eclipse independent of the vehicle wiring and power supply.

Note

The network signal cables inside the supplied cable are Shielded Twisted Pairs (STP). If splicing to a connector whip that is not provided with twisted pairs, it is important to keep the untwisted length to a minimum (no more than 20cm). Long lengths might result in network losses or communication failure.

Pin	Colour	Function	Diagram	Photograph
1	Blue (4mm²)	DC Ground		
2	White (STP #1)	TX +		
3	Red (STP #1)	TX -		
4	Screen (STP #1)	Screen		
5	Blue (STP #2)	RX +		
6	Red (STP #2)	RX -		
7	Brown (4mm²)	DC +		
8	Screen (STP #2)	Screen	Teledyne Impulse MHDG 3#16 5#20	
Minimum static bend radius: 90mm				
Minimum dynamic bend radius: 125mm				
Note: STP = Shielded Twisted Pair				

Caution

Never try to make the Eclipse work down a long cable by increasing the PSU output voltage above 28V DC.

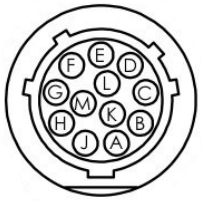
3.2. Bench Power Supply

Warning

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

During installation and testing of the Eclipse it is possible to use the included PSU to provide both power and Ethernet connection to the Eclipse.

The Ethernet connector should be attached to the Eclipse SPU (using the PCI card and not the motherboard connector) and the Souriau connector to the Eclipse cable whip. The Eclipse bench PSU is wired as follows:

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

3.3. Connector Maintenance Guidelines

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

Caution

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

Caution

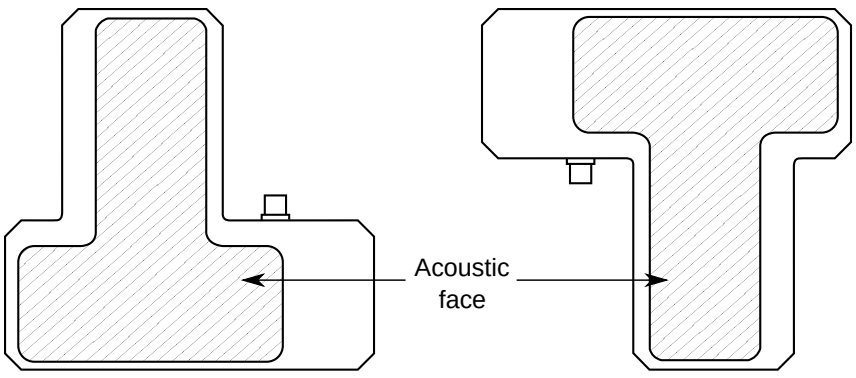
If using alcohol or IPA to clean out the connector take care that it does not come into contact with any other part of the sonar. If an O-ring is present it should be first removed and discarded and the new O-ring only inserted after the IPA has evaporated.

3.4. Positioning the Sonar

The black sonar face should be pointed in the required direction. Normally this would be facing in the same direction as the vehicle. The sonar has a field width of 120°and a field height of 40°. Objects on the vehicle within this field of view will obstruct the sonar view and cause undesirable artifacts in the data.

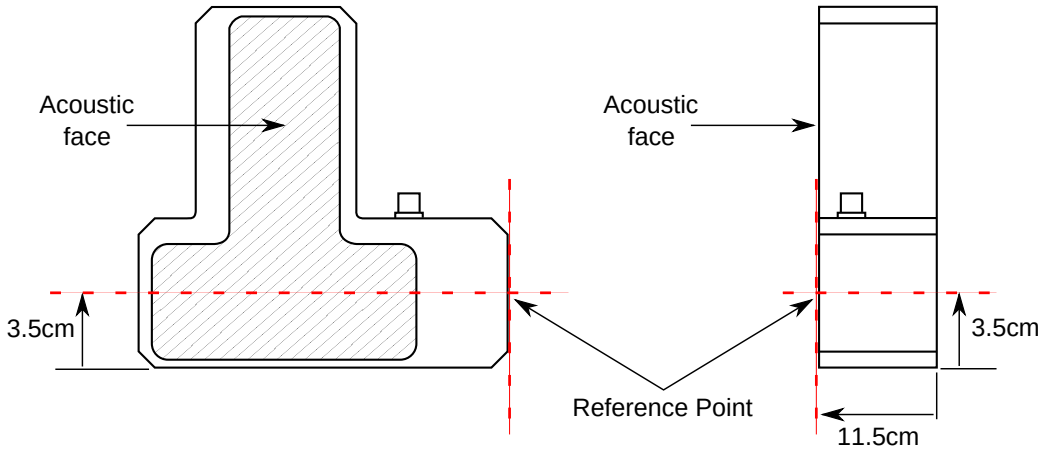
It is recommended that the sonar is pitched down between 10° and 30° which will direct the sonar energy at the seabed in front of the vehicle.

The head can be installed in one of two orientations:



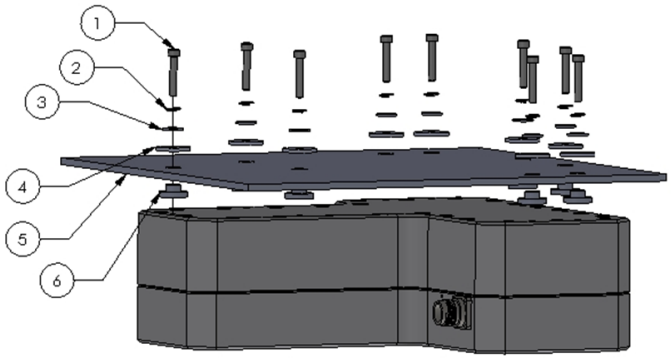
3.5. Reference Point

The reference point for the Eclipse sonar head is taken as being level with the front face, at a point along the short edge closest to the connectors as shown below. The offsets of the individual transducer arrays are contained within the software.

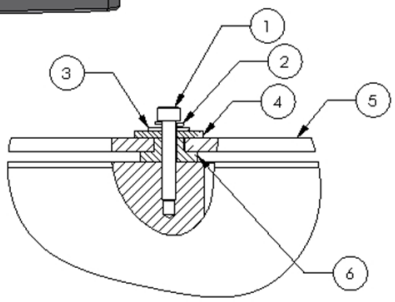


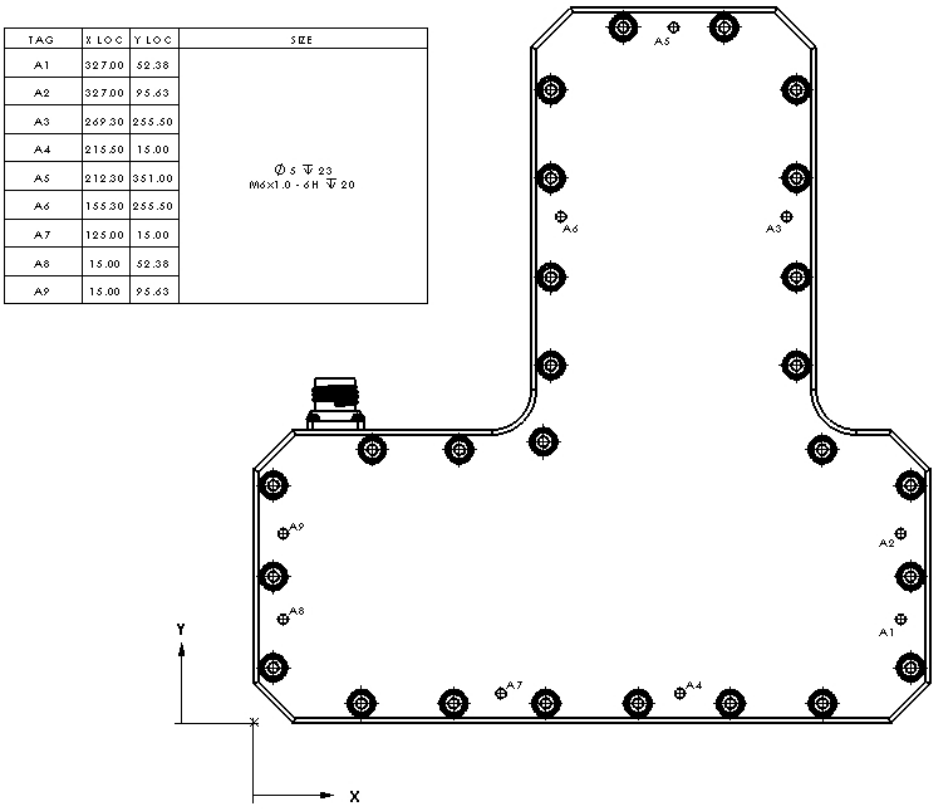
3.6. Mounting the Sonar

The Eclipse has 9, 20mm deep M6 fixing points:



ITEM NO.	DESCRIPTION	QTY.
1	M6 x 30 Stainless Steel Cap Head	9
2	M6 Stainless Steel Spring Washer	9
3	M6 Penny Washer	9
4	Plain Insulating Washer	9
5	Plate Minimum thickness 6mm	1
6	Insulating Washer Sleeve	9





The Eclipse is supplied with a number of insulating washers and fixings. These fixings insulate the sonar from its mounting and are required if the sonar is to be mounted to a non-aluminium frame.

Caution

Mounting the sonar to a non aluminium frame without the use of the isolation fixings will cause corrosion of the unit and reduce its life expectancy.

3.7. Surface Equipment

The Eclipse is supplied with the following dry end components:

- 19" 4U rack mountable Eclipse SPU with case key and mains lead
- USB keyboard
- USB mouse
- RJ45 terminated Cat5 Ethernet cable

- DVI to VGA adapter
- User manual
- Eclipse Bench PSU

Note

The Eclipse system is not supplied with a monitor. A quality 24" widescreen monitor with a minimum resolution of 1280x1024 or above is recommended.

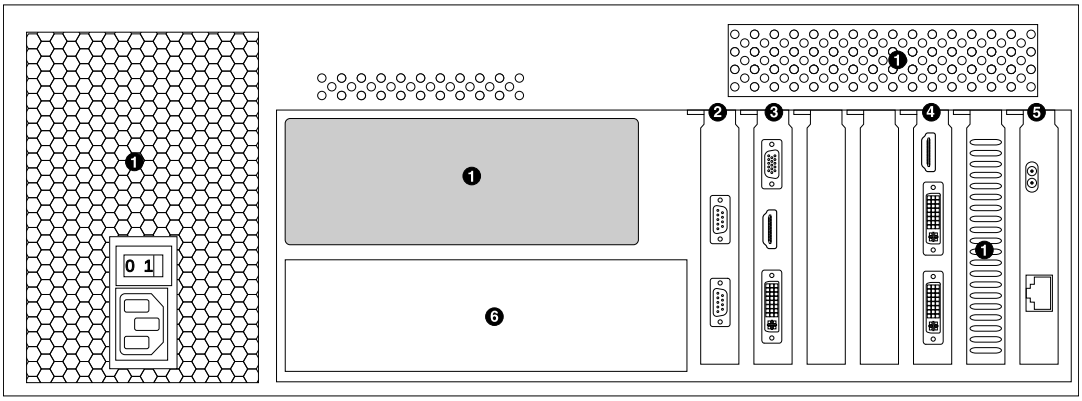
Caution

The Eclipse SPU should be positioned such that the front and rear vents are not obstructed. Obstruction to the vents may result in the machine overheating which could result in damage to the equipment.

Power

The Eclipse SPU is turned on using a button located behind the lockable front panel. If this does not work it may also be necessary to turn the switch on the rear to the `1` position.

Rear Panel



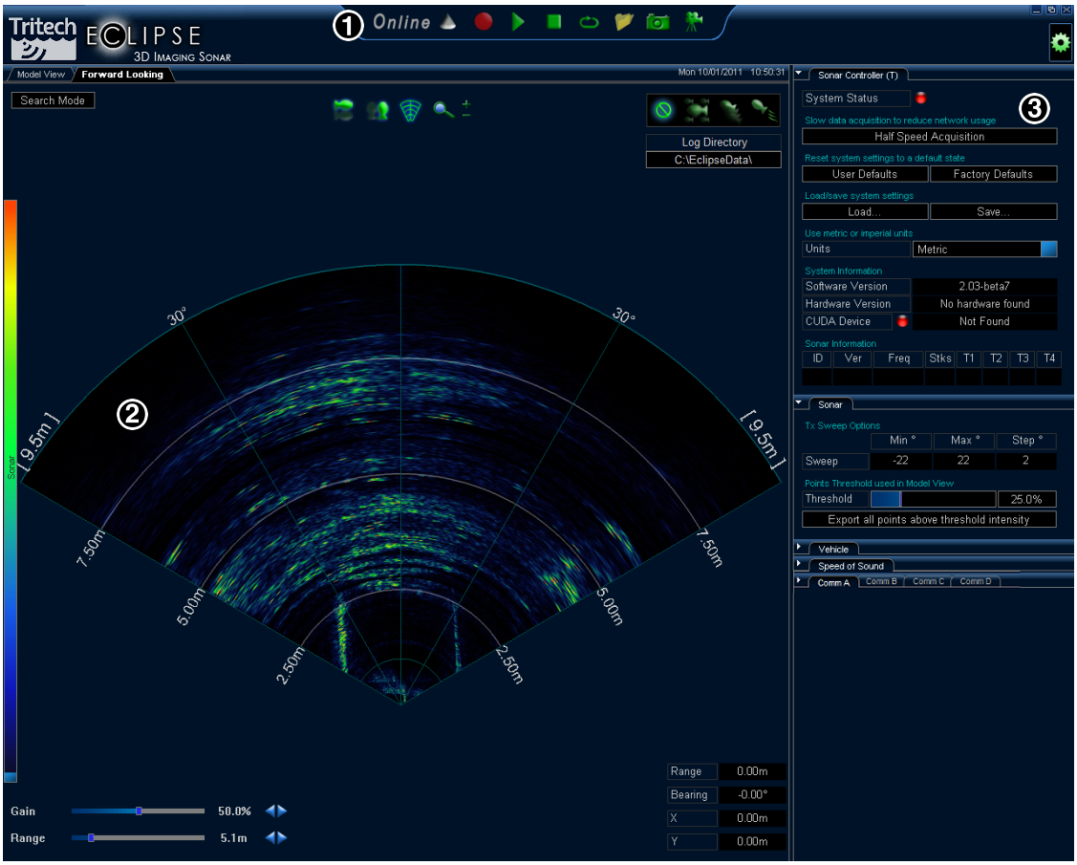
❶ Ensure all vents are free from obstructions.
❷ DE-9 (RS232 ports for ancillary sensors.
❸ VGA or DVI connector for monitor.
❹ Graphics card for CUDA processing (*do not* connect monitor to this card).
❺ Ethernet card for connection to Eclipse.
❻ Motherboard connectors. Connect keyboard/mouse to the USB ports here. If an Ethernet (RJ45) port is present it can be used to connect to an IT infrastructure but *should not* be used for the Eclipse (type, quantity and layout of these connectors may vary depending on the motherboard model).

3.8. Software

The Eclipse SPU will be supplied with all the required software already installed.

4. Operation

4.1. Overview



❶ Toolbar containing buttons to control common functions.
❷ Display area for the sonar images.
❸ Advanced options (toggled on/off with the button in upper right) for setup and configuration.

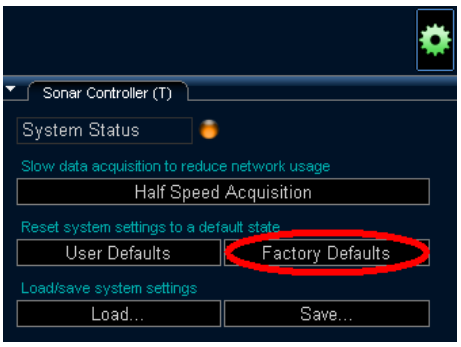
Note

When the mouse is hovered over a control, a tooltip will be displayed showing a description of that control and pressing `F1` on the keyboard will open the online help at the relevant section.

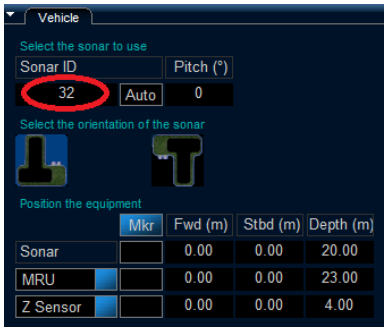
A PDF copy of the manual is installed along with the Eclipse software and is accessible from the Windows Start menu.

4.2. Sonar Communications

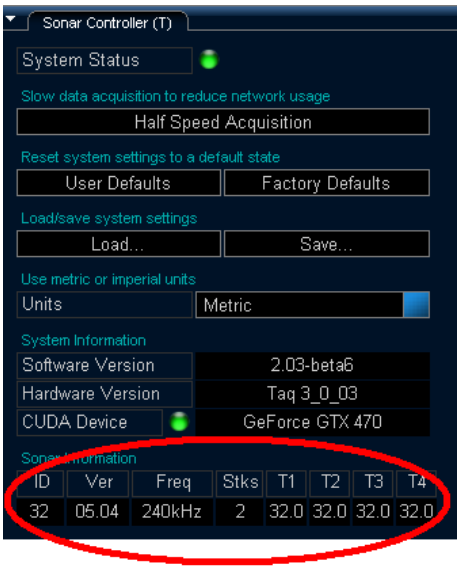
Ensure all connections are made and power is provided to the sonar head. Next make sure the Eclipse software is in the default state by pressing the `Factory Defaults` button in the advanced options area:



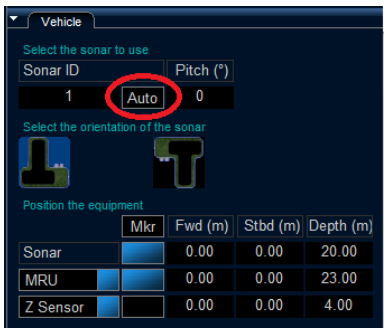
Enter the `Sonar ID` of the Eclipse sonar head in the `Vehicle` tab in the advanced options area:



The `Sonar ID` of the first sonar that the software has found is displayed in the `Sonar Controller` tab:



To automatically use the `Sonar ID` of the first sonar that the software has found, press the `Auto` button in the `Vehicle` tab:



Once the `Sonar ID` is set, press the `Online` button in the toolbar to enable sonar operation.

Note

Occasionally when the Eclipse software is first started the sonar head will not communicate due to network issues. If restarting the software does not resolve the problem the physical connection should be checked.

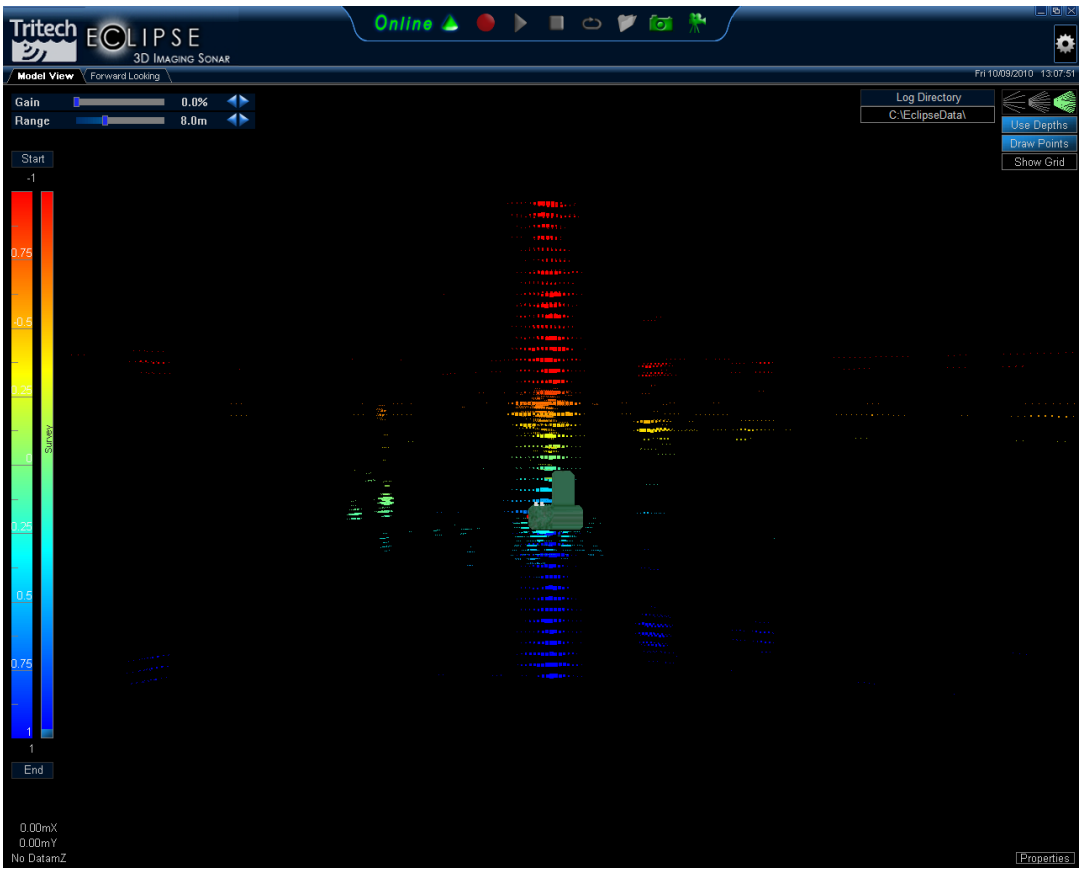
4.3. Keyboard Shortcuts

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

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

4.4. 3D Volume Visualisation (Model View)

The Model View is a 3D display that can be rotated and tilted by holding down the left mouse button and dragging the mouse around the display. Data is displayed in a 3D perspective model. This view automatically zooms and centres based upon the current range.



4.4.1. Gain

0 to 100%

Gain is the amount of amplification applied to the sonar signal at the Eclipse sonar head. Increasing the gain will show targets of lower strength but will also increase the amount of noise and interference seen by the sonar.

4.4.2. Range

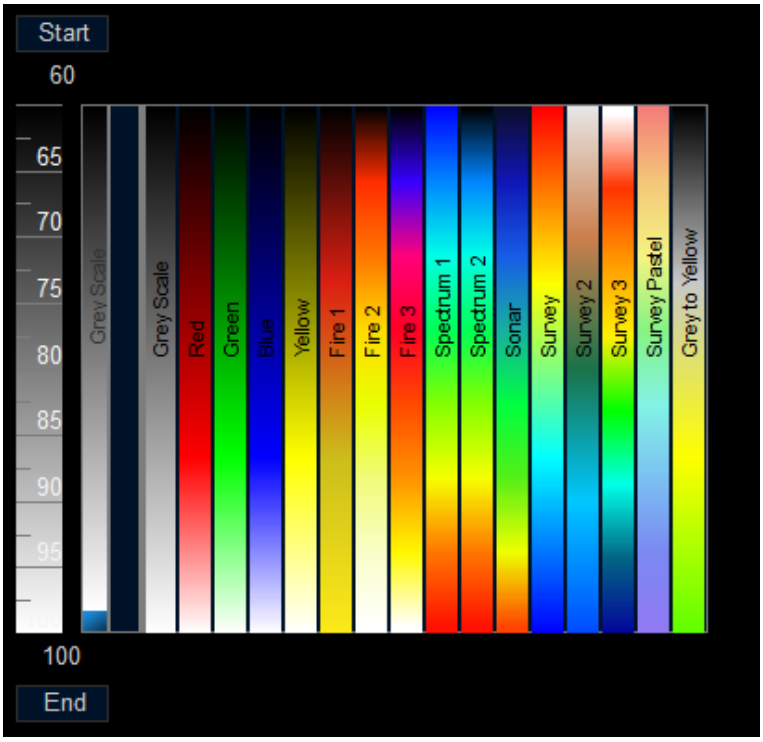
4 to 120m

This is the maximum slant range used by the sonar. The end range will determine the maximum update rate of the system. A longer range value will have slower update rates due to the time taken for the sonar pulse to return from the furthest range. Short ranges will have faster update rates.

Note

The range can also be increased and decreased using the scroll wheel on the mouse.

4.4.3. Palette



Palettes are used to convert numerical values for intensity and depth into a representative colour. A number of palettes are available and can be selected by clicking on the palette bar. Eclipse has a `Depth Palette` and `Intensity Palette` (see *Use Depths*).

When *Use Depths* is enabled, the text at the top and bottom of the palette is editable and represents the start and end depth for the palette. Any sonar return which is shallower than the start depth will be coloured in the start colour and any return deeper than the end depth will be given the end colour.

If depth data is available from an external depth sensor, then the values entered here are absolute depths (see Section 4.7, “Advanced Controls”). If no depth data is present then anything above the centre of the Eclipse is considered to be negative and anything below it is positive so the `Start` should be set to a negative number and the `End` set to a positive number.

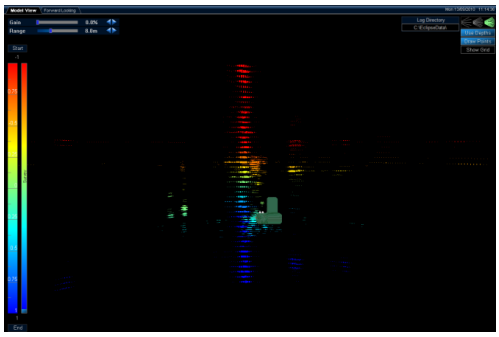
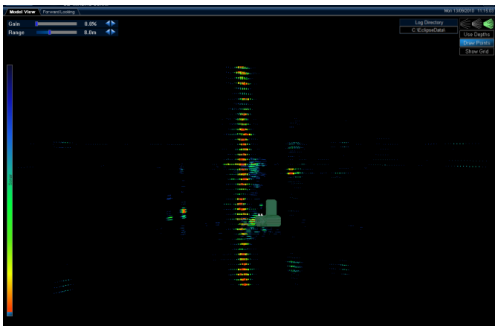
4.4.4. Scan Step

Scanning a 3D volume takes a period of time which is mainly dictated by the end range of the system and the number of scans contained in a volume. Increasing the scan step will reduce the amount of time needed to generate a 3D volume but will reduce the level of detail visible:

Course 4° step, fastest, least detailed.

Medium	2° step.
Fine	1°step, slowest, most detailed.

4.4.5. Use Depths

Depth Palette	Intensity Palette
	
When `Use Depths` is enabled the the `Depth Palette` is used to show different depths in different colours. The start and end depth of the palette can be entered (in metres or feet, depending on the unit type selected). All depths shallower than the top depth use the first colour of the palette and depths deeper than the bottom depth will use the last colour of the palette. The bottom depth of the palette also sets the bottom depth of the 3D grid.	When `Use Depths` is not enabled the `Intensity Palette` is used to colour points for 0-100% of intensity. The `Intensity Palette` is also used for the Forward Looking (2D) display.
	

4.4.6. Draw Points

Normally data is shown as a series of scan images with data being faded based upon the intensity of the target. Targets with intensity below 5% are not displayed and those above 5% are semi-transparent becoming more opaque as the targets become brighter.

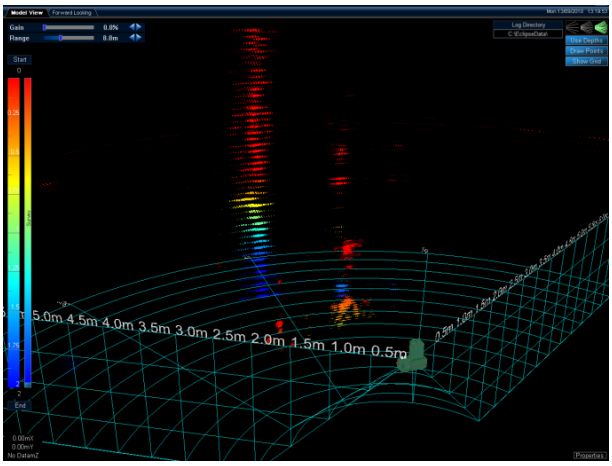
With `Draw Points` enabled, data is instead drawn as a points cloud, which allows accurate measurements to be made between points. Only sonar contacts with an intensity above a set threshold are considered to be a point (the `Threshold` is set in the Advanced Options - see Section 4.7.2, “Sonar”).

Note

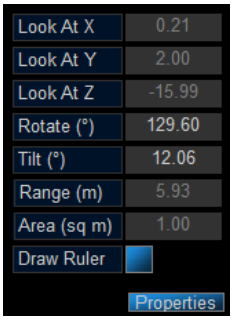
The system will slow down if a very large number of points are displayed, so do not set the threshold too low when working at long ranges or when lots of targets or background noise is present in the sonar image.

4.4.7. Show Grid

Toggles the display of the 3D grid. The grid is drawn as far as the `Range` setting, and also uses the bottom depth value given in the depth palette.



4.4.8. Properties



This pop-up menu shows information about the current display view.

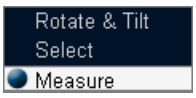
The `Draw Ruler` check box forces the ruler to be permanently displayed - normally the ruler is only displayed while the left mouse button is being held down to take a measurement.

4.4.9. Cursor

When the mouse cursor is in the display area, the cursor display will show the cursor position relative to the `Reference Point` in metres or feet, depending on the unit type selected.

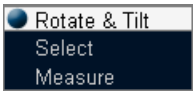
4.4.10. Measurements

To make a a measurement, right-click with the mouse anywhere in the display area and select `Measure` from the pop-up menu.



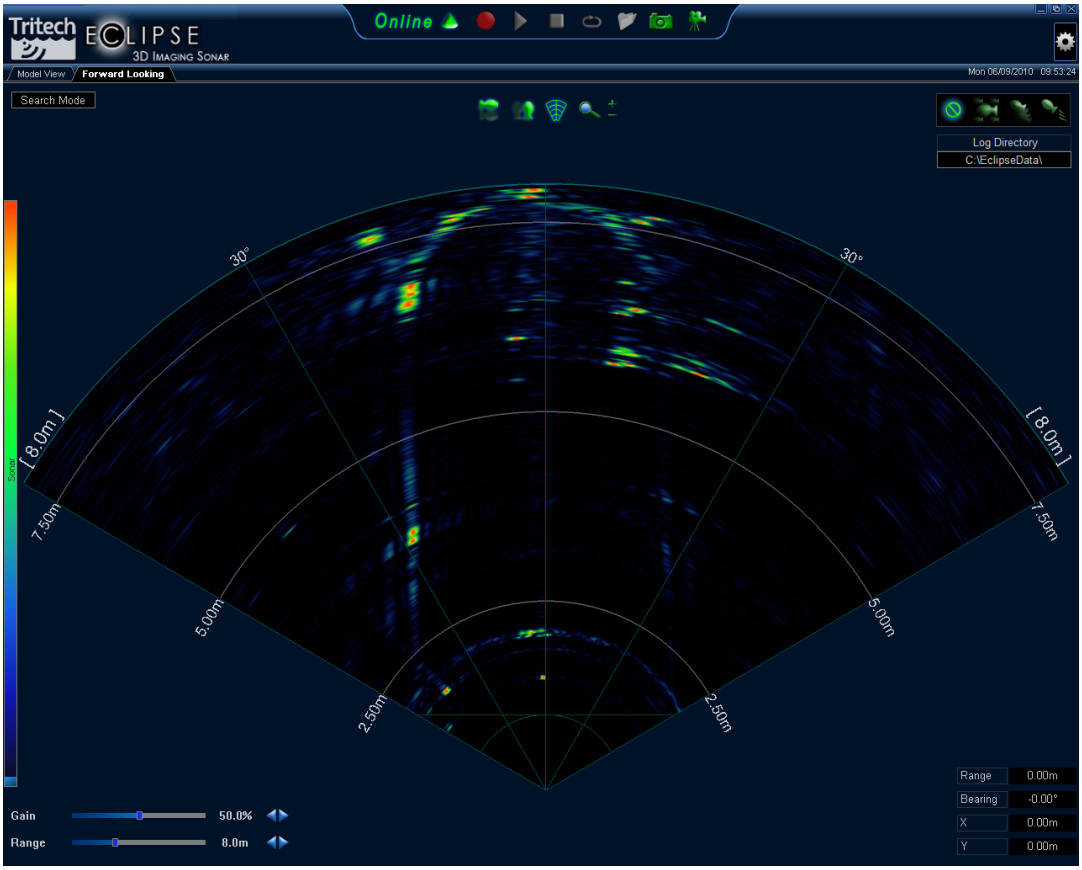
Then hold down the left mouse button above the measurement start point and drag the mouse to the measurement end point. The measurement will be displayed on the ruler.

To finish measuring and return the 3D scan to default operation, right-click with the mouse anywhere in the display area and select `Rotate & Tilt` from the pop-up menu:



4.5. 2D Forward Looking

The Forward Looking display is a top down plan display that draws data acquired as a 2D image.



Rather than building a 3D image, the 2D display provides an instant picture of the seabed in front of the vehicle. Only one image is used so the display updates very quickly, even at longer ranges, which allows the ROV to be piloted using the screen.

4.5.1. Search Mode

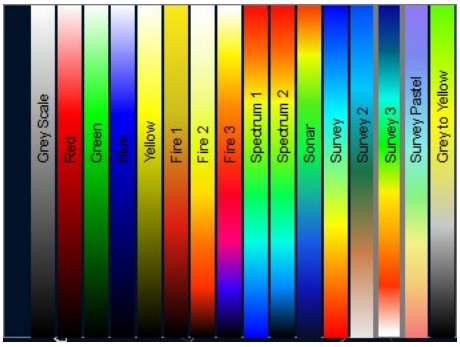
Normally the Eclipse transmits a thin 1.5° by 120° beam which is useful for:

- Measurements between vertical targets are required.
- Only a small part of the total image is of interest.
- Long ranges are required (up to 120m depending on water conditions).

By enabling `Search Mode`, Eclipse will transmit a thicker beam (40° by 120°). This mode illuminates all of the area in front of the sonar and is used as a general forward looking sonar (maximum range 60m).

4.5.2. Palette

There is no depth information on the 2D display so the data is displayed using the `Intensity Palette`. Clicking on the palette bar opens the palette selector.



4.5.3. Invert Display (Up/Down)

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

4.5.4. Flip Image (Left/Right)

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

4.5.5. Draw Grid

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

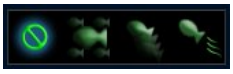
4.5.6. Zoom

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

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

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

4.5.7. Filter Selector



The image filters are used to take information from a number of consecutive sonar images and compile them into one continuous output image. From left to right they are:

No Filter	No filtering is applied, each image received from the sonar replaces the previous image.
Average Filter	This output displays the average of a number of scans. This is useful for removing noise and transient data from the image. Static targets will get strengthened and moving targets will get reduced.
Persistence Filter	This output displays the maximum of a number of scans. The maximum is decayed over time. The previous positions of moving targets are persistent and will generate a slowly decaying image (i.e., "snail trails"). When in this mode, noise and other transient data will also be persistent.
Movement Filter	This output enhances moving targets. Targets that are static are faded out. Moving targets remain on the screen. This feature is useful to highlight movement of targets that have a low strength compared to the background returns.

4.5.8. Gain

0 to 100%

Gain is the amount of amplification applied to the sonar signal at the Eclipse sonar head. Increasing the gain will show targets of lower strength but will also increase the amount of noise and interference seen by the sonar.

4.5.9. Range

4 to 120m

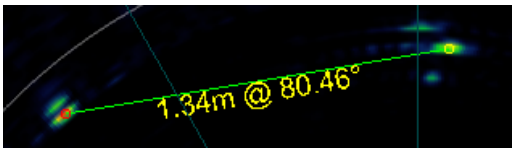
This is the maximum slant range used by the sonar. The end range will determine the maximum update rate of the system. A longer range value will have slower update

rates due to the time taken for the sonar pulse to return from the furthest range. Short ranges will have faster update rates.

4.5.10. Cursor Display

When the mouse cursor is in the display area the cursor display will show the cursor position relative to the Reference Point in metres and degrees.

To make a measurement between two points in the image, hold down the left mouse button at the measurement start point, and drag the mouse to the measurement end point. The range and bearing from the start point to the end point will be displayed along the line.



4.6. Toolbar Functions

The toolbar is at the top of the screen and gives quick access to eight common functions.

Online	Toggles the sonar operation.
Record	Toggles the logging of the sonar data.
Play/Pause	Toggles the replay of log files.
Stop	Stops the replay of log files.
Repeat	Repeats the replay of the log file when it reaches the end.
Load	Loads a log file.
Capture Screen	Captures the current workspace view as a JPEG file.
Record as WMV	Toggles the recording of the display area as a WMV file.

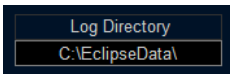
Note

Alarm and information messages are displayed below the toolbar:

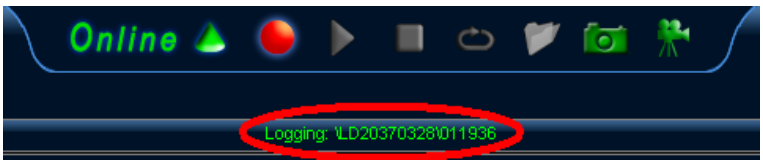
4.6.1. Recording (Logging) Sonar Data

Sonar data can be logged at any point by pressing the `Record` button on the toolbar. Data is saved as a compressed sonar image that can be replayed at a later date.

When logging is active, all sensor data being received by the software will be logged in conjunction with the sonar data. The log files are saved in a directory as specified by clicking on the `Log Directory` on the main sonar screen (the default is `C:\EclipseData` or `D:\EclipseData`, depending on the configuration of the SPU disk):

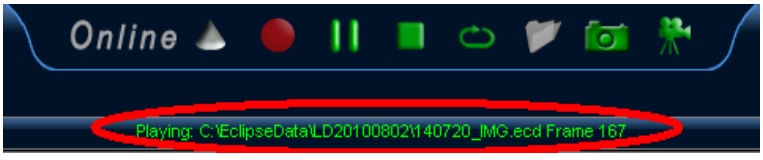


The files will be saved to an automatically created subdirectory which is named based on the current date and to a filename which is named based on the current time. The location and name of the files are displayed in the titlebar:



4.6.2. Replaying Sonar Data

Sonar data can be replayed by clicking on the `Load` button on the toolbar and selecting the log file using the dialog. Once opened the log file will automatically start to play and the name of the file is displayed in the titlebar together with the frame number. The software will automatically select the same view (`Forward Looking` or `Model View`) that was used when the log file was created.



When a log file is being played, the `Play/Pause` button can be used to halt and restart the replay of data from the current frame. The `Stop` button halts the replay

of data and resets the file to the first frame. The `Repeat` button replays the log file when it reaches the last frame.

4.6.3. Capture Screen

The `Capture Screen` button in the toolbar will snapshot the current workspace view and save it as a JPEG. The first time this button is pressed it will create an `images` subdirectory to the selected log file directory (the default being `C:\EclipseData\images`) and then store the image. The filenames are automatically numbered in ascending sequence and given the title "Eclipse" (i.e. `Eclipse_0001.jpg`, `Eclipse_0002.jpg`).

4.6.4. Record as WMV

The `Record as WMV` button in the toolbar will toggle recording of the current workspace view and save it as a WMV file. The first time this button is pressed it will create an `images` subdirectory to the selected log file directory (the default being `C:\EclipseData\images`) and then store the movie. The filenames are automatically numbered in ascending sequence and given the title "Eclipse" (i.e. `Eclipse_0001.wmv`, `Eclipse_0002.wmv`).

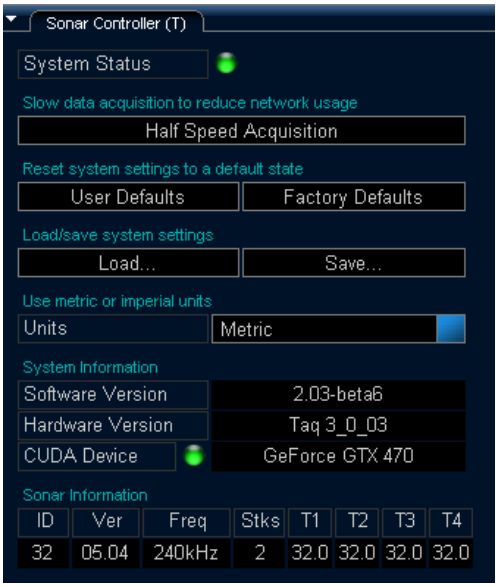
4.7. Advanced Controls

The `Advanced Options` area contains setup options which are not normally required for day to day sonar operation.

Within the advanced options area, there are five separate tabs, each containing setup options for different parts of the Eclipse system. The tabs can be opened or closed by clicking on the white arrow on the left hand side of the tab.

4.7.1. Sonar Controller

The Sonar Controller manages communications with the Eclipse sonar head. It also allows all the system settings to be loaded or saved to a settings file.



System Status

The `System Status` is a three-colour indicator which shows the state of the hardware:

Green	Communications with Eclipse sonar head is OK.
Orange	Eclipse SPU ready but no communications with Eclipse sonar head.
Red	Driver or interface card failure in the Eclipse SPU. Hover the mouse pointer over the indicator for more detailed information about the problem.

Half Speed Acquisition

Normally the Eclipse system tries to fire the sonar continuously with little or no delay between pings. This buttons slows the sonar ping rate to 50% of the maximum rate, reducing the amount of data that is sent by the Eclipse sonar head.

Note

If the column being visualised has been generated with very small steps it may be necessary to reduce the sonar ping rate.

User Defaults

This loads all the system settings from the file `UserDefaults.xml` which is normally in `C:\EclipseData\Settings`.

One advantage of having a custom default setup (rather than using the factory default setup) is that it is possible to set up the default vehicle parameters corresponding to a specific installation.

Factory Defaults

This reverts all system settings to the default factory settings. Use this option if experiencing unusual behaviour from the Eclipse sonar to be certain that the software is set up properly.

Note

After resetting to factory defaults it will be necessary to set the `Sonar ID` again (see Section 4.2, “Sonar Communications”).

Load/Save Settings

Eclipse automatically saves all the system settings when the software is shut down. These settings are also automatically reloaded when the software starts. The `Load` and `Save` buttons are to load and save the system settings to an XML file. This is useful to keep if ever the software or operating system requires re-installation.

Note

To use the XML file as a `User Default` file it will have to be saved as `C:\EclipseData\Settings\UserDefaults.xml`.

Units

This allows the units of measurement to be selected. Available options are `Metric` and `Imperial`.

System Information

This displays the version information for the Eclipse (SPU). If there is ever a requirement to contact *Tritech International Ltd* Technical Support it may be necessary to provide this information.

Note

The CUDA Device indicator shows the status of the graphics processor which is being used for processing the 3D imagery. If the indicator is red or amber, hover the mouse pointer over it to get more detailed information on the problem.

Sonar Information

This displays version information for the Eclipse sonar head. If there is ever a requirement to contact *Tritech International Ltd* Technical Support it may be necessary to provide this information.

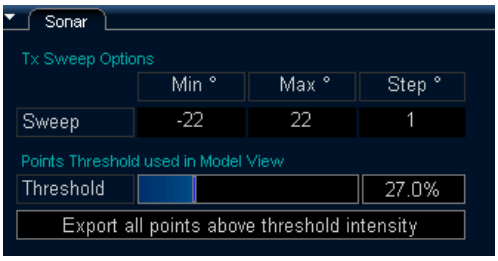
ID Sonar ID

Ver Sonar head firmware version.

Freq	Frequency of operation of the transducer.
Stks	Number of TX/RX stacks in the sonar head.
T1-T4	Temperatures at positions inside the sonar head.

4.7.2. Sonar

These options control the sonar when scanning a 3D volume in the `Model View`.



Sweep Options

These options control the scanning transmitter.

Min °	The minimum (top) angle that the sonar scans to in degrees. Normally -22°.
Max °	The maximum (bottom) angle that the sonar scans from in degrees. Normally 22°.
Step °	The step size between scans. Normally this is set using the `Scan Step` control on the `Model View`, however, if desired it can be set here.

Points Threshold

With `Draw Points` enabled the `Model View` is drawn as a points cloud. Only sonar contacts with an intensity above the `Points Threshold` are considered to be a point (this threshold is also used for the `Export` function).

Note

The system will slow down if a very large number of points are displayed. Do not set the threshold too low, particularly when working at long ranges or when lots of targets or background noise is present in the sonar image.

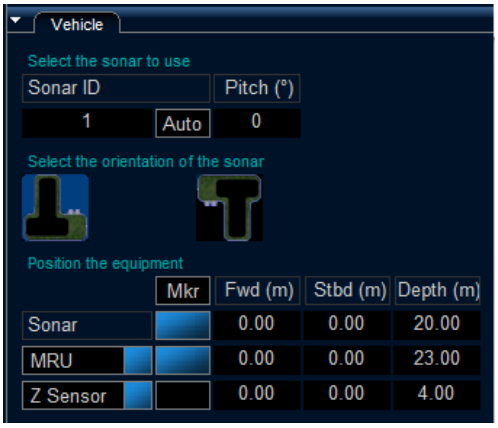
Export all points above threshold intensity

All points in the volume above the specified threshold will be exported to an ASCII comma separated value (.csv) file that has the format:

```
dY, dY, dZ, Intensity
```


The dX, dY and dZ values are relative to the vehicle Central Reference Point (CRP).

4.7.3. Vehicle



Sonar ID

The easiest way to set the `Sonar ID` is to press the `Auto` button and the first sonar available on the network will then be automatically selected.

If desired, a number can be entered manually.

Sonar Pitch

Set the sonar pitch to match the pitch angle (in degrees) at which the Eclipse sonar head is mounted on the vehicle. Use a negative number if the sonar is pointing down towards the seabed.

Sonar Orientation

Set the orientation to match how the Eclipse sonar head is mounted on the vehicle. The options are connectors-up and connectors-down as indicated by the illustrations, click on the image which matches the correct orientation.

Changes in the orientation are reflected in the `Model View` with the Eclipse head changing according to which button is pressed.

Equipment Position

It is useful to be able to configure the offset of various equipment in relation to the Central Reference Point (CRP) of the vehicle, this is particularly important on larger ROVs where there may be a significant distance between the different devices.

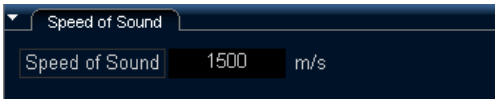
Text can be entered in each box to configure the position of the sonar, a Motion Reference Unit (MRU) and the `Z Sensor` (depth sensor). Clicking in the `Mkr` column turns the marker on/off on the `Model View`. Clicking the `Mkr` column *title* turns the CRP marker on/off. When turned on each device will show as a red dot to indicate its position.

Note

Changing the equipment positions will cause any existing image data to be cleared from the Model View. This ensures that new image data is immediately visible using the new equipment positions.

4.7.4. Speed of Sound

The speed of sound can be manually entered using this text field.

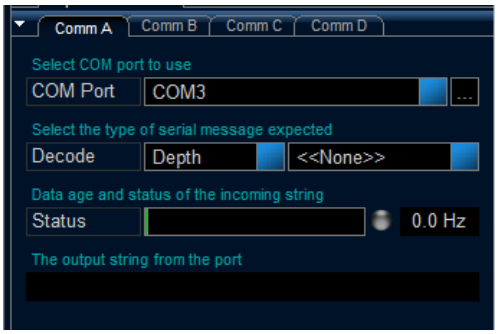


If a speed of sound serial input device is configured in the `Comm` setup (see below) the text field will be automatically updated with the measured speed of sound. Averaging is applied to the measured speed of sound values to smooth out sensor readings.

4.7.5. Comm

Eclipse provides for a motion sensor to be connected into the Eclipse SPU to apply heave, pitch and roll compensation to the sonar position in the water. Depth data can also be supplied by an external altimeter device.

Up to four external sensors can be fitted to the system and are configured by selecting the tabs `Comm A` through to `Comm D`. For each tab the configuration options are the same.



Comm Port

The drop-down list allows the selection of the SPU serial port to configure. Once this has been selected, click on the ellipsis to bring up the Windows `COM Properties` dialog for further configuration.

Note

Make sure that the settings in the `COM Properties` dialog match those of the sensor which is attached.

Decode

The first drop-down list selects the sensor type, choose from `Motion`, `Depth` or `SOS` (speed of sound).

Once the type of sensor has been selected choose from an appropriate input string using the second drop-down list.

Status

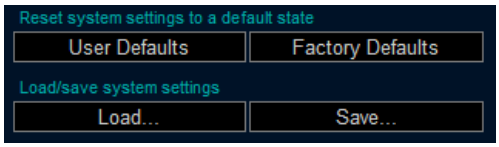
The data age status indicator will show the status of the port. A grey indicator means no data is present, red is for an incorrect data string, yellow indicates an incomplete data string and green is for normal operation.

The output string from the sensor is also displayed.

4.8. Manually Restore Settings

Note

The following instructions should be considered as a last resort only when the Eclipse software fails to start due to a corrupted XML settings file. In preference the software should be run and the reset or load settings buttons should be used (`Advanced` settings, `Sonar Controller`):



Note

Depending on the system setup the Eclipse data files are either stored in the `C:\` drive or the `D:\` drive - please examine the system at hand and adjust the instructions accordingly (i.e. change `C:\EclipseData` to `D:\EclipseData` where necessary).

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

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

1. Shut down the Eclipse software.

2. Delete (or rename) the `C:\EclipseData\Settings\Eclipse.xml` file.

3. Copy the historical settings (*.xml) file into the location `C:\EclipseData\Settings` and rename it to `Eclipse.xml`

4. Start the Eclipse software.

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

1. Shut down the Eclipse software.

2. Delete (or rename) the `C:\EclipseData\Settings\Eclipse.xml` file.

3. Copy the `Factory.xml` file into the location `C:\EclipseData\Settings` and rename it to `Eclipse.xml`

4. Start the Eclipse software.

5. Care & Maintenance

5.1. Sonar Head

After using the sonar

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

If storing the sonar for extended periods

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

Regular maintenance

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

5.2. Eclipse SPU

Software Maintenance

The operating system running on the SPU is Microsoft Windows and does not have any anti-virus or protection software installed by default.

It is possible to restrict access to the USB drives using the lock on the front panel. The Eclipse SPU is designed to be a stand-alone machine, however, if it is to be installed on a network appropriate software should be used to protect against viruses known to affect Windows computers.

Note

A regular backup schedule for any important log files should be in place for the SPU since re-initialisation may erase the hard drive contents.

To ensure that the system remains secure and error free it is recommended that no extra software other than is absolutely necessary (such as anti-virus software) is installed on the SPU.

Hardware Maintenance

The maintainable parts of the hardware are limited to the cooling fans in the chassis.

Care should be taken to keep the filters clean and the environment free from dust and moisture.

Failure of the chassis fans will result in elevated temperatures which will shorten the life of the product, so any failures should be replaced immediately. If the CPU, GPU or PSU fans fail then the SPU will auto-shutdown and operation will not be possible until the fan is replaced.

Chassis fans can be replaced with standard computer case fans. Replacement of the CPU, GPU or PSU fans will require replacement components. Please contact *Tritech International Ltd* for details of the support options available.

6. Troubleshooting

The software reports that no sonars are detected

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 Eclipse is connected and powered through a vehicle Ethernet infrastructure it may be helpful to isolate it from the vehicle and connect directly to the Eclipse SPU. Use the 10m test cable and bench PSU to make a direct connection to the Eclipse.

Make sure that the Eclipse is connected to the correct network interface on the rear of the SPU (i.e. *do not* use the motherboard connector).

Note

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

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.

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

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

Sonar is present, but screen shows no sonar images

Make sure that the `Gain` is not set to 0%.

Check the nVidia graphics drivers are up to date and support the latest CUDA functionality - if in doubt install the latest drivers from Nvidia. Drivers are available directly from the nVidia website so it may be necessary to connect the Eclipse SPU to the Internet. Make sure that the correct operating system is selected while browsing for the drivers.

CUDA Device is not recognised

First try updating the graphics card drivers with the latest version available from the nVidia website.

If after updating the drivers the card is still not recognised, open the Eclipse SPU case and make sure that both of the graphics cards are securely fitted into the PCI slots.

No Hardware Found, or program crashes

Open the Eclipse SPU and check that the TAQ card (PCI Timestamped Acquisition card - the PCI card which the Eclipse Ethernet cable connects to) is securely seated in the PCI slot.

If this does not solve the problem search the entire `C:\` drive for files named `tvichw*.*` and delete them. Reboot the computer and then re-install the Eclipse software.

Appendix A. Eclipse Software String Decode

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

Name	Description	Format/Examples
Digi	Parascientific Digiquartz (depth sensor)	`000.0`

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

OctansGHPR	Heading, Heave, Pitch, Roll	`$HEHDT...` `$PHTRH...`
OctansHPR	Heave, Pitch, Roll	`$PHTRH...`
OctansPR	Pitch, Roll	`$PHTRO...`
SonDepth	Depth	`$SONDEP...`
TSS Std 1	Heave, Pitch, Roll	`:000000 -0000H-0000 -0000`
Octans Std 2	Heading, Heave, Pitch, Roll	`:00000 -0000H-0000 -0000F`
Speed of Sound	Speed of Sound	`1500.0`
Simard EM3000	Heading, Heave, Pitch, Roll	n/a
CDL Mini Tilt	Pitch, Roll	`P+0000.0R+0000.0`
HMRU	Heave, Pitch, Roll	`$PHTRH...` `:000000 -0000H-0000 -0000`
AML Smart SVP	Speed of Sound	`0 1500.0`

Note

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

Glossary

ASCII	American Standard Code for Information Interchange - a character encoding scheme originally based on the English alphabet.
CPU	Central Processing Unit, the processor of a computer.
CRP	Central Reference Point
CSV	Comma Separated Value - a text file in tabular format with table cells separated by commas, usually given the filename extension `.csv` but this can vary depending on the application.
CUDA	Compute Unified Device Architecture - a parallel computing architecture developed by Nvidia for graphics processing.
DC	Direct Current
DE-9	A 9 pin D shaped connector commonly used for serial communications on computers.
DVI	Digital Visual Interface, a standard connector for connecting from a computer to a monitor.
Eclipse SPU	A special version of the Tritech Surface Processing Unit (SPU) which has a high power graphics card capable of processing the Eclipse 3D imagery and a special Ethernet card for connection to the Eclipse.
Ethernet	A family of computer networking technologies for local area networks (LANs).
GPU	Graphics Processing Unit, the card within the computer which is responsible for generating visual output.
IPA	Isopropyl Alcohol (also known as 2-propanol, isopropanol, rubbing alcohol and iPrOH).
IT	Information Technology
JPEG or JPG	Joint Photographics Expert Group - a compression method and file format for image files, files can be stored with either `.jpeg` or `.jpg` file extensions
MHDG	Miniature High Density - a connector range from Teledyne Impulse.
MRU	Motion Reference Unit

PCI	Peripheral Component Interconnect - used to refer to both the transfer bus and the socket for expansion cards within a computer.
PDF	Portable Document Format - a file format designed for the distribution of documents among different operating systems and devices.
PSU	Power Supply Unit
RJ45	Registered Jack wiring scheme commonly used to refer to the 8 position 8 contact (8P8C) connector wired for Ethernet communications.
ROV	Remotely Operated Vehicle
RS232	Traditional name for a series of standards for serial binary data control signals.
RX	Receive (data)
SCU	Surface Control Unit - a specially manufactured computer which is rack mountable and capable of processing the data from the sonar equipment running either Windows XP Embedded or Windows 7 and Seanet Pro or Gemini software.
SOS	Speed of Sound
SPU	Surface Processing Unit - a more powerful specialised computer than the Tritech Surface Control Unit (SCU) capable of driving multiple sonar heads.
STP	Shielded Twisted Pair (cable) - a standard for communications cable with no cable screen and foil pair shielding (known as Unshielded Foil Twisted Pair (U/FTP) under ISO/IEC 11801).
TAQ	PCI Timestamped Acquisition card - the PCI card in the Eclipse SPU which the Eclipse Ethernet cable connects to.
TX	Transmit (data)
USB	Universal Serial Bus.
VGA	Video Graphics Adapter
WMV	Windows Media Video - a compression format for several proprietary codecs developed by Microsoft for storing video files.
XML	Extensible Markup Language. A markup language and file format that is designed to be both human and machine readable.

